Pelican NP & NR T4i & T4F Diagnostics

DIAGNOSTICS MANUAL



ELGIN
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Pelican NP & NR Error Code Diagnostics

Preliminary Checks

Before starting to diagnose and check components related to an error condition, always CHECK ALL FUSES used to protect the circuit. See the back side of the fuse box cover for fuse and relay locations

NOTICE

In some circumstances the fuse may be routing a limited amount of current. If a doubt exist, replace the fuse.

Read the sections in the service manual related to the error and become familiar with the switches and electrical circuits associated with the error.

See the section entitled Solenoid Valves in the service manual for a description of solenoid valves and location of the solenoid.

Read and understand the service manual sections related to the electronic control modules, pin locations and uses, Speedometer connectors and Indicator Lamps and Icons.

Use the Diagnostics and Troubleshooting section to help locate and correct errors and problems. Use the service manual section entitled LCD Display and Menu Selection to check component settings and parameters.

Perform a complete battery and charging circuit test. Refer to the Service Manual for this procedure. Make sure the battery terminals are clean and secure. Inspect the ground cable for excessive wear and damage.

Testing Relays

The relays are mounted in the fuse and relay panel located on the left side of the console (Figure 1).

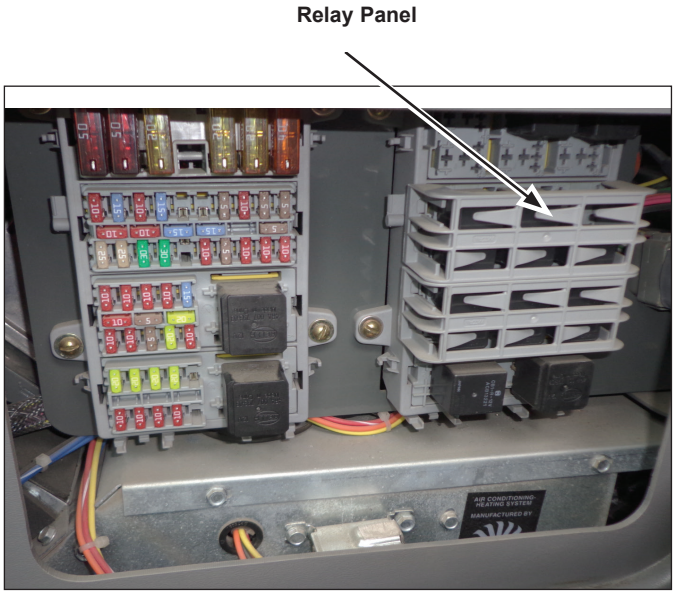
The relay wiring connections can be accessed from the back of the panel inside the console (Figure 2).

The relay pins for micro and mini relays are shown in Figure 3. Locate the relay using the relay chart mounted on the back of the fuse and relay panel cover. After locating the relay find the reverse side of the relay inside the console (Figure 2).

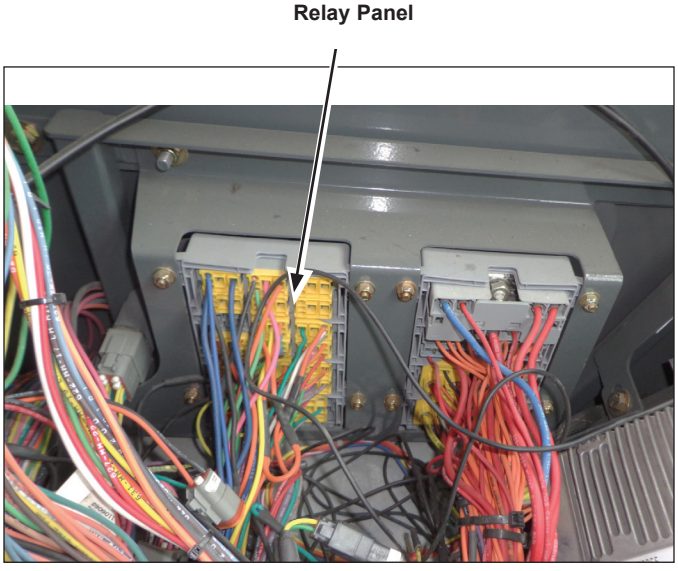
Ensure proper testing by always matching the wire number, wire color and pin number, as described in the error code description and electrical schematic before testing.

Testing Diodes

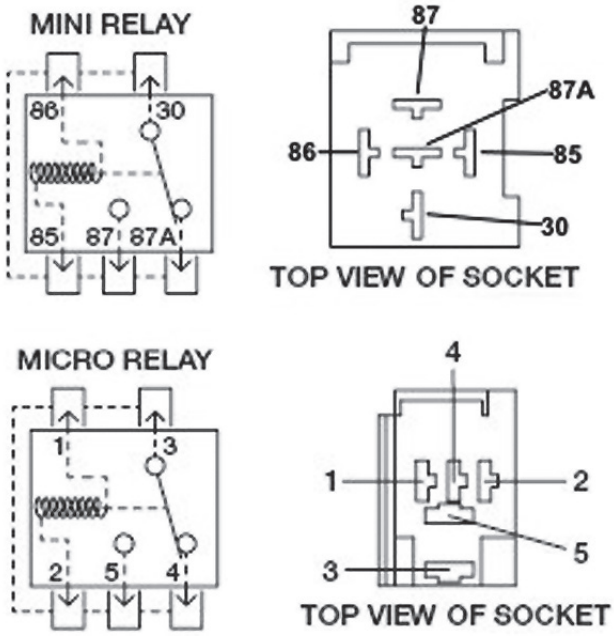
Diodes are made from semi-conducting material. Their resistance is very low in one direction and very high in the opposite direction. When a diode is measured with a multimeter and it reads low ohms, this is not the resistance of the diode. It represents the voltage drop across the diode. A multimeter can only be used to



Relay Panel Locator
Figure 1



Relay Panel Back
Figure 2



Relay Socket and Pin Locator
Figure 3

detect if the diode is not damaged.

Place one lead on one side of the diode and the other lead on the opposite side of the diode. Then reverse the leads. If the reading is low in one direction and very high in the other direction, the diode is operational. When a diode is placed in a circuit and the voltage on the anode is higher than the cathode, it acts like a low value resistor and current will flow. If it is connected in the opposite direction it acts like a large value resistor and current does not flow. In the first case the diode is said to be “forward biased” and in the second case it is “reverse biased.”
Using an analog multimeter use the low resistance (ohms) scale. A diode should read low resistance in the forward direction and infinite resistance in the reverse direction. It should not read near 0 ohms or open in both directions.

On digital multimeters, there will usually be a diode test mode. Using this, a silicon diode should read between 0.5V to 0.8 V in the forward direction and open in reverse.

NOTICE

A defective diode may indicate resistances lower than infinity especially on the highest ohms range. Any reading of this sort would indicate a bad diode.

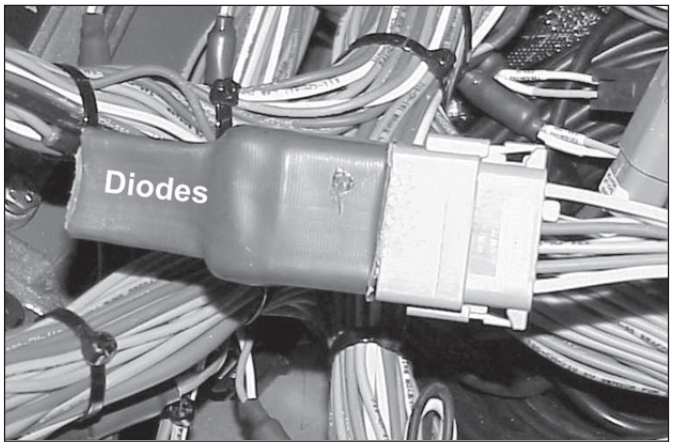
NOTICE

The above procedures assume the diode is not part of any circuit. A diode that is part of a circuit board or connected to other components should be disconnected before testing. Feedback from components on the same circuit as the diode can distort or change the test readings.



Control Module Operation

Before performing troubleshooting and diagnostic checks and tests on components, always shut down the sweeper completely including the chassis engine. Allow the sweeper systems to de-energize and shut down.



Diode Connector
Figure 4

After shutdown, start the engine. See the Operator's Manual for sweeper start up and operation. The speedometer needle should sweep during initial startup and self test and return to zero. If the needle continues to sweep the CANBus and Actia systems have a communication problem and must be diagnosed using a laptop computer.

Pelican CAN Network Overview

Pelican electronic control system uses a Danfoss electronic control system. This system integrates engine response and hydrostatic control to provide improved performance. The Danfoss control system requires a new Danfoss Service Tool laptop program and tool connection. The Danfoss system uses a single module that communicates with the LIN bus (gauge display system) using a conventional CAN backbone. Additional modules may be added if necessary and electronic engine controls (ECU) may be used in the future.

The following information provides an overview of the Elgin Sweeper CAN Network. This overview can be used to understand how component signals are transmitted from the operator controls to the components used to perform sweeping operations. This section is concerned primarily with CAN communication failure and not with individual module or circuit failure. Faults in individual components (nodes) will not generally cause total loss of CAN communication but will affect system inputs and outputs. Component testing is included in the error code diagnostics section.

NOTICE

The backbone (Figure 5) of the CAN system is a two wire harness that contains a CAN High wire (yellow) and a CAN Low wire (Green). The backbone is routed throughout the CAN system for communication between components. Each section of the CAN contains a node connection. These nodes provide a link to the CAN for the individual components. A short in the node CAN high to CAN low connection or a short to ground will cause loss of communication. A short exist when a stripped portion of the CAN high wire touches a stripped portion of the CAN low wire. A short can also exist between the CAN wires and a ground. The short may exist between node terminals and not always between the wires. See the section entitled Testing for CAN Shorts for testing procedures.

The control area network (CAN) (Figure 5) communicates with the components in the sweeper system using a bus. The bus is a subsystem that transfers data between components inside a controller or between controllers. The bus can logically connect several nodes over the same set of wires. A node sends or receives communication. The bus connects the nodes together in a logical system. All nodes see all CAN- bus information in real time. The nodes used in the sweeper control system include:

- Sweeper Network, including the J1939 CAN and controller – Contains the sweeper system programming and manages component interaction between components to provide sweep control. The J1939 CAN is the backbone of the communication system.

- The controllers make decisions based on initial programming and signals transmitted over the CANBus.

- Sweeper Gauge and Display Network (LINbus – Local Interconnect Network) – The sweeper gauge and display network modules are linked together in their own network known as the LIN bus. Also contains a translator used to share data on the J1939 (CAN) network. The gauge module is used to display sweeper and engine faults and status message.

- If the LINbus is disconnected from the CAN the gauges will sweep continually and display will not function. Console circuits using the LINbus will not be available.

NOTICE

A normal or proper reading on the backbone would display as 60Ω with both terminating resistors installed or 120Ω with one terminating resistor removed.

- John Deere Engine Electronic Control Unit – Provides engine operational control (John Deere programming). Also connects to the J1939 CAN to receive sweeper commands (throttle, status, etc) and to transmit fault information to the display for operator action.

- If communication is lost to the ECU, engine information will not be displayed on the gauges causing the gauges to sweep and throttle control will not be available. No engine information will be available at the John Deere test port. The engine may or may not start.

Sweeper CAN Backbone

The backbone (Figure 5) of the network communication system takes place through a pair of wires that must be physically next to each other. The matchingor twisting of the pair allows outside interference to affect both wires at the same time, which in turn cancels the interference. A ground shield my b used to provide additional protection from electrical interference.

The pair must be contiguous from end to end with individual node connections spliced to the backbone The 120 ohm resistors (terminating resistors) in the end of the backbone between CAN high and CAN Low wires prevent reflection or bounce-back of the transmissions in the network. If the resistors are not present, data in the transmissions may be missed and the functions will not work correctly

Sweeper Network

The controller receives all network communication and responds with operational outputs to the sweeper components. The programming responds to predetermined signals from control switches and devices. During the process of communication, if a signal is not responsive, fault codes will be displayed on the LCD screen in the speedometer.

Gauge Display (LINbus Modules)

The speedometer, gauge display and information ICON display are all linked by a dedicated network that communicates using LIN programming protocol. The speedometer also contains a J1939 CAN translator that is connected to the sweeper CAN. The LIN reads and displays information from the engine and sweeper networks. The translator also allows LIN outputs to be transmitted to the sweeper CAN.

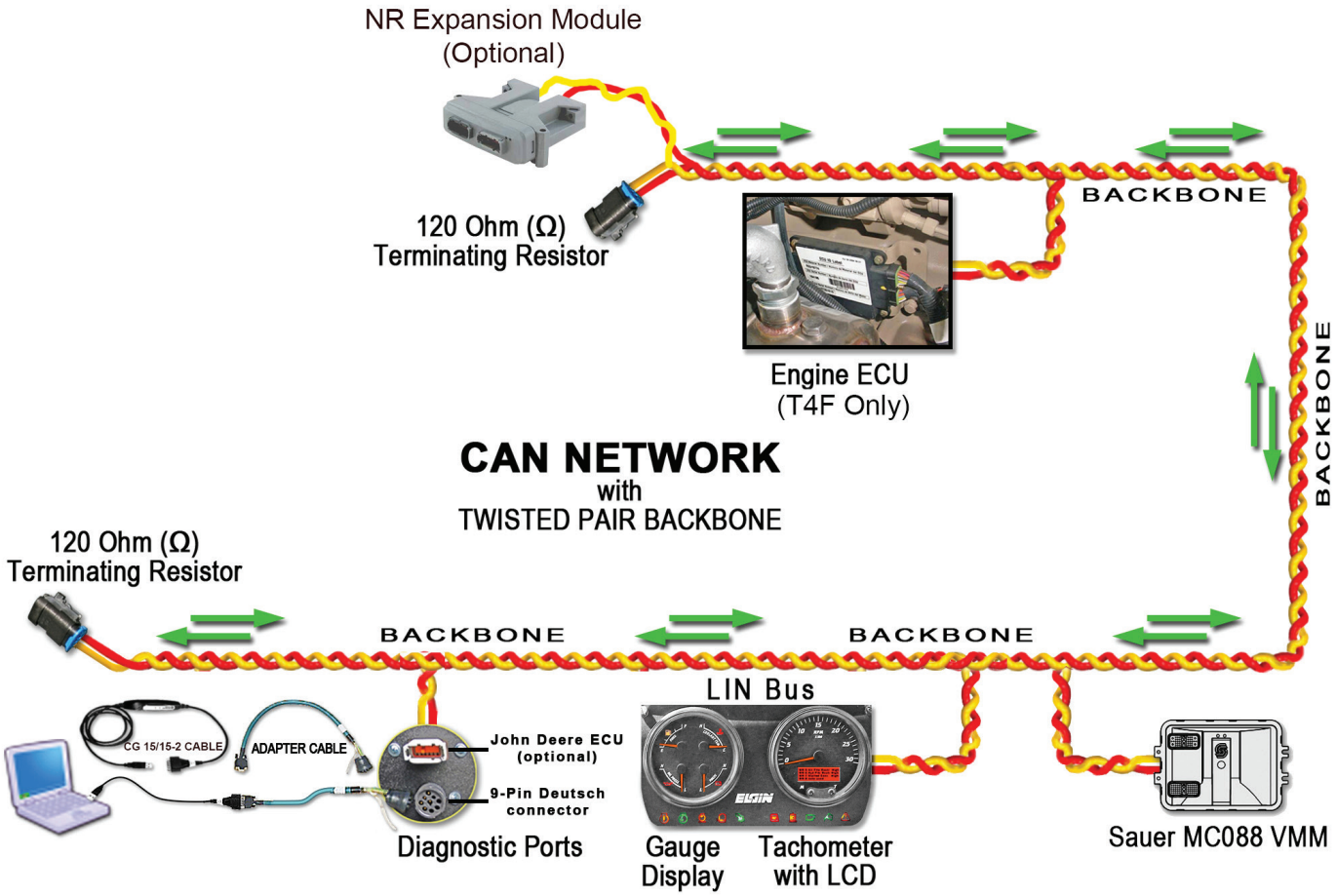


Figure 5

The LIN bus gauges are are connected to the speedometer in a daisy chain configuration so each gauge will have a LIN bus “in” connector and an “out connector and each gauge is connected to the gauge before it. This connector houses the LIN gauge power, ground and LIN bus circuits. If the LIN bus is open circuited then all modules after the open will sweep or flash but modules before the open will function normally. If the LIN bus is shorted to ground then all LIN gauges will sweep or flash. If either the LIN power or ground circuits are open circuit then all gauges after the open will not function nor will they sweep or flash since they have no power or ground.

John Deere Electronic Control Unit (ECU) (T4F Only)

When used, the John Deere auxiliary engine is equipped with a remotely mounted ECU. The ECU is connected to the sweeper CAN using J1939 protocol. The gauge display (LINbus) receives engine operating information through the CAN communication connection. The MC088 also use ECU information as part of the operational program and transmit engine speed (throttle output) commands to the ECU. Auxiliary engine faults are displayed on the speedometer LCD screen.

A console mounted access port is supplied for connecting a John Deere service tool to the system for auxiliary engine evaluation.

Controller Pin Locator and Usage

The following table provides a listing of the controller pins and usage.

MC088 Electronic Control Module Pin Usage

Pin Number	Description
C1-p1	Ground
C1-p2	Switched Power
C1-p3	CAN +
C1-p4	CAN -
C1-p5	Right Broom Tilt Sensor
C1-p6	Washdown Switch
C1-p7	Right Broom Water Switch
C1-p8	5VDC Sensor Power
C1-p9	Sensor Power (-)
C1-p10	Left Selection Switch
C1-p11	Service Brake PSI Switch
C1-p12	Park Brake PSI Switch
C1-p13	Right Pedal Forward Switch
C1-p14	Right Pedal Reverse Switch
C1-p15	Left Pedal Forward Switch
C1-p16	Left Pedal Reverse Switch
C1-p17	Key Start Switch
C1-p18	Right Pedal Sensor
C1-p19	Left Pedal Sensor
C1-p20	CAN2+
C1-p21	CAN2-
C1-p22	Left Broom Tilt Sensor
C1-p23	Left Motor Direction
C1-p24	Left Motor Speed via PPU
C1-p25	Right Motor Speed via PPU
C1-p26	Engine Speed via Pump PPU
C1-p27	Auxiliary Temperature Sensor 1
C1-p28	Auxiliary Temperature Sensor 2
C1-p29	Engine Water Temperature Sensor
C1-p30	
C1-p31	Back-Up Alarm
C1-p32	Brake Lamp Relay
C1-p33	
C1-p34	Station Select Relay
C1-p35	

MC088 Electronic Control Module Pin Usage

Pin Number	Description
C1-p36	Fuel Relay
C1-p37	Propel Pump Reverse – Port A
C1-p38	Propel Pump Forward – Port B
C1-p39	Right Motor Brake Defeat
C1-p40	Left Motor Brake Defeat
C1-p41	Starter Solenoid Relay
C1-p42	Main Broom Raise
C1-p43	Right Broom Raise
C1-p44	Left Broom Raise
C1-p45	Main Broom Balance
C1-p46	Proportional Fan Bypass Valve
C1-p47	Radiator Fan Reverse Activate
C1-p48	
C1-p49	Throttle Position Sensor
C1-p50	
CP-p1	Sweep Power Relay
C2-p2	Hopper Cut-Out
C2-p3	Water Pump Relay
C2-p4	Radiator Fan Reverse Coil
C2-p5	
C2-p6	
C2-p7	
C2-p8	Right Broom Pressure Transducer
C2-p9	Left Broom Pressure Transducer
C2-p10	Main Broom Pressure Transducer
C2-p11	Main Broom Balance Transducer
C2-p12	
C2-p13	Conveyor Raise Relay
C2-p14	Battery (-)
C2-p15	Left Broom Water Switch
C2-p16	Main Broom Rotate Switch
C2-p17	Main Broom Float Switch (MSB)
C2-p18	Main Broom Float Switch (LSB)
C2-p19	Main Broom/Conveyor Lower Switch
C2-p20	Battery (-)
C2-p21	Left Broom Float Switch (MSB)
C2-p22	
C2-p23	Left Broom Float Switch (LSB)
C2-p24	Left Broom Lower Switch
C2-p25	Right Broom Float Switch (MSB)
C2-p26	Right Broom Float Switch (LSB)

Pin Number	Description
C2-p27	Right Broom Lower Switch
C2-p28	Sweep Mode Switch
C2-p29	
C2-p30	
C2-p31	
C2-p32	
C2-p33	
C2-p34	
C2-p35	Fused Battery +
C2-p36	Fused Battery +
C2-p37	Fused Battery +
C2-p38	Fused Battery +



Figure 6a

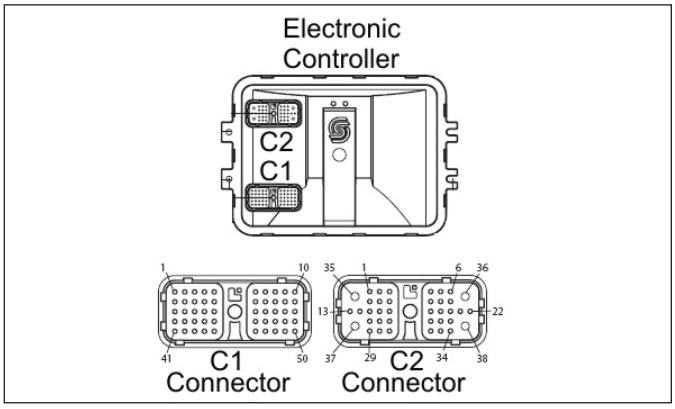


Figure 6b

Pelican NR Input/Output Module

The pelican NR input/output expansion module extends the controller (MC088) operations to the NR (waterless) functions. The module uses input signals from the sensors such as the vacuum sensor and fan sensor to the control system. The module inputs such as the fan/shaker switch and dust control switch are used to determine the outputs for operation of the fan pump and shaker solenoids.

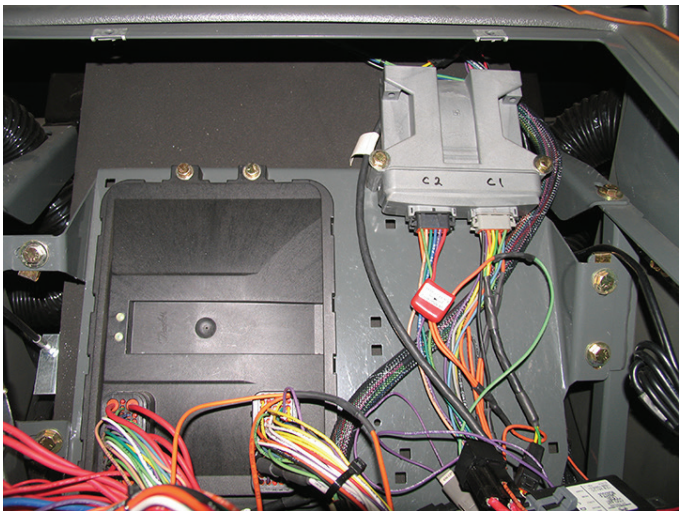
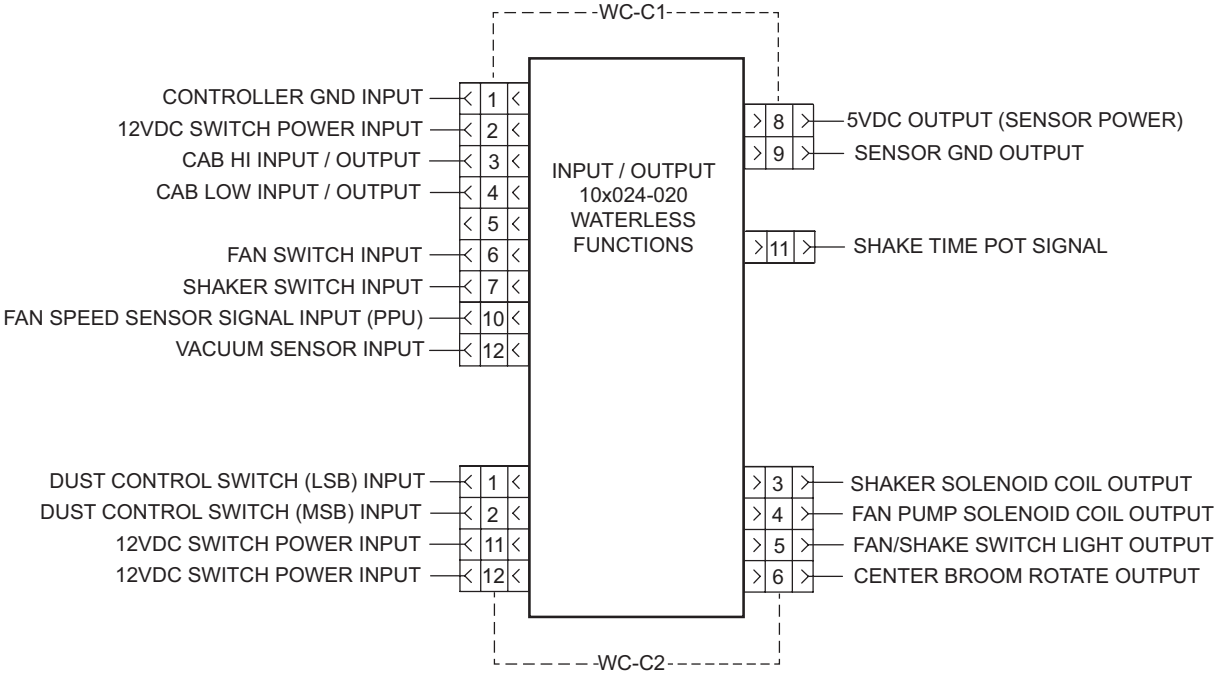


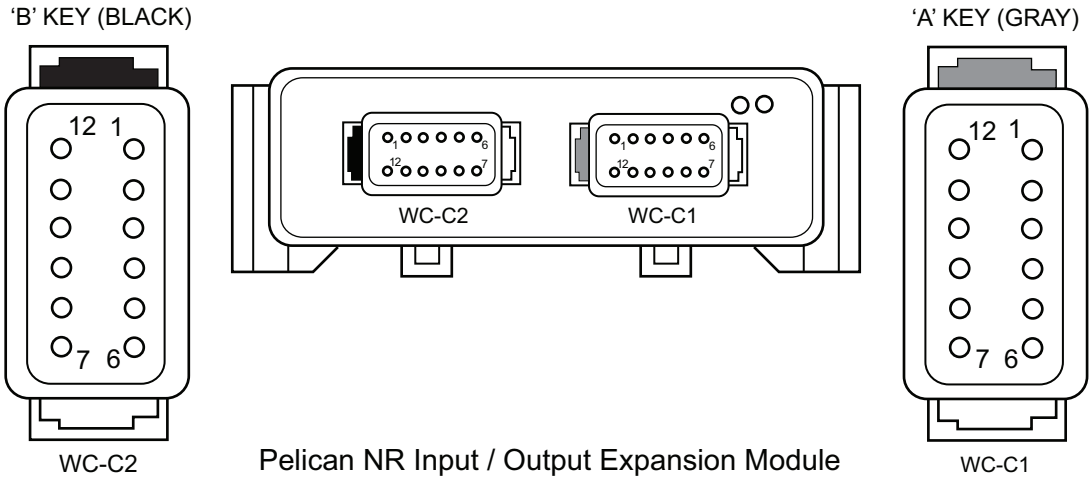
Figure 7 Pelican NR Inupt/Output Module

Pelican NR Input/Output Module Pin Usage

The following table provides a listing of the I/O module pins and usage.

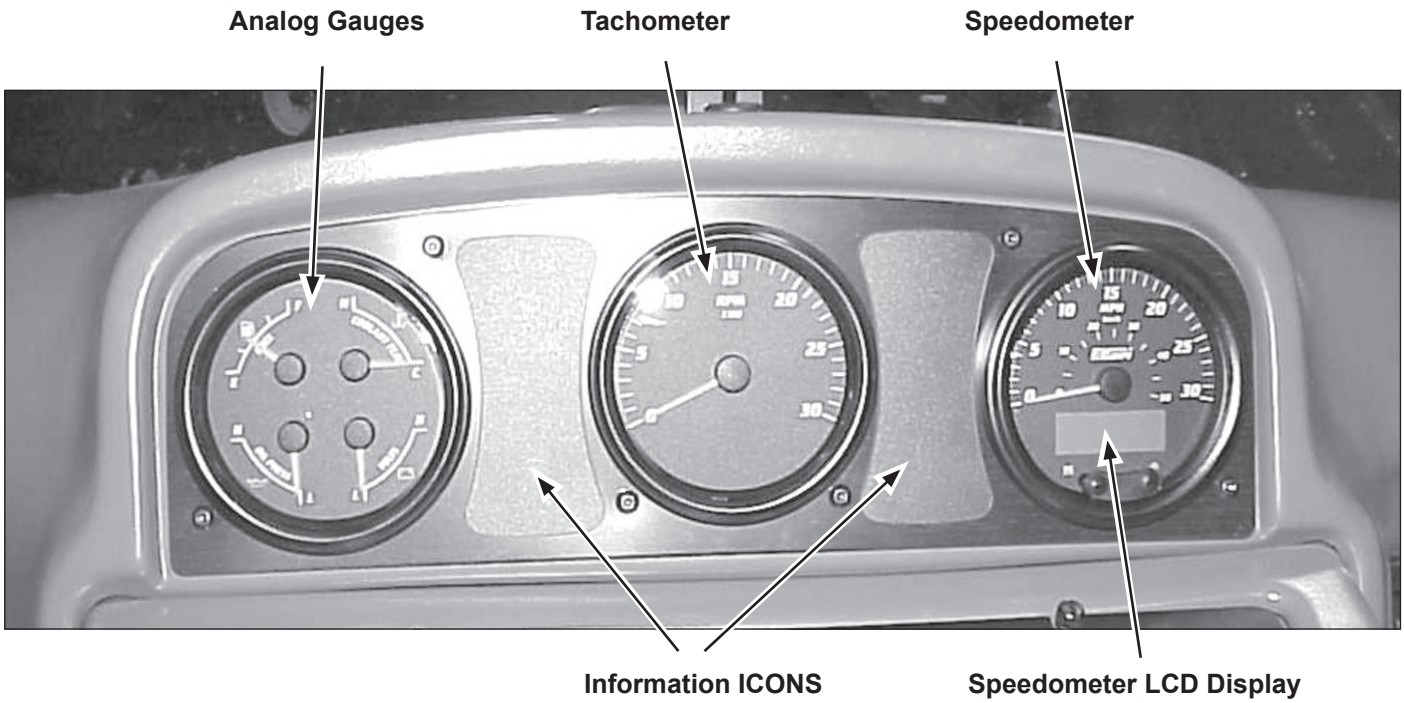


Pelican NR I/O (Input/Output) Module Schematic



Pelican NR Input / Output Expansion Module

PIN NUMBER	DESCRIPTION
	Conector WC-C1
1	Controller Ground Input
2	12VDC Switch Power Input
3	CAN Hi Input/Output
4	CAN Low Input/Output
5	Spare
6	Fan Switch Input
7	Shaker Switch Input
8	5VDC Power Output
9	Sensor Ground Output
10	Fan Speed Input
11	Shake Time Input
12	Vacuum Sensor Signal Input
	Connector WC-C2
1	Dust Control (LSB) Input
2	Dust Control (MSB) Input
3	Shaker Solenoid Coil Output
4	Fan Pump Solenoid Coil Output
5	Fan/Shaker Switch Light Output
6	Center Broom Rotate Output
11	12VDC Switch Power Input
12	!2VDC Switch Power Input



Gauges and ICON Display
Figure 9

CAN Diagnostic Steps

- Check the sweeper gauge and ICON display (Figure 9).
- Check for active faults using the speedometer display. The active faults can also be checked using the service tool. On the service tool start page click on Active Faults located underneath the Faults page. Any active faults will be displayed on the active faults screen.
- Compile recorded data of faults, dates and occurrences.

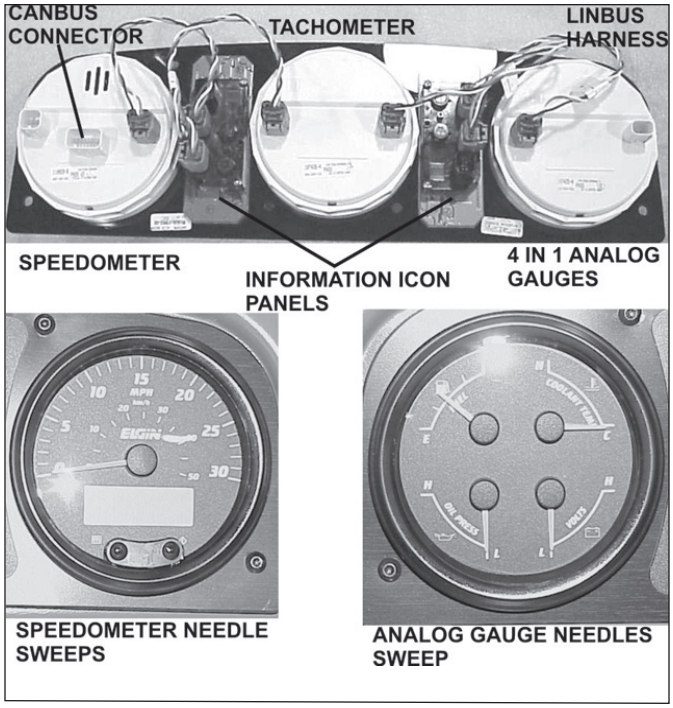
CAN Diagnostic Tips

Elgin Sweeper fault codes are generated by missing information or faulty circuits. Sweeper fault codes may be repaired by using the information in the Error Code Diagnostic section and service manual information.

John Deere fault codes are generated by missing information or faulty circuits. Engine fault codes may be repaired using the information in the John Deere service manual.

Gauge and Speedometer Needles Sweep Continually

During initial startup, the CANBus and controller system perform a self-test. As the self-test progresses, the gauge needles sweep and the ICON displays (Figure 10) will flash. If the self-test is successful and the system is normal, the gauge needles will cease sweeping and stabilize.



Speedometer and Gauge Needle Connections
Figure 10

The needles will continue to sweep if there is no communication with the CAN. The lack of communication may be due to a poor or broken connection between the speedometer J1939 terminals and the sweeper CAN.

Without CAN communication, the speedometer LCD will display limited information. If these conditions exist, contact Elgin Sweeper Service Department. If these conditions exist, follow the instructions under “Total CAN Communication Failure” found in the next section.

The gauges will also sweep if there is a lack of information being transmitted by the CANbus. A lack of information from the ECU (If Equipped) to the LINbus will cause the gauges to sweep. The speedometer will continue to display sweeper fault codes and sweeper CAN messages. In most cases, the fault is caused by no power to the ECU.

Total CAN Communication Failure

Total CAN communication failure is the most serious failure for the Control Area Network. A complete CAN failure is generally caused by a short between CAN High and CAN Low or to ground. Some symptoms of a CAN failure are:

- No sweep system operation.
- Gauge needles sweep continually.
- Auxiliary engine may not run.
- Electronic Service Tool connection cannot be completed.

NOTICE

The backbone (Figure 5) of the CAN system is a two wire harness that contains a CAN High wire (yellow) and a CAN Low wire (Green). The backbone is routed throughout the CAN system for communication between components. Each section of the CAN contains a node connection. These nodes provide a link to the CAN for the individual components. A short in the node CAN high to CAN low connection or a short to ground will cause loss of communication. A shielded ground within the backbone may be present in some earlier systems. A short exists when a stripped portion of the CAN high wire touches a stripped portion of the CAN low wire. A short can also exist between the CAN wires and a ground. The short may exist between node terminals and not always between the wires. See the section entitled Testing for CAN Shorts for testing procedures.

Testing for CAN Shorts

⚠ CAUTION

Make sure the ignition switch is in the OFF position before testing CAN resistance.

With the ignition switch in the OFF position, the resistance within the backbone (two wire twisted harness) is measured using a multimeter set for resistance. The terminating resistors installed at the ends of the backbone are 120Ω resistors. The multimeter should be set to display resistance not greater than 200Ω. Place one multimeter lead in one node pin connection and one lead in the other pin connection.

NOTICE

The CAN high wire is yellow and the CAN low wire is green. The multimeter leads should be contacting the pin connections associated with the yellow and green wires.

- A normal or proper reading on the backbone would display as 60Ω with both terminating resistors installed or 120Ω with one terminating resistor removed.
- A low reading may indicate that a partial intermittent short exists between CAN high (yellow) and CAN low (green). Check for resistance between nodes until the short is located.

- A low reading may also indicate an intermittent short or water in the node. Check for resistance between nodes until the short is located.

- A low reading indicates a complete short between CAN high and CAN low. Check resistance between each backbone node until the short is located. Very low resistance may indicate CAN high and CAN low wire strands are in contact, incorrect pin connections short terminating resistors. Each node ust be checked to find the short.

- An infinite resistance reading (open) may indicate a terminating resistor is missing or failed (open) or a CAN high or CAN low wire is broken. Check between each node until the open is located.

NOTICE

A single break in one of the CAN wires will generally not cause complete system failure but may cause inconsistent functions.

A CAN short at any point in the backbone or node will cause a loss of system communication. Individual nodes may still function if the input and output takes place internally but information passed outside the node will cease. The short may be caused by one of the following:

- CAN terminal pins displaced and shorted together.

- Harness damage that permits CAN high and low to make contact.

- Water in a node causing partial or complete failure.

- Terminating resistor damaged.

CAN (Backbone) Loss of Connection

Any disconnect in the CAN will cause disruption of communication. An open, such as a broken wire in the backbone circuit, may cause inconsistent or intermittent operation. One broken or damaged wire will cause weak signals. Any open will prevent the CAN from operating normally. An open in both wires, such as disconnected node terminals, will cause partial operation. The modules will be powered but communication will be impossible between sections of the backbone.

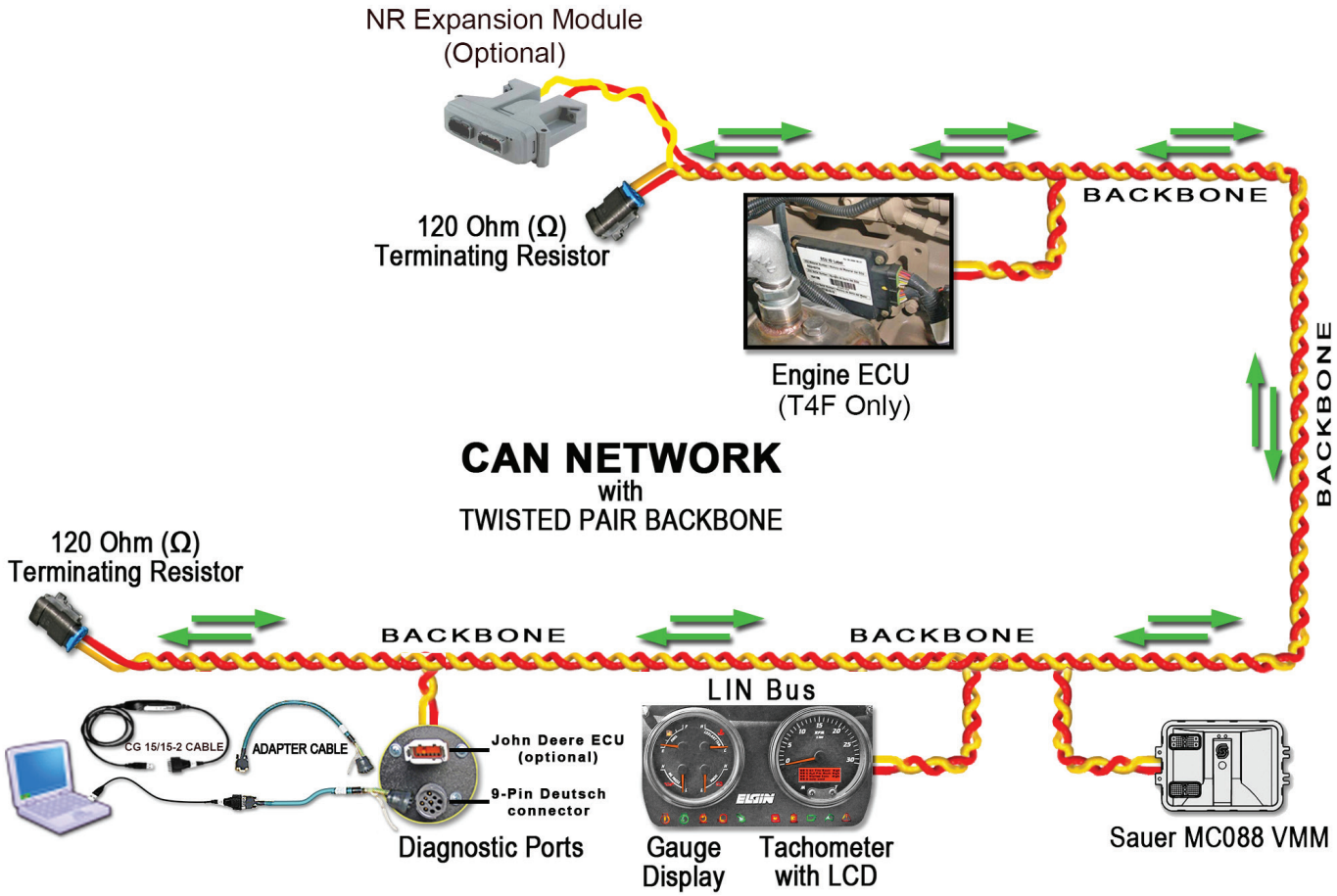


Figure 11 - Error Code Display – Missing Circuit Information

Elgin/Danfoss Service Tool Connection

A laptop adapter harness Elgin part number 1112208 and Danfoss CG150 or CG150-2 CAN/USB interface communicator Elgin part number 7179220 are required to connect the sweeper to a laptop. See the section entitled Connection Diagnostics for adapter and CG150 or CG150-2 installation and usage.

NOTICE

If the CAN is shorted CAN high to CAN low, the laptop service tool and engine service tool will not function.

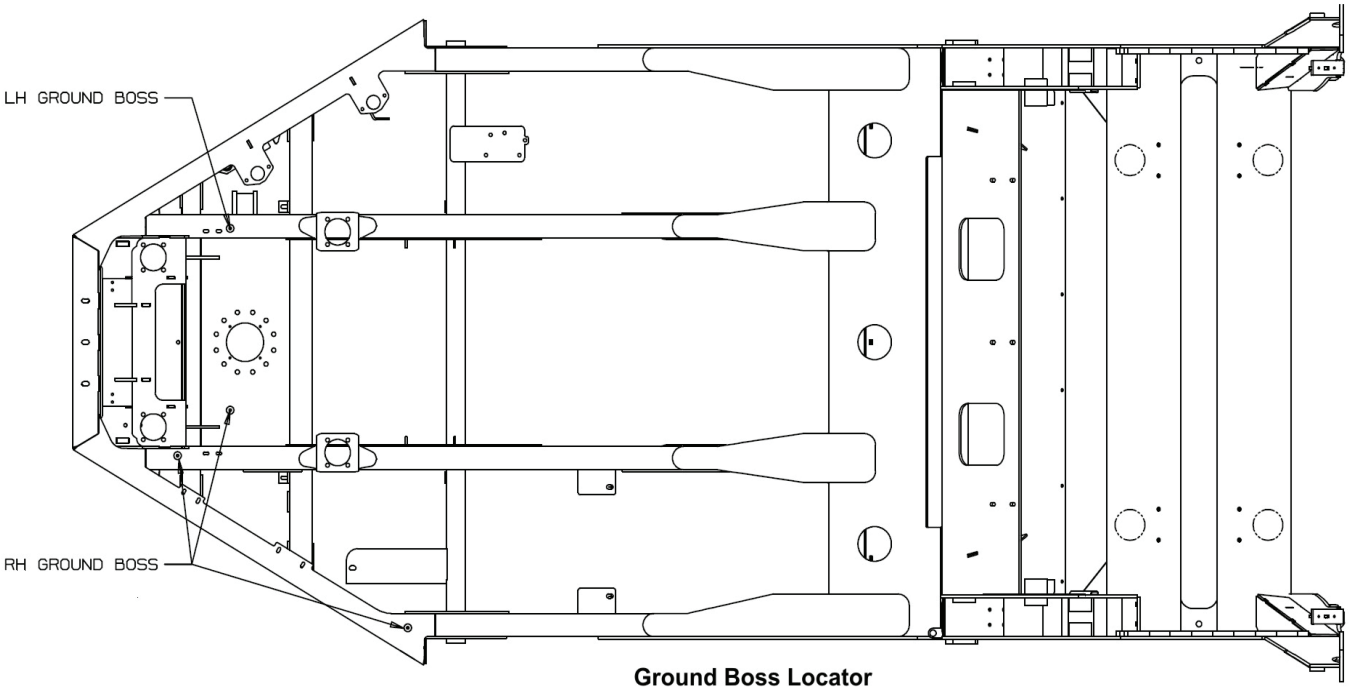
The software, password and system files are necessary for viewing the system.

NOTICE

See the Service Tool application section for complete instructions on installing the laptop connection kit, laptop and using the service tool.

Laptop System Requirements

- PC with minimum 16mb RAM equipped with Windows 7 or 8
- Harness Adapter (1112208)
- CG 150 or CG150-2 CAN/USB (7179220)
- Elgin Sweeper Service Tool Software
- Elgin Sweeper License Key (Generated by Elgin Sweeper.



Ground Boss Locator
Figure 12

Power and Ground Connections

Pelican electronic systems may demonstrate multiple failures that seem unrelated. When failures of unrelated operations are present, they may be found to have common circuit connections for power or ground. Seemingly unrelated malfunctions may include but are not limited to:

- Incorrect hydro pedal control
- Inoperative start circuit or “starter runs when the key is ON”
- Inconsistent or inoperable broom downpressure control
- Wiper, light, signal or other stalk malfunctions

Circuit Ground-Point failure:

- Thoroughly check all circuit ground ground-point connections. Resistance across terminal connections must be less that .1 Ohms.

1. Battery “-” connection terminal must be clean of corrosion and tightened securely. All circuits must ground to the battery terminal.

2. Check connections as shown in fig 12 for paint or powder coat deposits, corrosion. damaged wires or terminals. Remove any paint, repair any damage or corrosion and tighten securely.

3. Check connections at the Main External Ground Stud “D” (see fig 15). Remove any paint, repair any damage or corrosion and tighten securely.

4. Check connections at the Main External Ground Stud “G” (see fig 16). Remove any paint, repair any damage or corrosion and tighten securely.

IMPORTANT: Failure of a ring terminal may not be obvious because the terminal crimp may be covered with heat-shrink. It may be necessary to remove the heat shrink to inspect the terminal.

- Overtightening the retaining nut on a ring-terminal can cause the terminal to fail or be twisted so that it will eventually break. Clean terminal studs thoroughly and tighten enough to retain the connection.
- Route harness away from moveable components or hydraulic hoses that may flex and cause terminal failure due to fatigue.

Cab and Chassis Circuits

The 102 pin connector (fig. 13) which is mounted on the bottom rear of the cab provides a connection between the main cab wiring harness (CM-C1). These circuit connections provide a path for control of the sweeping components using the switches on the cab control panel.



102 Pin Connector (Harness Side CH-C1 Shown)
Figure 13

GROUNDS

The circuit ground trees shown in Figure 14 (next page) provide ground circuits for many components. If any of the ground connections become loose, broken or corroded the electronic control system and other circuits may not function as needed. Use the following illustrations to locate, check and repair suspected grounds.

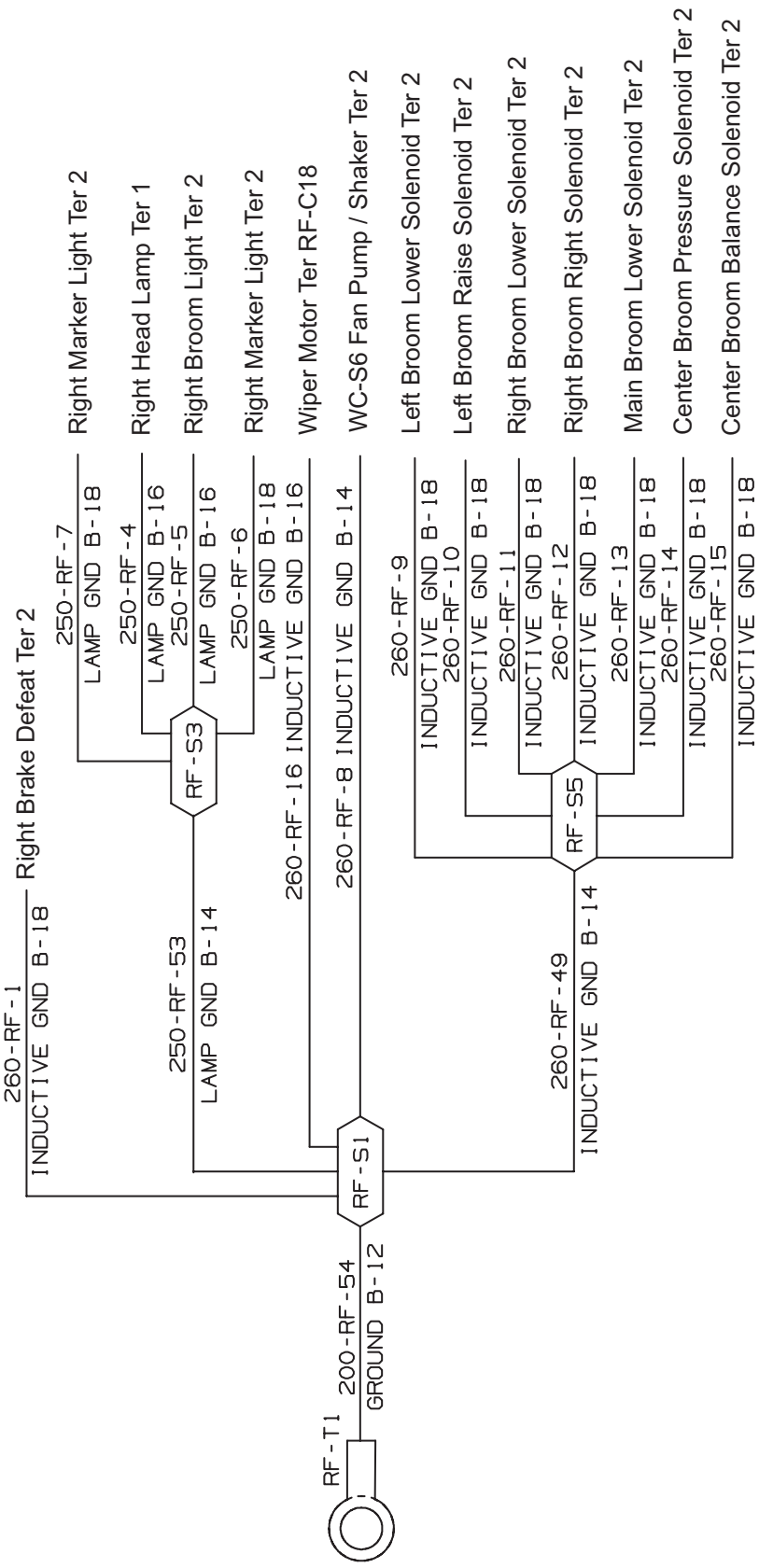
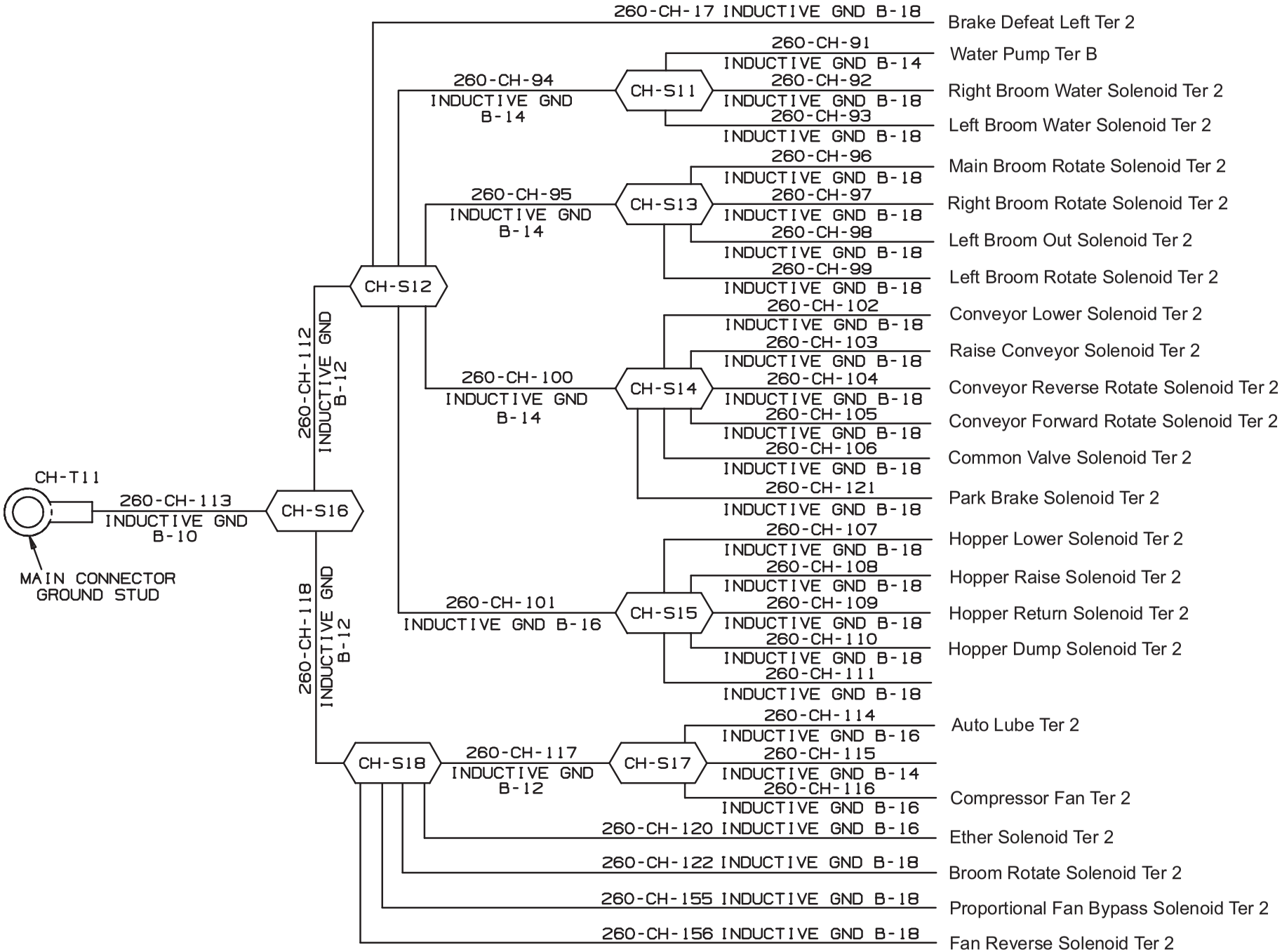
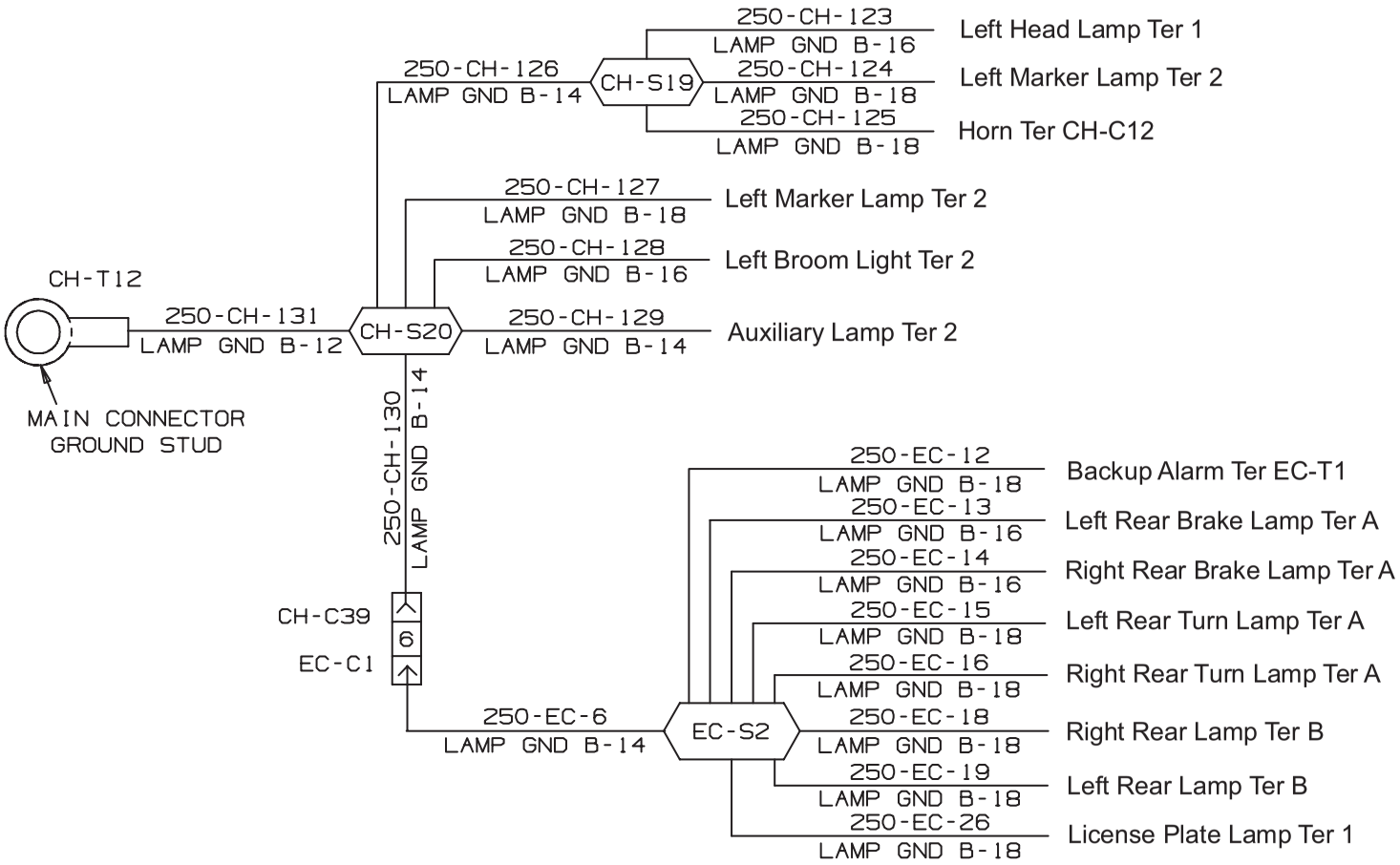


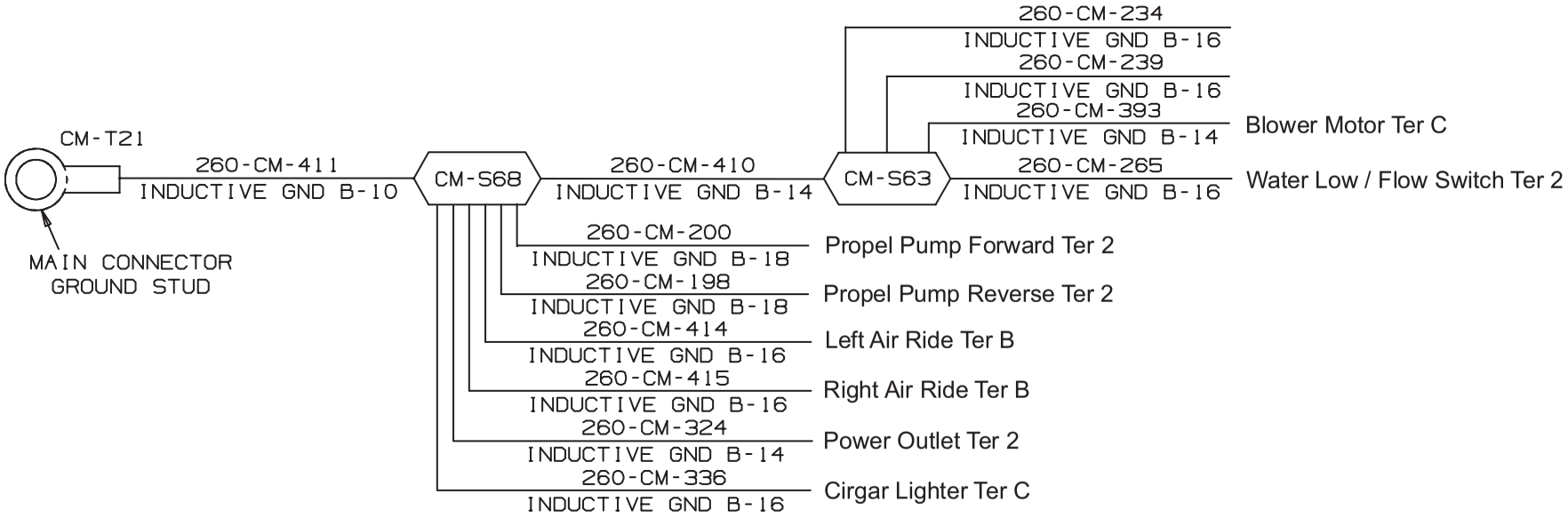
Figure 14 Ground Trees



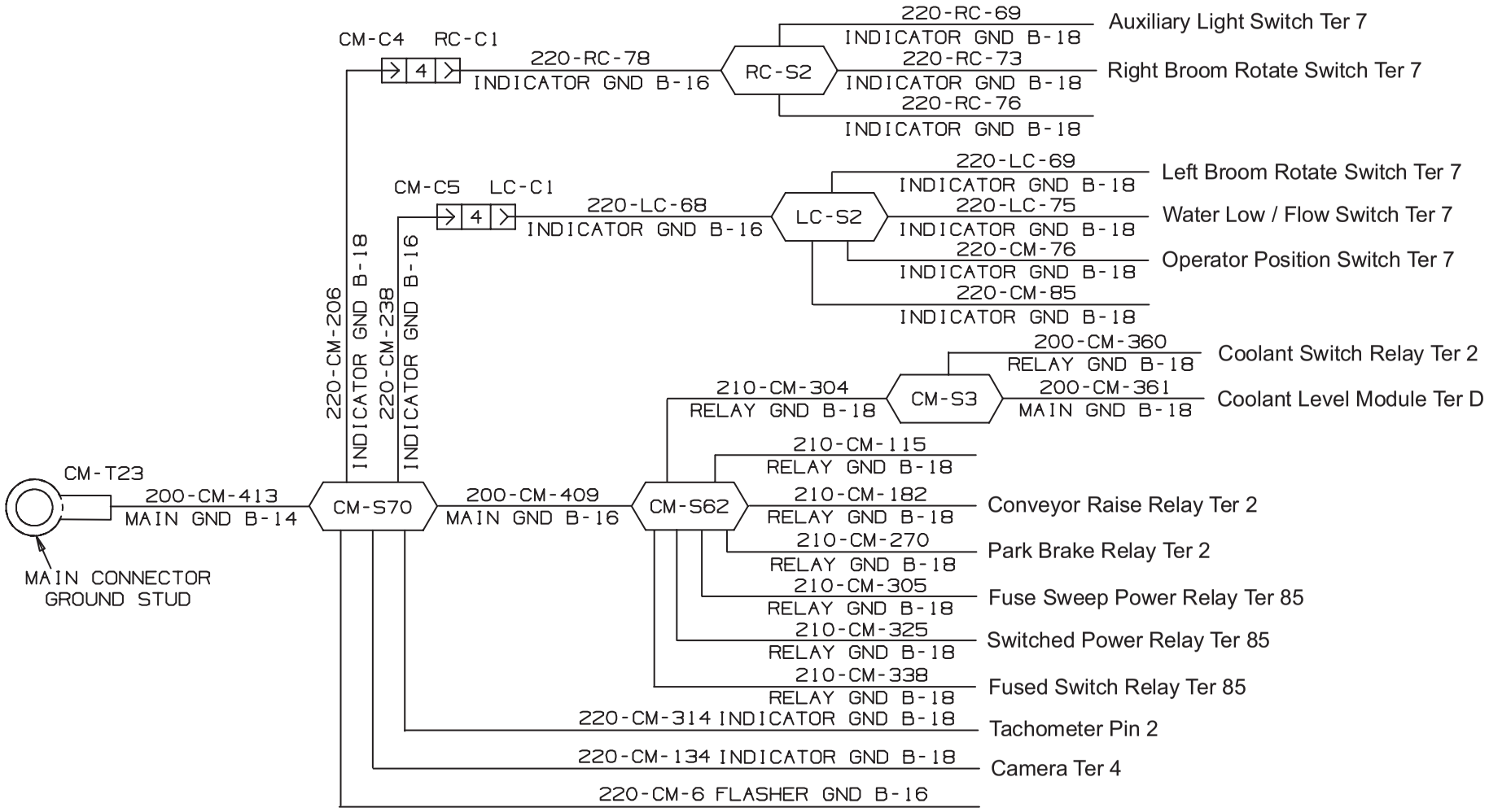
Ground Tree - Sheet 2



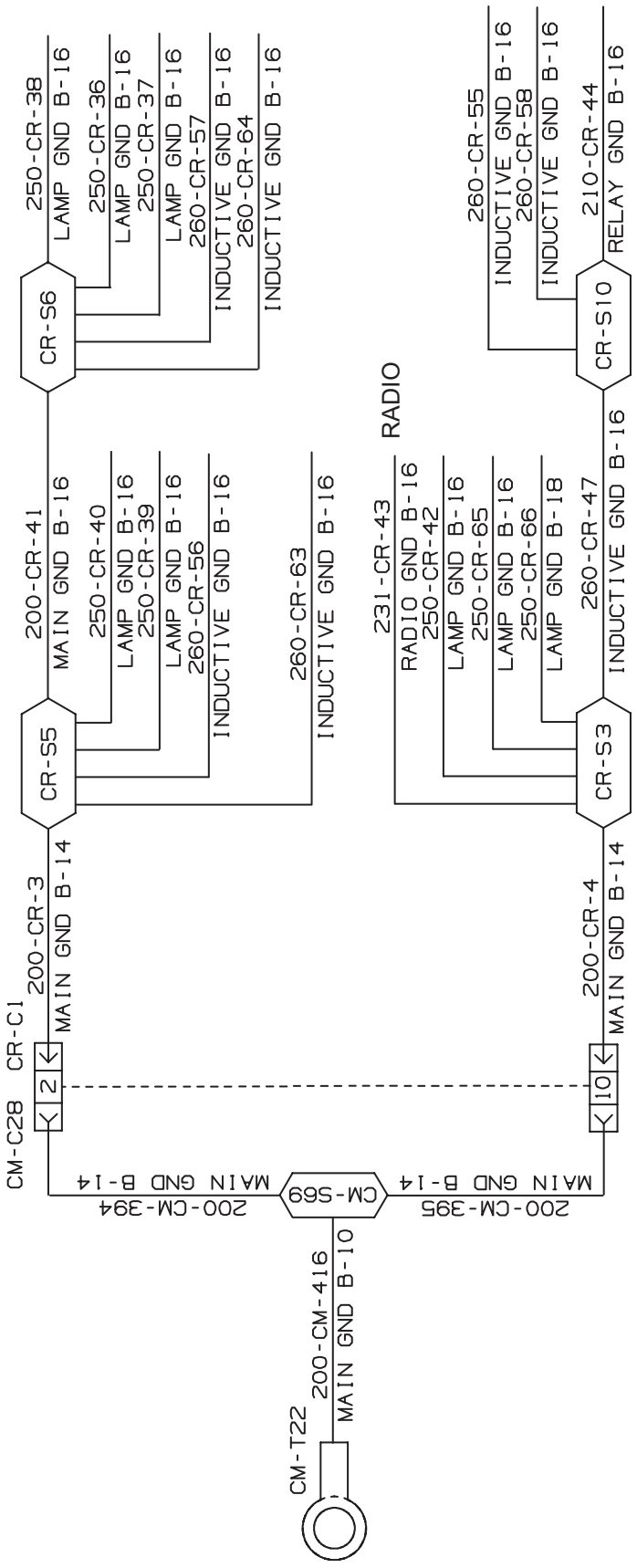
Ground Tree - Sheet 3



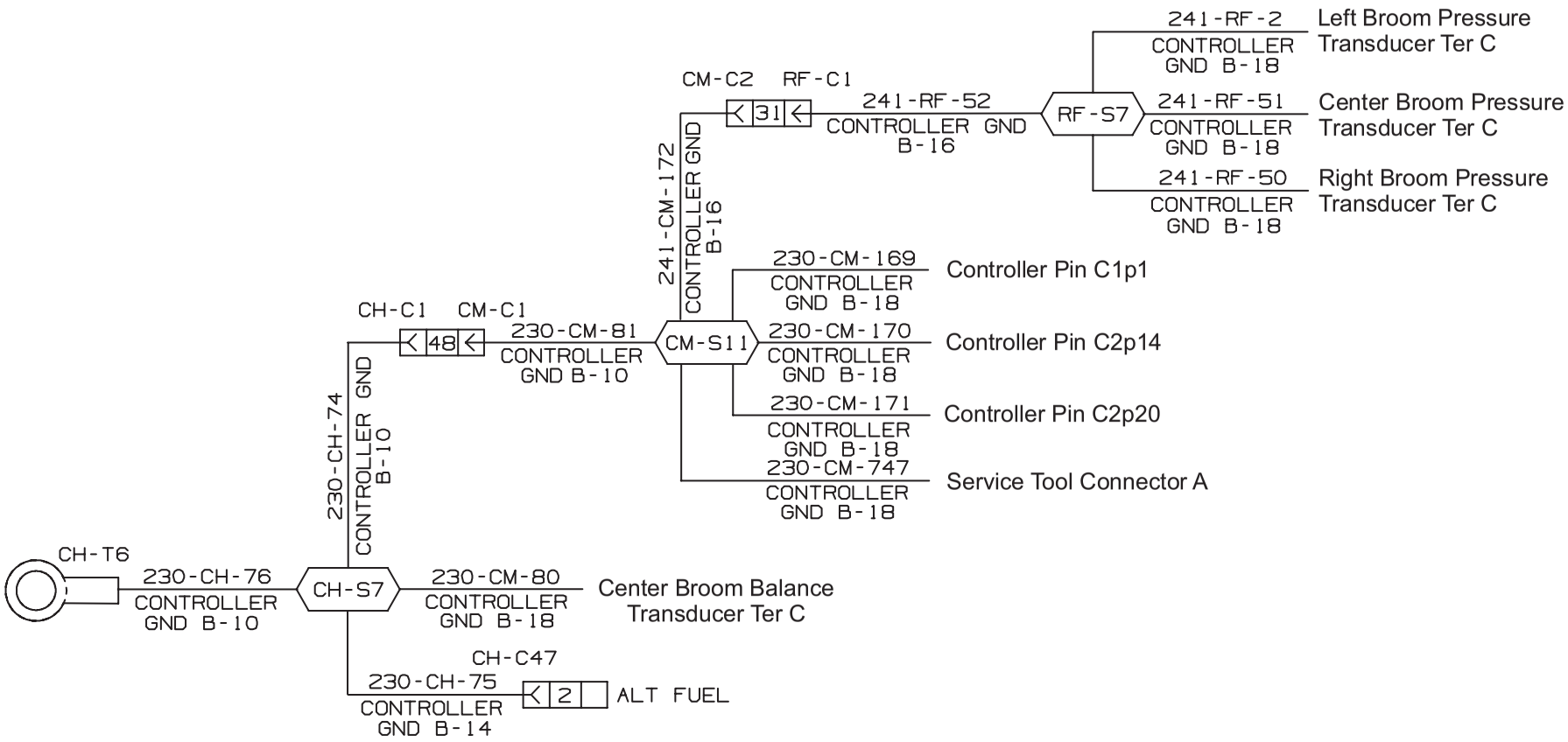
Ground Tree - Sheet 4



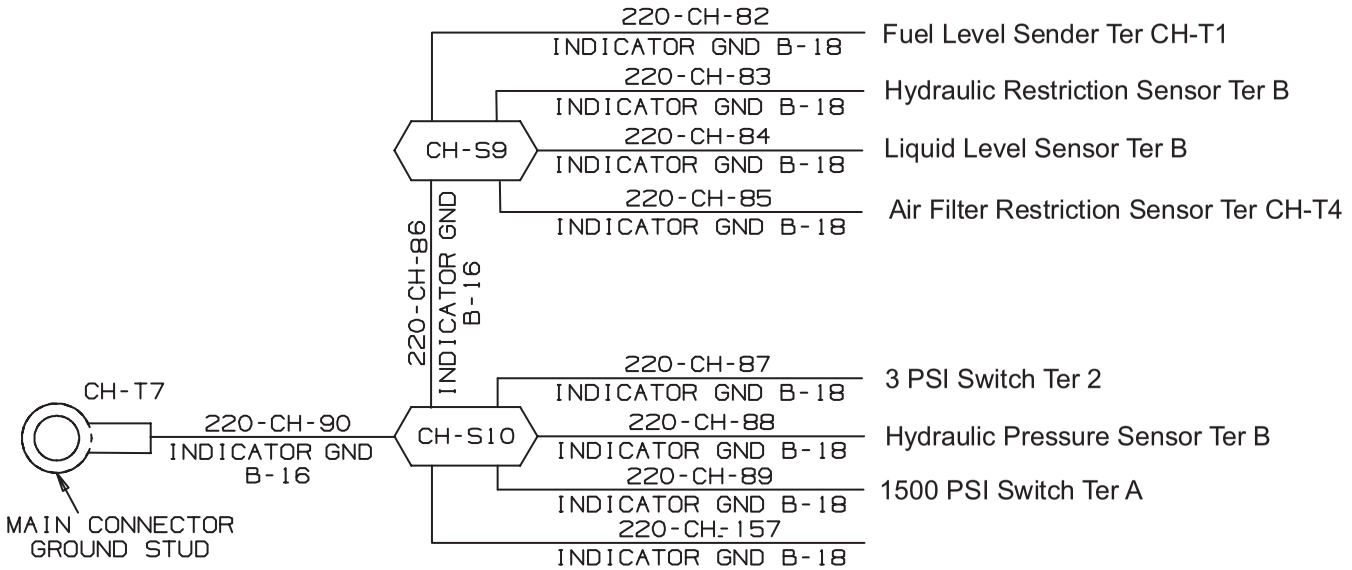
Ground Tree - Sheet 5



Ground Tree - Sheet 6



Ground Tree - Sheet 7



Ground Tree - Sheet 8

Confirm correct operation of the affected circuits

- Connect the Elgin Service Tool and observe that the INPUT and OUTPUT functions are performing correctly.
- Operate the circuits and ensure that sweeper functions are operational.

Service Tool Indications

Use the section entitled Service Tool Screens to diagnose error codes using the Elgin/Danfoss Service Tool.

NOTES

See the section entitled Troubleshooting Flowcharts for additional troubleshooting and diagnostic steps.

Also see the Service Tool usage document embedded in the Service Tool. A link to it is located on the Start page of the tool.



Adapter Harness Elgin Part Number 1112208
CG 150 CAN/USB Communicator Elgin Part Number 7179220

Figure 15

T4i & T4F Pelican NP & NR Elgin Service Tool

Elgin Service Tool

Connect the sweeper to the electronic system using the J1939 Service Tool Port Connector. Service Tool Connection requires:

- 7179220 Sauer CG-150 Interface

and

- 1112208 Adapter Harness

and

- Sauer PLUS 1 Service Tool with Elgin P1D operating file

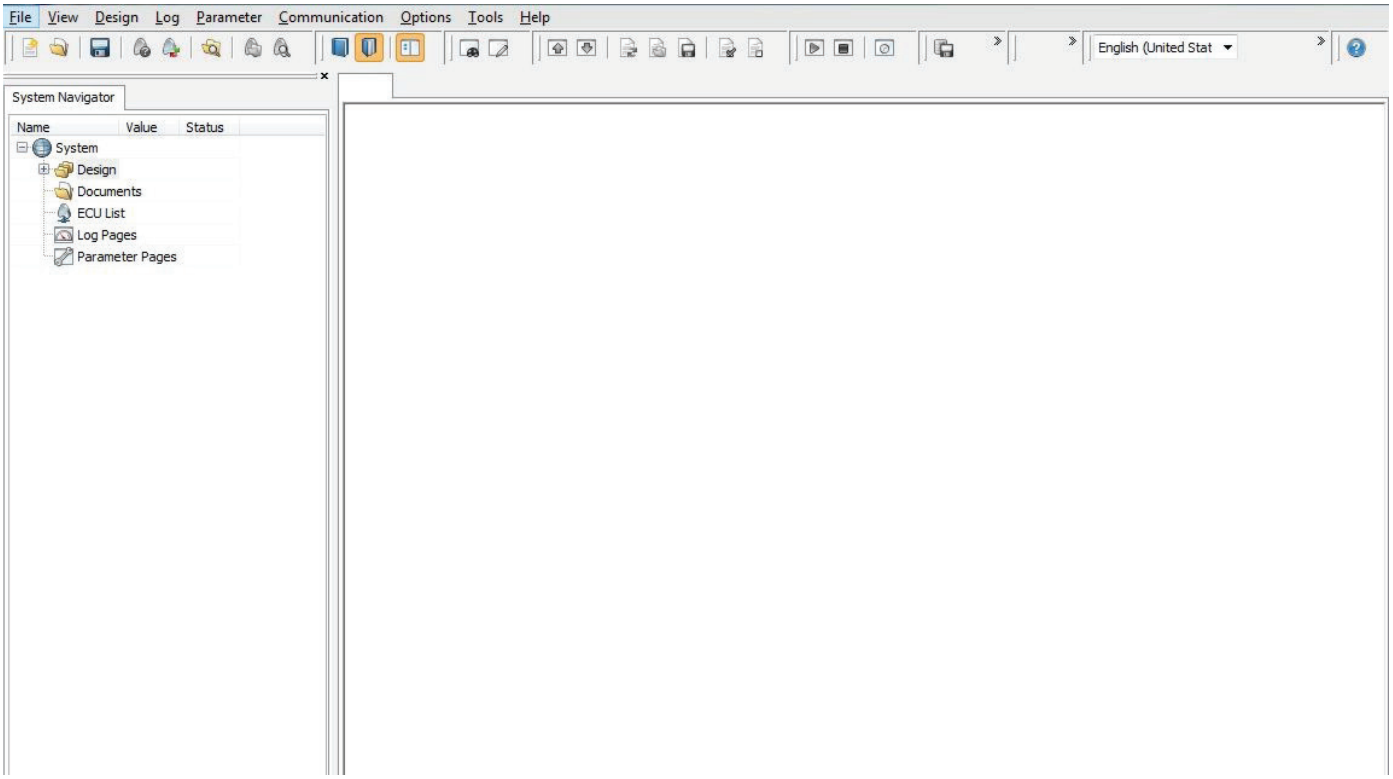
and

- Elgin Product Key



Plus 1 Service Tool Icon
Figure 16A

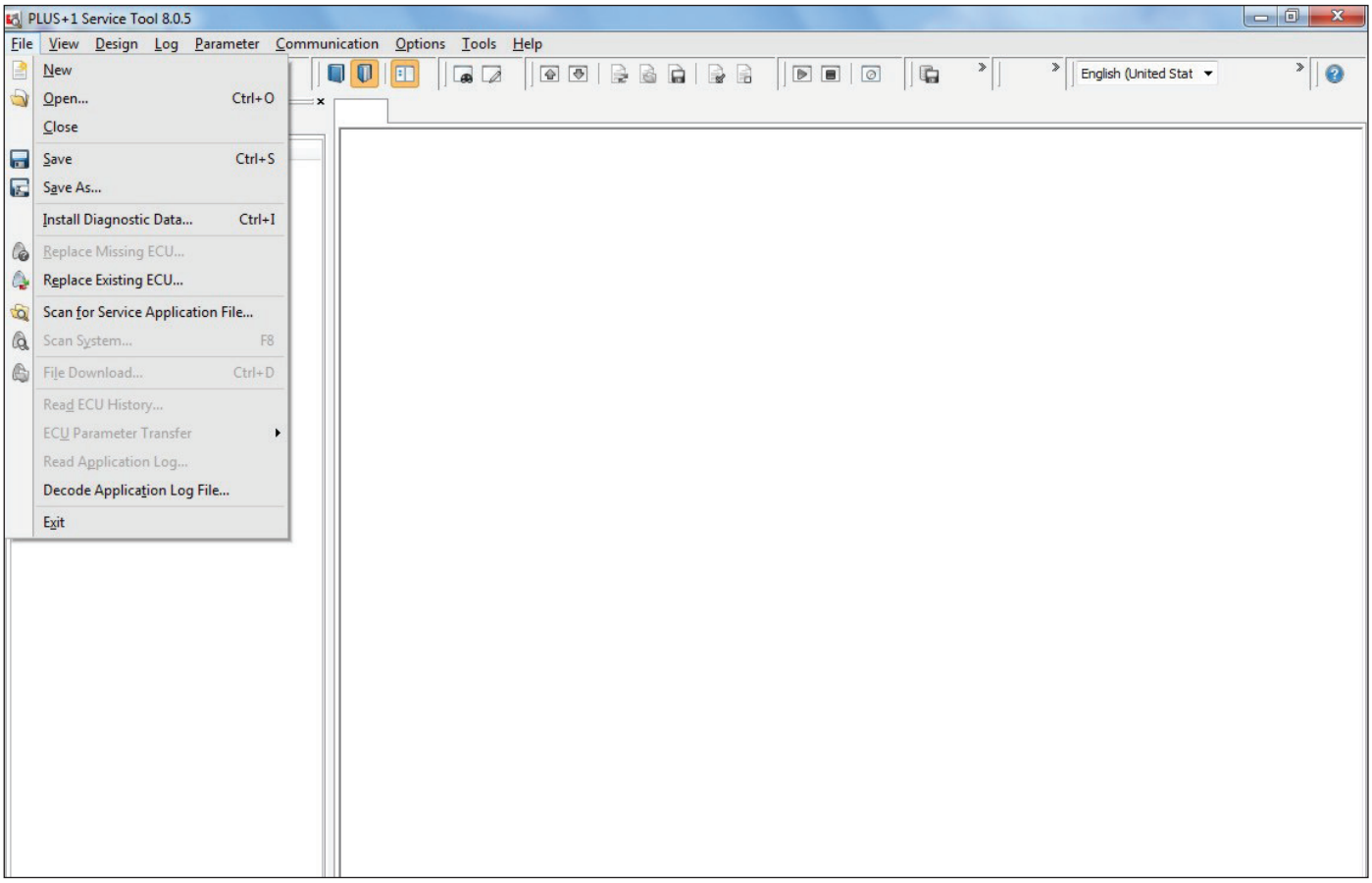
After connecting to the service tool, open the service tool program using the Plus 1 Service Tool icon (Figure 16A).

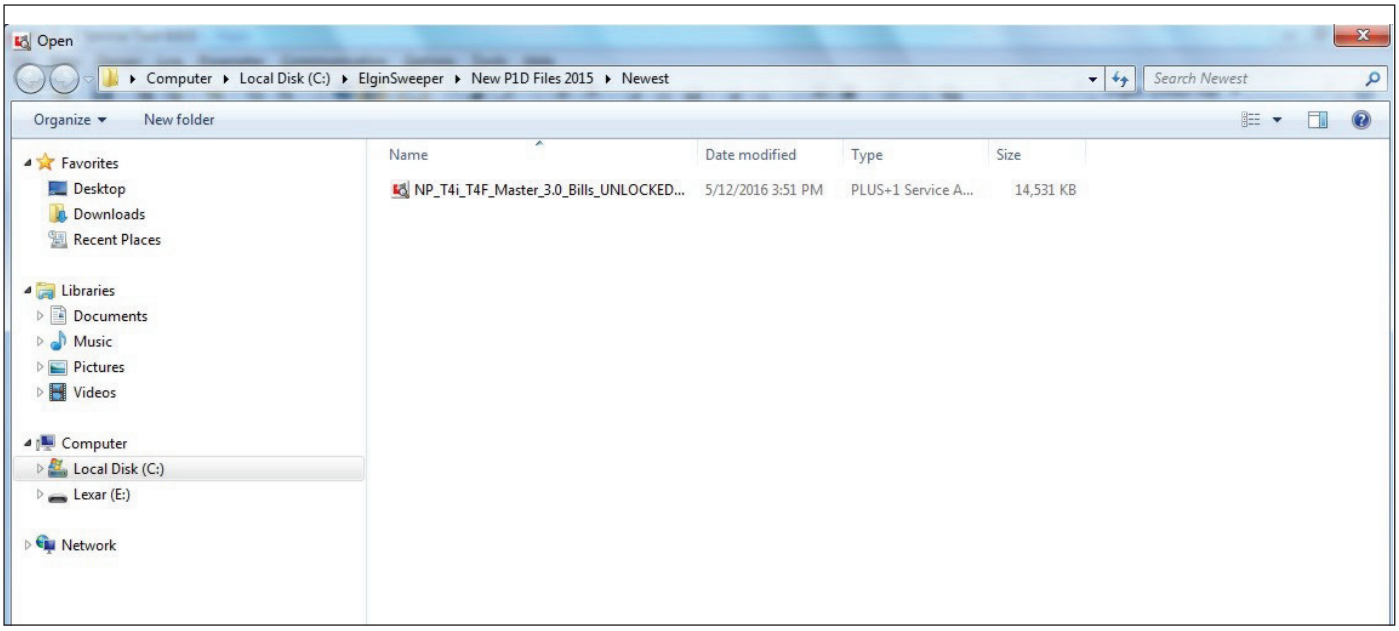


System Navigator Screen
Figure 16B

The service tool screen opens but the Pelican P1D file must be opened to view the sweeper controller and monitor screens.

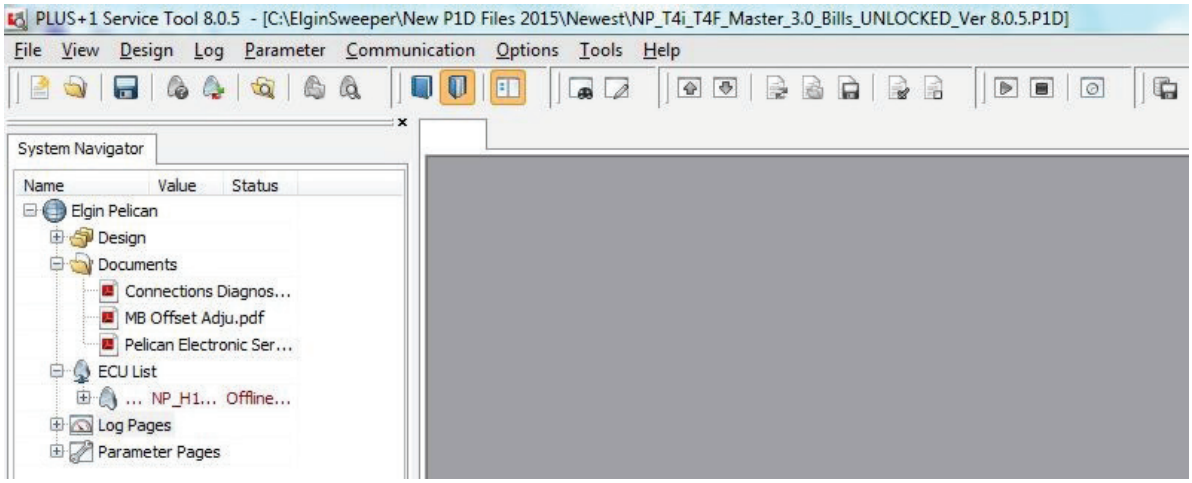
NOTE: *Access to service tool screens is restricted by Elgin Sweeper Company and some screens may not be available to all users. The screens and adjustment abilities are limited based on a need to view basis and to promote safe and effective operation of the sweeper.*





Opening the Plus 1 P1D File
Figures 17A & B

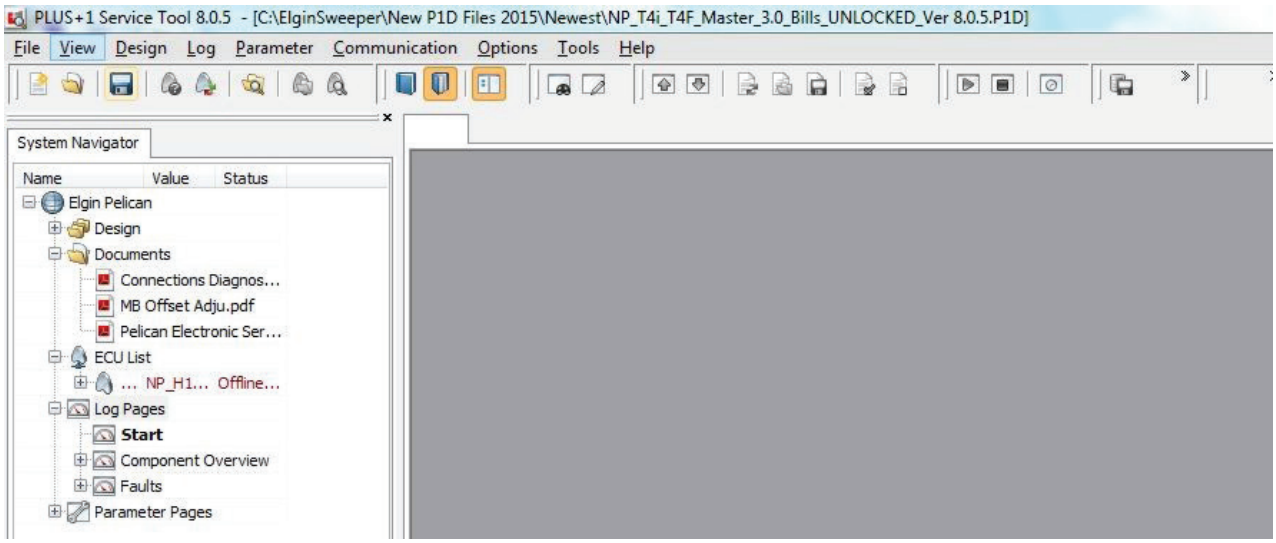
When the service tool opens use the File drop down menu to OPEN the Pelican P1D file (Figure 17).



Log Pages and Parameter Pages
Figure 18

The service tool navigator is divided into two primary fields. The Log Pages and the Parameter Pages (Figure 18). The ECU List displays the P1D file currently in use.

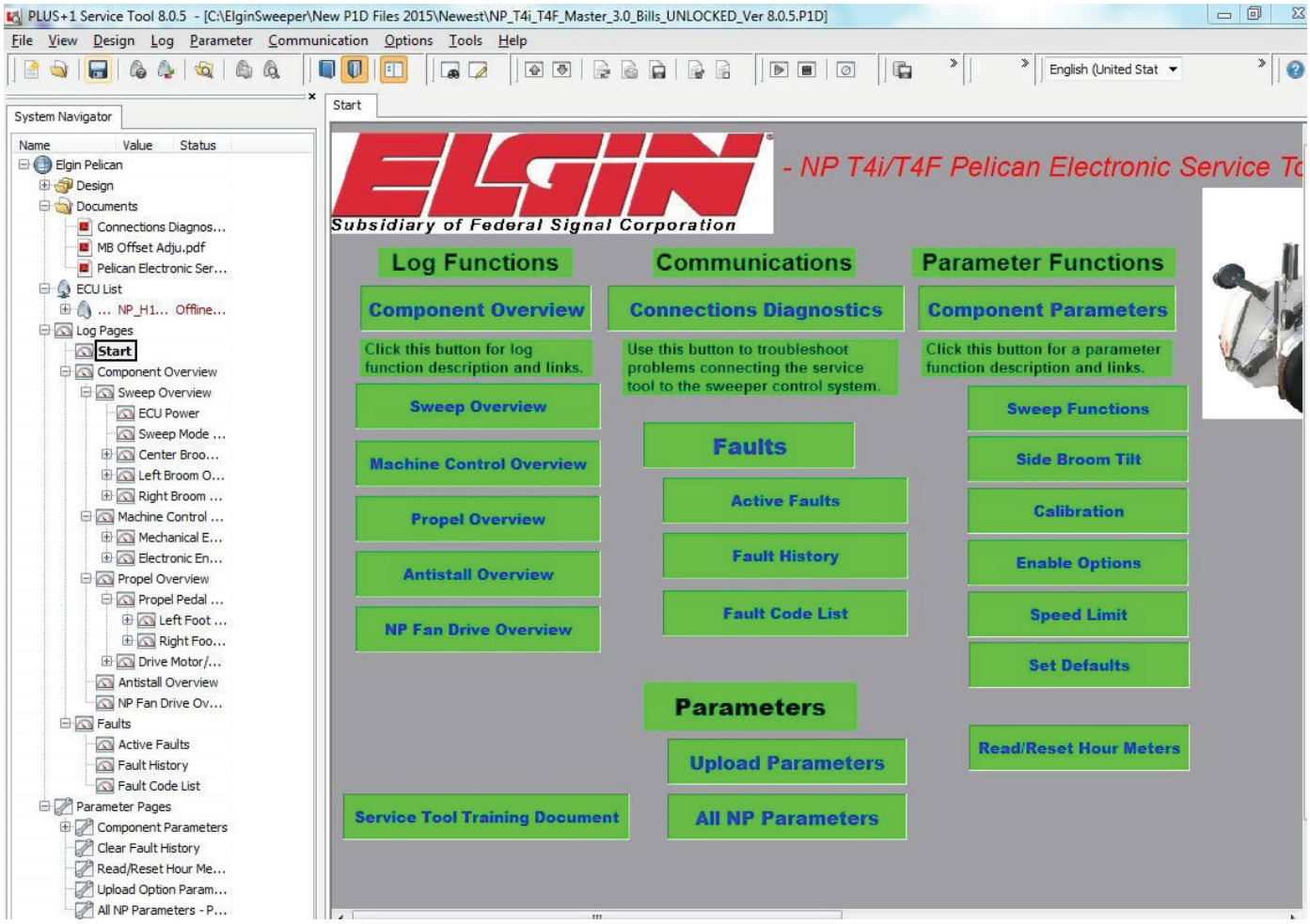
LOG PAGES



Log Pages Fields
Figure 19

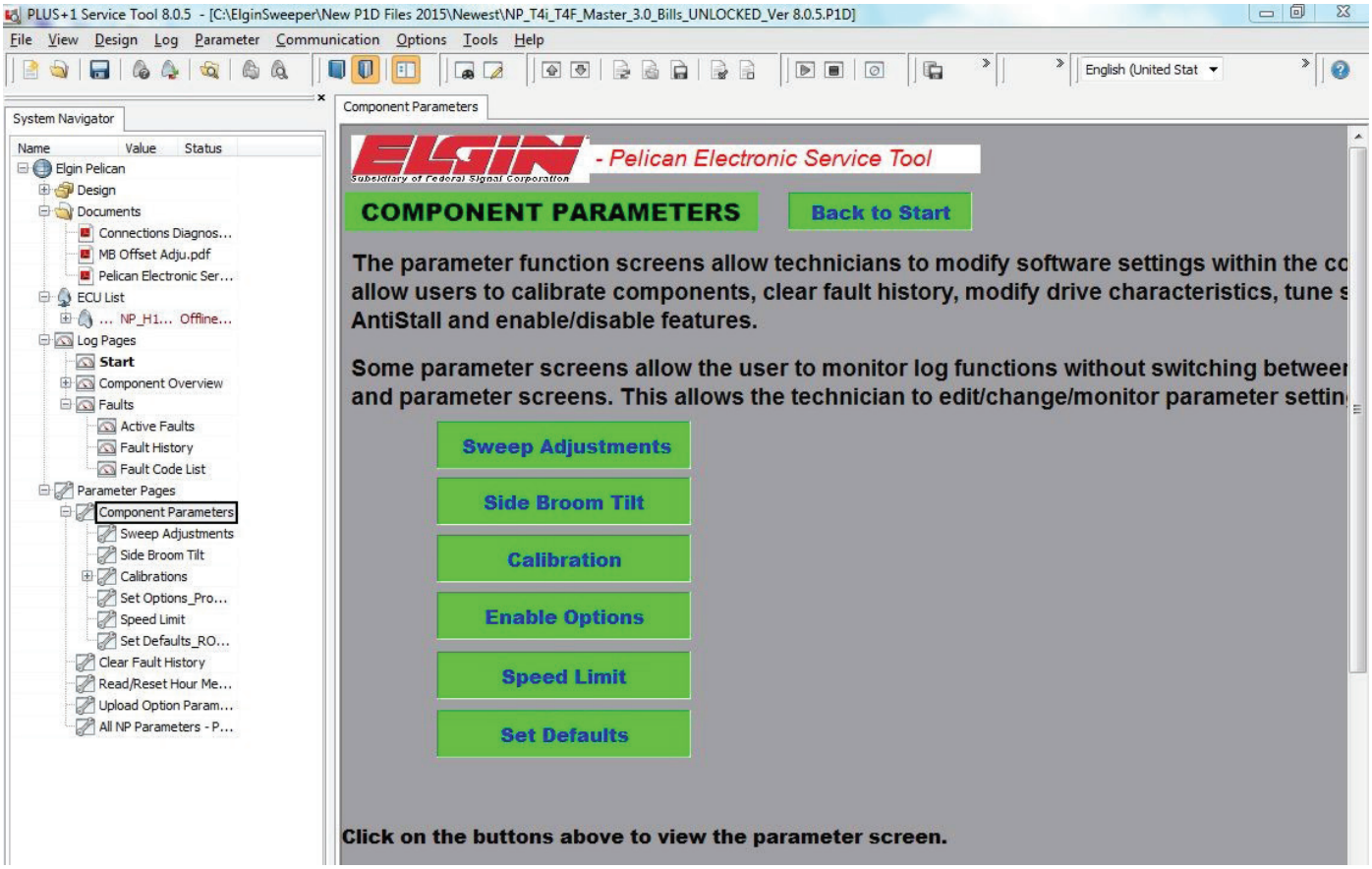
The Log Pages section is divided into two fields. The Component Overview field and the Faults field (Figure 19).

Component Overview Screens



Start Screen
Figure 20

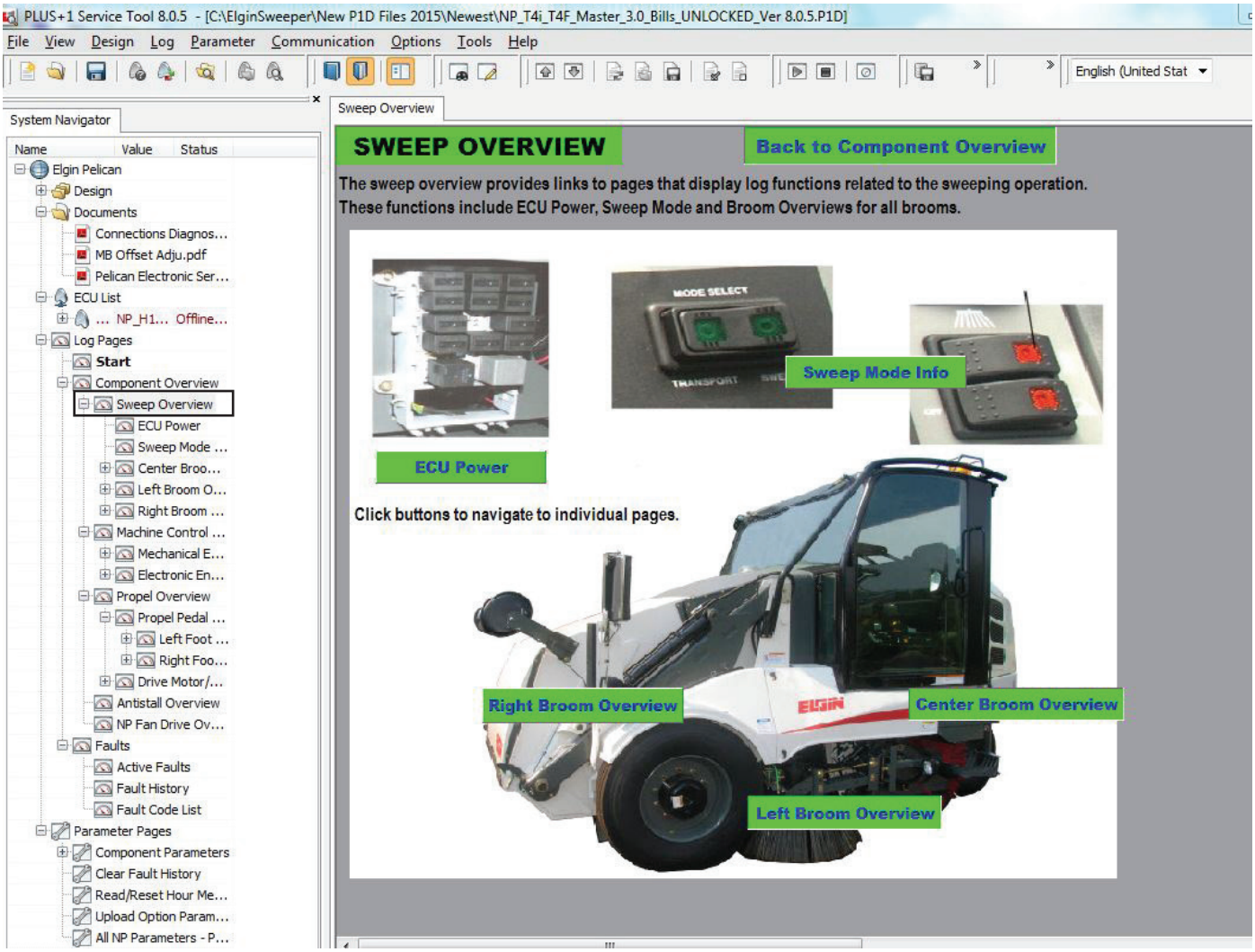
The Start Screen (Figure 20) appears when the Pelican P1D file opens. Use the buttons on the screen to access the log pages or parameter pages. The diagnostic navigator (left column of the screen) can be used to navigate the service tool or the buttons on each screen can be used navigate between screens.



Component Overview
Figure 21

The fields listed under the component overview field (Figure 21) can be accessed by clicking the field in the diagnostic navigator (left hand screen) or by clicking on the buttons displayed in the components overview screen. The inputs to the controller from sensors and voltage values produce output commands. These commands provide output voltage and ground circuits which operate the various sweeper components. The output values from the sweeper (i.e. propel pedal, switch position, etc) are routed to the controller. The controller is monitored by the service tool. The service tool displays the log functions to provide the operator or technician the information needed to operate, repair or monitor sweeper components and operation. The log function component overview includes:

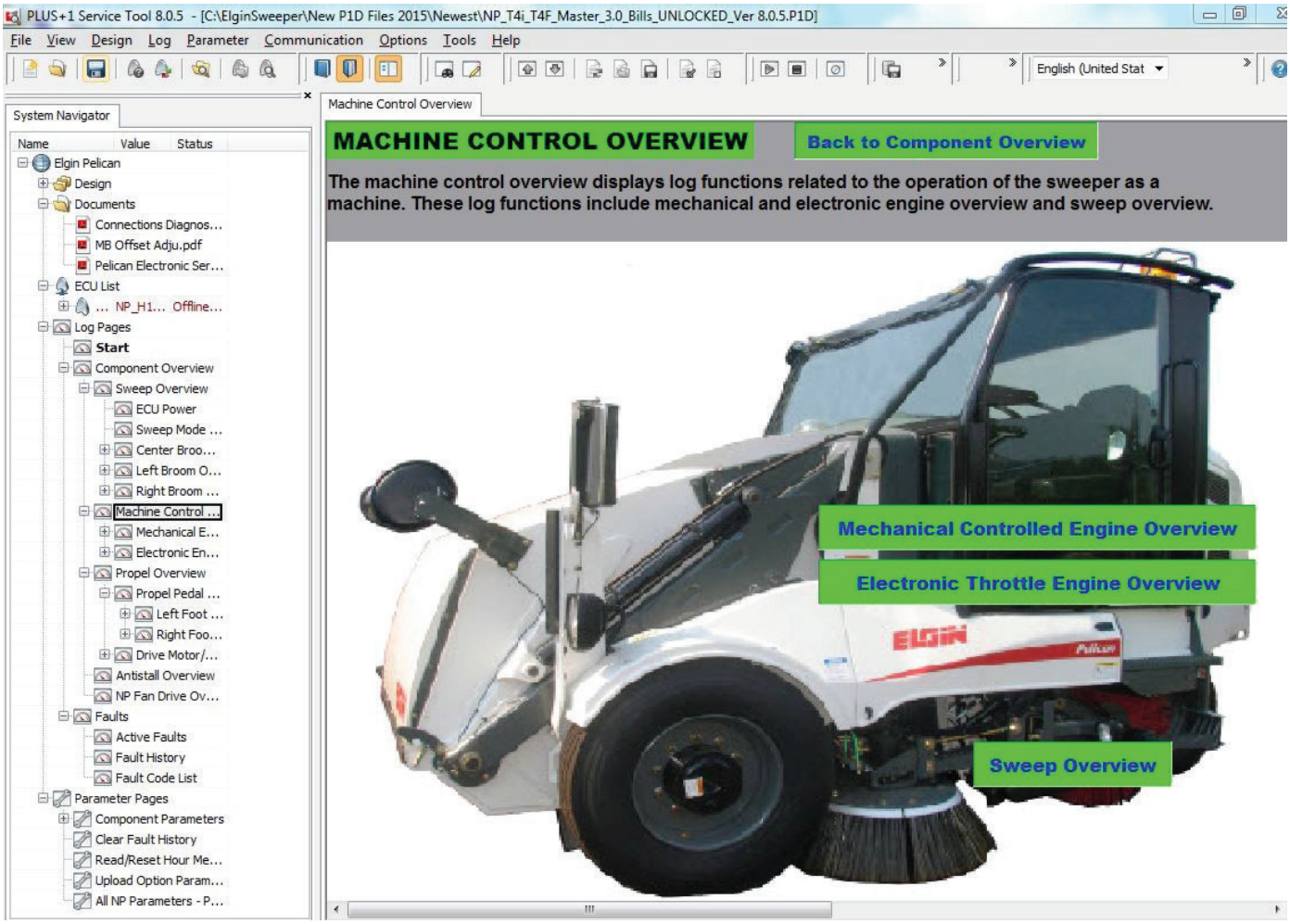
- Sweep Overview
- Machine Control Overview
- Propel Overview
- NP fan drive overview
- Antistall Overview



Sweep Overview Screen
Figure 22

The fields listed under the sweep overview field (Figure 22) can be accessed by clicking the fields in the diagnostic navigator (left hand screen) or by clicking on the buttons displayed in the sweep overview screen. The sweep overview screen displays log functions associated with the sweeping operation. The log functions include:

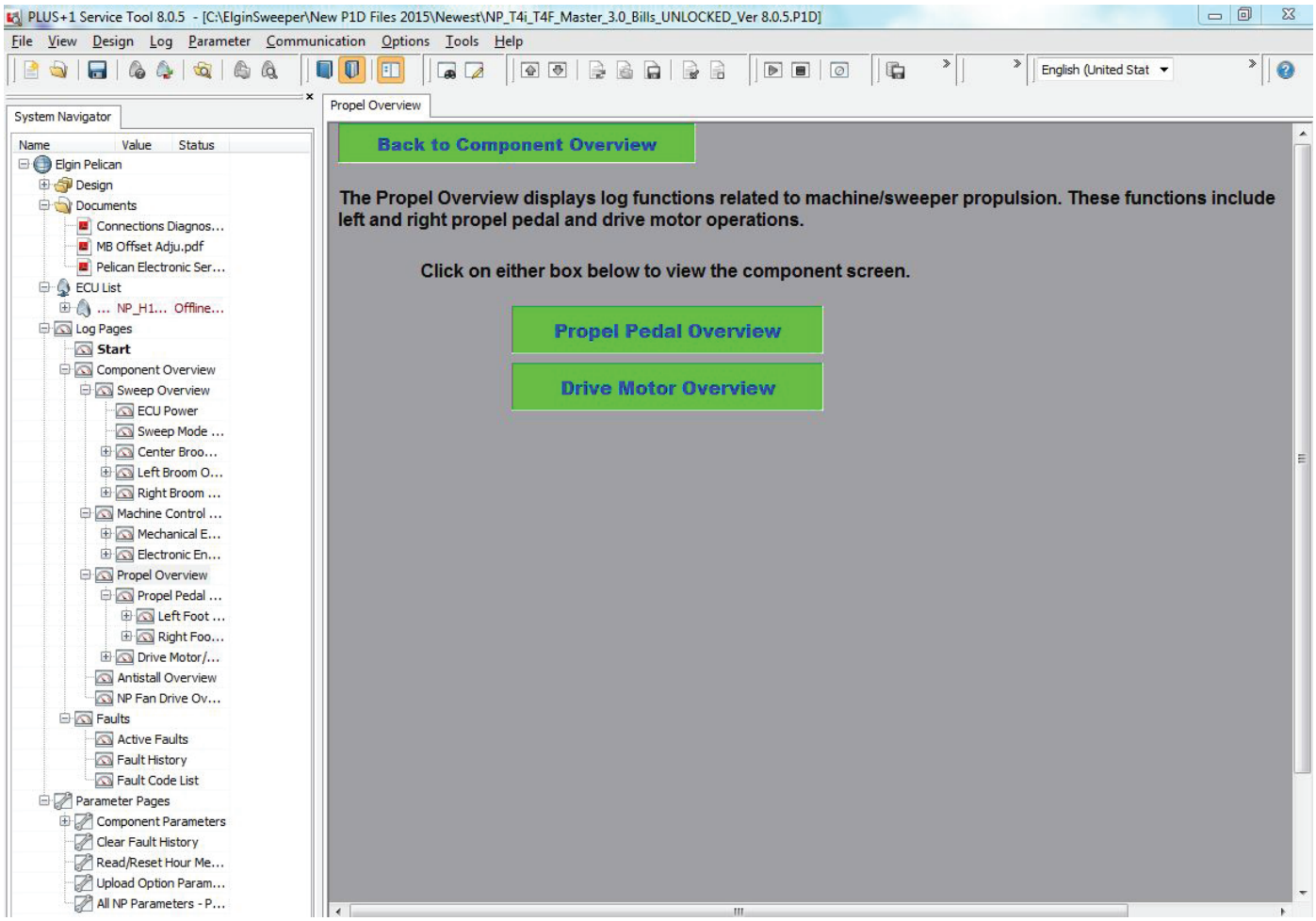
- ECU Power
- Sweep Mode Info
- Center Broom Overview
- Left Broom Overview
- Right Broom Overview



Machine Control Overview Screen
Figure 23

The fields listed under the machine control overview field (Figure 23) can be accessed by clicking the fields in the diagnostic navigator (left hand screen) or by clicking on the buttons displayed in the machine control overview screen. The machine control overview screen displays log functions associated with machine operation. The log functions include:

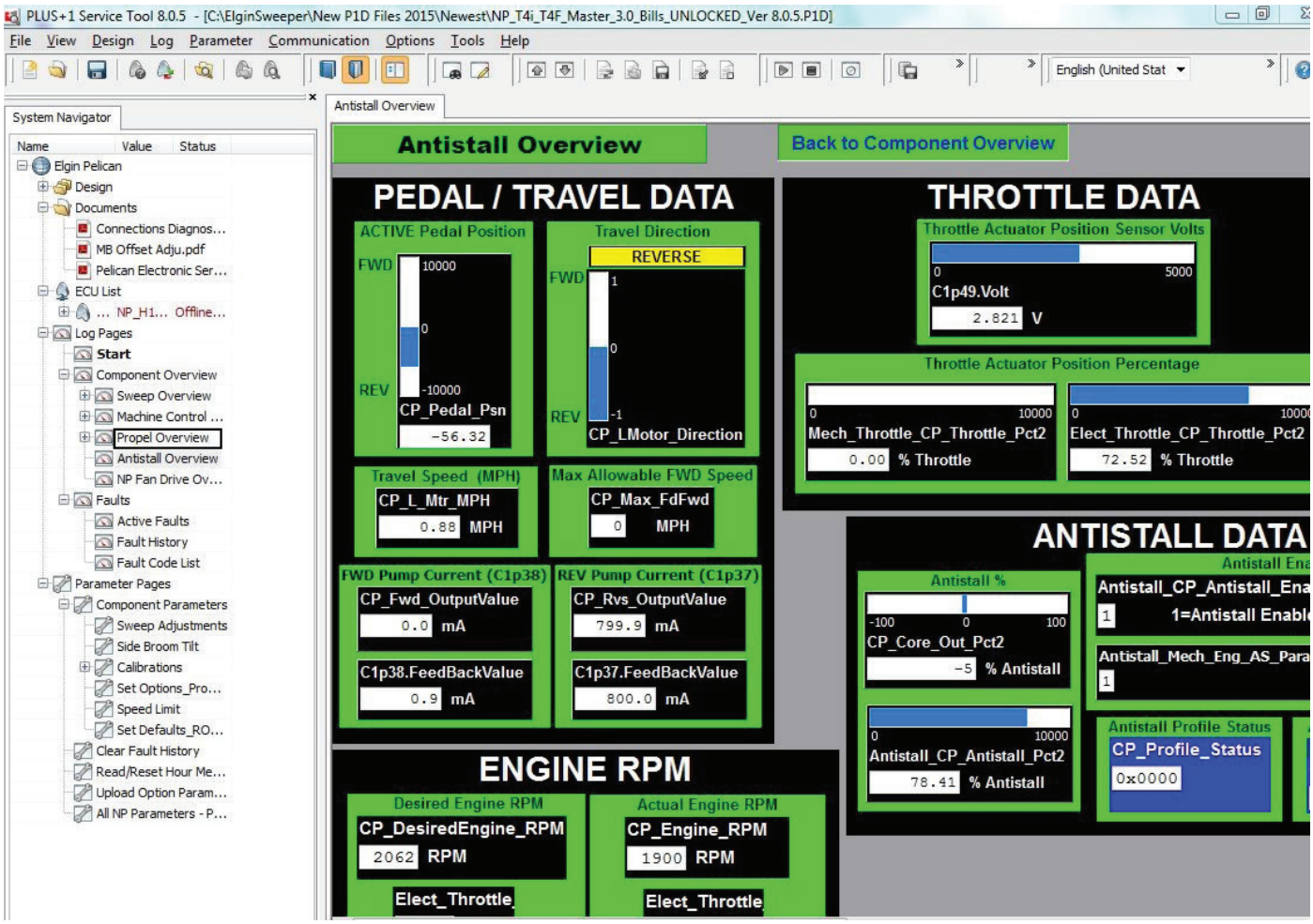
- Mechanical Engine Overview
- Electronic Engine Overview



Propel Overview Screen
Figure 24

The fields listed under the propel overview field (Figure 24) can be accessed by clicking the field in the diagnostic navigator (left hand screen) or by clicking on the buttons displayed in the propel overview screen. The propel overview screen displays log functions associated with machine propulsion. The log functions include:

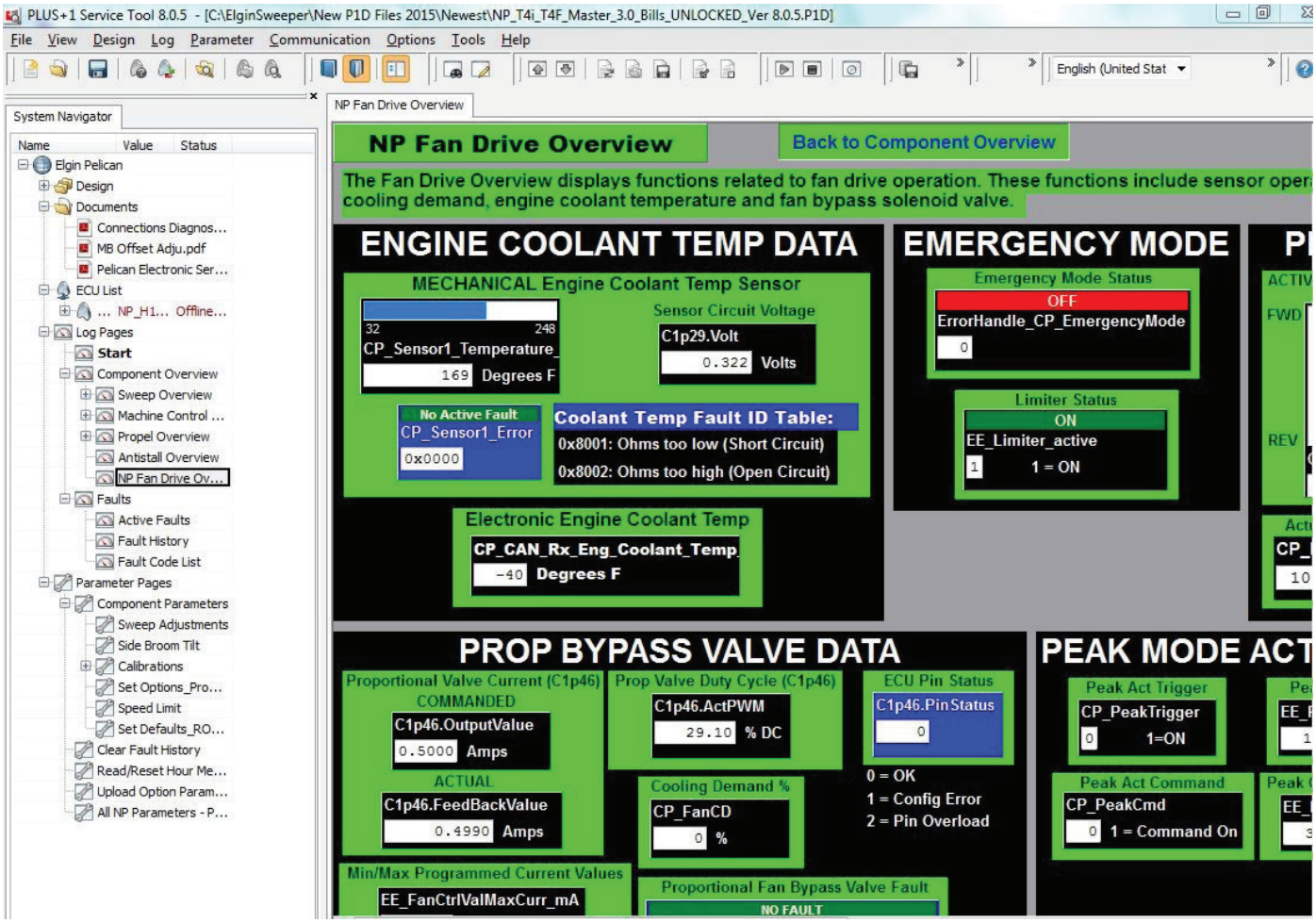
- Propel Pedal Overview
  - Right Foot Pedal
  - Left Foot Pedal
- Drive Pump/Motor Overview



Antistall Overview Screen
Figure 25

The antistall overview displays log function related to the antistall operation. The log functions are shown in antistall related fields and include::

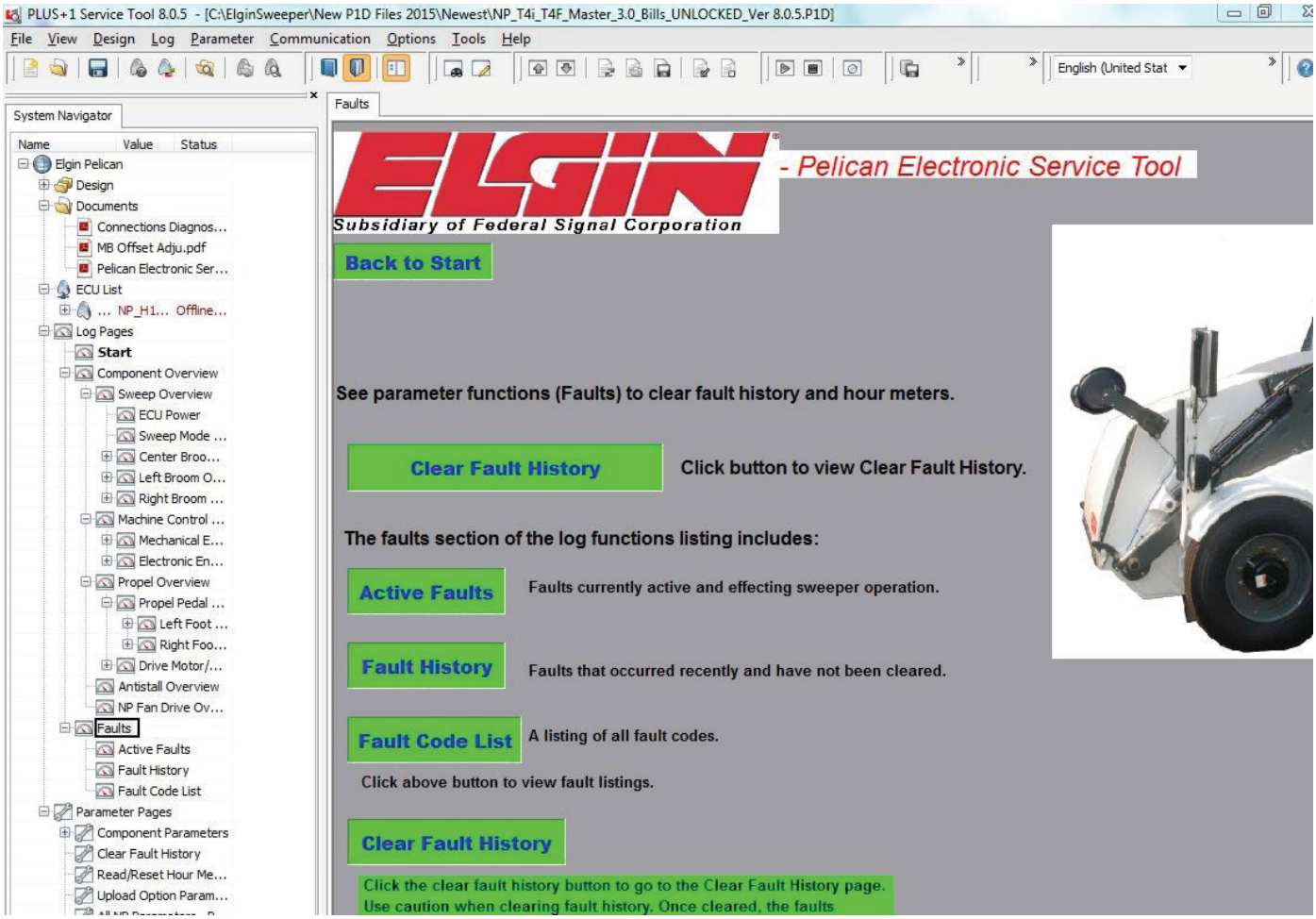
- Pedal/Travel Data
- Throttle Data
- Engine RPM
- Antistall Data



Fan Drive Overview Screen
Figure 26

The fan drive overview displays functions related to fan drive operation. The log functions are shown in fan related fields and include:

- Engine Coolant Temperature Data
- Emergency Mode
- Proportional Fan Bypass Valve Data
- Pedal/Travel Data
- Peak Mode Activation



Fault Screen
Figure 27

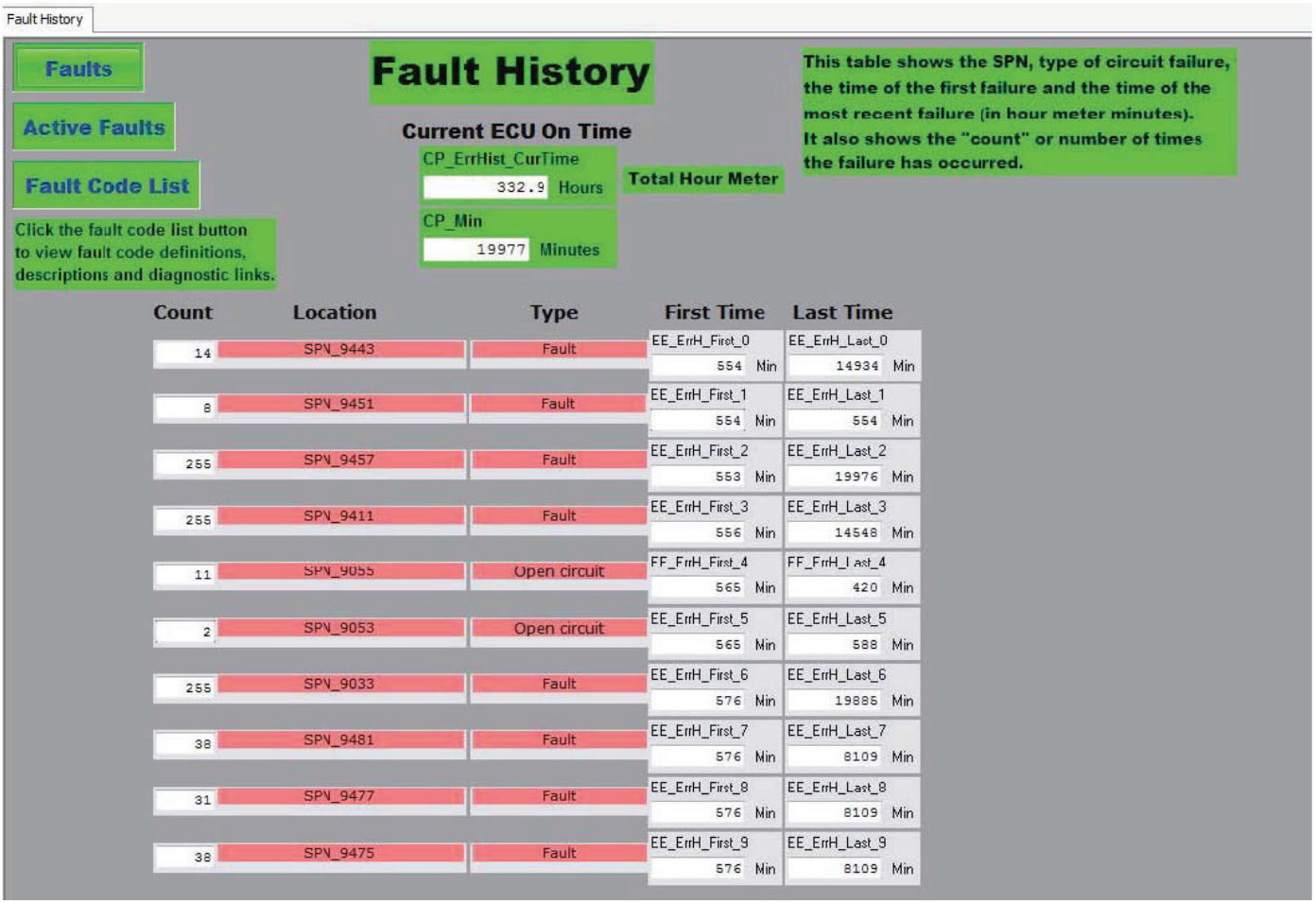
Faults Screens

The fields listed under the faults field (Figure 27) can be accessed by clicking the fields in the diagnostic navigator (left hand screen) or by clicking the buttons displayed on the faults screen. The faults are generated by the controller based on sensor input from the sweeper components. The faults are displayed on the speedometer display. The log function faults screen includes:

- Active Faults
- Fault History
- Fault Code List

Fault History Screen

The fault history screen displays the number of times the fault has occurred, the fault location, type of fault, and the first time the fault set and the last time the fault set.



Service Tool Fault History Screen
Figure 28

The fault history screen will only display ‘open circuit’ for open circuits, short to grounds and short to power faults for the following error codes:

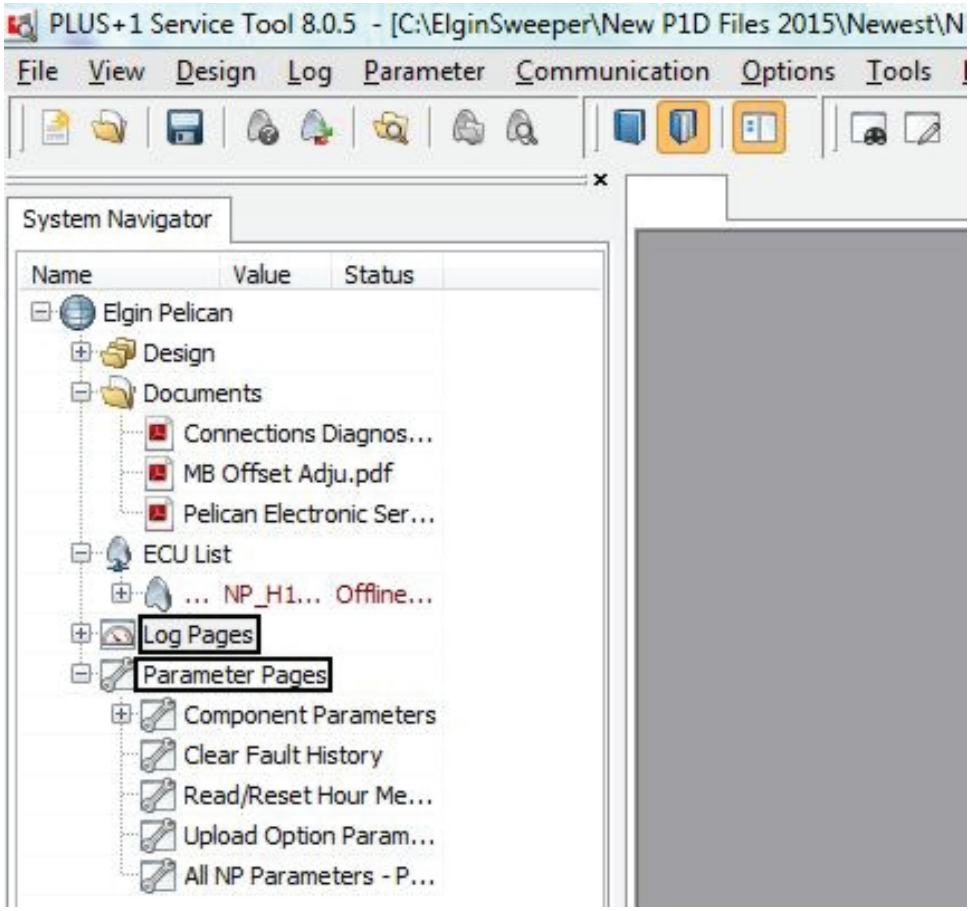
SPN 9053 SPN 9055 SPN 9057 SPN 9061
SPN 9063 SPN 9221 SPN 9223

The fault history screen will only display ‘fault exist’ for the following error codes:

SPN 9011 SPN 9015 SPN 9021 SPN 9027 SPN 9031 SPN 9033
SPN 9043 SPN 9213 SPN 9215 SPN 9411 SPN 9413 SPN 9415
SPN 9443 SPN 9451 SPN 9453 SPN 9455 SPN 9461 SPN 9463
SPN 9467 SPN 9471 SPN 9473 SPN 9475 SPN 9477
SPN 9481

The fault history screen will display the actual fault for the SPN 9023 and SPN 9025 error codes.

A better indicator of a fault condition (assuming it is active) can be found on the service tool screen associated with the fault as shown in the flowcharts.

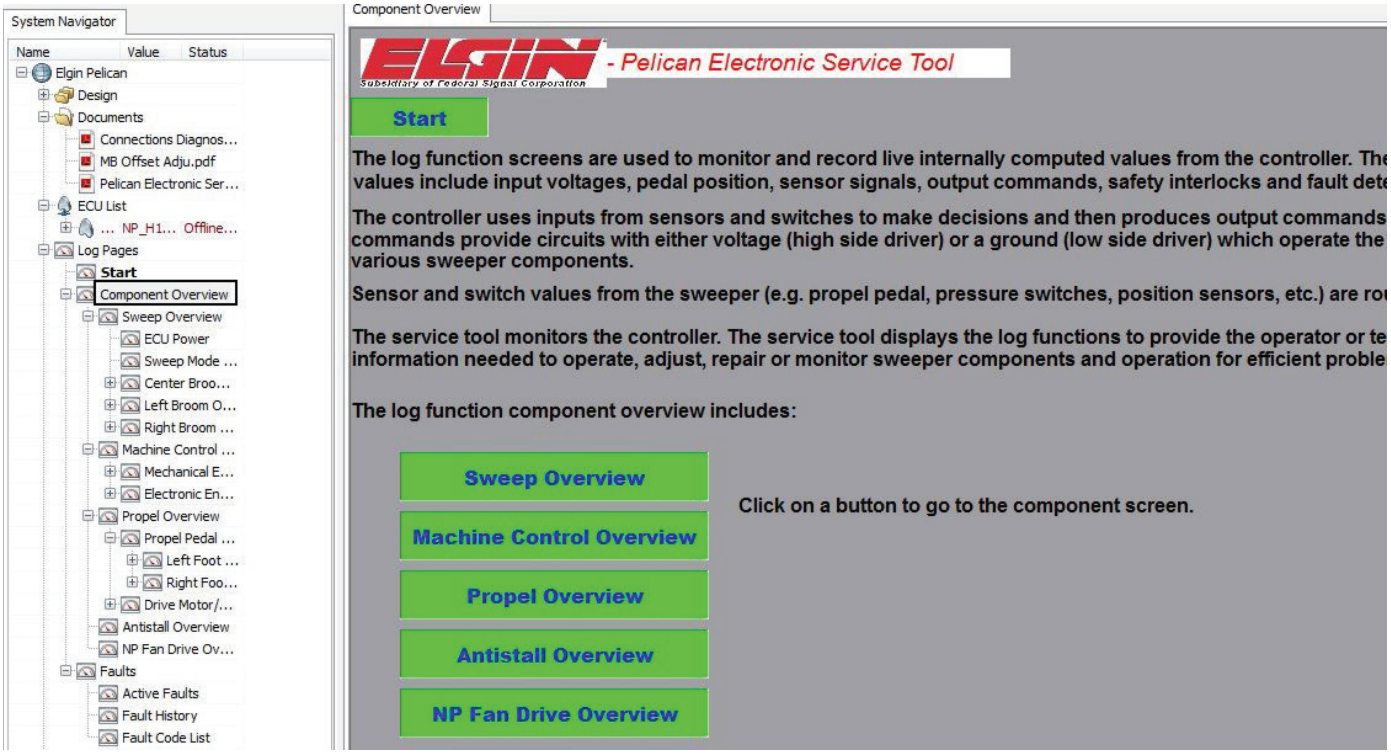


Parameter Pages Fields
Figure 29

The parameter pages section is divided into five fields.

- Component Parameters
- Clear Fault History
- Read/Reset History/Hour Meter
- Upload Option Parameters
- All Parameters

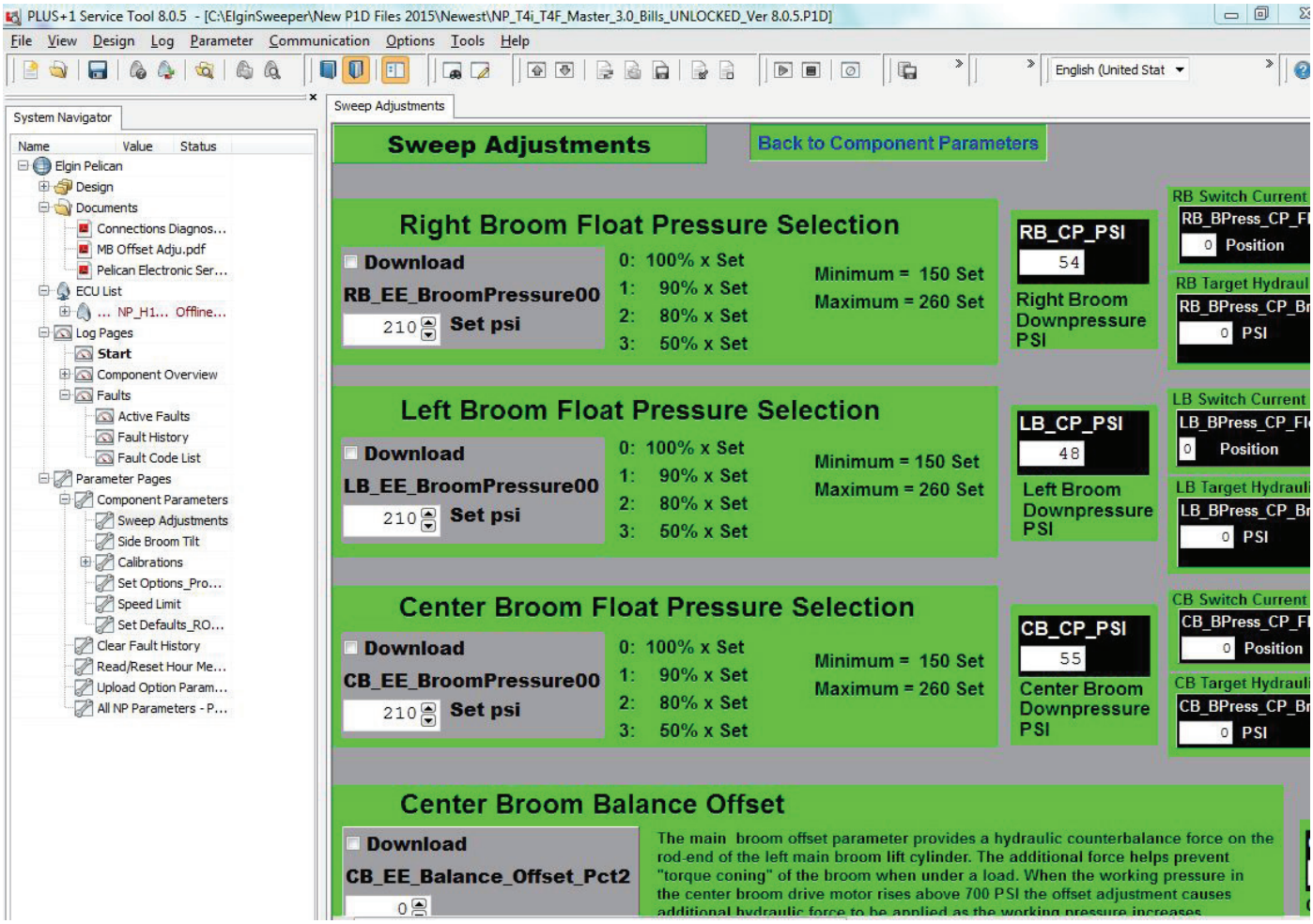
Component Parameters



Component Parameters Screen
Figure 30

The parameter page screens allow technicians to modify software settings within the controller. The settings allow users to calibrate components, clear fault history, and adjust speed limits. Some parameter screens allow the user to monitor log functions without switching between log function screens and parameter screens. This allows the technician to edit/change/monitor parameter settings using the same screen. The fields listed under the component parameters field (Figure 30) can be accessed by clicking the field in the diagnostic navigator (left hand screen) or by clicking on the buttons displayed in the components parameters screen. The parameter adjustments are a direct link to the controller and will change the operation of the sweeper. The component parameters screen includes adjustments for:

- Sweep Adjustments
- Side Broom Tilt
- Calibrations
- Speed Limit
- Set Defaults - (ROSM/Production Only)

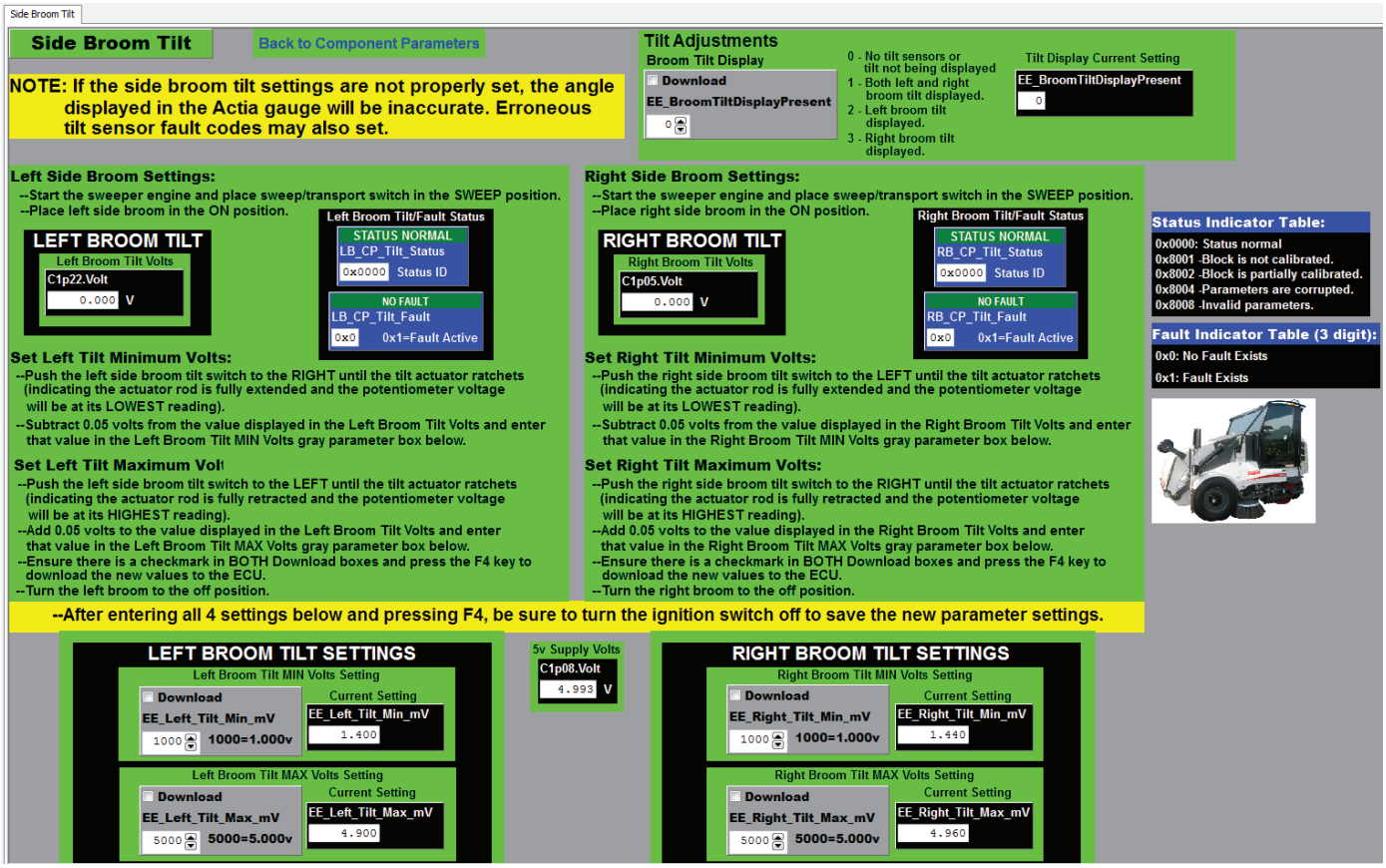


Sweep Adjustments Screen
Figure 31

The fields listed under the sweep adjustments field (Figure 31) can be accessed by clicking on the component parameter. The sweep adjustments screen includes adjustments for:

- Center Broom Float Pressure Selection
- Right Broom Float Pressure Selection
- Left Broom Float Pressure Selection
- Center Broom Balance Offset

NOTE: *Instructions for adjusting sweep offset can be viewed by clicking on the Offset Adjustment Procedure at the bottom of the screen.*



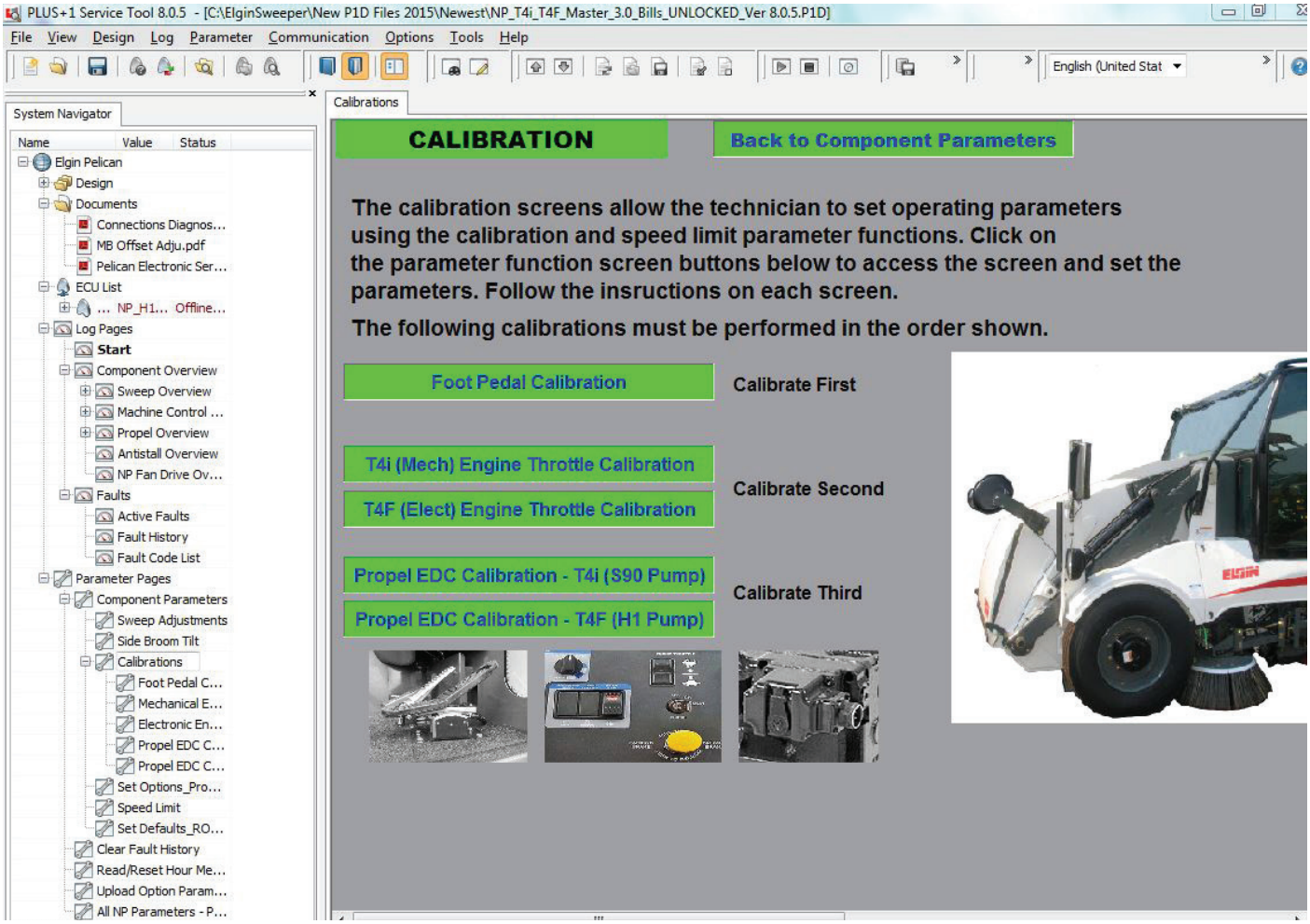
Side Broom Screen
Figure 32

The fields listed under the side broom tilt field (Figure 32) can be accessed by clicking on the component parameter. The side broom tilt screen includes information for:

- Current Tilt Readings/Status/Faults

The side broom tilt screen includes adjustments for:

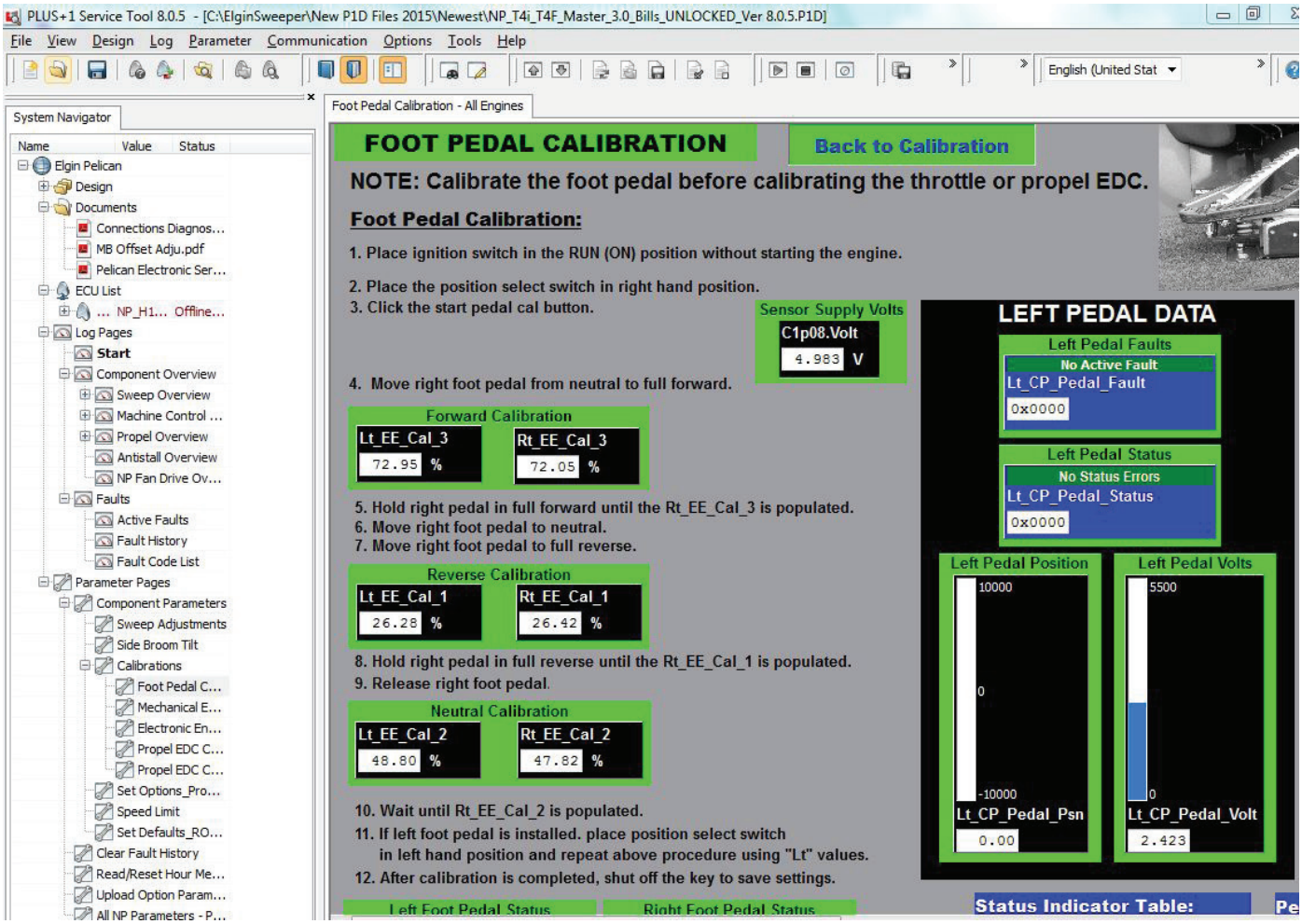
- Tilt Adjustments
- Right Broom Tilt
- Right Broom Tilt Settings
- Left Broom Tilt
- Left Broom Tilt Settings
- Current Tilt Readings/Status/Faults



Calibration Screen
Figure 33

The calibration screen is used to calibration of sweeper functions. The fields listed on the calibration screen (Figure 33) can be accessed by clicking on the field in the diagnostic navigator or by clicking on the buttons displayed on the calibration screen. The calibration fields include:

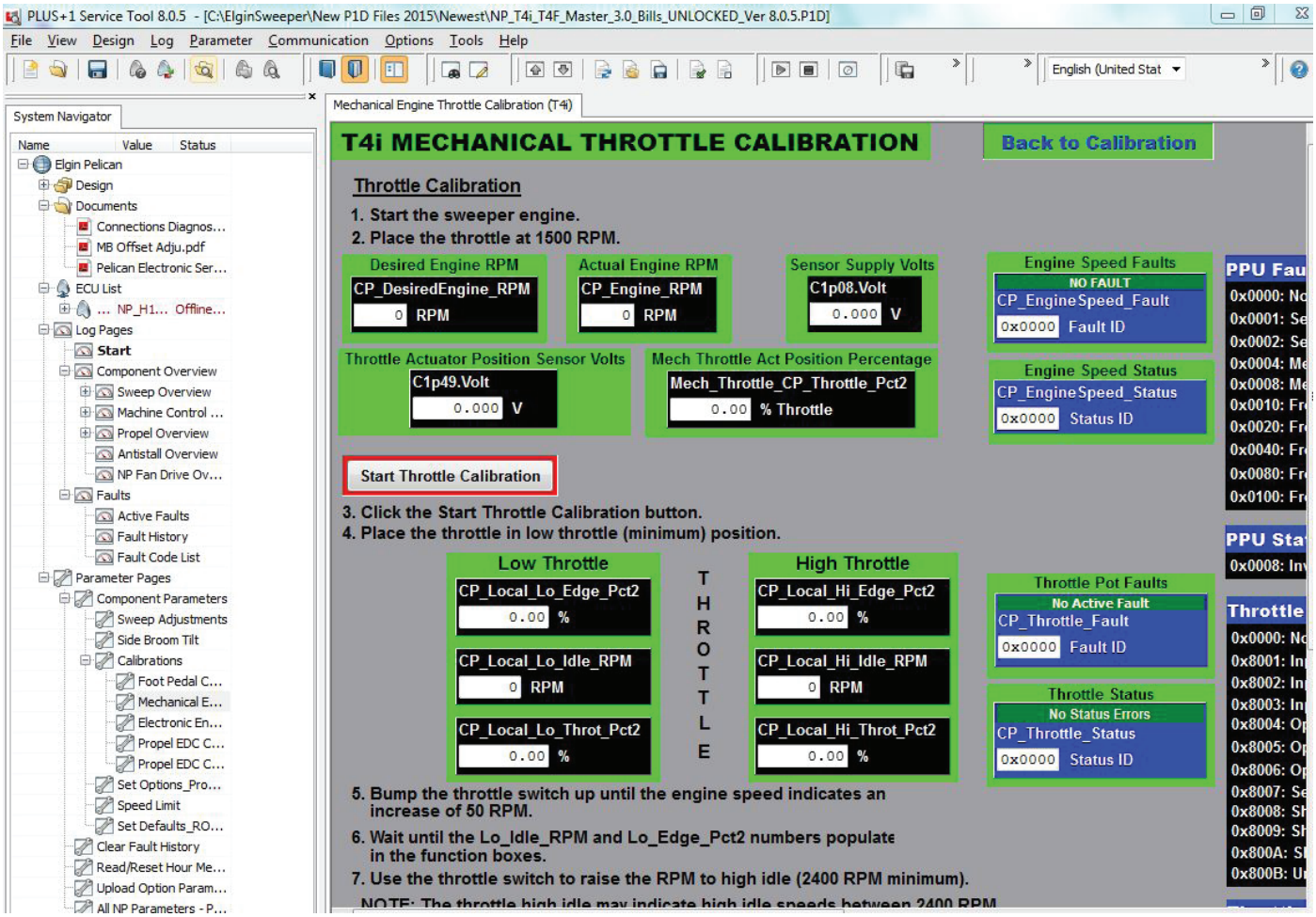
- Foot Pedal Calibration
- T4i (Mech) Engine Throttle Calibration
- T4F (Elect) Engine Throttle Calibration
- Propel EDC Calibration - T4i (S90 Pump)
- Prepel EDC Calibration - T4F (Hi Pump)



Foot Pedal Calibration Screen
Figure 34

The foot pedal calibration screen allows technicians to calibrate the right and left foot pedal. The screen includes buttons and calibration data for:

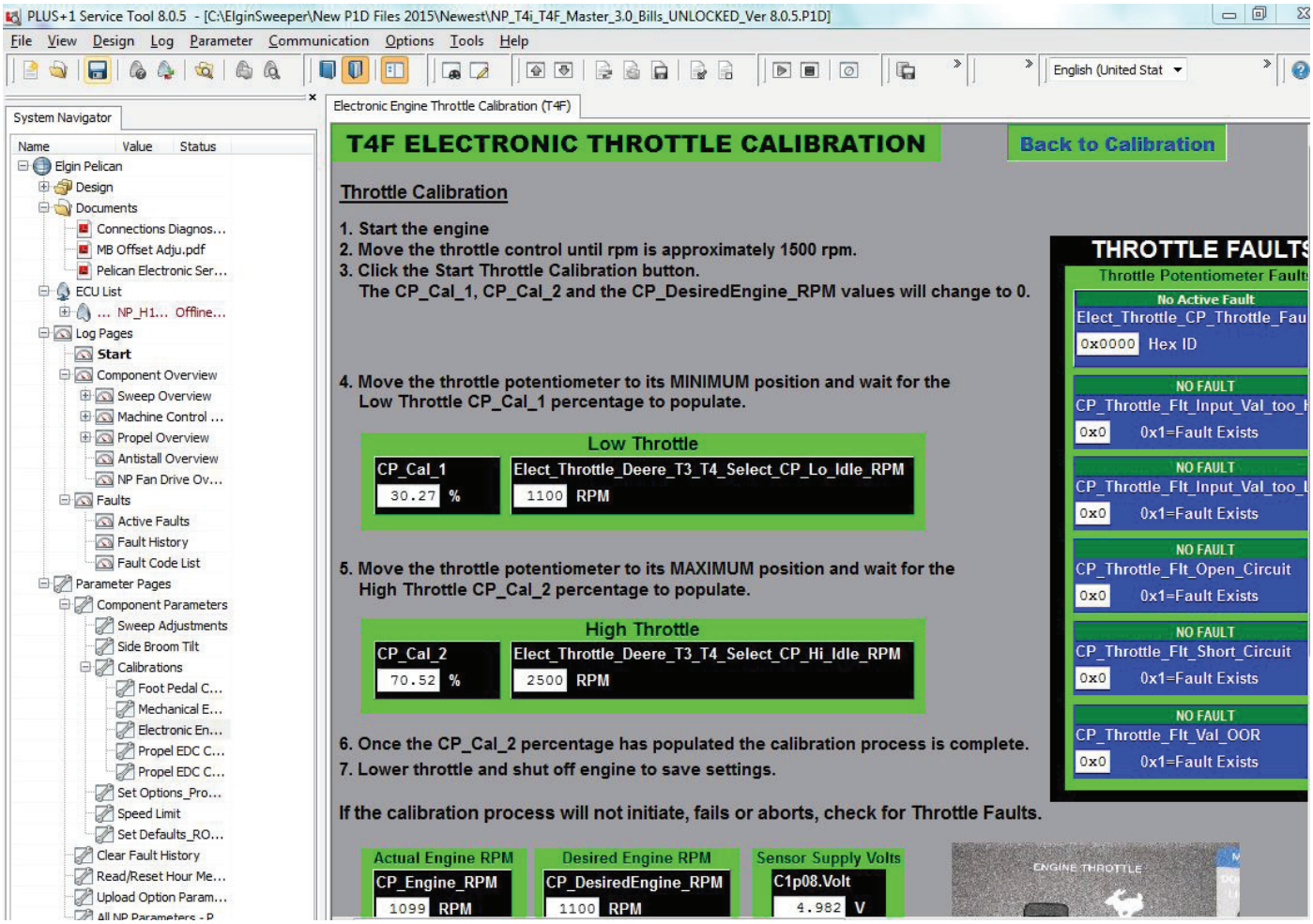
- Start Pedal Calibration Button
- Forward Calibration Data and Instructions
- Reverse Calibration Data and Instructions
- Neutral Calibration Data and Instructions
- Left Foot Pedal Status
- Right Foot Pedal Status
- Left Foot Pedal Data
- Right Foot Pedal Data



Mechanical Engine Throttle Calibration Screen
Figure 35

The mechanical engine throttle calibration screen allows a technician to calibrate the engine throttle. The field can be accessed by clicking the mechanical engine throttle calibration field in the diagnostic navigator. The screen includes buttons and throttle data for throttle calibration and includes:

- Start Calibration Button
- Desired Engine RPM
- Actual Engine RPM
- Sensor Supply Volts
- Throttle Actuator Position Sensor Volts
- Mechanical Throttle Act Position Percentage
- Low Throttle Data
- High Throttle Data



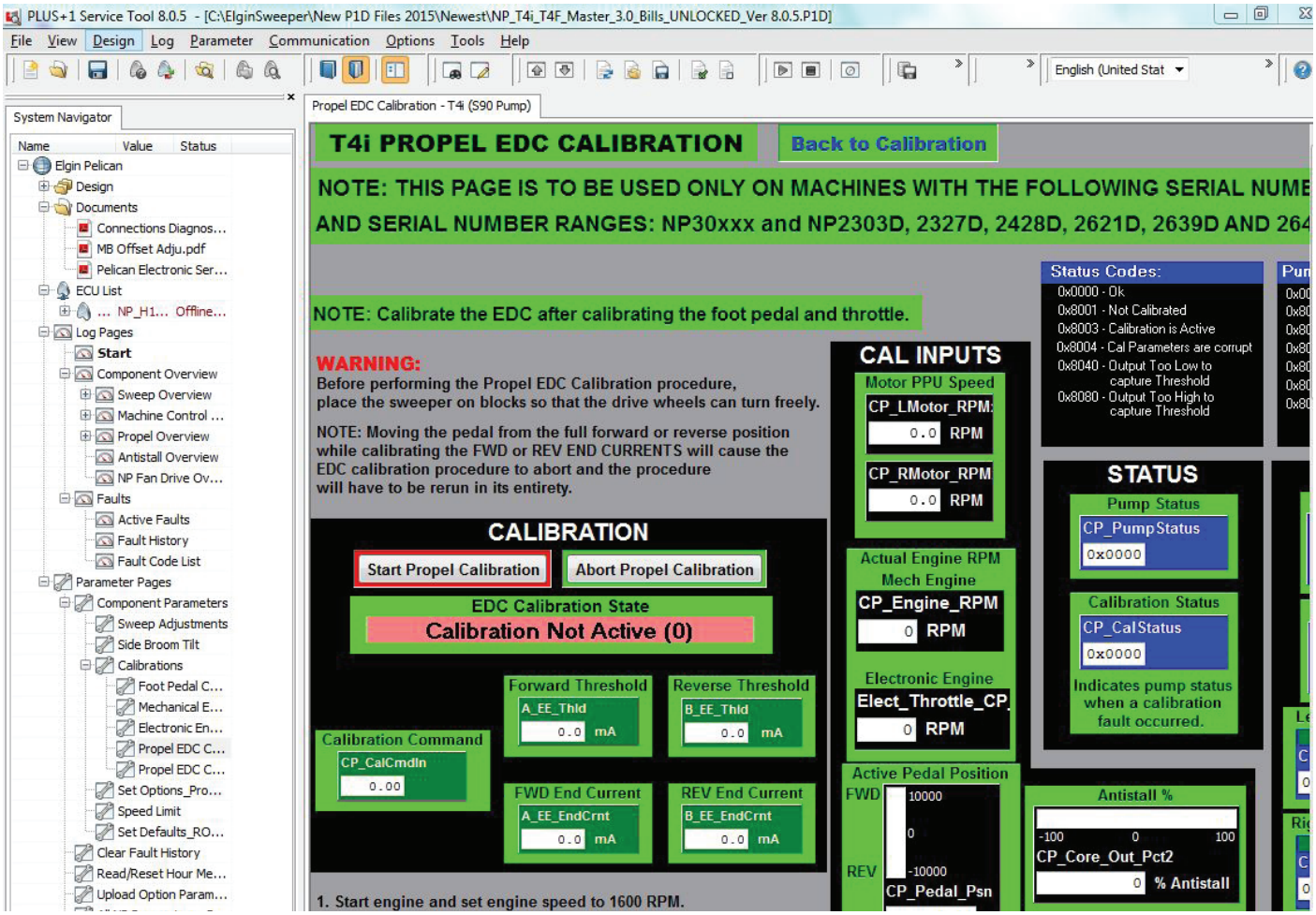
Electronic Engine Throttle Calibration Screen
Figure 36

The mechanical engine throttle calibration screen allows a technician to calibrate the engine throttle. The field can be accessed by clicking the mechanical engine throttle calibration field in the diagnostic navigator. The screen includes buttons and throttle data for throttle calibration and includes:

- Low Throttle Calibration with Instructions
- High Throttle Calibration with Instructions
- Actual Engine RPM
- Desired Engine RPM
- Sensor Supply Volts
- Dash Throttle Potentiometer Volts
- Throttle Percentage
- Throttle Faults

NOTE: The ‘ THIS PAGE IS NOT FOR USE WITH THIS MACHINE ‘ warning will appear on the calibration screen if there is an attempt to use the screen for mechanical throttle calibration.

THIS PAGE IS NOT FOR USE WITH THIS MACHINE.

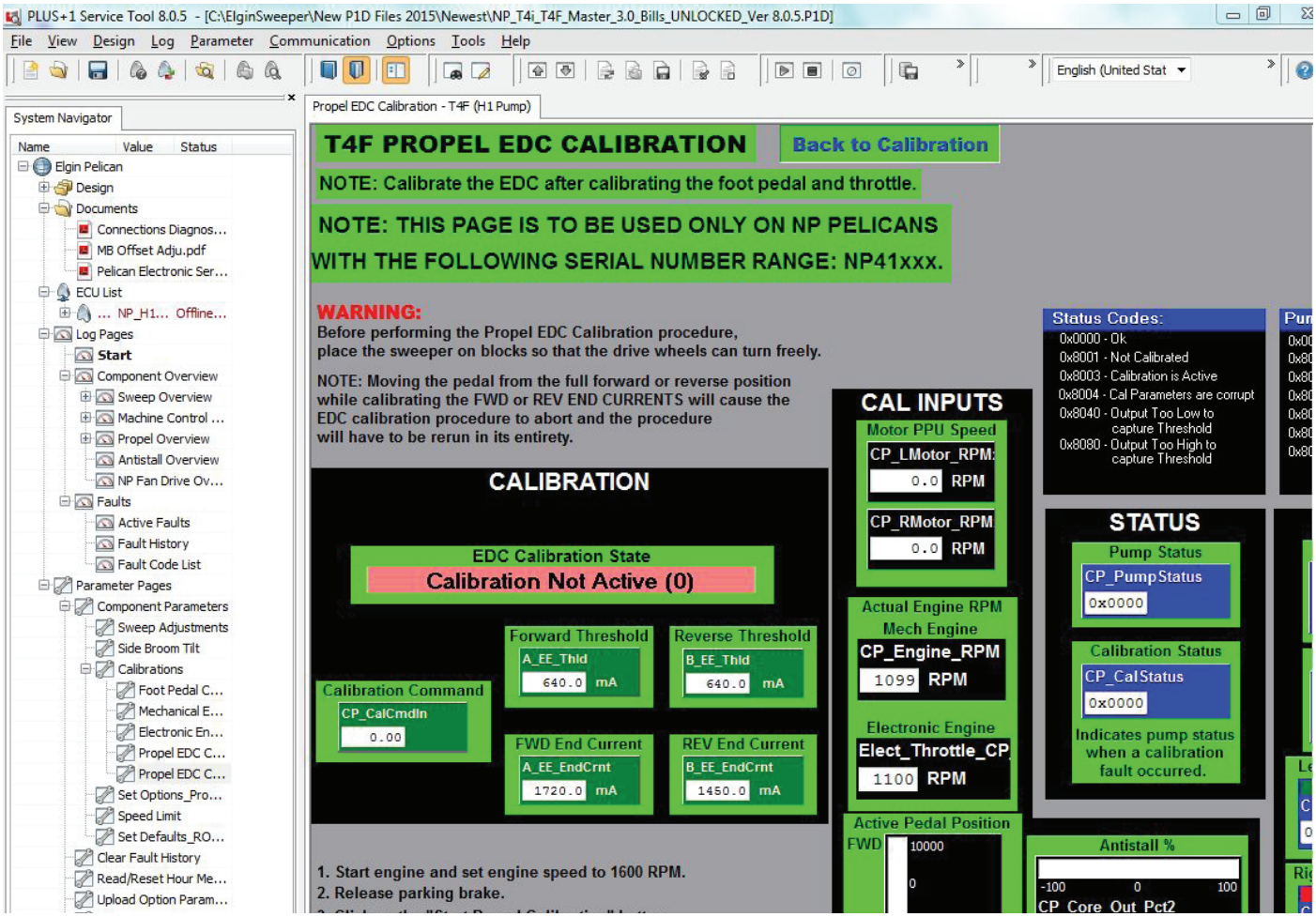


T4i Propel EDC Calibration Screen
Figure 37

The T4F propel EDC calibration screen allows technicians to celibrate the EDC. The screen provides buttons and data for the calibration. The screen includes:

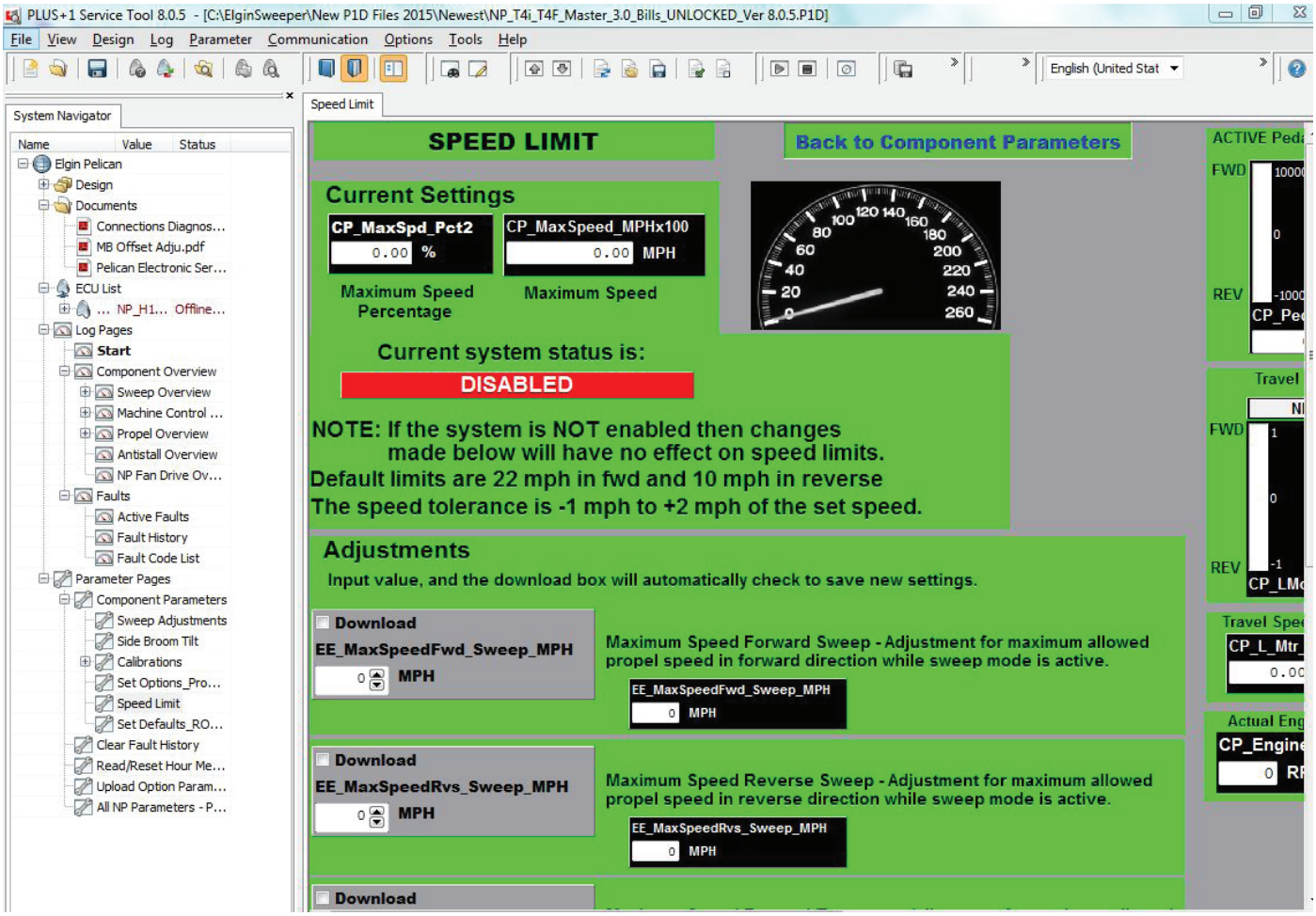
- Calibration Procedures with Instructions
- Calibration Inputs Affecting the Calibration
- Pump Status Indicators
- Pump Fault Indicators

NOTE: *The ‘ THIS PAGE IS NOT FOR USE WITH THIS MACHINE ‘ warning will appear on the calibration screen if there is an attempt to use the screen for mechanical throttle calibration.*



T4F EDC Calibration Screen
Figure 38

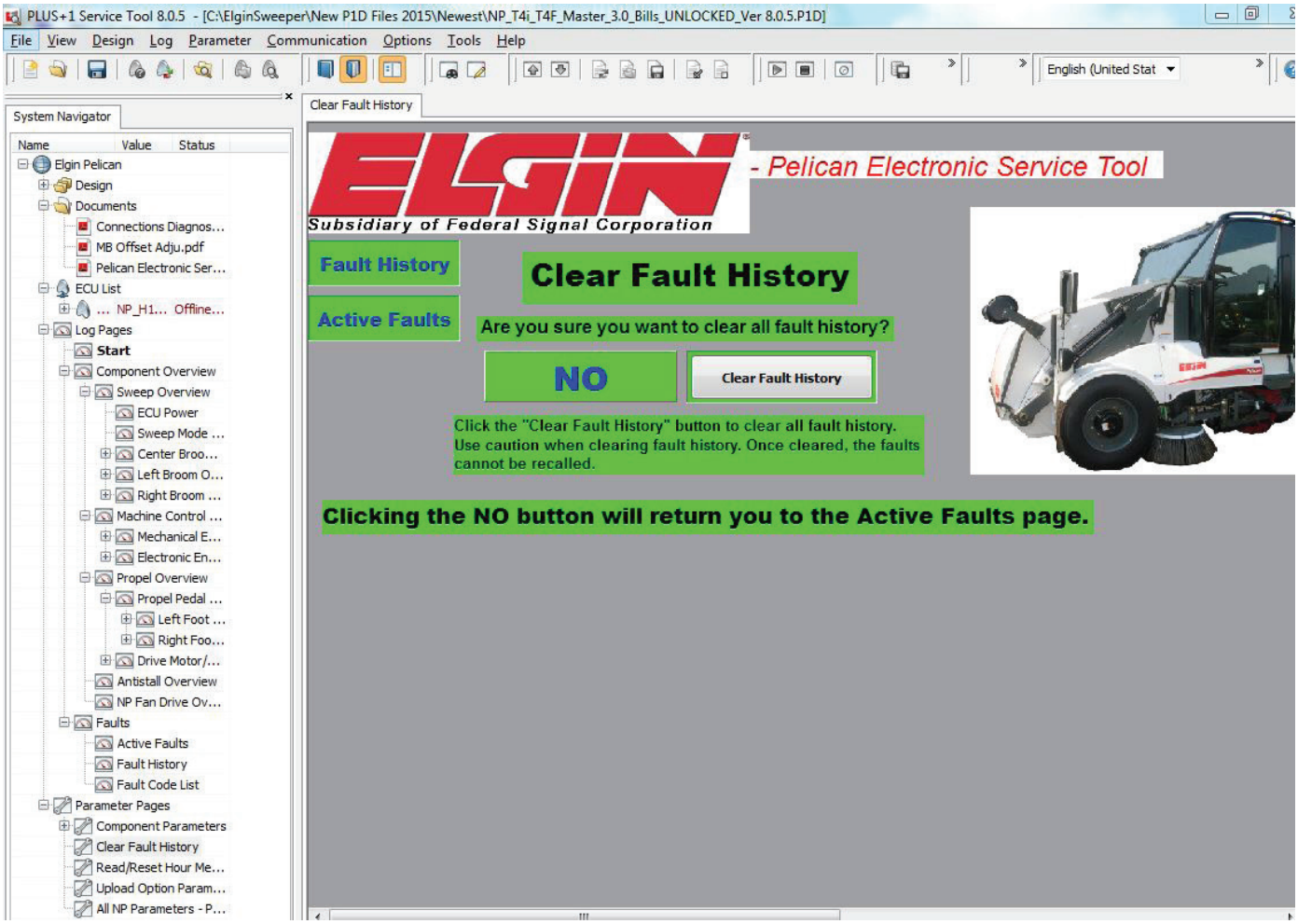
THIS PAGE IS NOT FOR USE WITH THIS MACHINE.



Speed Limit Screen
Figure 39

The speed limit screen allows a technician to adjust sweeper speed limits. The adjustments include:

- Maximum Speed Forward in Sweep
- Maximum Speed Reverse in Sweep
- Maximum Speed Forward in Transport
- Maximum Speed Reverse in Transport
- Maximum Speed

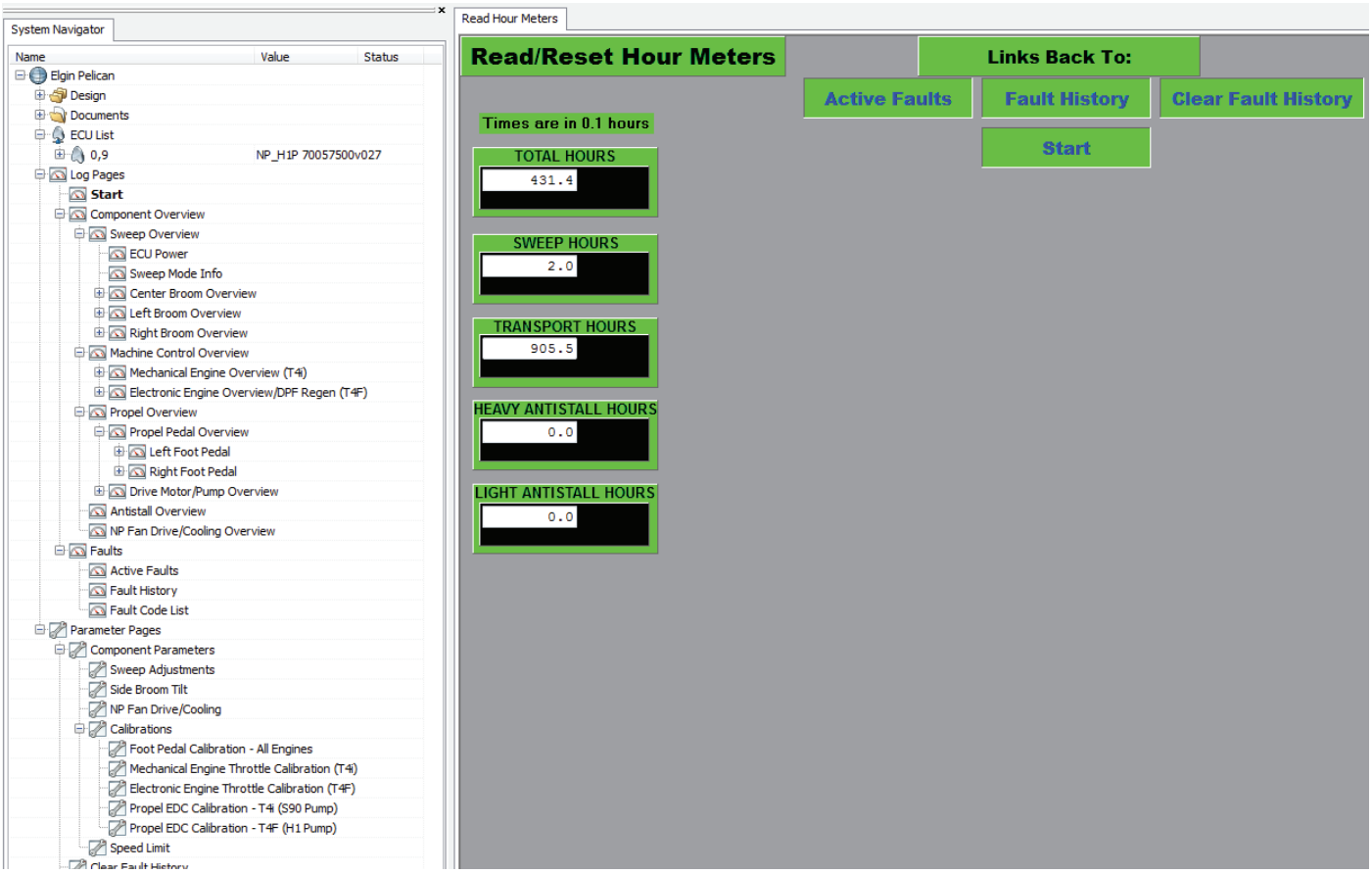


Clear Fault History Screen
Figure 40

The fault history screen (Figure 41) is a continuation of the faults screen in the log pages fields. A button allows the user to return to the Log Pages Faults. A clear Fault History button allows the user to clear all faults from fault history. The NO button returns the user to the Active Faults screen to view any active faults.

This is the only page Fault History can be cleared from. Fault History should be cleared after all reparis are complete and verified as “fixed”

NOTE: *Use caution when clearing the fault history. Once cleared the faults cannot be recalled.*



Read/Reset Hour Meter Screen
Figure 41

The clear history/hour meter screen allows select technicians to clear all history and hour meters. The screen includes buttons for the following reset operations:

- Read Total Hour Meter
- Read Sweep Hour Meter
- Read Transport Hour Meter
- Read Heavy Antistall Hour Meter
- Read Light Antistall Hour Meter

The screen also allows the user to return to the Fault History screen located in the log pages under Faults fields.

Pelican T4i/T4F Error Codes
SPN List

SPN	Component -Error	Details
9011	Right Foot Pedal	Voltage greater than 4.7VDC or less than 0.3VDC or IVS switch mismatch with pedal position.
9015	Left Foot Pedal	Voltage greater than 4.7VDC or less than 0.3VDC or IVS switch mismatch with pedal position.
9021	Neutral Pedal	Not in neutral when engine is started or park brake is released.
9025	Reverse Pump	Circuit current too high or too low.
9027	Forward Pump	Circuit current too high or too low.
9031	Throttle Position Sensor	Voltage greater than 4.7VDC or less than 0.3VDC.
9033	Left PPU Speed	Voltage greater than 4.7VDC or less than 0.3VDC.
9035	Left PPU Direction	Voltage greater than 4.7VDC or less than 0.3VDC.
9043	Park Brake Status	Circuit current too high or too low.
9053	Right Broom Raise Solenoid	Circuit current too high or too low.
9055	Left Broom Raise Solenoid	Circuit current too high or too low.
9057	Center Broom Raise Solenoid	Circuit current too high or too low.
9061	Center Broom Balance Solenoid	Circuit current too high or too low.
9063	Center Broom Balance Transducer	Possible open circuit or short to ground.
9213	Right Tilt Sensor	Voltage above or below Max/Min voltage settings.
9215	Left Tilt Sensor	Voltage above or below Max/Min voltage settings.
9221	Brake Defeat Forward	Brake defeat left solenoid open circuit or shorted to ground.
9411	Right Broom Transducer	Voltage greater than 4.7VDC or less than 0.3VDC.
9413	Left Broom Transducer	Voltage greater than 4.7VDC or less than 0.3VDC.
9415	Center Broom Transducer	Voltage greater than 4.7VDC or less than 0.3VDC.
9443	Throttle Calibration Error	Indicated engine speed too far from target speed. T4i only.
9451	Engine Coolant Temperature Sensor	Output values outside of the defined range.
9453	Starter Solenoid Relay	Circuit resistance too high (open circuit) or too low (short to ground).
9455	Proportional Fan Bypass Valve	Bypass valve output in error.
9467	Park Brake Applied	Applied during operation.
9471	Battery Voltage	Controller CM-C8 pin 2 status.
9473	Controller Battery Power 1	Controller CM-C8 input power not available at C2p35.
9475	Controller Battery Power 2	Controller CM-C8 input power not available at C2p36.
9477	Controller Battery Power 3	Controller CM-C8 input power not available at C2p37.
9481	Controller Battery Power 4	Controller CM-C8 input power not available at C2p38.

Back Probe Testing

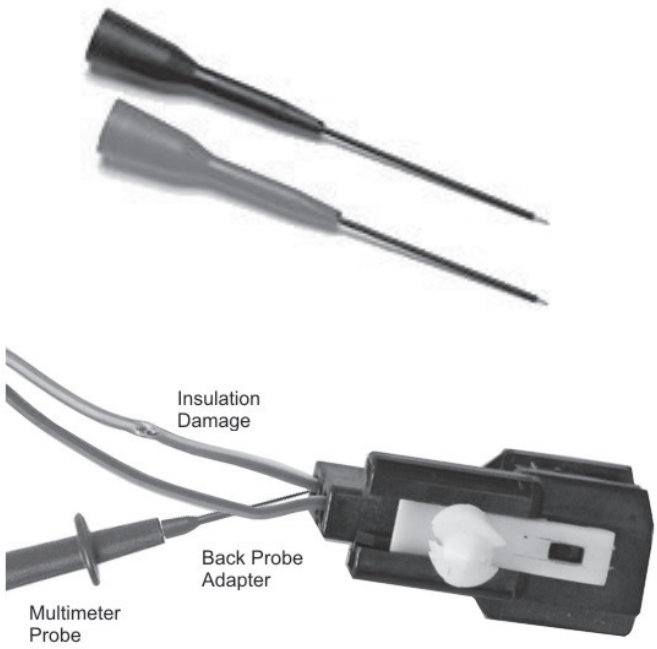
In this diagnostic manual some wires must be tested while mounted in a connector. The most accurate and safe way of testing the wires is a method called ‘back probing’. Using the back probe test method requires the aid of back probe adapters.



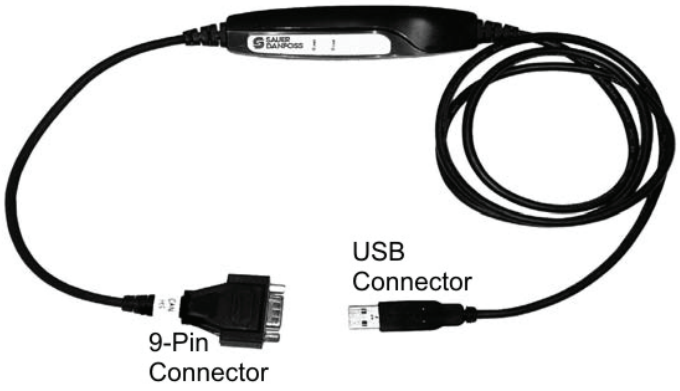
Digital Multimeter
Figure 42

The adapters have very thin pins that can be inserted iinto a connector between the wire and connector wall. This method of testing does not require insulation penetration and possible damage to the wire or insulation. When used properly the circuit can be tested in ‘real time’ actually watching the circuit while in operation.

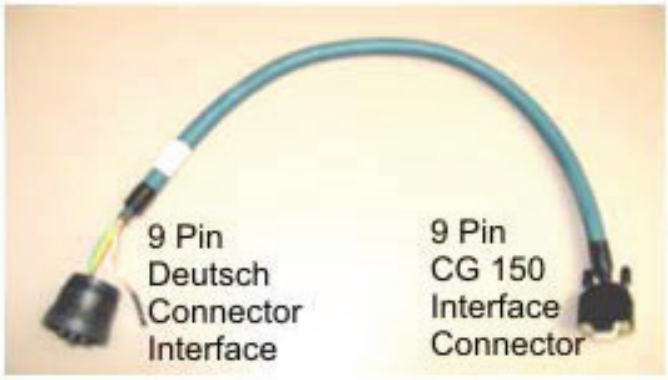
The back probe adapters can be purchased in many sizes and configurations. These pins are should be used carefully to prevent damage to the fine pins located inside the connector.



Back Probe Adaptors
Figure 43A & B



CG 150 CAN/USB Interface Communicator

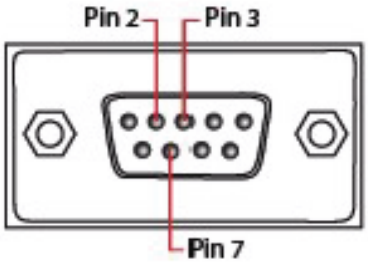


Adapter Harness

After the service tool is installed on a laptop computer use the following procedure to connect the computer to the sweeper controller.

The service tool uses a CANBus connection to communicate with the controller and receive real time sensor signals. The sweeper CANBus is routed from a 9-pin Deutsch connector through an adapter harness to a Danfoss CG 150/150-2 CAN/USB gateway interface communicator. The CG 150/150-2 communicator provides application download of programs to PLUS+1compliant devices on the PLUS+1 CAN network and upload/download of application tuning parameters.

One end of the CG 150/150-2 interface uses a 9-pin connector to interface with the adapter harness. The connector pin 2 routes the CAN- to the CG 150/150-2 for processing. The connector pin 3 is a shield ground and pin 7 routes the CAN + to the CG 150/150-2 for processing. The adapter harness routes the CAN- and CAN+ from the sweeper 9-pin Deutsch connector through the 9-pin CG 150/150-2 interface to the CG 150/150-2.

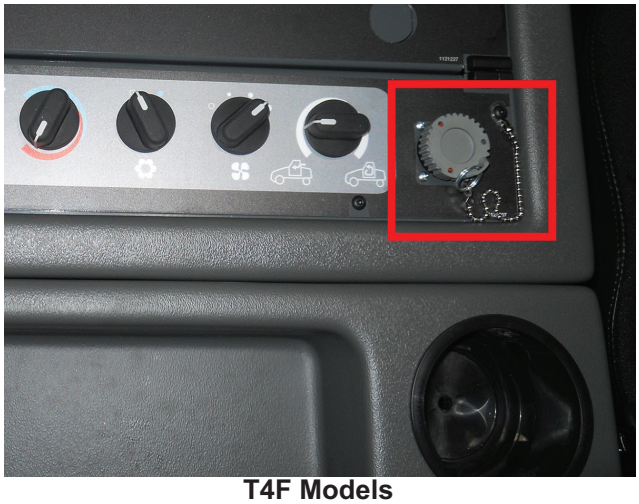


CG 150 9-Pin Connector

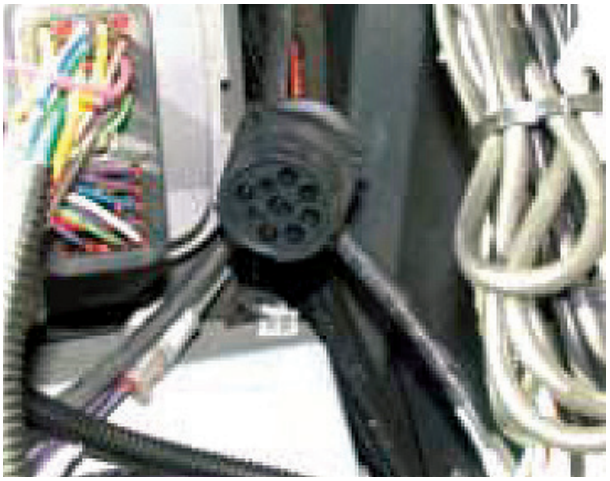


CG 150-2 CAN/USB Interface Communicator

Continued



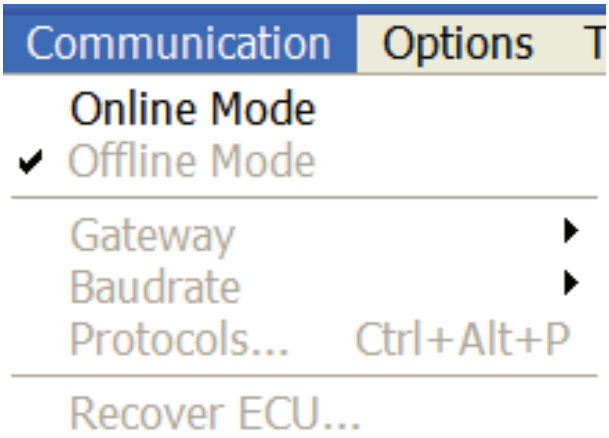
T4F Models



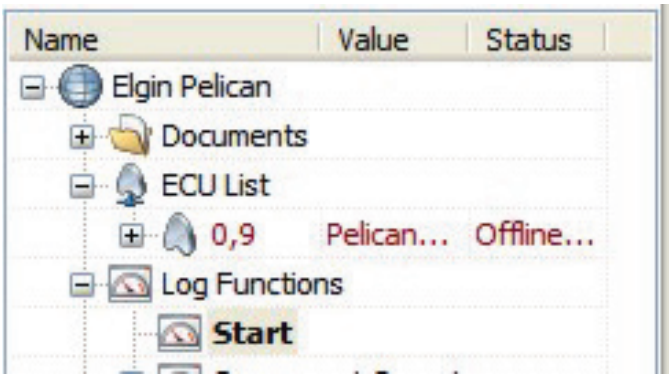
T4i Models

9-Pin Deutsch Sweeper Connector

Connect the laptop computer to the sweeper CAN by connecting the adapter harness 9-pin connector to the sweeper 9-pin deutsch connector. Then connect the adapter harness 9-pin connector to the CG 150/150-2 9-pin connector. After the adapter harness and CG 150/150-2 is connected to the sweeper harness, plug the CG 150 USB connector into the laptop computer.



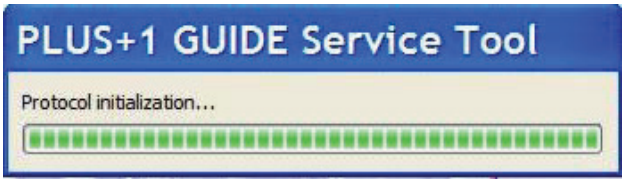
Communication Drop Down Menu



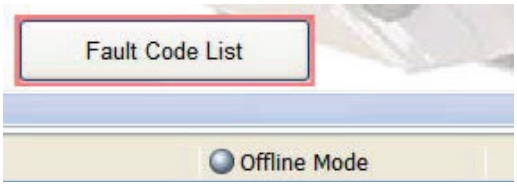
Navigator Menu

When placed in Online Mode the service tool will begin a search for the controller (ECU) connection.
In the navigator column on the top left side of the service tool display screen underneath the ECU List the Application file (i.e. 0,9) controller (i.e., Pelican) and ECU will be listed.
If the service tool has not connected to the sweeper controller the ECU will be listed as Offline.
When placed in the online mode the current controller program and version will be listed.
Also, at the bottom center of the display screen the service tool will indicate Offline Mode (with gray indicator).

Continued

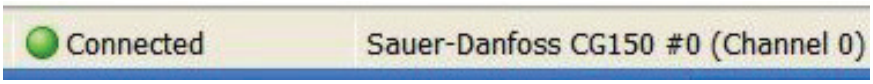


Protocol Initialization Box

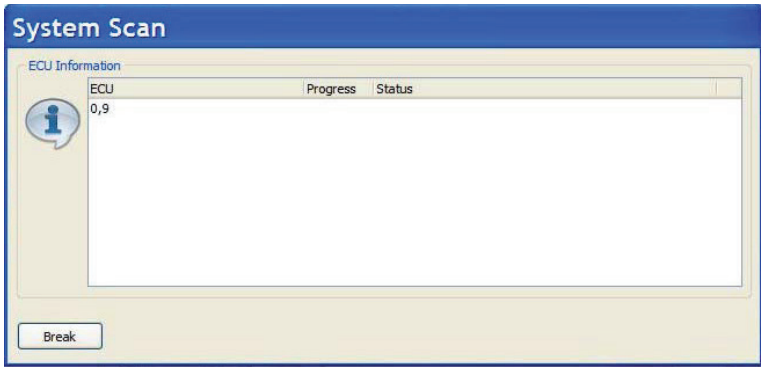


Display Screen Mode Indicator

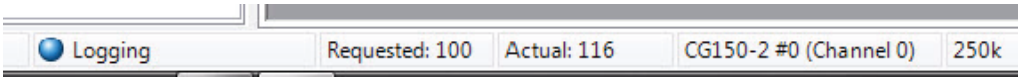
When the service tool is placed in the online mode a protocol initialization box will appear briefly.
When the controller application is located the system scan dialogue box will appear indicating the ECU selected.
When connected to the controller application file the lower right side of the screen will display as Connected (with green indicator) and display the CG 150/150-2 interface is active and the channel in use.



ECU Connected Using CG 150/150-2



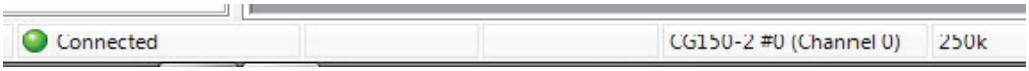
System Scan Dialogue Box



CG 150-2 Connected and Logging

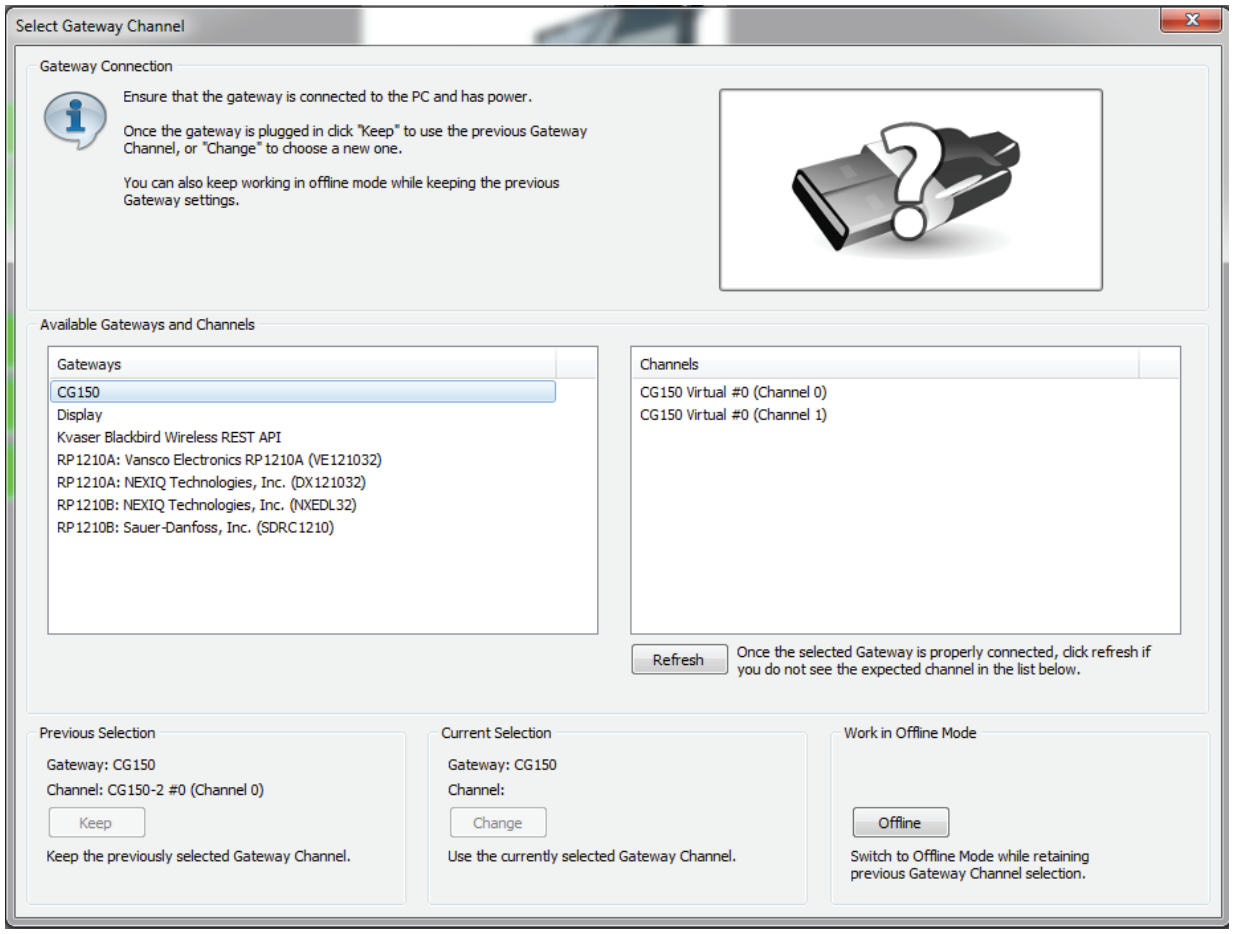
If the system box does not appear, press the F8 key to initiate a module scan. Pressing F8 forces the scan dialog box and a system scan.

The F8 button should also be used anytime the service tool shows "connected" but is not receiving data from the controller. A yellow triangle may be displayed on the controller icon in the Navigator Menu. (See the Module Not Scanned illustration).

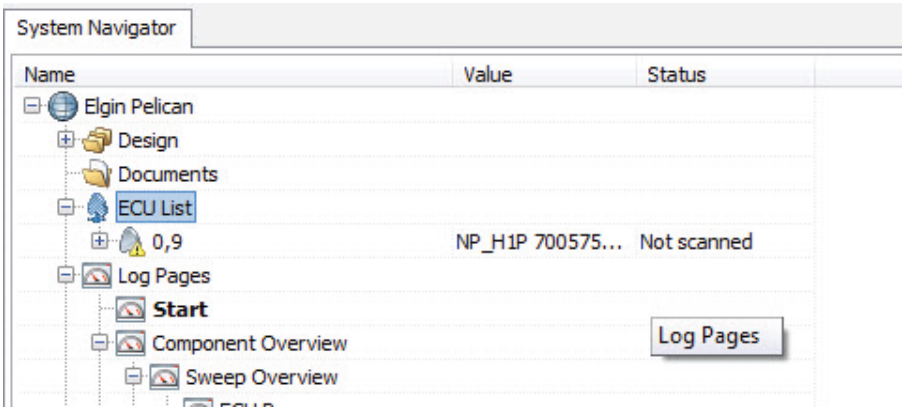


CG150-2 Connected Not Logging

Continued



Connection Warning Message



Module Not Scanned

Continued

START

If the CG 150/150-2 cannot be located or is inoperative the Select CG 150/150-2 Channel search box will display a warning message indicating the CG 150/150-2 is no longer available. If this message appears make sure the CG 150/150-2 is connected to the laptop computer.

Is the CG 150/150-2 interface connected to the laptop computer?

YES

Check that the CG 150/150-2 is connected properly to the adapter harness.

NO

Connect the CG 150/150-2 interface to the laptop computer using the USB connector. Press retry on the Select CG 150/150-2 Channel message box.

Is the CG 150/150-2 properly connected to the adapter harness?

YES

Shutdown and restart the service tool software.

NO

Connect the CG 150/150-2 9-pin connector to the adapter harness 9-pin connector. Shutdown and restart the service tool software.

Is the service tool connected to the control module.

YES

Continue service tool diagnostics.

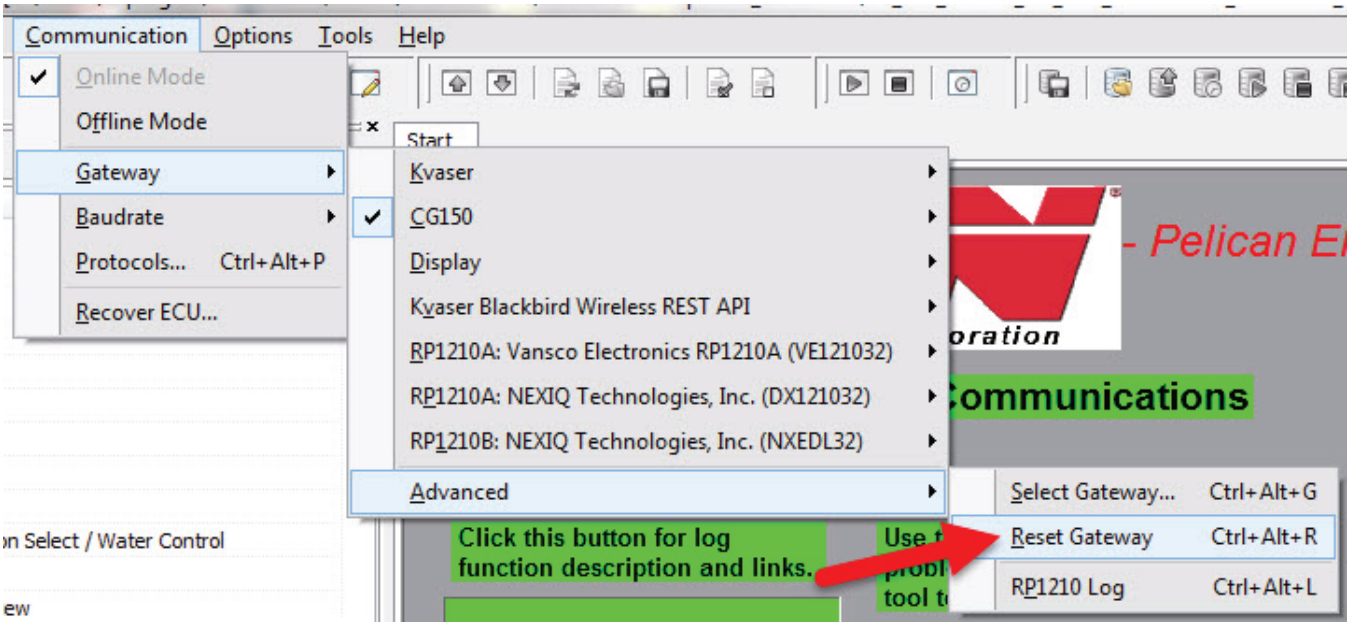
YES

Is the CG 150/150-2 connected?

NO

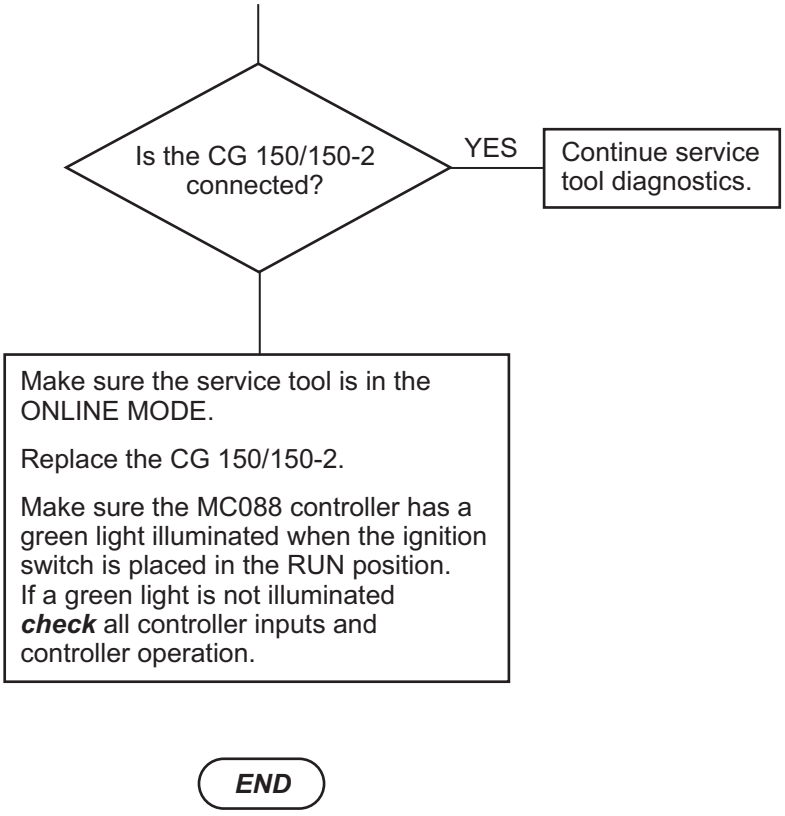
Reset the CG 150/150-2 gateway. See the Resetting Gateway illustration.

NO



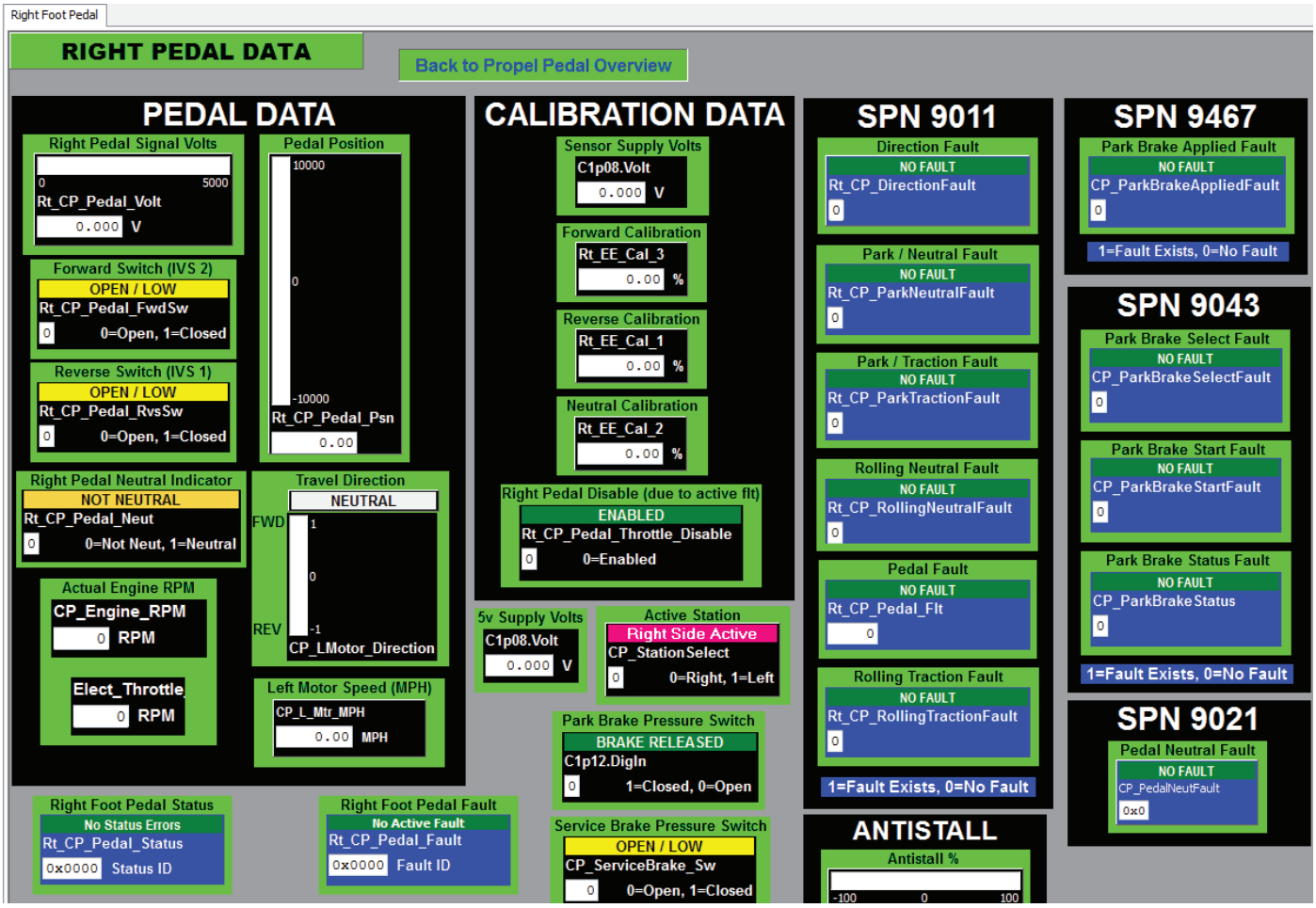
Resetting Gateway

Continued

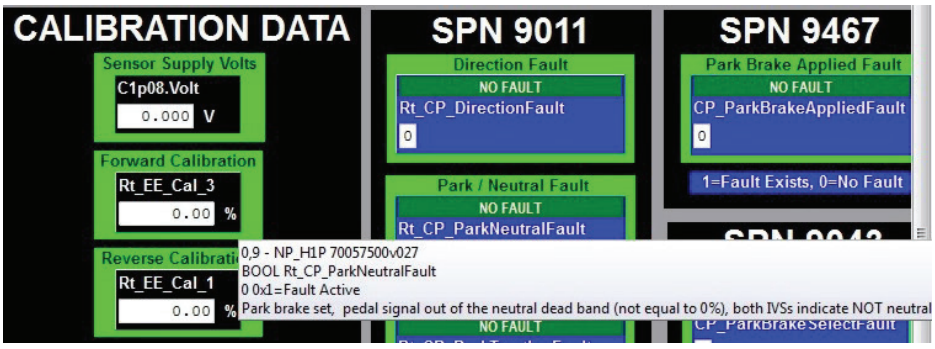

Is the CG 150/150-2 connected?
YES
Continue service tool diagnostics.
Make sure the service tool is in the ONLINE MODE.
Replace the CG 150/150-2.
Make sure the MC088 controller has a green light illuminated when the ignition switch is placed in the RUN position. If a green light is not illuminated ***check*** all controller inputs and controller operation.
END

SPN 9011
Right Foot Pedal Signal or
Neutral Switch Failure

The 9011 error code indicates the right foot pedal signal circuit output is greater than 4.7VDC or less than 0.3VDC, or a mismatch between Signal Voltage and IVS 1 or IVS 2 Switch Positions.
Check neutral switch operation as follows.



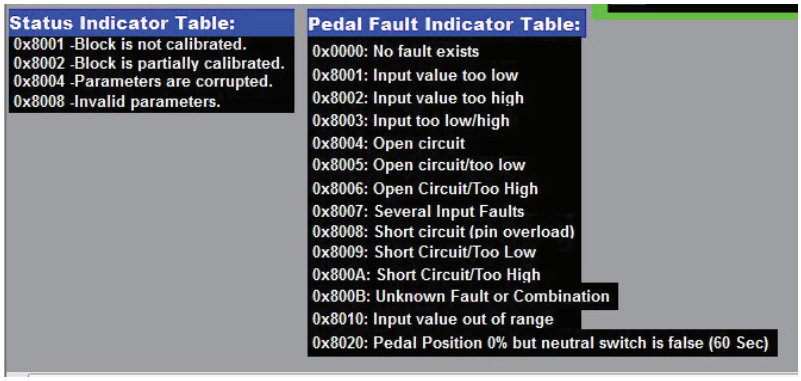
Right Foot Pedal Screen



Hover Park / Neutral Fault Screen

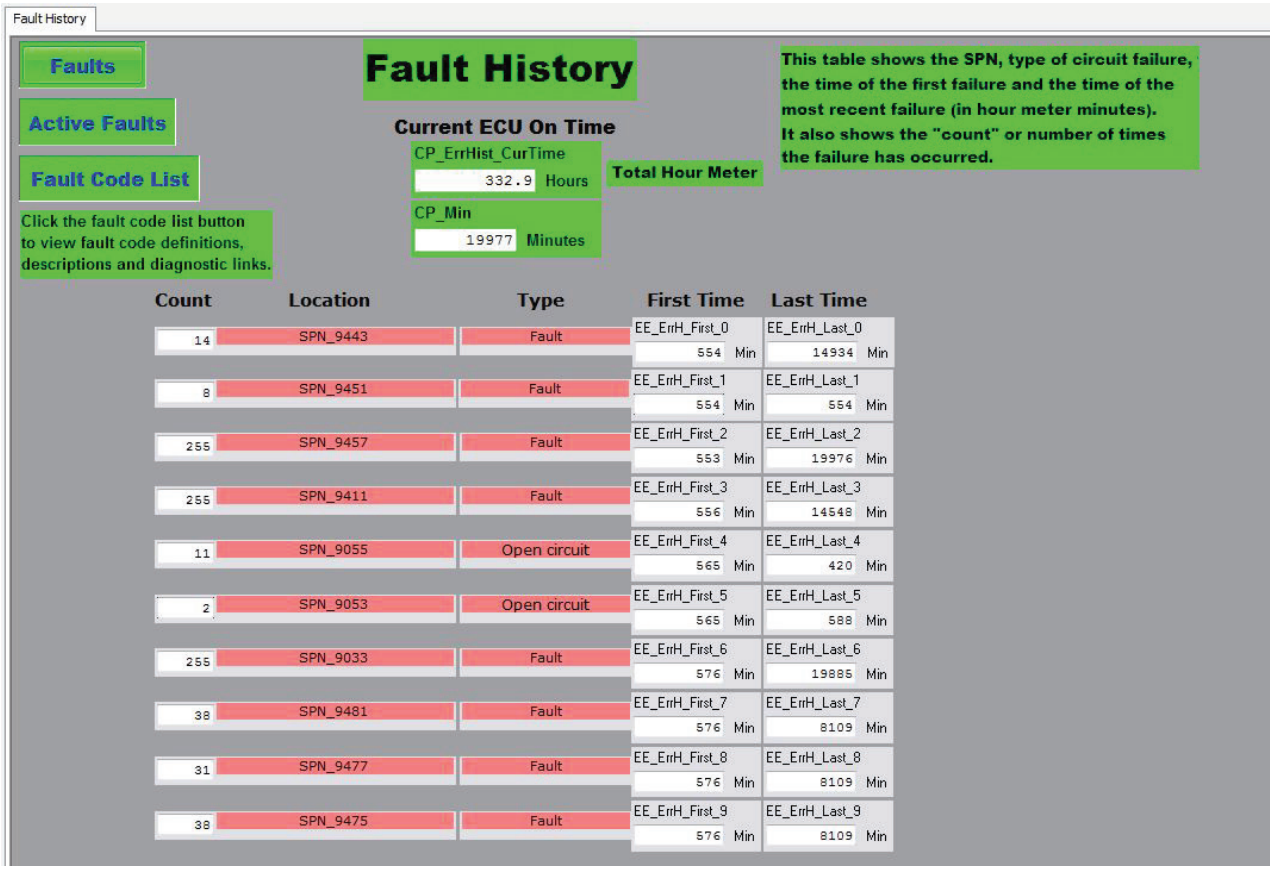
Continued

Check and observe the right foot pedal operation using the service tool, Right Foot Pedal screen located under the Component Overview > Propel Overview > Propel Pedal Overview fields. The right foot pedal signal volts, travel direction, pedal neutral indicator and pedal position among other parameters can be checked and observed on the service tool screen. If a fault exist one or more of the fault checkpoints in the SPN 9011 box will display a 1 in the fault box. If the Pedal Fault checkpoint box (Rt_CP_Pedal_Flt) has a 1 in it, look at the Right Foot Pedal checkpoint box below the Pedal Data box to determine what electrical fault has occurred to the pedal signal circuit. Place the cursor over fault box that displays a 1 and hover. A box will appear displaying fault condition information. Additional fault information can be found in the Pedal Fault indicator table.



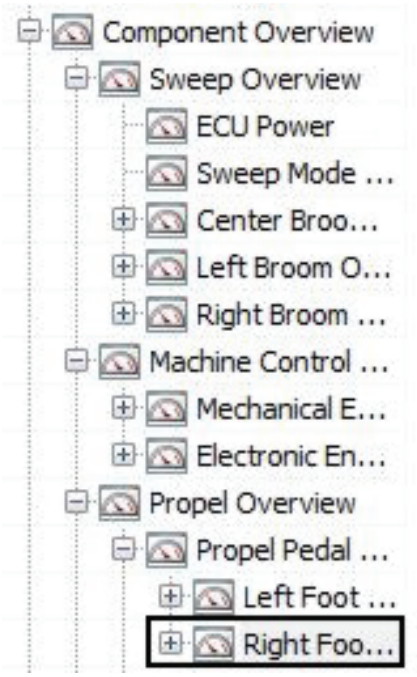
Pedal Fault Indicator Table

The SPN 9011 fault condition can be verified using the service tool fault history screen. The fault history screen will display SPN 9011, the number of times the fault has occurred, the first time and last time the fault occurred. This information can be used to help diagnose the fault conditions. Be sure to clear the fault history after the repair is complete before leaving the machine.

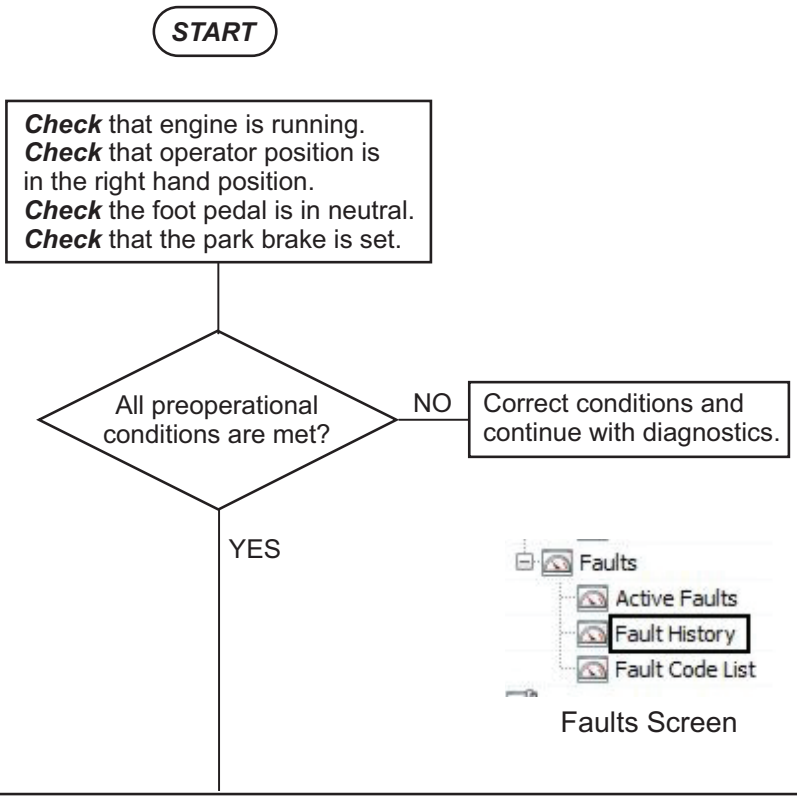


Fault History Screen

Continued

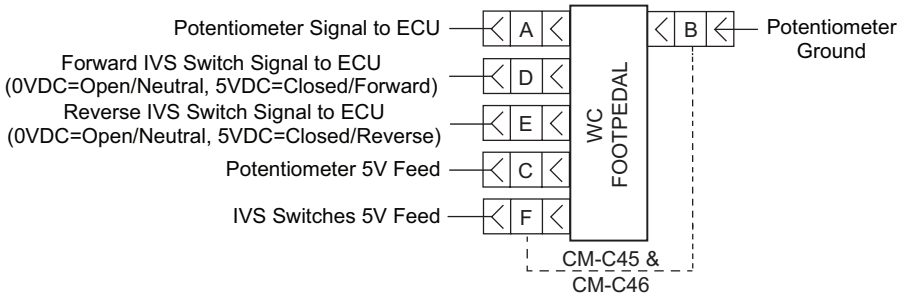


Navigator Box



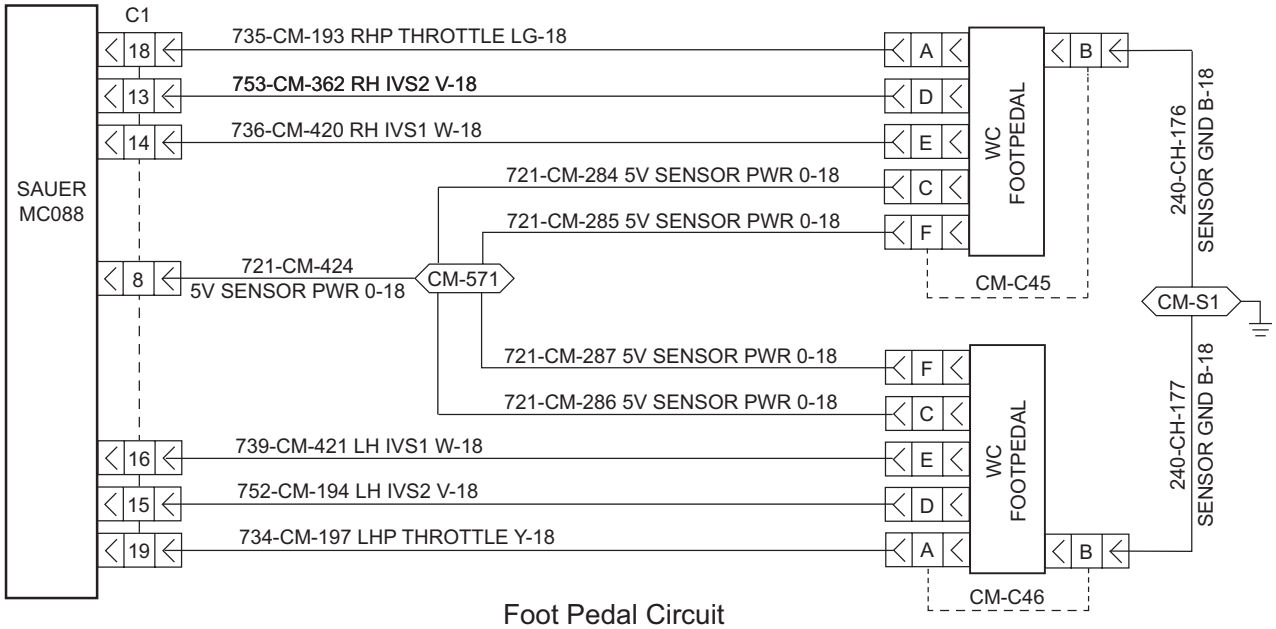
Faults Screen

The foot pedals act as sensors with an output signal from 1.38VDC TO 3.64VDC.
The voltage range from 1.38VDC to 2.2VDC is sent as a signal to the controller for reverse position.
The range from 2.8VDC to 3.64VDC is sent as a signal for forward position.
The right foot pedal is used to send a signal through the controller and CANBus to control the direction and speed of hydrostatic transmission operation. The pedal provides a voltage input to the controller indicating pedal position as forward or reverse and desired speed. The pedal primary voltage (5VDC) is routed from the 5VDC Sensor Power circuit and controller MC088 pin C1-8 to the pedal connectors pin C and F. When the pedal is placed in the forward or reverse positions a voltage signal is routed from the pedal pin A to controller pin C1-18. The svoltage level is dependent upon the position of the pedal. If the voltage to the controller is less than 0.3VDC or greater than 4.7VDC an error condition exist and must be corrected before the hydrostatic drive can be used effectively.

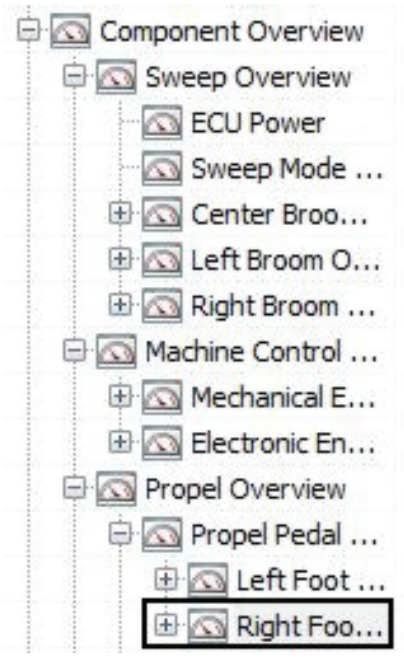


Foot Pedal Pins

Continued



Foot Pedal Circuit

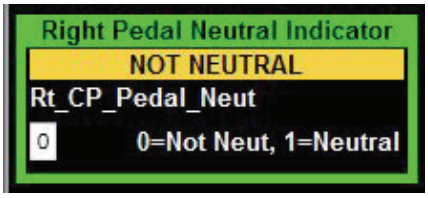


Navigator Box

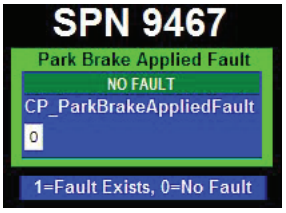
In addition to the neutral foot pedal position there are two neutral switches built into the foot pedal speed sensors. These switches are used to validate neutral position.

The error code can also indicate a neutral switch fault. The foot pedal outputs a signal when placed in either forward or reverse position. A voltage generated from connector pin D (forward) or pin E (reverse) to the controller (forward pin C1-13) or (reverse pin C1-14) signals the controller that the pedal is not in neutral.
If pin D sends a higher voltage signal to the controller, pin E must send a lower voltage signal. If pin E sends a higher voltage signal to the controller, pin D sends a lower voltage signal.

The error code can also indicate a park brake pressure (40psi) switch failure. The park brake pressure switch sends a signal to the controller pin C1-12 when the park brake is applied. If the switch is stuck in the closed position the controller indicates park brake applied and will not allow transmission operation and will generate error code 9043 - Park Brake Status. See error code 9043 for park pressure switch testing procedures.
See error code SPN 9467 for park brake applied testing procedures.

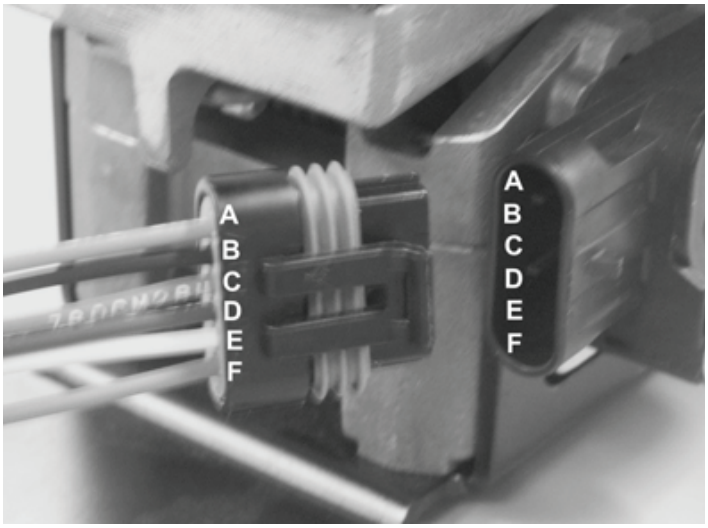


Neutral Indicator Box



SPN 9067 Fault Box

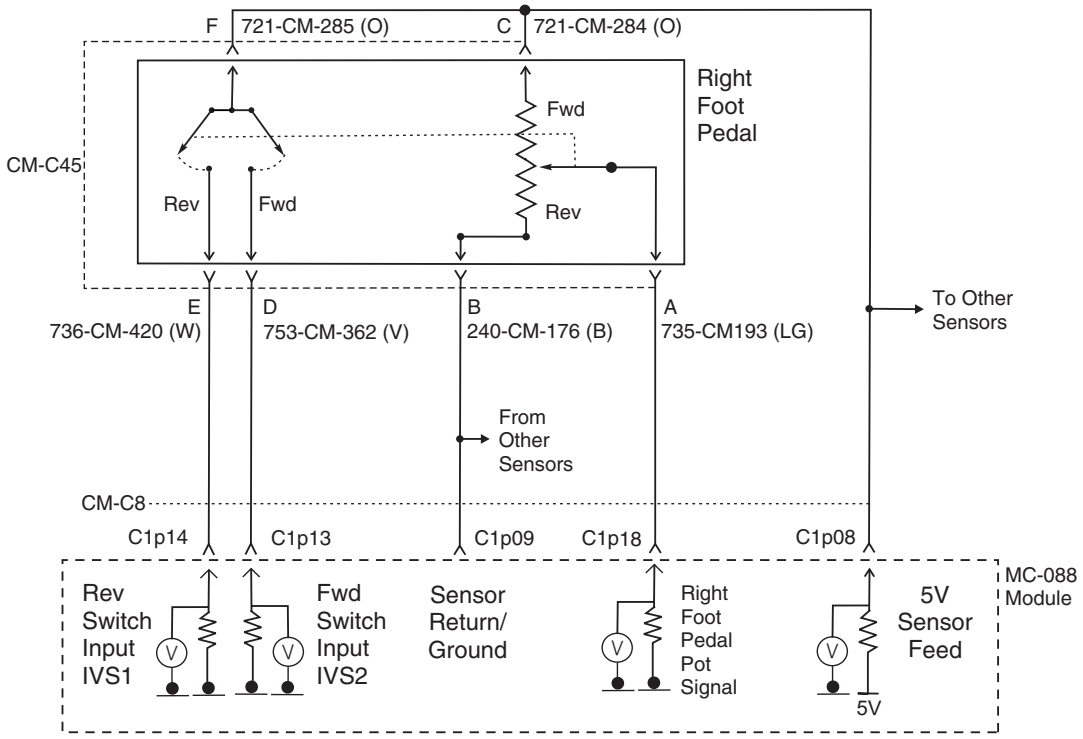
Continued



Foot Pedal Connector

FOOT PEDAL CONNECTOR PINS		
Pin Number	***Wire Purpose***	
A	Light Green 735-CM-193	Potentiometer Signal Output to Controller pin C1-18
B	Black 240-CM-176	Pedal Ground
C	Orange 721-CM-284	5VDC Input Power
D	Violet 753-CM-284	IVS2 (FWD) Signal Output Controller pin C1-13
E	White 736-CM-420	IVS1 (REV) Signal Output Controller pin C1-14
F	Orange 721-CM-285	5VDC IVS Switches Input Power

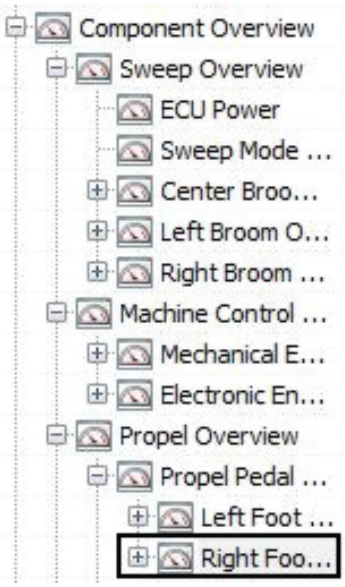
Right Foot Pedal



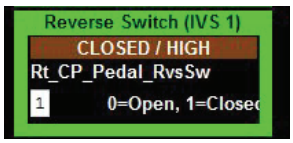
Check the Right Foot Pedal log function for Neutral Switch ON or OFF and Park Brake Switch ON or OFF. Use the service tool screens in conjunction with the diagnostic steps to locate & repair circuit problems. In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot voltage, foot pedal and circuit problems.

YES

Continued



Navigator Box



Reverse Switch IVS1

Remove the connector (CM-C45) from the right foot pedal.
Place a jumper wire between connector pin F (orange wire) and pin E (white wire). The service tool right foot pedal screen Reverse Switch (IVS2) should display CLOSED/HIGH and a 1 for Closed. The display indicates the 5VDC is available at the controller pin C1p8, foot pedal pin F and the IVS1 pin E circuit to the controller pin C1p14 does not have an open circuit.
Place a jumper wire between connector (CM-C45) pin F (orange wire) and connector pin D (violet wire). The service tool right foot pedal screen Forward Switch (IVS2) should display CLOSED/HIGH and a 1 for closed. The display indicates 5VDC is available at controller pin C1-8, at the foot pedal pin F and the IVS2 pin D circuit to the controller pin C1p13 does not have an open circuit.

Voltage at connector CM-C45 pin F is 5VDC?

NO

Check with a multimeter equipped with back probe adapters the voltage output at the MC088 controller pin C1-8.
Low or no voltage routed from the controller to the foot pedal will result in fault conditions on the service tool propel overview screen and generate fault codes.

YES

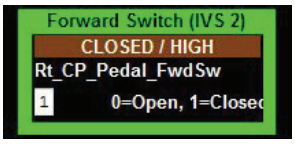
Voltage at pin C1-8 is 5VDC?

YES

Place a jumper wire between connector pin C (orange wire) and pin D (violet wire).
The service tool right foot pedal screen should display CLOSED/HIGH and a 1 for Closed.
The display indicates the 5VDC is available at the controller pin C1-8 and at the foot pedal pin C.

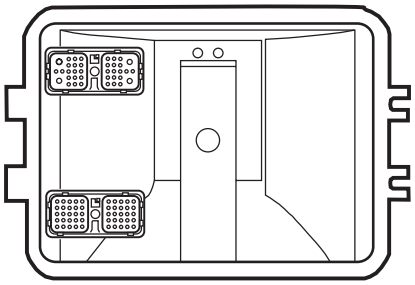
NO

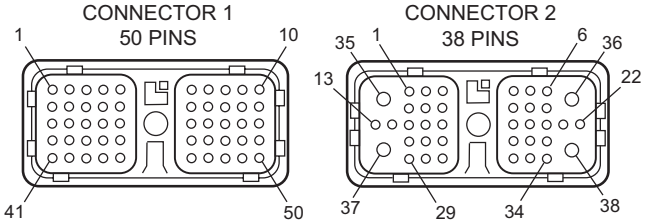
Check that all connectors are mated and fully connected.
Check operation of the MC088 controller.
Check wiring harness for short circuits to power circuits between the controller pin C1-8 and the right foot pedal connector CM-C45 pin F.
Check for open circuits between the controller pin C1-8 and the right foot pedal pin CM-C45 pin F.
Check for short to ground.



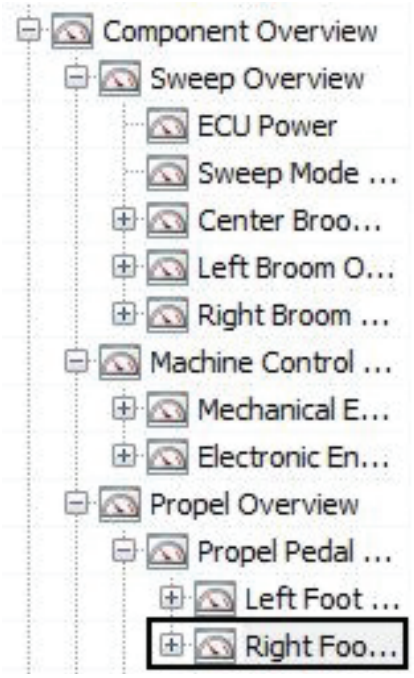
Forward Switch IVS2

CONTROLLER





Continued



Navigator Box

Voltage at connector CM-C45 pin C is 5VDC ?

NO

Check for an open circuit between connector CM-S71 and right foot pedal connector pin C (orange wire).

YES

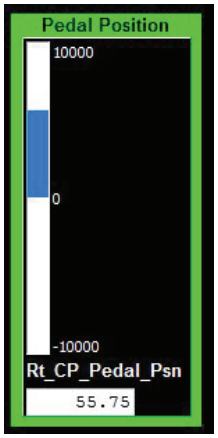
Check with a multimeter set to resistance (ohms lowest setting) between the right foot pedal connector (CM-C45) pin B (black wire) and a know ground.
The multimeter should display a 0 indicating a ground continuity.

Ground circuit available at the foot pedal connector pin B (black wire)

NO

Check for a loose or broken gnd wire between the foot pedal pin B (blk wire) & gnd splice CM-S1.
A bad gnd connection or circuit can result in low voltage readings and error codes.

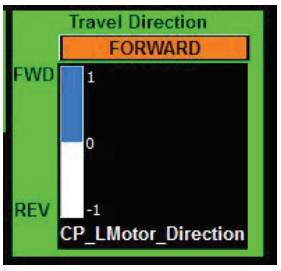
YES



Pedal Position C1p18

While watching the service tool right foot pedal screen slowly actuate the foot pedal in the forward and reverse directions.
The pedal position box should display increasing/decreasing input voltage from the foot pedal signal output pin A to controller pin C1p18.
The travel direction box should display the sweeper FORWARD, NEUTRAL or REVERSE direction and controller voltage input. The travel direction box will only be accurate while the machine is moving.
The proper pedal position and travel direction displays indicate the foot output (CM-C45) pin A is operational and does not have an open circuit.

NOTE: See the section entitled Back Probe Testing for information on back probe adapters and uses.

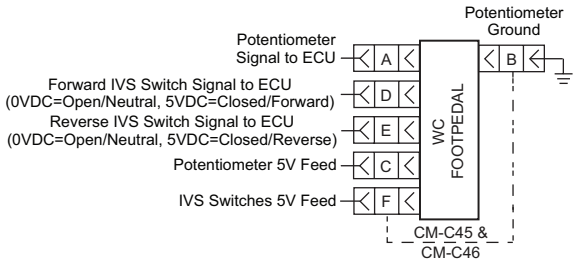


Travel Direction

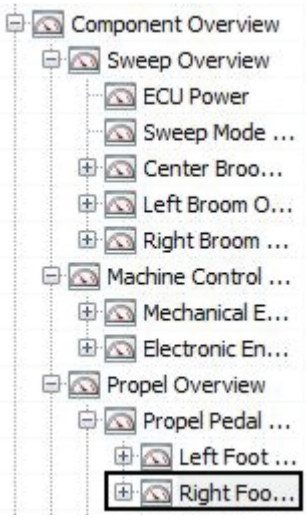
Use a multimeter equipped with back probe adapters to test right foot pedal output.
Place the multimeter positive probe on pedal pins D & E in turn & note voltage output.
Place the ground probe on a known ground.
Perform the test with the pedal in forward and in reverse.
The service tool right foot pedal screen is the most accurate method of checking the switch operation. Release the park brake. While watching the foot pedal screen (foot pedal switch) slowly actuate the foot pedal in full forward and full reverse positions.

Note: The right foot pedal neutral output signal from pins D & E to controller pins C1-13 & C1-14 indicate when the foot pedal is in neutral. In forward the pedal output from pin D will be higher than pin E and in reverse the pedal output from pin E will be higher than pin D. If both D & E have low output the pedal is in neutral. Improper voltage readings will result in right pedal faults and status displays on the propel pedal overview log function screen.

Continued



Foot Pedal Pins



Navigator Box

Higher voltage output at pin D with pedal in forward position & higher voltage output at pin E with pedal in reverse position?

YES

Pedal neutral signal normal, if problem persist ***check*** controller operation.

NO

Check for an open circuit or shorted circuit between the foot pedal and controller. Remove the connector CM-C45 RH from the foot pedal.

The foot pedal is connected to the controller as follows:
RH IVS2 pedal pin D (violet wire) to controller C1 connector pin C1p13 (violet wire).
RH IVS1 pedal pin E (white wire) to controller C1 connector pin C1p14 (white wire).
Remove the C1 50 pin connector from the controller.
Place a jumper wire between the foot pedal connector pin D and a known good ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p13 and a known good ground.
The multimeter should display 0 indicating wire continuity. Repeat the continuity test on the remaining IVS wire - RH IVS1 pedal pin E to controller pin C1p14.

Is ground continuity reading between the foot pedal pin & controller pin?

NO

The IVS wire is open. Repair or replace the wiring harness.

YES

Remove the jumper wire from the foot pedal connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p13 and a known good ground. The multimeter should display 1 indicating an open circuit. Repeat the short circuit test for the remaining IVS circuit - RH IVS1 pedal pin E to controller pin C1p14.

Is ground continuity reading between the foot pedal pin and controller pin?

YES

The IVS wire is shorted. Repair or replace the wiring harness.

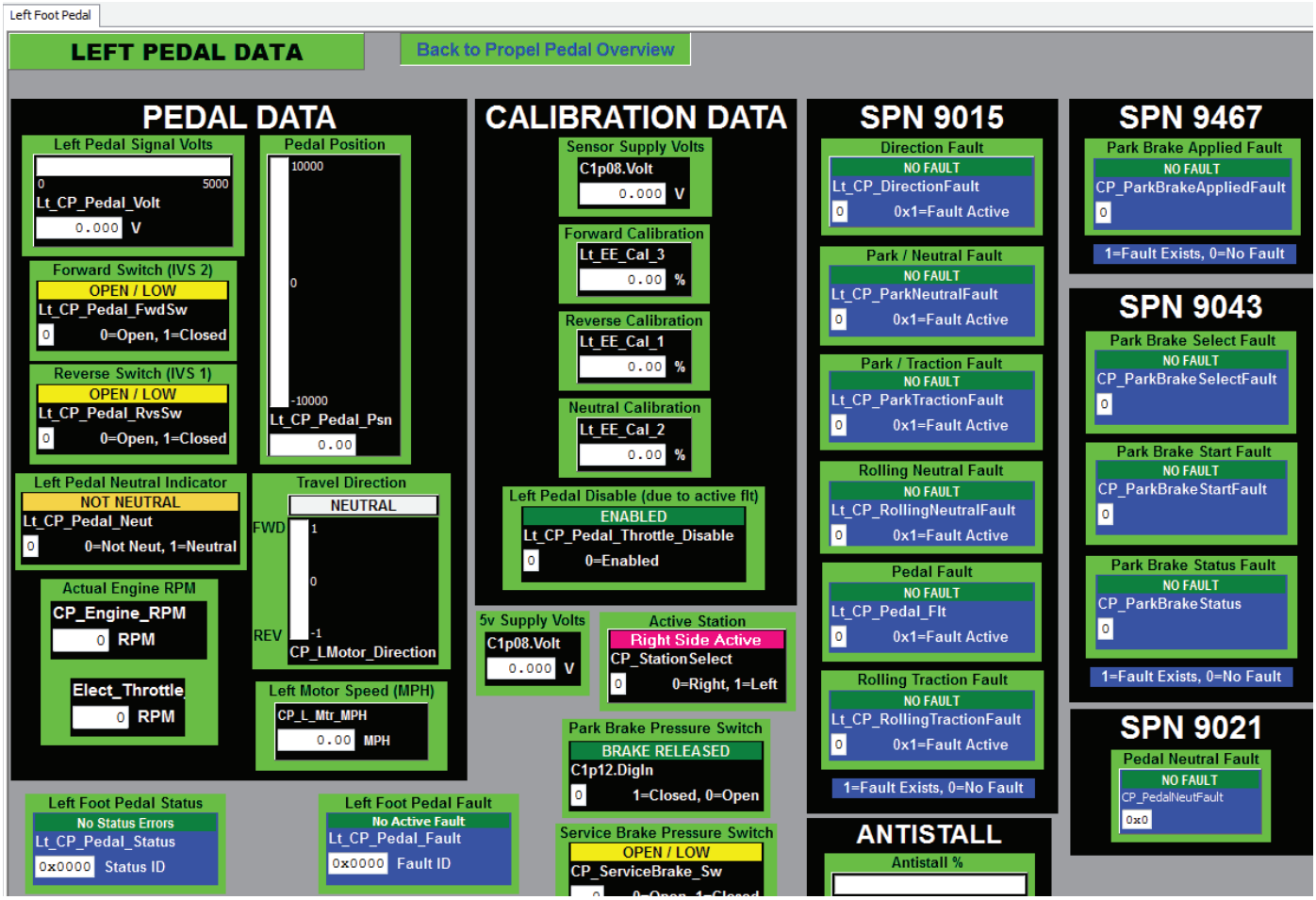
NO

Replace foot pedal

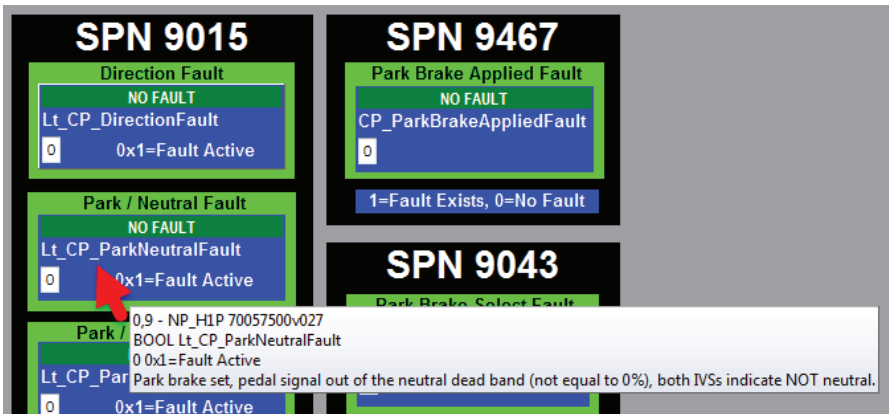
END

SPN 9015
Left Foot Pedal or
Neutral Switch Failure

The 9015 error code indicates the left foot pedal signal circuit output is greater than 4.7VDC or less than 0.3VDC, or a mismatch between signal Voltage and IVS 1 or IVS 2 Switch Positions.
Check neutral switch operation as follows.



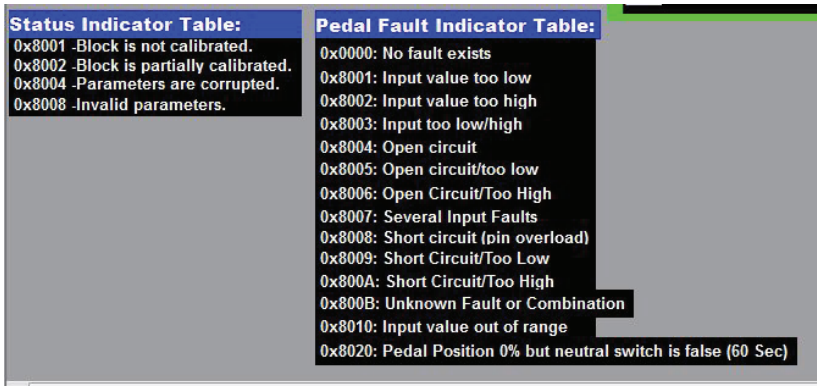
Left Foot Pedal Screen



Hover Park / Neutral Fault Screen

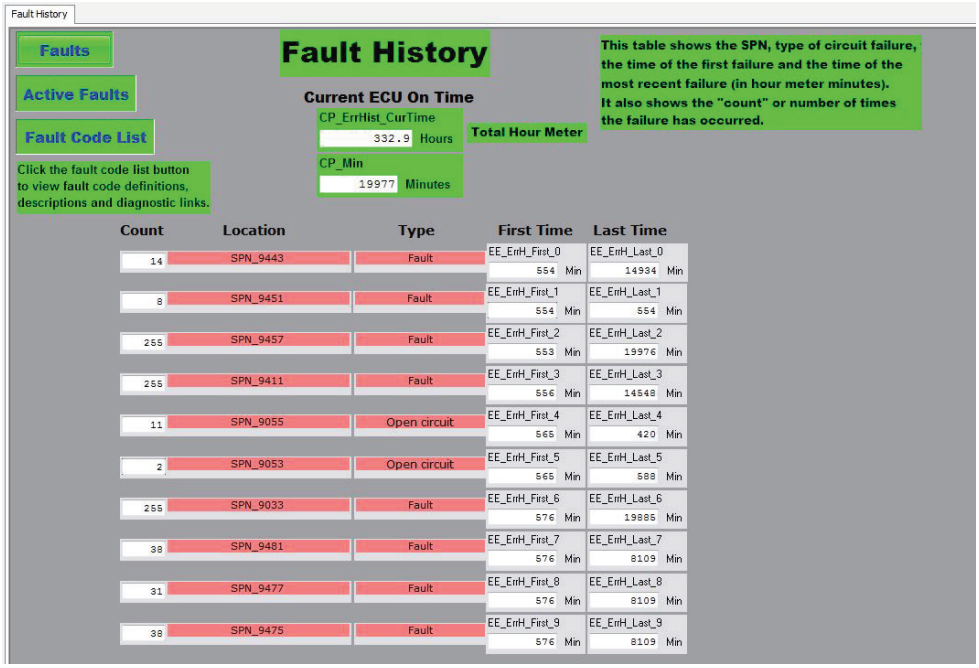
Continued

Check and observe the right foot pedal operation using the service tool, Left Foot Pedal screen located under the Component Overview, Propel Overview and Propel Pedal Overview fields.
The left foot pedal signal volts, travel direction, pedal neutral indicator and pedal position among other parameters can be checked and observed on the service tool screen. If a fault exists one or more of the fault checkpoints in the SPN 9015 box will display a 1 in the fault box. If the Pedal Fault checkpoint box (Rt_CP_Pedal_Flt) has a 1 in it, look at the Right Foot Pedal checkpoint box below the Pedal Data box to determine what electrical fault has occurred to the pedal signal circuit. Place the cursor over the fault box that displays a 1 and hover. A box will appear displaying fault condition information. Additional fault information can be found in the Pedal Fault indicator table.



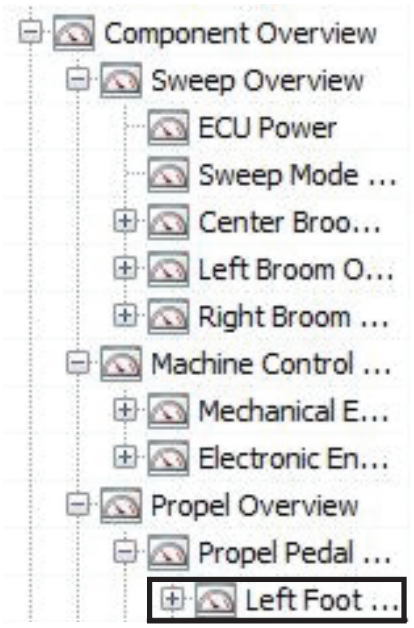
Pedal Fault Idicator Table

The SPN 9015 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9015, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions. Be sure to clear the fault history after the repair is complete before leaving the machine.



Fault History Screen

Continued



Navigator Box

START

Check that engine is running.
Check that operator position is in the left hand position.
Check the foot pedal is in neutral.
Check that the park brake is set.

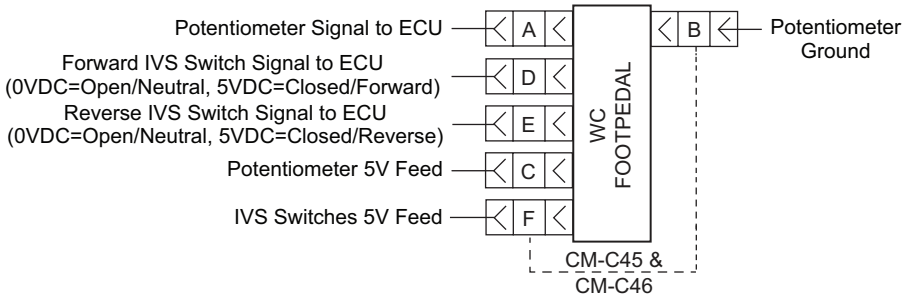
All preoperational conditions are met?

NO — Correct conditions and continue with diagnostics

YES

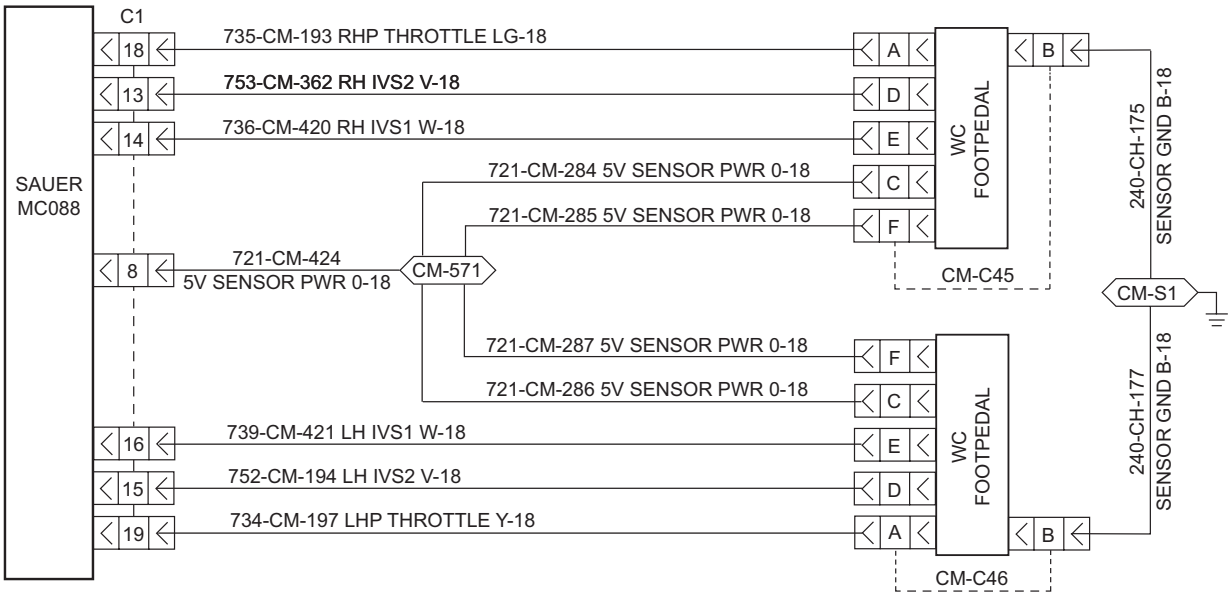


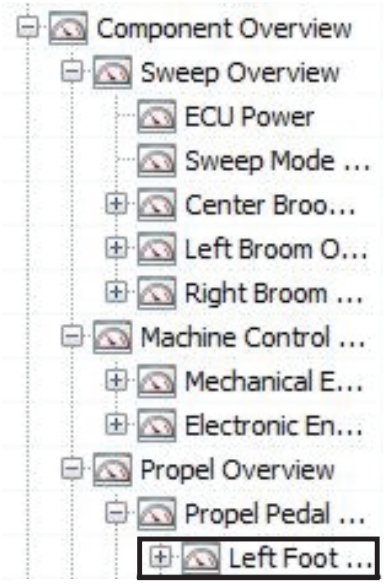
The foot pedals act as sensors with an output signal from 1.38VDC to 3.64VDC.
The voltage range from 1.38VDC to 2.2VDC is sent as a signal to the controller for reverse position.
The range from 2.2VDC to 2.8VDC is sent as a signal for neutral position.
The range from 2.8VDC to 3.64VDC is sent as a signal for forward position.
The left foot pedal is used to send a signal through the controller and CANBus to control the direction and speed of hydrostatic transmission operation. The pedal provides a voltage input to the controller indicating pedal position as forward or reverse and desired speed. The pedal primary voltage (5VDC) is routed from the 5VDC Sensor Power circuit and controller MC088 pin C1-8 to the pedal connectors pin C and F. When the pedal is placed in the forward or reverse positions a voltage signal is routed from the pedal pin A to controller pin C1-19. The voltage level is dependent upon the position of the pedal. If the voltage to controller is less than 0.3VDC or greater than 4.7VDC an error condition exist and must be corrected before the hydrostatic drive can be used effectively.



Foot Pedal Pins

Continued





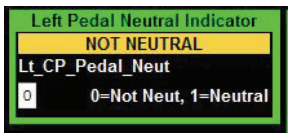
Navigator Box

In addition to the neutral foot pedal position there are two neutral switches built into the foot pedal speed sensors. These switches are used to validate neutral position.

The error code can also indicate a neutral switch fault. The foot pedal outputs a signal when placed in either forward or reverse position. A voltage generated from connector pin D (forward) or pin E (reverse) to the controller (forward pin C1-15) or (reverse pin C1-16) signals the controller that the pedal is not in neutral.
If pin D sends a higher voltage signal to the controller, pin E must send a lower voltage signal. If pin E sends a higher voltage signal to the controller, pin D sends a lower voltage signal.

The error code can also indicate a park brake pressure (40psi) switch failure. The park brake pressure switch sends a signal to the controller pin C1-12 when the park brake is applied. If the switch is stuck in the closed position the controller indicates park brake applied and will not allow transmission operation and will generate error code 9043 - Park Brake Status.
See error code 9043 for park pressure switch testing procedures.
See error code SPN 9467 for park brake applied testing procedures.

YES

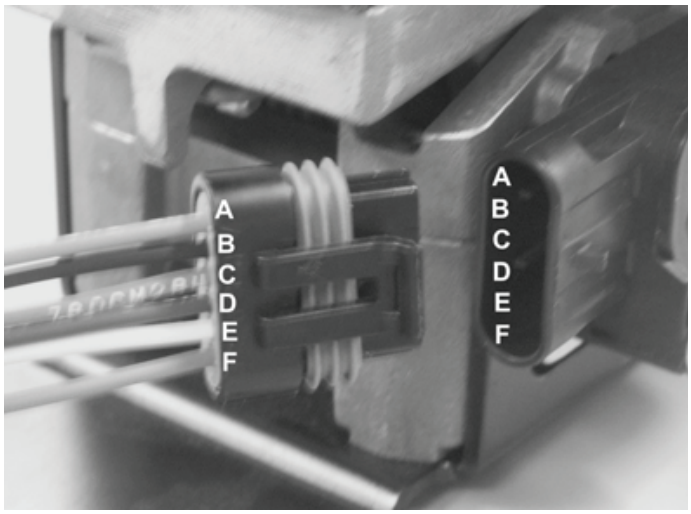


Neutral Indicator Box



SPN 9067 Fault Box

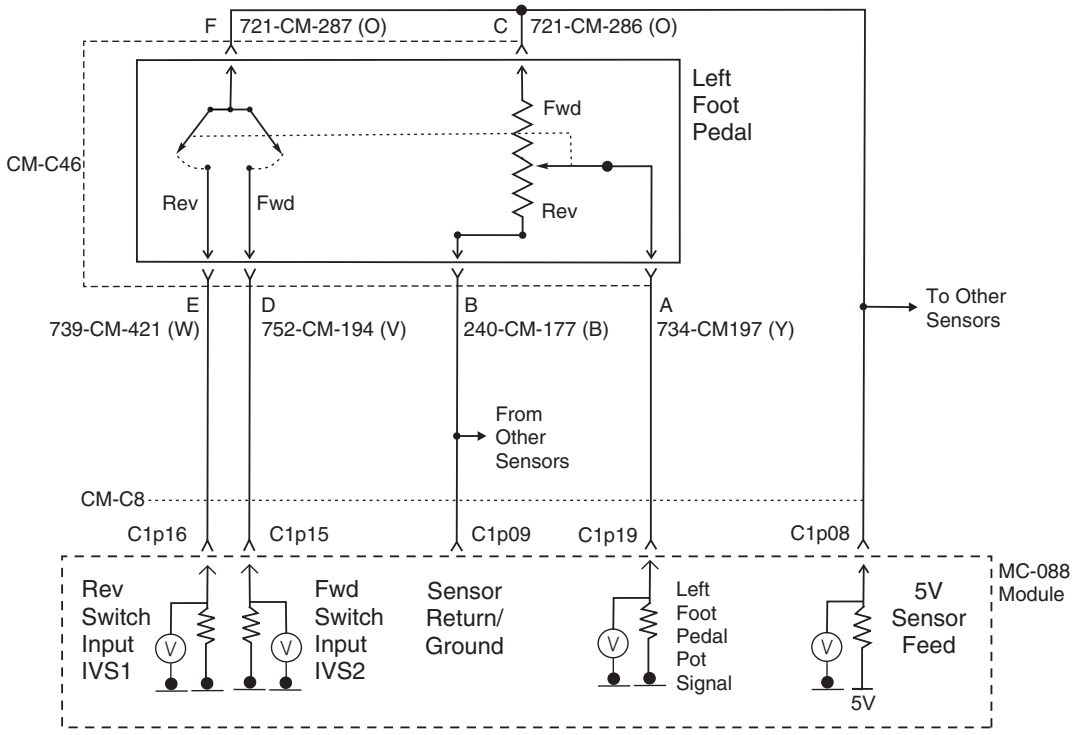
Continued



Foot Pedal Connector

FOOT PEDAL CONNECTOR PINS		
Pin	***Wire***	***Number Purpose***
A	Yellow 735-CM-197	Potentiometer Signal Output to Controller pin C1-18
B	Black 240-CM-177	Pedal Ground
C	Orange 721-CM-286	5VDC Input Power
D	Violet 752-CM-194	IVS2 (FWD) Signal Output Controller pin C1-13
E	White 739-CM-421	IVS1 (REV) Signal Output Controller pin C1-14
F	Orange 721-CM-287	5VDC IVS Switches Input Power

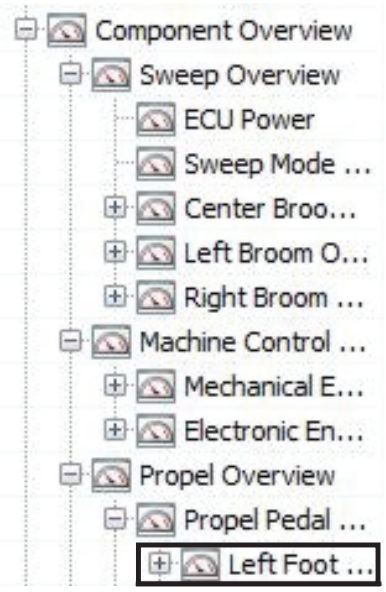
Left Foot Pedal



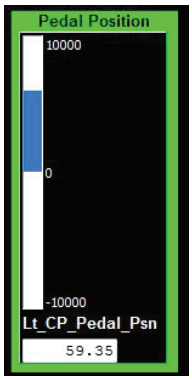
Check the Left Foot Pedal log function for Neutral Switch ON or OFF and Park Brake Switch ON or OFF. Use the service tool screens in conjunction with the diagnostic steps to locate & repair circuit problems. In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot voltage, foot pedal and circuit problems.

YES

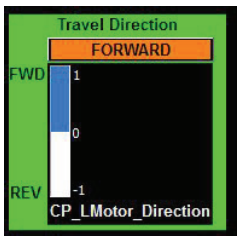
Continued



Navigator Box



Pedal Position C1p18



Travel Direction

Voltage at connector CM-C45 pin C is 5VDC ?

NO — ***Check*** for an open circuit between connector CM-S71 & right foot pedal connector pin C (orange wire).

YES

Check with a multimeter set to resistance (ohms lowest setting) between the right foot pedal connector (CM-C46) pin B (black wire) & a know ground. The multimeter should display a 0 indicating a ground continuity.

Ground circuit available at the foot pedal connector pin B (black wire)

NO — ***Check*** for a loose or broken ground wire between the foot pedal pin B (black wire) and ground splice CM-S1. A bad ground connection or circuit can result in low voltage readings and error codes.

YES

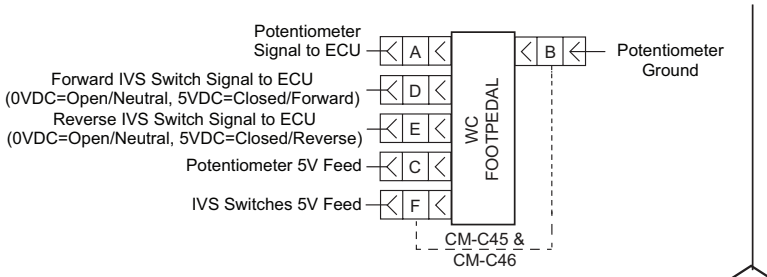
While watching the service tool left foot pedal screen slowly actuate the foot pedal in the forward and reverse directions. The pedal position box should display increasing/decreasing input voltage from the foot pedal signal output pin A to controller pin C1p19. The travel direction box should display the sweeper FORWARD, NEUTRAL or REVERSE direction and controller voltage input. The travel direction box will only be accurate while the machine is moving.
The proper pedal position and travel direction displays indicate the foot output (CM-C46) pin A is operational and does not have an open circuit.

NOTE: See the section entitled Back Probe Testing for information on back probe adapters and uses.

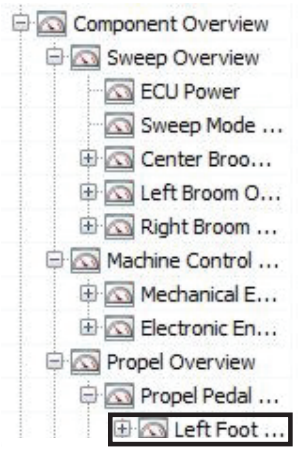
Use a multimeter equipped with back probe adapters to test left foot pedal output. Place the multimeter positive probe on pedal pins D & E in turn and note voltage output. Place the ground probe on a known ground. Perform the test with the pedal in forward and in reverse.The service tool left foot pedal screenis the most accurate method of checking the switch operation. While watching the foot pedal screen (foot pedal switch) slowly actuate the foot pedal in full forward and full reverse positions.

Note: The left foot pedal neutral output signal from pins D & E to controller pins C1-13 & C1-14 indicate when the foot pedal is in neutral. In forward the pedal output from pin D will be higher than pin E and in reverse the pedal output from pin E and in reverse the pedal output from pin E will be higher than pin D. If both D & E have low output the pedal is in neutral. Improper voltage readings will result in right pedal faults and status displays on the propel pedal overview log function screen.

Continued



Foot Pedal Pins



Navigator Box

Higher voltage output at pin D with pedal in forward position & higher voltage output at pin E with pedal in reverse position?

YES → Pedal neutral signal normal, if problem persist ***check*** controller operation.

NO

Check for an open circuit or shorted circuit between the foot pedal and controller. Remove the connector CM-C46 LH from the foot pedal.
The foot pedal is connected to the controller as follows:
LH IVS2 pedal pin D (violet wire) to controller C1 connector pin C1p15 (violet wire).
LH IVS1 pedal pin E (white wire) to controller C1 connector pin C1p16 (white wire).
Remove the C1 50 pin connector from the controller.
Place a jumper wire between the foot pedal connector pin D and a known good ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p15 and a known good ground. The multimeter should display 0 indicating wire continuity. Repeat the continuity test on the remaining IVS wire - LH IVS1 pedal pin E to controller pin C1p16.

Is ground continuity reading between the foot pedal pin and controller pin?

NO → The IVS wire is open. Repair or replace the wiring harness

YES

Remove the jumper wire from the foot pedal connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p15 and a known good ground.
The multimeter should display 1 indicating an open circuit. Repeat the short circuit test for the remaining IVS circuit - LH IVS1 pedal pin E to controller pin C1p16.

Is ground continuity reading between the foot pedal pin and controller pin?

YES → The IVS wire is shorted. Repair or replace the wiring harness.

NO

Replace foot pedal

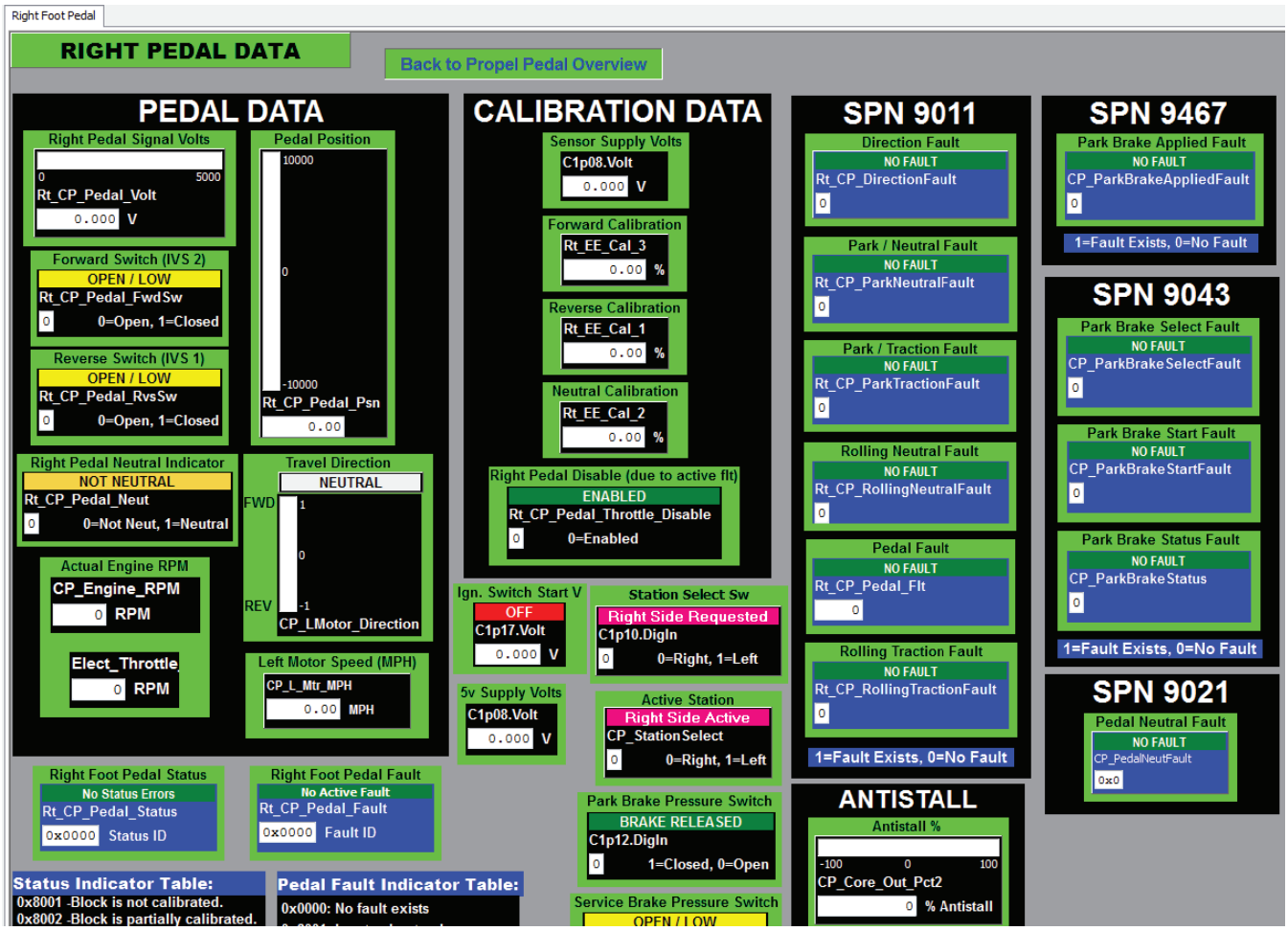
END

SPN 9021
Neutral Pedal

The 9021 error code indicates the foot pedal is not in neutral when the engine is being started or the park brake is being released.

The fault can be set from either operator position, but it will only set related to the active pedal.

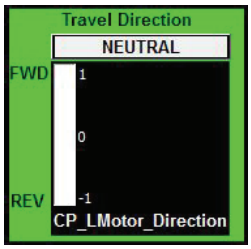
Pedal "neutral" consists of both the Fwd (IVS2) and Rev (IVS1) switches being open (low) and the pedal % being at 0%. All 3 must occur at the same time for a neutral condition to exist. The error code will prevent transmission operation until the problem is corrected and the error code cleared.



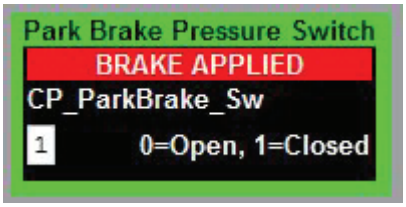
Right Foot Pedal Screen

NOTE: The left foot pedal is used as an example in the flowchart.
The fault can be set from the (left or right) pedal in use at the time the error occurs.

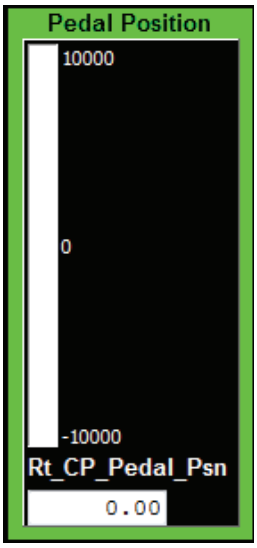
Continued



Travel Direction



Park Brake Pressure Switch



Pedal Position

START

Check that engine is running.
Check that operator position is in the left hand position.
Check that foot pedal is in neutral.
Check that park brake is set.

After above conditions, **Check**:

Check park brake is released.
Check 40 PSI switch pressure is above 40 PSI.
See the Park Brake Pressure Switch box on the left foot pedal screen.
Check foot pedal percent is at 0%.
Check operator's foot is not resting on foot pedal.

All preoperational conditions are met?

NO — Correct conditions and continue with diagnostics

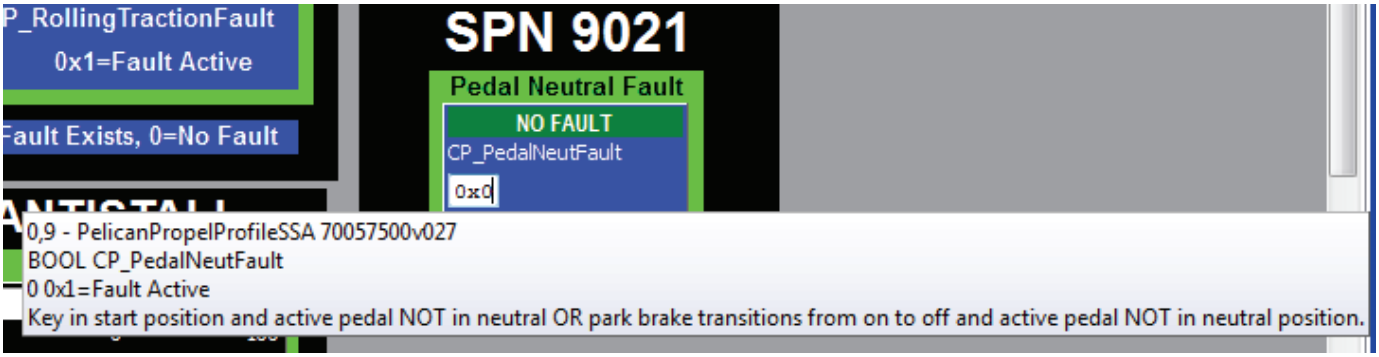
YES



Faults Screen

The SPN 9021 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9021, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions.
If a fault exist the Pedal Neutral Fault box on the right pedal screen should indicate a FAULT and display a 1 in the fault box.
Place the cursor over the Pedal Neutral Fault box and hover over the box.
A box will appear displaying fault condition information.

Continued

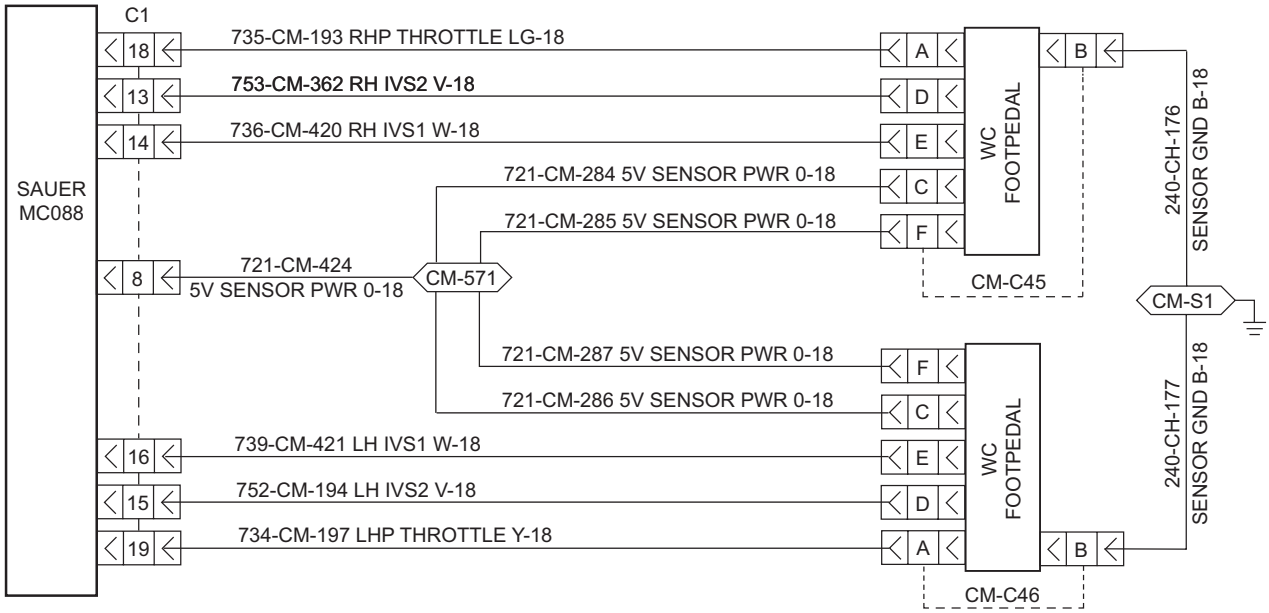


Pedal Neutral Fault Hover Over Screen

The foot pedals act as sensors with an output signal from 1.38VDC to 3.62VDC. The voltage range from 1.38VDC to 2.2VDC is sent as a signal to the controller for reverse position. The range from 2.2VDC to 2.8VDC is sent as a signal for neutral position. The range from 2.8VDC to 3.64VDC is sent as a signal for forward position.

The foot pedal is used to send a signal through the controller and CANBus to control the direction and speed of hydrostatic transmission operation. The pedal provides a voltage input to the controller indicating pedal position as forward or reverse and desired speed. The pedal primary voltage (5VDC) is routed from the 5VDC Sensor Power circuit and Danfoss controller MC088 pin C1-8 to the pedal connectors pin C and F. When the pedal is placed in the forward or reverse positions a voltage signal is routed from the pedal pin A to controller. The signal strength is dependent upon the position of the pedal. If the voltage to the controller is less that 0.3VDC or greater than 4.7VDC an error condition exist and must be corrected before the hydrostatic drive can be used effectively.

In addition to the neutral foot pedal position there are two neutral switches built into the foot pedal speed sensors. These switches are used to validate neutral position. One neutral switch is used to signal forward (wire code-IVS2) neutral position. The other neutral switch is used to signal reverse (wire code-IVS1) neutral position. When foot pedals are in neutral position both neutral switches will output 0VDC to the controller (IVS2 to controller pin C1-15 & IVS1 to controller pin C1-16). When the pedal is in the reverse position switch IVS1 will output 5VDC & IVS2 will output 0VDC to the controller. When the pedal is in the forward position IVS1 will output 0VDC & IVS2 will output 5VDC.



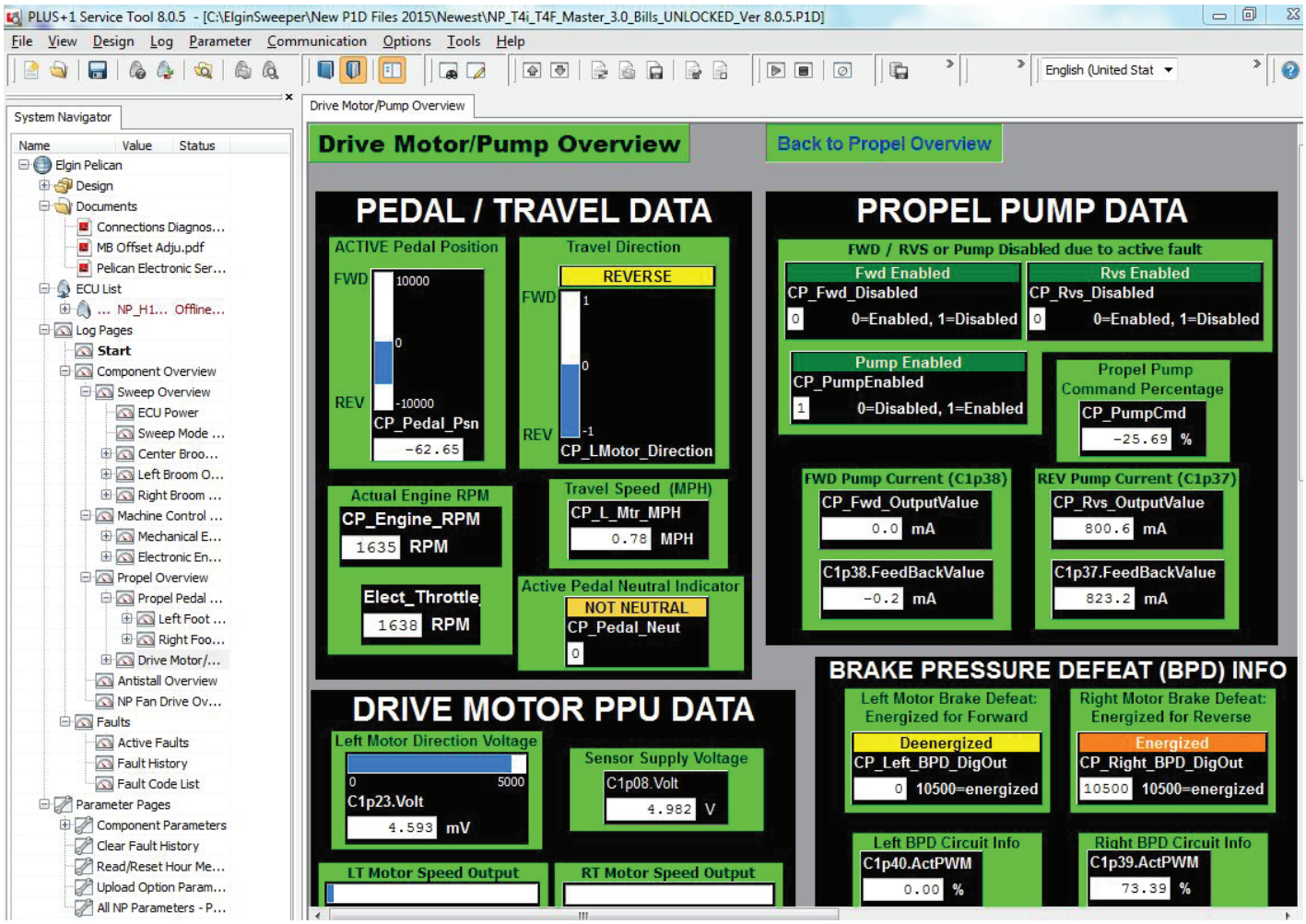
Pedal Circuit

Use the diagnostic flowchart for error code 9011 right foot pedal or 9015 left foot pedal to ***check*** pedal operation. The specific foot pedal diagnostics flowchart includes steps used to ***check*** the neutral switch operation.

END

SPN 9025
Reverse Pump
Solenoid

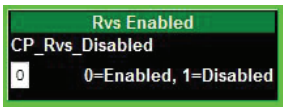
The 9025 error code indicates measured coil resistance is not within specifications for more than 500 mS. Resistance is calculated by measuring current flow.
The T4i forward (A-B) coil has a nominal resistance of 20 ohms at 75 degrees (F).
The T4i reverse (C-D) coil has a nominal resistance of 16 ohms at 75 degrees (F).
The T4F forward (A-B) and reverse (C_D) coils have a nominal resistance of 3.6 ohms at 68 degres (F).
The current can be too high or too low due to an open circuit or short circuit in the harness or in one of the coils.
NOTE: When a fault occurs the control system will disable the reverse pump operation and voltagewill no longer be routed to the reverse side of the pump until the fault is cleared.



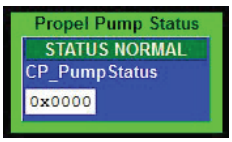
Drive Motor / Pump Overview

The service tool drive motor/pump overview screen can be used to ***check*** / observe the reverse pump operation.
The propel pump data section contains log functions displaying the operation of the forward pump, reverse pump and pump operation.
The Fwd Enabled, Rvs Enabled and Pump Enabled boxes indicate when the pump is enabled or disabled.
The Fault/Status Info section of the overview screen contains fault indicator boxes that display fault warning and fault ID codes.

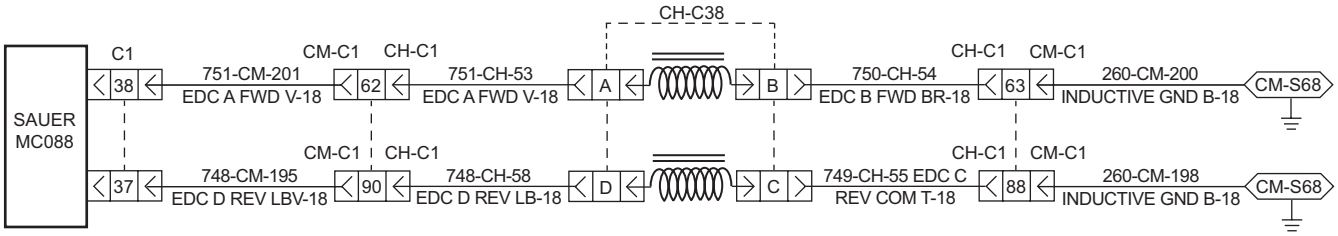
Continued



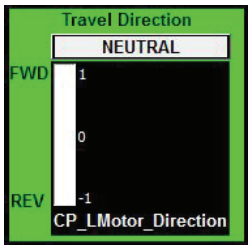
Reverse Pump Enabled



Propel Pump Status



Pelican T4i /T4F 74hp Reverse Pump Circuit



Travel Direction



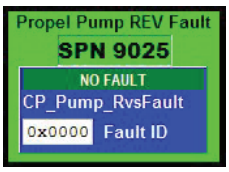
Park Brake
Pressure Switch



Faults Screen

START

Check that engine is running.
Check that foot pedal is in neutral.
See the travel direction box on the drive motor/pump overview screen.
Check that park brake is released.
See the park brake pressure SW box on the drive motor/pump overview screen.



SPN 9025
Fault Indicator

All preoperational conditions are met?

NO

Correct conditions and continue with diagnostics

YES

Use the service tool drive motor/pump overview screen to ***check*** fault conditions.
The SPN 9025 fault indicator box will display a fault condition and a fault code when a fault occurs. Use the pump fault indicator table to find the fault code and causes.
The pump status indicator will display the pump status and any fault status conditions.
See the pump status indicator table to find status code and causes.
Place the cursor over the SPN 9025 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
The SPN 9025 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9025, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions.

Continued

Pump Fault Indicator Table:

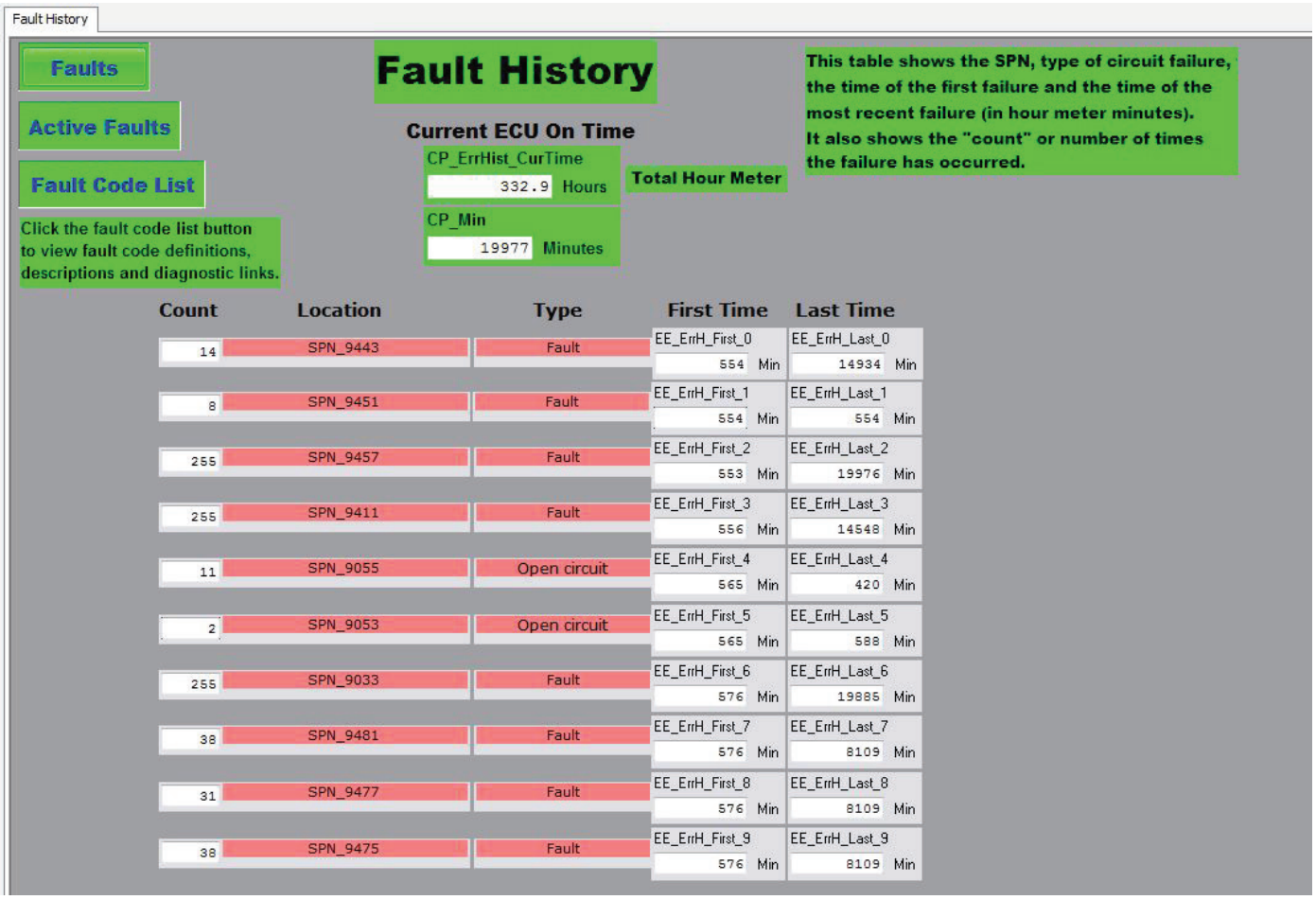
0x0000: No fault exists
0x8001: Input value too low
0x8002: Input value too high
0x8003: Input too low/high
0x8004: Short circuit (pin overload)
0x8005: Open circuit/too low
0x8006: Open Circuit/Too High
0x8007: Several Input Faults
0x8008: Short Circuit
0x8009: Short Circuit/Too Low
0x800A: Short Circuit/Too High
0x800B: Unknown Fault or Combination
0x8040: Current Overload
0x8080: Current flowing between A and B sides. Check for poor ground.

Pump Fault Indicator Table

Pump Status Indicator Table:

0x0000: Status normal
0x8001: Block is not calibrated
0x8002: Block is currently in a cal cycle
0x8004: Parameters are corrupt
0x8008: Invalid setup / calibration
0x8010: Checksum error
0x8020: Time out error
0x8040: Output too low to capture threshold current value.
0x8080: Output too high to capture threshold current value.

Pump Fault Indicator Table



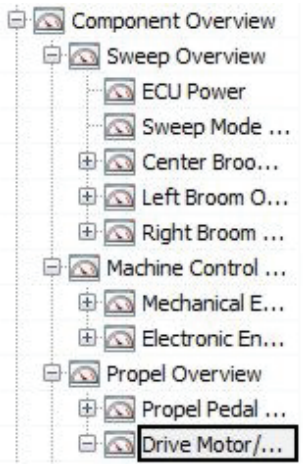
Fault History

Continued

The 9025 error code indicates an open or short in the hydrostatic pump circuit on the reverse side. An open or short in the hydrostatic pump circuit prevents shifting into reverse using the electrical displacement control (EDC). The propel pedal sends a signal to the controller indcating reverse direction. The pedal signal routed through wiring to the controller. The controller then routes a current to the EDC pump circuit based on the pedal position. The controller routes current from CM-C8 pin 37 to EDC pin D. The other side of the EDC (pin C) is grounded by a circuit from ground splice CM-S68. With voltage and a ground circuit available the reverse EDC moves to be desired position for reverse operation. An open in the circuit prevents the pedal signal and / or controller signal from reaching the EDC.

The ECU uses the propel pedal input along with other inputs to control the direction and speed of the hydrostatic pump. The pedal provides a voltage input to the controller indicating pedal position as forward or reverse and desired speed. The pedal primary voltage (5VDC) is routed from the 5V Sensor Power circuit to pedal connector pin C (potentiometer) and F (IVS switches). When the pedal is placed in the forward or reverse positions avoltage signal is routed from the pedal pin A to the controller CM-C8 pin 18 (right foot pedal) or pin 19 (left foot pedal). The signal strength is dependent upon the position of the pedal.See the SPN 9011 RH Foot Pedal Neutral Fail and SPN 9015 LH Foot Pedal Neutral Fail flowcharts for pedal circuit description and diagnostics.

After the foot pedal signals the controller with reverse direction and the reverse speed the controller routes current to the EDC connector pin D. The other side of the EDC at pin C is grounded by a ground circuit from ground splice CM-S68. The amperage (current) routed to the EDC depends on the position of the foot pedal.
With a ground at EDC pin C and voltage at pin D a magnetic field is generated in the EDC drawing the spool toward the reverse side and shifting the hydrostatic pump output into reverse.



Navigator Box

In Reverse and in TRANSPORT mode (immediately after startup):

Check that park brake pressure (40psi) switch is above 40psi.
The service tool screen does not display switch pressure.
The screen will display the park brake status based on the switch status.
If the park brake is released the switch pressure is above 40 psi (switch open).
If the park brake is applied the switch pressure is less than 40 psi (switch closed, no pressure).
See the Park Brake Pressure SW box on the Drive Motor/Pump Overview screen.
Check that the foot pedal voltage between 1.38VDC and 2.2VDC.
See the Pedal Signal Volts on the Left Pedal or Right Pedal screen.
Check that mode switch is in TRANSPORT position.
Note: Use service Drive Motor/Pump Overview screen to ***check*** reverse in transport mode conditions.

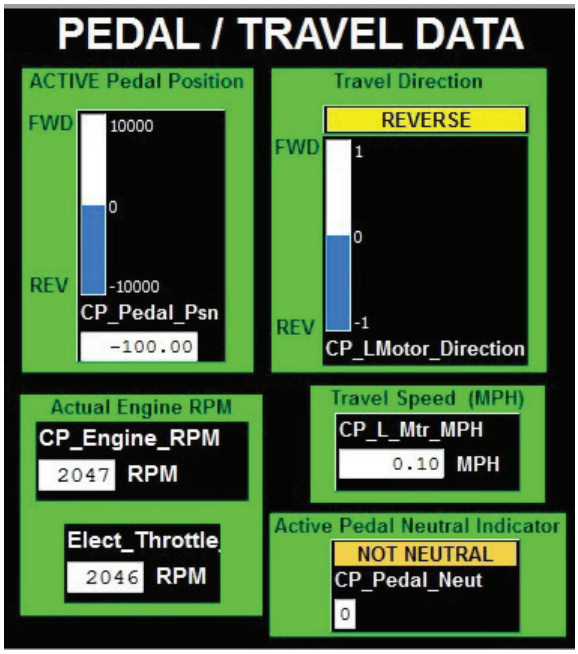
All operational conditions are met?

NO → Correct conditions and continue with diagnostics

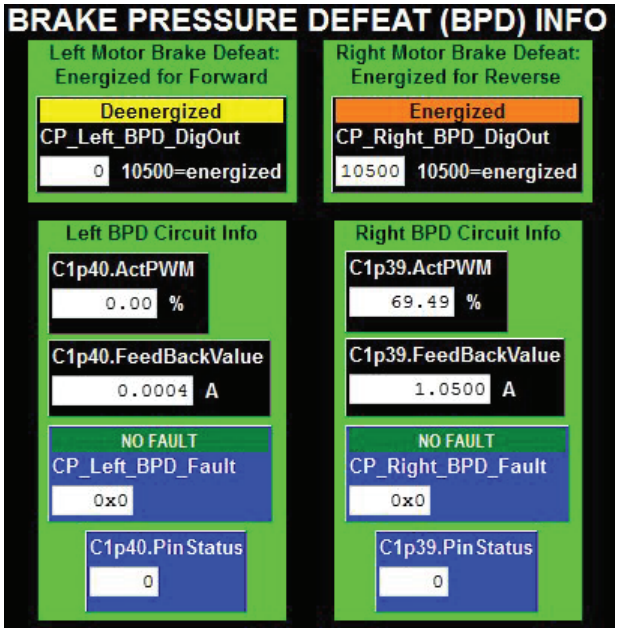
YES

When all conditions have been met the controller will energize the reverse brake defeat solenoid (right side), activate the backup alarm and output a PWM signal to the EDC at the selected foot pedal position. All brooms will raise and stop rotating.
Note: See the brake pressure defeat(BPD) info on the drive motor overview screen.
Note: The reverse speed is limited to a lower speed defined by Elgin Sweeper Corporation.

Continued



Pedal Travel Data



Brake Defeat Status

Check that all connectors are fully mated, terminals and pins are installed fully inserted with no bent pins or broken wires.
Check to make sure the EDC connector at the foot pedal is secure and not broken.
Check the CM-C8 connector at the controller pin 37 (light blue wire) is secure and not bent or broken.

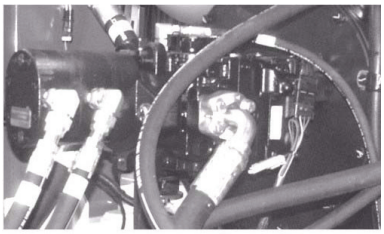
Loose or broken connection or wire?

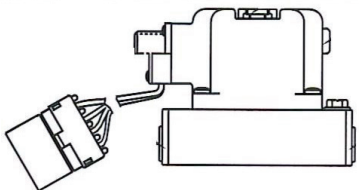
YES → Repair or replace loose or broken terminal, wire or pin.

NO →

Remove the wiring harness connector from the EDC.
Check the reverse solenoid coil for open circuit or short circuit using a multimeter set for resistance (ohms).

Check coil resistance between EDC pins C and D.
The T4i coil should display a reading of approximately 16 ohms at 70 degrees (F) and 4.5 ohms at 176 degrees (F).
The T4F coil should display a reading of approximately 3.6 ohms at 68 degrees (F).





EDC Mounting

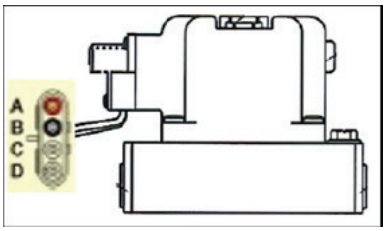
Continued

Is the EDC coil resistance reading within range?

NO

Replace the EDC.

YES



EDC Pin Locator

Disconnect the harness connector from the EDC.
Using a multimeter set for resistance (ohms lowest setting), ***check*** for ground continuity at the EDC pin C.
Place one multimeter lead in the harness connector for pin C.
Place the other lead on a known good ground.
The multimeter should indicate 0 indicating ground continuity.

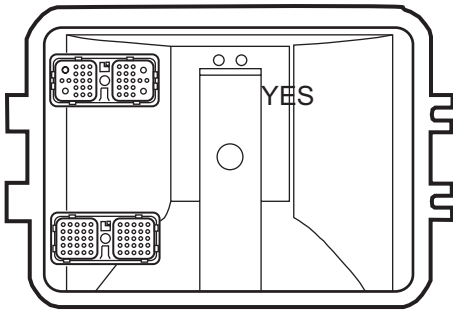
Is ground continuity reading at EDC pin C?

NO

The EDC harness has an open circuit. Repair ground circuit between ground connector CM-S68 and the EDC harness connector for pin C.

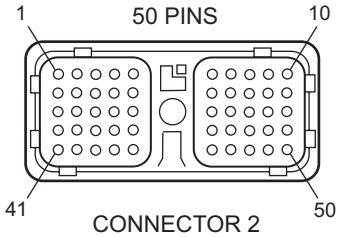
YES

CONTROLLER

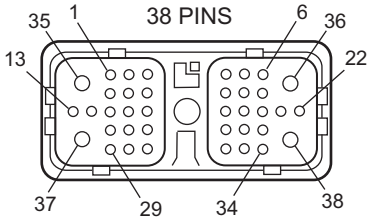


Remove the C1 (50 pin) connector from the controller.
Remove the harness connector from the EDC.
Place a jumper wire between the harness connector pin D and a known good ground.
Using a multimeter set for resistance (ohms lowest setting).
Check for a ground circuit between the C1 connector pin C1p37 and a known good ground.
The multimeter should indicate 0 indicating a ground circuit.

CONNECTOR 1
50 PINS



CONNECTOR 2
38 PINS



Is ground continuity reading between the controller connector C1p37 and EDC connector pin D?

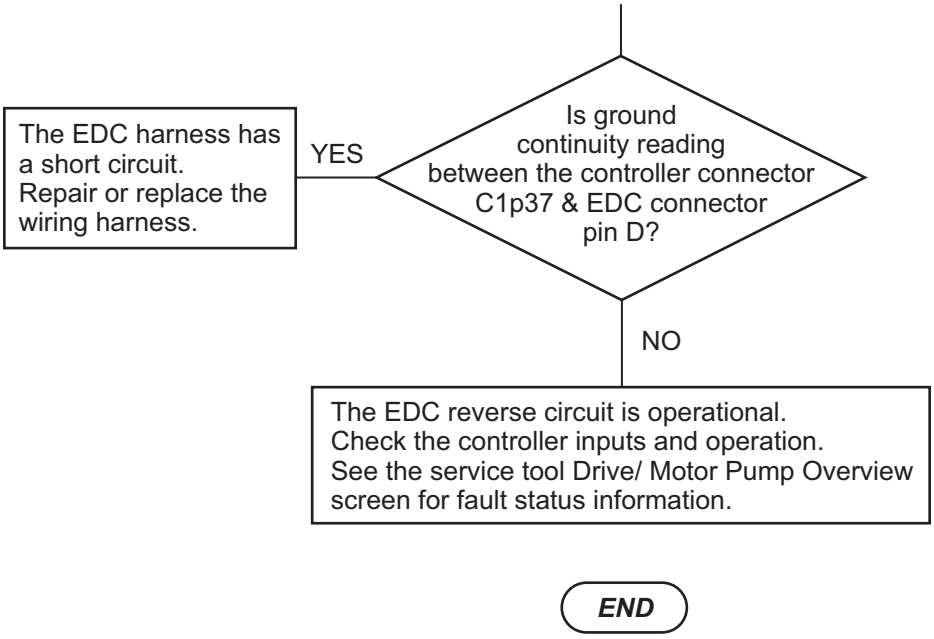
NO

Repair or replace the wiring harness.

YES

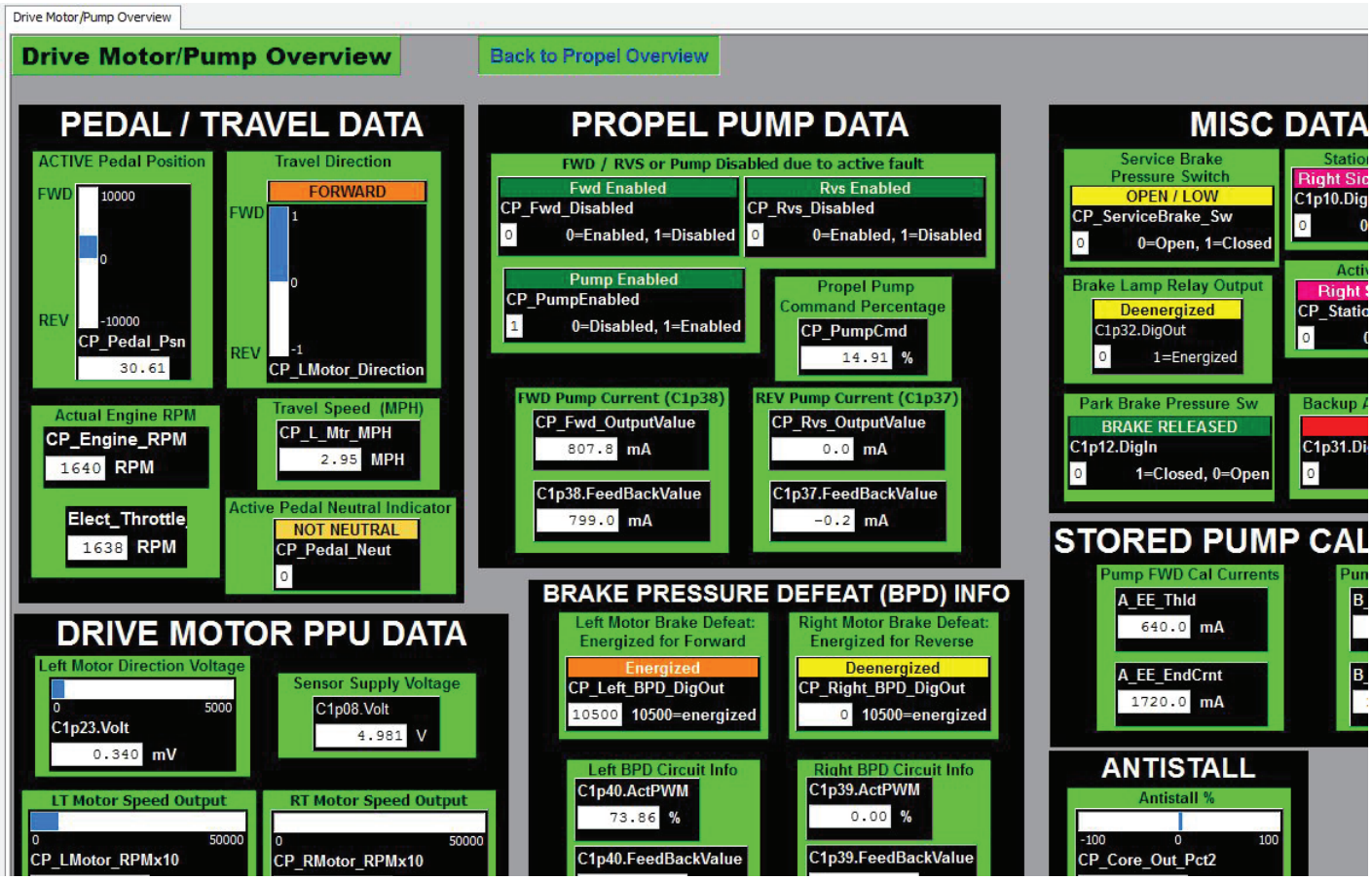
Remove the jumper wire from the EDC wiring harness connector pin D.
Using a multimeter set for resistance (ohms lowest setting)
Check for a ground circuit between the C1 connector pin C1p37 and a known good ground.
The multimeter should indicate 1 or infinity no short to ground.
Connect harness connectors to the controller C1 (50 pin) and the EDC.

Continued


Is ground continuity reading between the controller connector C1p37 & EDC connector pin D?
YES
The EDC harness has a short circuit. Repair or replace the wiring harness.
NO
The EDC reverse circuit is operational. Check the controller inputs and operation. See the service tool Drive/ Motor Pump Overview screen for fault status information.
END

SPN 9027
Forward Pump
Solenoid

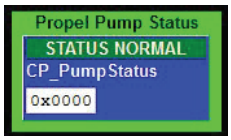
The 9027 error code indicates measured coil resistance is not within specifications for more than 500 mS. Resistance is calculated by measuring current flow.
The T4i forward (A-B) coil has a nominal resistance of 20 ohms at 75 degrees (F).
The T4i reverse (C-D) coil has a nominal resistance of 16 ohms at 75 degrees (F).
The T4F forward (A-B) and reverse (C_D) coils have a nominal resistance of 3.6 ohms at 68 degres (F).
The current can be too high or too low due to an open circuit or short circuit in the harness or in one of the coils.
NOTE: When a fault occurs the control system will disable the reverse pump operation and voltage will no longer be routed to the reverse side of the pump until the fault is cleared.



Drive Motor / Pump Overview

The service tool drive motor/pump overview screen can be used to **check** / observe the forward pump operation.
The propel pump data section contains log functions displaying the operation of the forward pump, reverse pump and pump operation.
The Fwd Enabled, Rvs Enabled and Pump Enabled boxes indicate when the pump is enabled or disabled.
The Fault/Status Info section of the overview screen contains fault indicator boxes that display fault warning and fault ID codes.

Continued



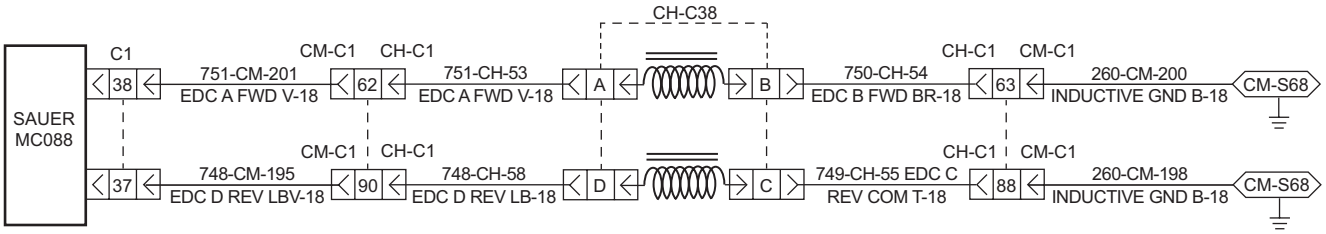
Propel Pump Status



Forward Pump Enabled

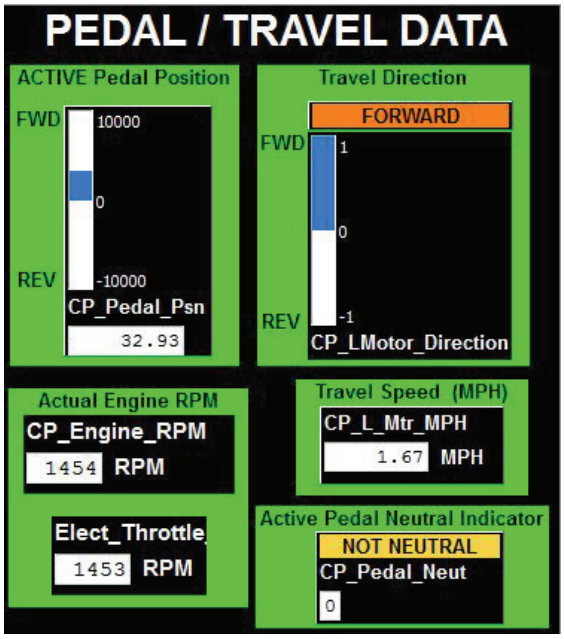


Faults Screen



Pelican T4i / T4F 74hp Forward Pump Circuit

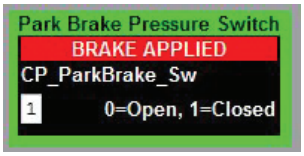
START



Travel Direction

The service tool drive motor/pump overview screen can be used to ***check*** / observe the forward pump operation.
The propel pump data section contains log functions displaying the operation of the forward pump, reverse pump & pump operation.
The Fwd Enabled, Rvs Enabled and Pump Enabled boxes indicate when the pump is enabled or disabled.
The Fault / Status Info section of the overview screen contains fault indicator boxes that display fault warning and fault ID codes.

Check that engine is running.
Check that foot pedal is in neutral.
See the travel direction box on the drive motor/pump overview screen.
Check that park brake is release.
See the park brake pressure SW box on the drive motor/pump overview screen.

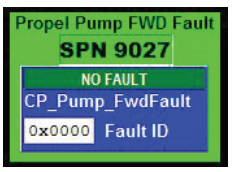


Park Brake Pressure Switch

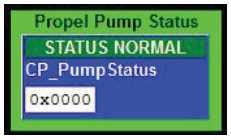
All preoperational conditions are met?

NO — Correct conditions and continue with diagnostics

YES



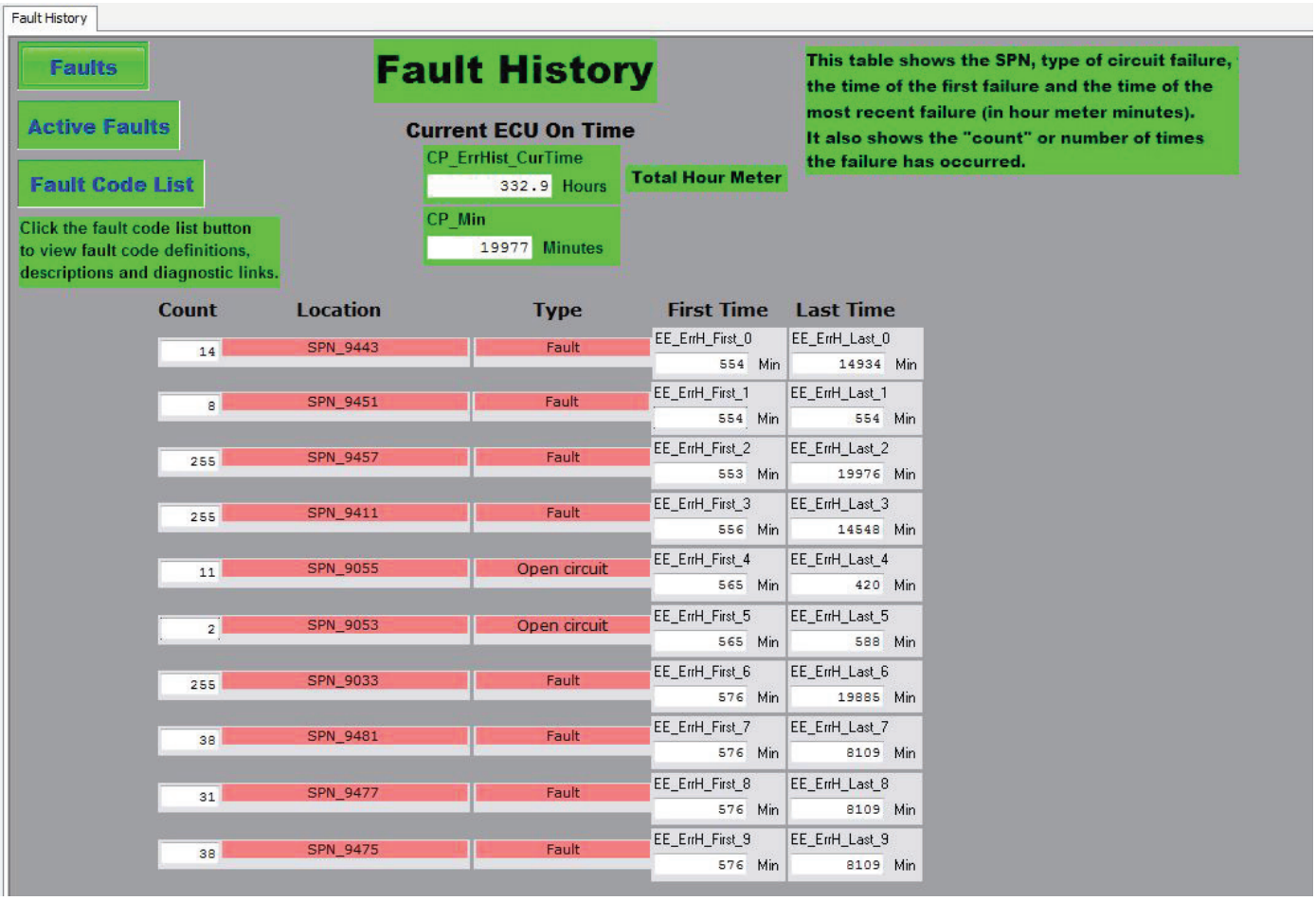
SPN 9027
Fault Indicator



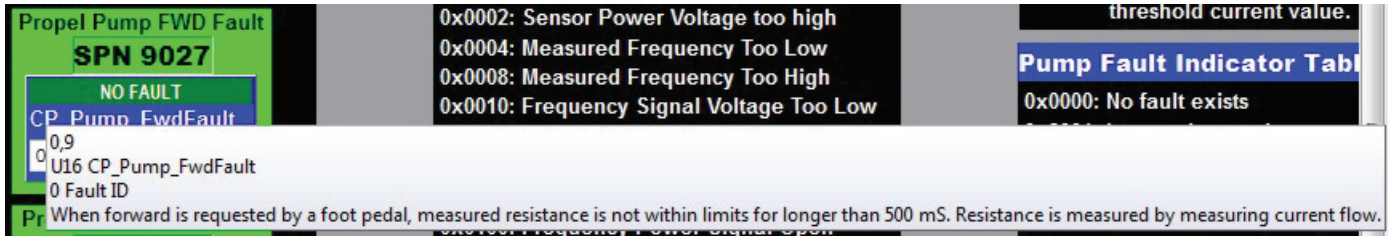
Pump Status Table

Use the service tool drive motor/pump overview screen to ***check*** fault conditions.
The SPN 9027 fault indicator box will display a fault condition and a fault code when a fault occurs. Use the pump fault indicator table to find the fault code and causes.
The pump status indicator will display the pump status and any fault status conditions.
See the pump status indicator table to find status code and causes.
Place the cursor over the SPN 9027 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
The SPN 9027 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9027, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions.

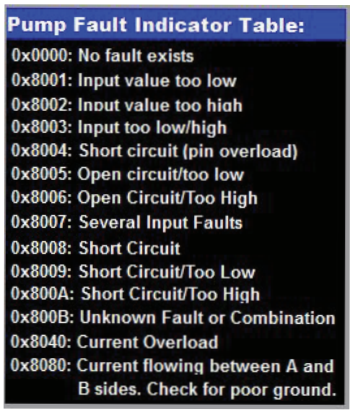
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Fault History



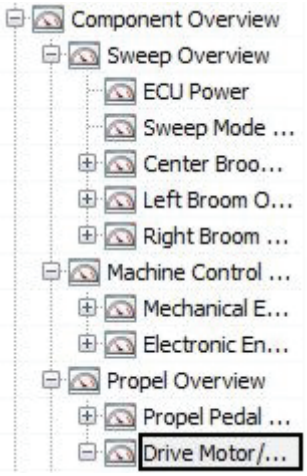
Hover SPN 9027 Fault Indicator



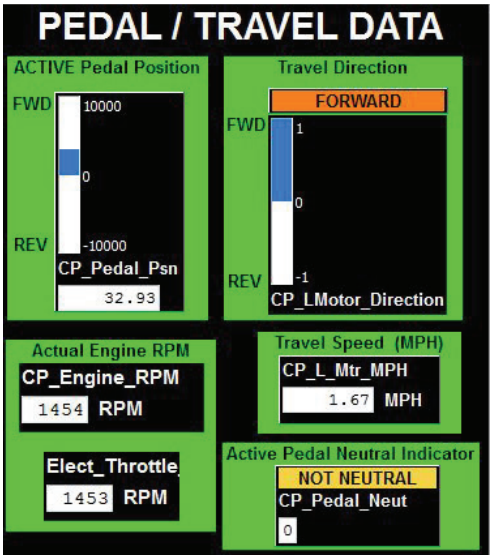
Pump Fault Indicator Table

The 9027 error code indicates an open or short in the hydrostatic pump circuit on the forward side. An open or short in the hydrostatic pump circuit prevents shifting into forward using the electrical displacement control (EDC).
The propel pedal sends a signal to the controller indcating forward direction. The pedal signal routed through wiring to the controller. The controller then routes a current to the EDC pump circuit based on the pedal position.
The controller current from CM-C8 pin 38 to EDC pin A. The other side of the EDC (pin B) is grounded by a circuit from ground splice CM-S68. With voltage and a ground circuit available the forward EDC moves to be desired position for forward operation. An open in the circuit prevents the pedal signal and / or controller signal from reaching the EDC.

Continued



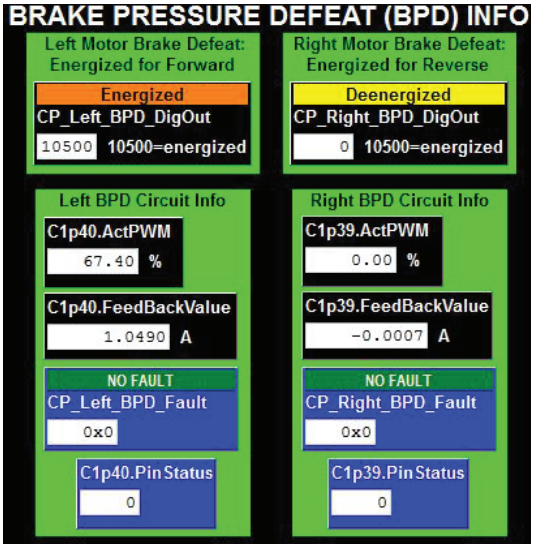
Navigator Box



Pedal Travel Data

The ECU uses the propel pedal input along with other inputs to control the direction and speed of the hydrostatic pump. The pedal provides a voltage input to the controller indicating pedal position as forward or reverse and desired speed. The pedal primary voltage (5VDC) is routed from the 5V Sensor Power circuit to pedal connector pin C (potentiometer) and F (IVS switches). When the pedal is placed in the forward or reverse positions a voltage signal is routed from the pedal pin A to the controller CM-C8 pin 18 (right foot pedal) or pin 19 (left foot pedal). The signal strength is dependent upon the position of the pedal.
See the SPN 9011 RH Foot Pedal Neutral Fail and SPN 9015 LH Foot Pedal Neutral fail flowcharts for pedal circuit description and diagnostics.

After the foot pedal signals the controller with forward direction and the forward speed the controller routes current to the EDC connector pin A. The other side of the EDC at pin B is grounded by a ground circuit from ground splice CM-S68. The amperage (current) routed to the EDC depends on the position of the foot pedal. With a ground at EDC pin B and voltage at pin A a magnetic field is generated in the EDC drawing the spool toward the forward side and shifting the hydrostatic transmission into forward.The current flow controls the angle of the pump swash plate. The higher the current, the steeper the swash plate angle.
The steeper the swash plate angle, the higher the pump output.



Brake Defeat Status

In Forward operation (immediately after startup):

Check that park brake pressure (40psi) switch is above 40psi. The service tool screen does not display switch pressure. The screen will display the park brake status based on the switch status.
If the park brake is released the switch pressure is above 40 psi (switch open). If the park brake is applied the switch pressure is less than 40 psi (switch closed, no pressure).
See the park brake pressure SW box on the drive motor / pump overview screen.
Check that the foot pedal voltage between 2.8VDC and 3.6VDC. See the pedal signal volts box o the left pedal overview or right pedal overview screen.
Note: Use service tool Drive Motor/Pump overview screen to ***check*** forward in forward mode conditions.

Continued

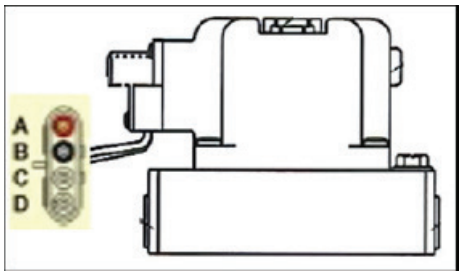
When all conditions have been met the controller will energize the forward brake defeat solenoid (left side), & output a PWM signal to the EDC related to (Fwd or Rev) at the selected foot pedal position.
NOTE: See the brake pressure defeat (BPD) info on the drive motor overview screen.

All operational conditions are met?

NO → Correct conditions and continue with diagnostics

YES

Check that all connectors are fully mated, terminals and pins are fully inserted with no bent pins or broken wires.
Check the EDC connector at the foot pedal is secure and not broken.
Check the CM-C8 connector at the controller pin 38 (violet wire) is secure and not bent or broken.



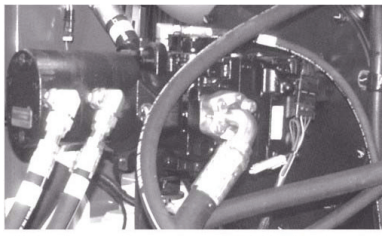
EDC Pin Locator

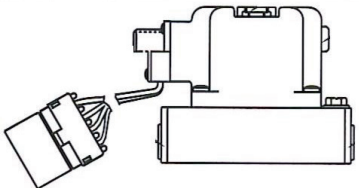
Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin.

NO

Remove the wiring harness connector from the EDC.
Using a multimeter set for resistance (ohms)
check the forward solenoid coil for open circuit or short circuit.
Check coil resistance between EDC pins A and B.
The T4i forward coil has a nominal resistance of 20 ohms at 75 degrees (F).
The T4F coil should display a reading of approximately 3.6 ohms at 68 degrees (F).




EDC Mounting

Is the EDC coil resistance reading within range?

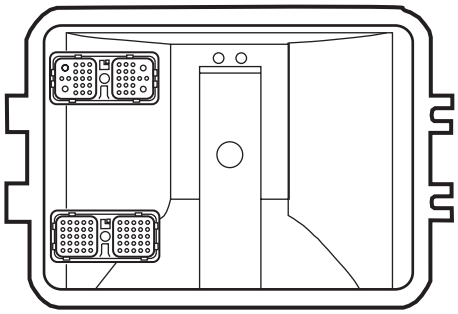
NO → Replace the EDC.

YES

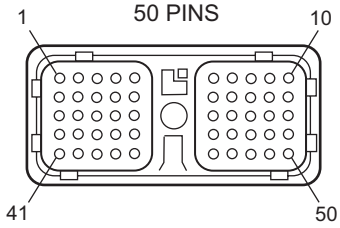
Disconnect the harness connector from the EDC.
Using a multimeter set for resistance (ohms lowest setting)
check for ground continuity at the EDC pin B.
Place one multimeter lead in the harness connector for pin B.
Place the other lead on a known good ground.
The multimeter should indicate 0 indicating ground continuity.

Continued

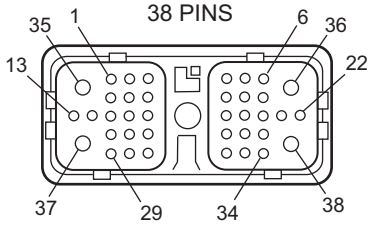
CONTROLLER



CONNECTOR 1
50 PINS



CONNECTOR 2
38 PINS



Is ground continuity reading at EDC pin B?

NO → The EDC harness has an open circuit. Repair ground circuit between ground connector CM-S68 & the EDC harness connector for pin C.

YES

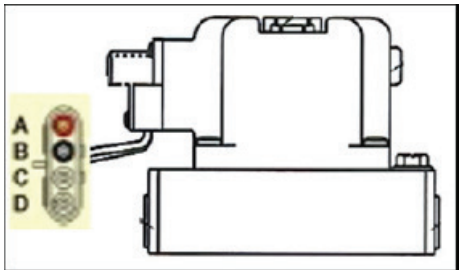
Remove the C1 (50 pin) connector from the controller.
Remove the harness connector from the EDC.
Place a jumper wire between the EDC harness connector pin A and a known good ground.
Using a multimeter set for resistance (ohms lowest setting).
Check for a ground circuit between the C1 connector pin C1p38 and a known good ground.
The multimeter should indicate 0 indicating a ground circuit.

Is ground continuity reading between the controller connector C1p38 & EDC connector pin A?

NO → Repair the open circuit or replace the wiring harness.

YES

Remove the jumper wire from the EDC wiring harness connector pin D.
Using a multimeter set for resistance (ohms lowest setting).
Check for a ground circuit between the C1 connector pin C1p38 and a known good ground.
The multimeter should indicate 1 or infinity no short to ground.
Connect harness connectors to the controller C1 (50 pin) and the EDC.



EDC Pin Locator

Is ground continuity reading between the controller connector C1p38 & EDC connector pin A?

YES → The EDC harness has a short circuit. Repair or replace the wiring harness.

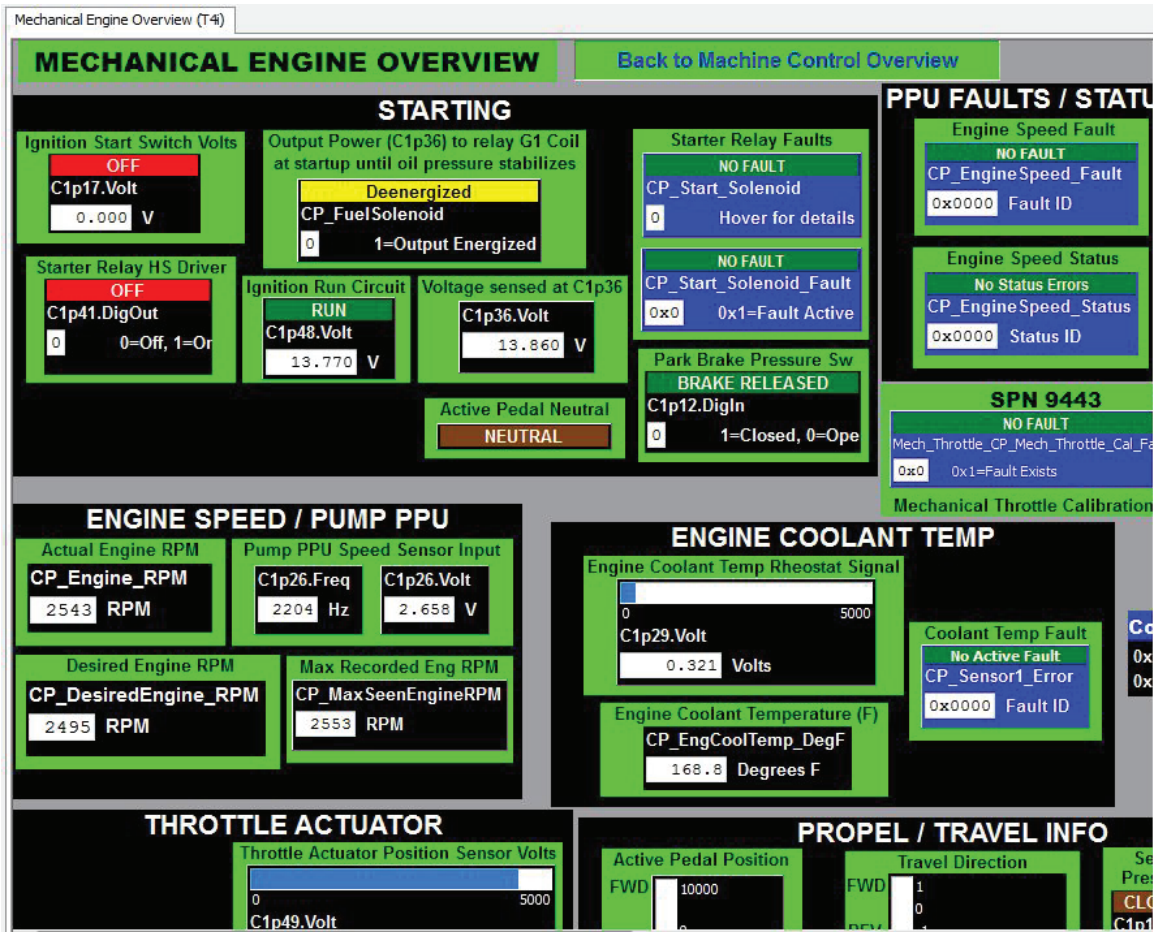
NO

The EDC reverse circuit is operational.
Check the controller inputs & operation.
See the service tool Drive / Motor Pump Overview screen for fault status information.

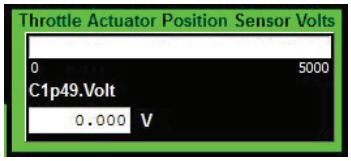
END

SPN 9031
T4i 74HP Throttle Actuator Position Sensor

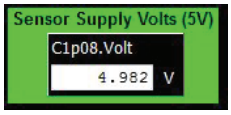
The 9031 error code indicates the throttle position sensor output is greater than 4.7VDC or less than 0.3VDC.
The sensor is located in the linear actuator mounted by the fuel pump.
See the service tool mechanical engine overview screen, throttle actuator position sensor volts log function.
Check throttle position sensor as follows.



Mechanical Engine Overview Screen



Throttle Actuator Position Sensor Volts



Sensor Supply Volts

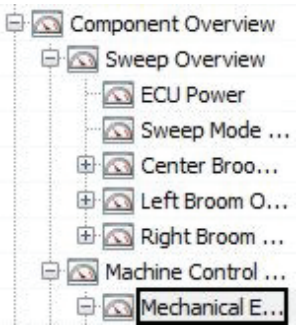
START

Check that ignition switch is in the IGN RUN position.
Check that voltage is available from the controller CM-C8 pin C1p08.
See the service tool mechanical engine overview screen, sensor supply volts (5V) log function.
The log function should display approximately 5VDC.
If the voltage is not available at the controller CM-C8 pin C1p08 ***check*** the controller inputs and operation.

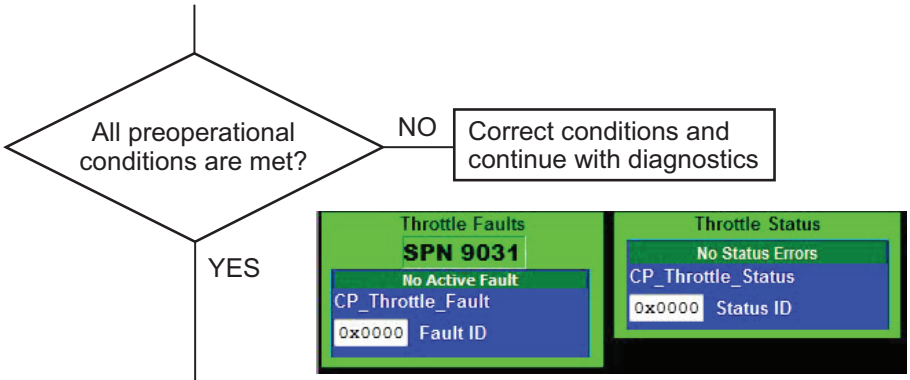
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Throttle Switch

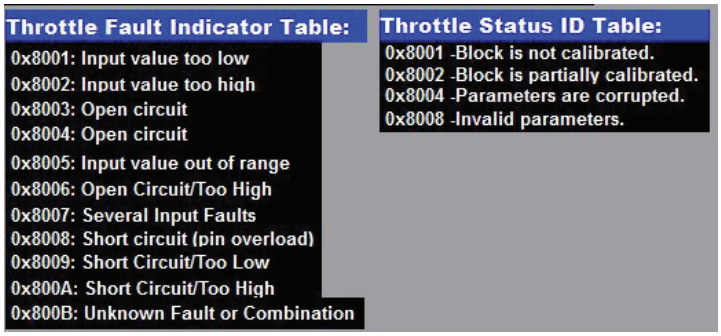


Navigator Box

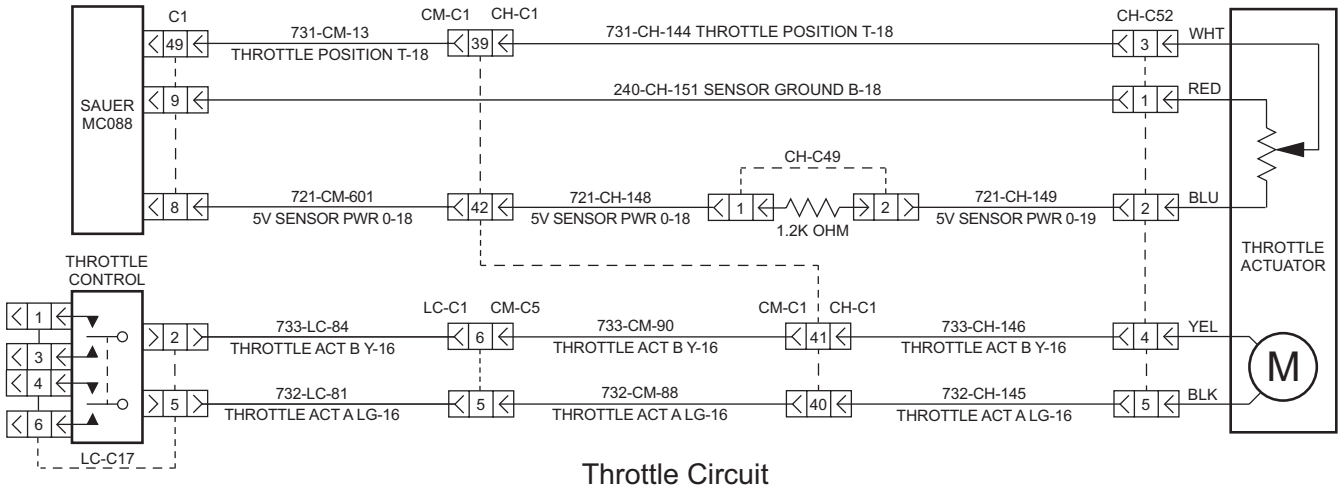


Throttle Fault Status Log

Check the service tool Component Overview > Machine Control Overview > Mechanical Engine Overview (T4i) screen for throttle status, controller inputs & outputs.
The SPN 9031 fault condition can be verified using the service tool fault history screen. Fault history screen will display SPN 9031, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions.
The Throttle Faults SPN 9031 box on the service tool mechanical engine overview screen will display active fault and fault ID if a throttle fault is set.
The throttle status box will display status error and ID.
Place the cursor over the throttle fault and status box to display of additional fault/status information.
The throttle fault indicator table and throttle status ID table provide additional information for the throttle faults and throttle status ID.
NOTE: Place the cursor over the fault boxes and allow to hover.
Additional information about the fault will be displayed in the information box.

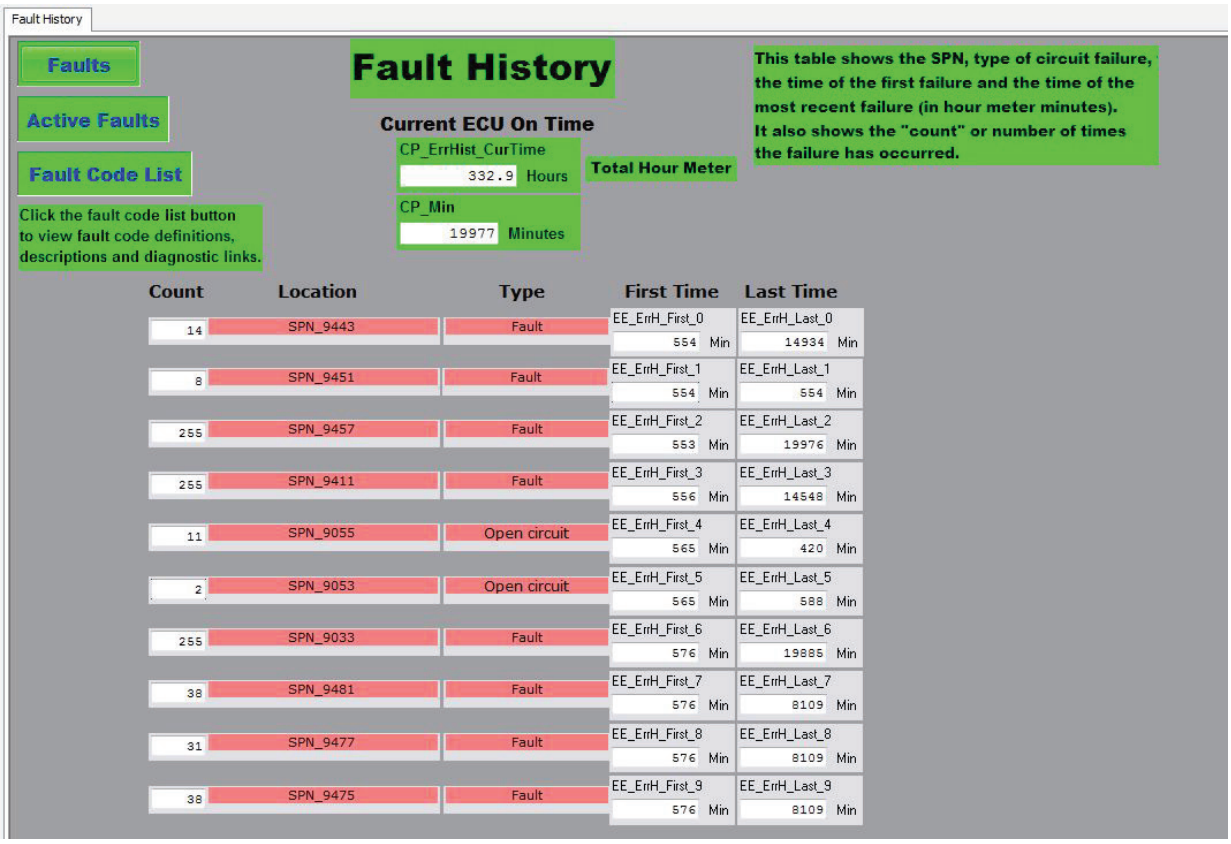


Throttle Fault / Status Table



Throttle Circuit

Continued



Fault History Screen

The throttle is controlled by a linear actuator that responds to commands from the throttle position switch. The switch is connected to the fuel fused power circuit (12VDC) at terminals 1 & 6. The switch is connected to the inductive ground circuit at terminals 3 & 4. In the throttle UP position the 12VDC is routed from the switch terminal 2 to the throttle actuator terminal 4. At the same time a ground circuit is routed from the switch terminal 4 to the other side of the throttle actuator at terminal 5. With voltage and ground available the actuator retracts inreasing throttle position until the switch is released.

In the throttle DOWN position the 12 VDC is routed from the switch terminal 5 to the throttle actuator at terminal 5. At the same time a ground circuit is routed from the switch terminal 2 to the throttle actuator at terminal 4. With voltage and ground available the actuator extends decreasing throttle position until the switch is released.

A potentiometer built into the throttle actuator monitors the throttle position and routes a throttle position signal to the controller at CM-C8 pin 49.
The 5VDC for position operation is routed from the 5V sensor power citcuit at the controller CM-C8 pin 8 to the throttle actuator connector pin 2.
The ground circuit for position operation is routed from the sensor ground circuit at the controller CM-C8 pin 9.
The voltage for operation of the position sensor is routed through a 1.2K ohm resistor to one side of the position potentiometer. The resistor is placed in the circuit to limit current flow in the 5v sensor feed circuit should this leg feeding the actuator become shorted to ground, thus protecting the 5v feed to other sensors on the sweeper.
As the sensor leg moves across the potentiometer a portion of the original 5VDC is routed to the controller CM-C8 pin 49. The controller uses the signal to display throttle position and calculations for sweeper operation.
The output signal from the position sensor is directly related to the position of the throttle actuator.

Continued

The throttle switch is mounted on the control panel and used by the operator to increase or decrease engine throttle.
With the ignition switch in the RUN position use a multimeter to ***check*** for 5VDC at the inline 1.2K resistor CH-C49 terminal 1 (orange wire).

5VDC available at the resistor?

NO

YES

Check with a multimeter for voltage at the inline resistor terminal 2 (orange wire).

Voltage available at the resistor terminal 2?

YES

NO

Replace the inline 1.2 ohn resistor.

Check with a multimeter for voltage at the throttle actuator terminal (org wire).

5VDC available at the actuator terminal 2?

NO

YES

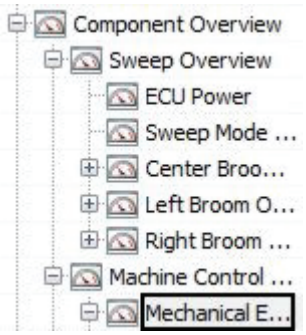
Continued

Check for open circuits, broken wires or bad connections between the inline 1.2K ohm resistor and the throttle actuator terminal 2.

NOTE: *A short circuit to a 12VDC circuit can cause the 9031 error code.*

Check the service tool mechanical engine overview (T4i) screen Sensor Supply Volts (5V) box.
If the box displays approximately 5v but there is 0 volts at the resistor there is an open circuit between the resistor & the controller pin C1p08.
With the ignition switch in the off position, disconnect connector C1 (CM-C8) from the controller. With CH-C49 still disconnected ***check*** with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller and terminal 1 of the resistor or between the controller and one of the sensors supplied with 5 volts.
The short circuit or short to ground may exist in any of the sensor power circuits connected to the controller pin C1p08.

These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15
While watching the multimeter display, disconnect each sensor connector until the multimeter displays a 1. Install all sensor connectors except the connector with the short circuit or short to ground.
Repair or replace the wiring harness between the shorted sensor and the controller pin C1p08.
Install all connectors removed during testing.



Navigator Box



Throttle Actuator

Check with a multimeter for a ground circuit at the throttle actuator terminal 1 (black wire).

Ground circuit available at the actuator terminal 1?

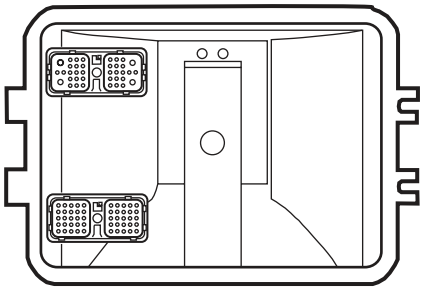
NO

Remove the connector CM-C8 50 pin connector from the controller & connector CH-C52 from the throttle actuator.
Place a jumper wire between the CH-C52 connector pin 1 (black wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller CM-C8 pin C1p09 (black wire) & a known ground.
The multimeter should display a 0 indicating ground continuity.
Repair or replace the wiring harness as necessary.

YES

Check with a multimeter, while operating the throttle switch in the throttle up and throttle down positions, for a voltage increase or decrease at the throttle actuator terminal 3 (white wire).
Check for a output signal between 4.7VDC & 0.3VDC.

CONTROLLER

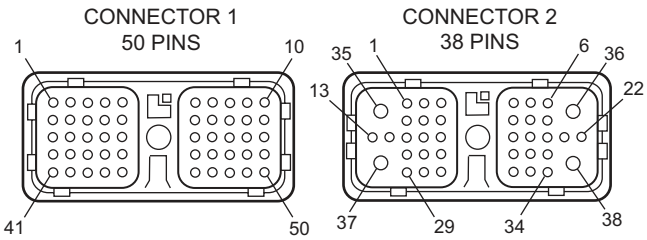


Proper voltage available that increases & decreases with throttle switch movement?

YES

Remove the connector CH-C52 from the throttle actuator.
While watching the service tool mechanical engine overview screen, throttle actuator position sensor volts box connect a jumper wire between the connector pins 2 (blue wire) and pin 3 (white wire).
The throttle actuator position sensor volts box should display approximately 5VDC.
If the box does not display voltage the harness wire between throttle actuator terminal 3 and controller pin C1p49 has an open circuit.
Repair or replace wiring harness.

NO

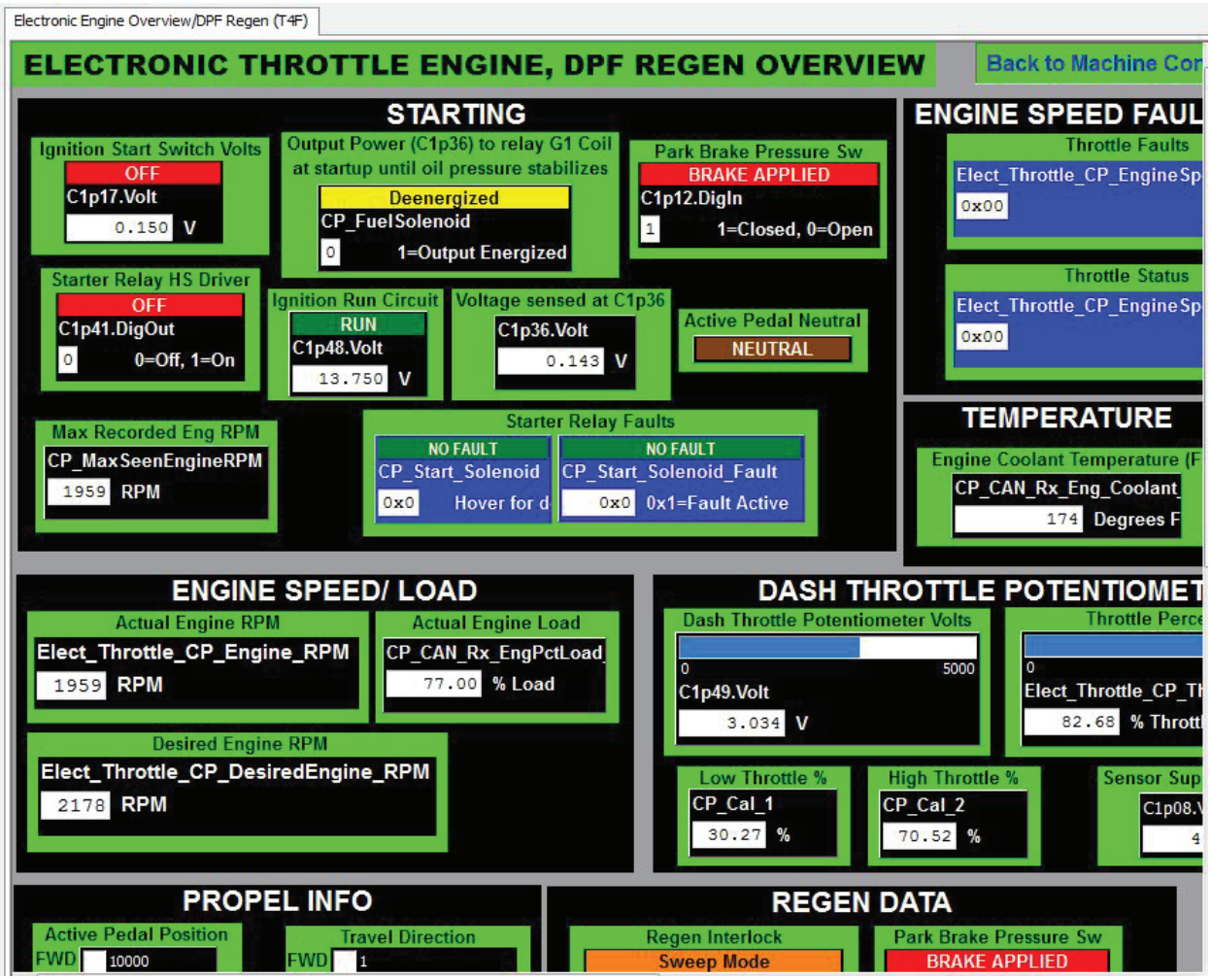


While watching the throttle linear actuator actuate the throttle switch in the throttle up and throttle down positions.
The linear actuator should extend and retract as the throttle switch is actuated.
If the linear actuator does not extend/retract check the throttle control switch voltage and ground inputs and outputs.
Check for an open circuit or short to ground between the throttle switch terminal 2 (yellow wire) and the throttle actuator terminal 4 (yellow).
Check for an open circuit or short to ground between the throttle switch terminal 5 (light green wire) and the throttle actuator terminal 5 (light green wire).
If the switch is operational and there are no open circuits or short to ground circuits between the throttle switch and throttle actuator replace the throttle actuator.

END

SPN 9031
T4F Electronic Engine ***74HP***
Throttle Position Switch

The 9031 error code indicates the throttle position sensor output is greater than 4.7VDC or less than 0.3VDC.
Check throttle position sensor as follows.



Electronic Engine Overview Screen

The service tool electronic engine overview screen can be used to observe throttle operation in real time.
Watch the Dash Throttle Potentiometer Volts and Throttle Percentage while rotating the rotary throttle switch.
The error code sets based on the voltage displayed on these parameters.

Continued

START

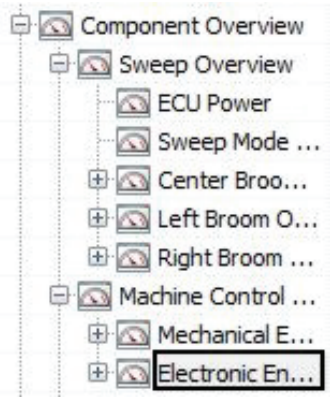
Check that the ignition switch is in the RUN position.
Check with a multimeter for 5VDC at the throttle rotary switch terminal A (orange wire).
NOTE: John Deere 5 VDC cannot be seen with the service tool.

All preoportional conditions are met?

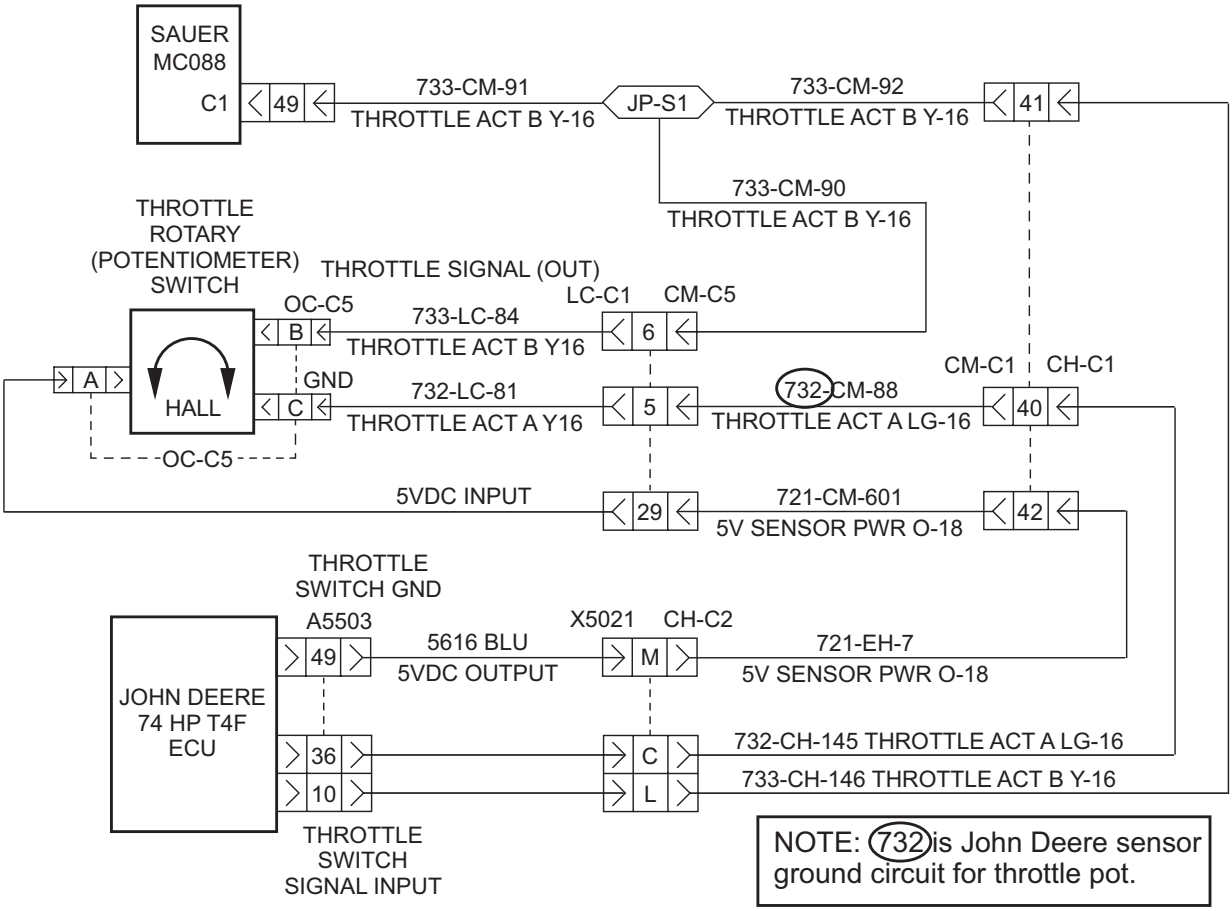
NO

Check ignition switch and circuit for proper operation. If the 5VDC is not available at the throttle rotary switch use the diagnostics steps to ***check*** the John Deere ECU pin 49 (blue wire) to the switch terminal A (orange wire) circuit.

YES



Navigator Box

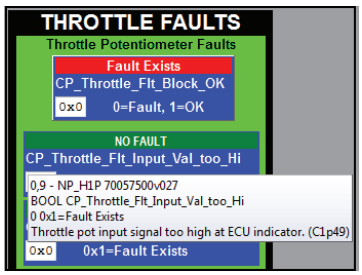


Pelican T4F 74hp Throttle Position Circuit

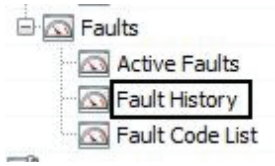
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Throttle Faults



Cursor Hover



Faults Screen

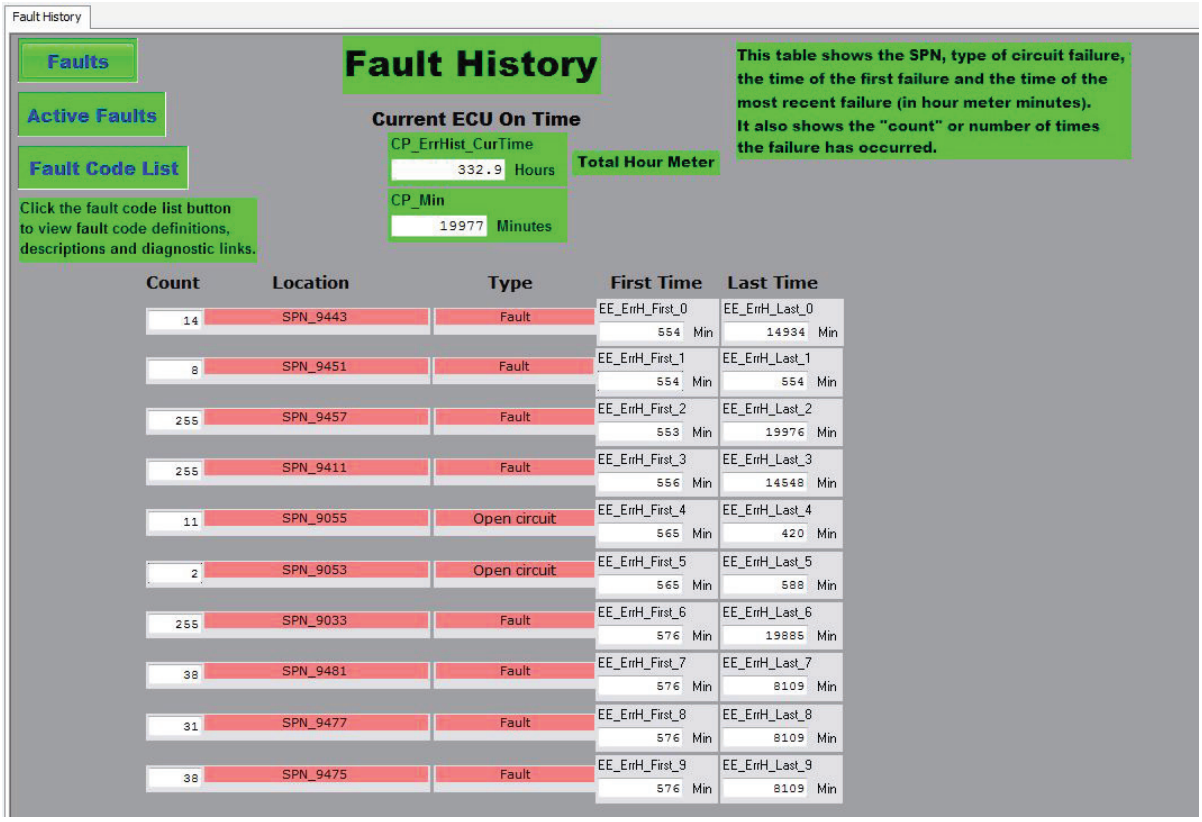
Check the service tool functions:
Component Overview > Machine Control Overview > Electronic Engine Overview, DPF Regen Overivew for throttle status, controller input and fault conditons.
The fault conditions shown on the Electronic Engine Overview log function screen will pinpoint input voltage and circuit problems.
The CP_Throttle_Flt_Block_OK (Fault Exist) box will display a fault condition if the SPN 9031 error code is set.
The input value too low and too high faults indicate that the signal circuit values are above the calibration thresholds for too long but have not reached the point of being either open circuit (low voltage) or shorted (high voltage).
The open circuit and short circuit faults indicate opens, shorts, loss of power or loss of ground in the pot circuitry which will be indicated by a signal voltage value too close to either 0v or 5v.
The CP_Throttle_Flt_Input_Val_too_Hi box on the electronic engine overview screen will display a FAULT condition if
the input voltage is to high and the SPN 9031 error code is set.
The CP_Throttle_Flt_Input_Val_too_Low box on the electronic engine overview screen will display a FAULT condition if the input voltage is to low and the SPN 9031 error code is set.
The CP_Throttle_Flt_Open_Circuit box on the electronic engine overview screen will display a FAULTS condition if the throttle pot input signal has an open circuit. The signal voltage is too close to either open or shorted to ground signal circuit or loss of 5v feed.
The CP_Throttle_Flt_Short_Circuit box on the electronic engine overview screen will display a FAULT condition if the throttle pot input signal is shorted high. The signal voltage is too close to 5v due to either an open ground or signal circuit is shorted to 5v or 12v.
The CP_Throttle_Flt_Val_OOR (Out Of Range) box on the electronic engine overview screen will display a FAULT condition if the throttle pot input signal is out of the normal range at the ECU indicator (C1p49).
The SPN 9031 fault condition can be verified using the service tool fault history screen. The fault history screen will display SPN 9031, the number of times the fault has occurred, the first time and last time the fault occurred. This information can be used to help diagnose the fault conditions.
NOTE: Place the cursor over the fault boxes and allow to hover. Additional information about the fault will be displayed in the information box.
Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems.
In case the servicce tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot throttle position and circuit problems.



John Deere ECU

The throttle position is controlled by the John Deere 74HP T4F ECU. The ECU responds to voltage input from the dash mounted throttle potentiometer (rotary switch).
The 5VDC for operation of the throttle potentiometer is routed from the John Deere 74HP ECU pin 49 (5616 BU) to the rotary throttle switch (potentiometer) terminal A. The potentiometer is grounded at terminal C by a gounrd circuit routed from the John Deere 74HP ECU pin 36. When the potentiometer is rotated a voltage signal is routed from the rotary switch terminal B to the John Deere 74HP ECU pin 10. The input at the pin 10 signals the ECU the desired throttle position.
See the John Deere engine manuals for ECU and throttle description and diagnostics. The throttle (voltage) signal is also routed to the controller CM-C8 pin 49 and used to monitor and control sweeper operations.

Continued



Fault History Screen

The rotary throttle switch is mounted on the control panel and used by the operator to increase or decrease engine speed. With the ignition switch in the RUN position use a multimeter to ***check*** for 5VDC at the throttle switch OC-C5 terminal A (orange wire). The controller sensor supply voltage (5VDC) can be ***checked*** on the service tool electronic engine overview screen as C1p08 Sensor Supply Voltage.

Is the 5VDC available at the rotary throttle switch terminal A?

YES

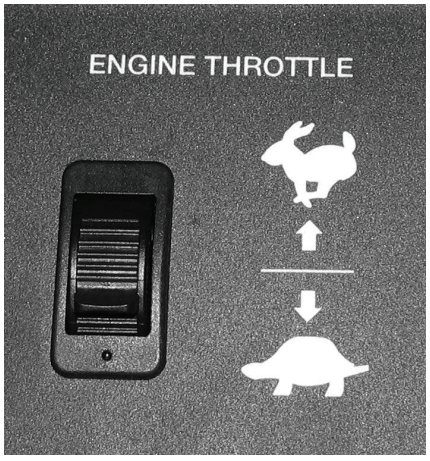
Check with a multimeter for a ground circuit at the rotary throttle switch terminal C (light green wire).

Continued

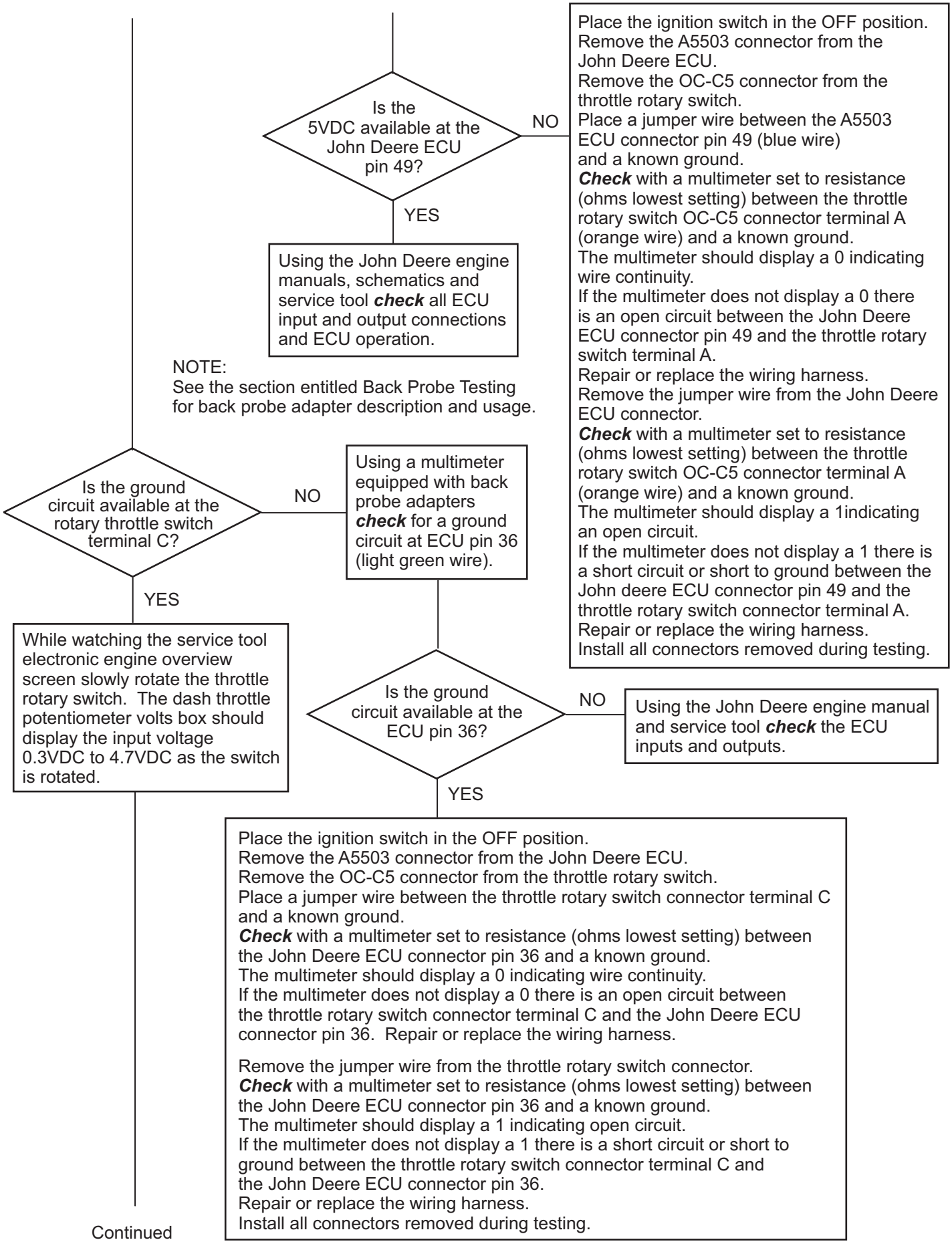
NO

Check with a multimeter equipped with back probe adapters for 5VDC at the John Deere ECU pin 49.

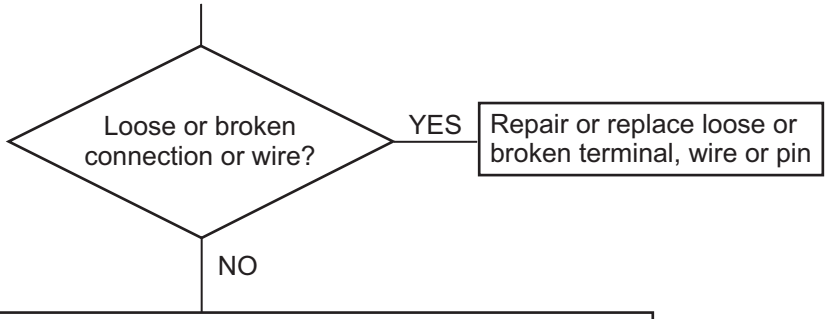
Continued



Rotary Throttle Switch


Is the 5VDC available at the John Deere ECU pin 49?
NO
YES
Place the ignition switch in the OFF position.
Remove the A5503 connector from the John Deere ECU.
Remove the OC-C5 connector from the throttle rotary switch.
Place a jumper wire between the A5503 ECU connector pin 49 (blue wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the throttle rotary switch OC-C5 connector terminal A (orange wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the John Deere ECU connector pin 49 and the throttle rotary switch terminal A.
Repair or replace the wiring harness.
Remove the jumper wire from the John Deere ECU connector.
Check with a multimeter set to resistance (ohms lowest setting) between the throttle rotary switch OC-C5 connector terminal A (orange wire) and a known ground.
The multimeter should display a 1indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the John deere ECU connector pin 49 and the throttle rotary switch connector terminal A.
Repair or replace the wiring harness.
Install all connectors removed during testing.
Using the John Deere engine manuals, schematics and service tool check all ECU input and output connections and ECU operation.
NOTE:
See the section entitled Back Probe Testing for back probe adapter description and usage.
Is the ground circuit available at the rotary throttle switch terminal C?
NO
YES
Using a multimeter equipped with back probe adapters check for a ground circuit at ECU pin 36 (light green wire).
While watching the service tool electronic engine overview screen slowly rotate the throttle rotary switch. The dash throttle potentiometer volts box should display the input voltage 0.3VDC to 4.7VDC as the switch is rotated.
Is the ground circuit available at the ECU pin 36?
NO
YES
Using the John Deere engine manual and service tool check the ECU inputs and outputs.
Place the ignition switch in the OFF position.
Remove the A5503 connector from the John Deere ECU.
Remove the OC-C5 connector from the throttle rotary switch.
Place a jumper wire between the throttle rotary switch connector terminal C and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the John Deere ECU connector pin 36 and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the throttle rotary switch connector terminal C and the John Deere ECU connector pin 36. Repair or replace the wiring harness.
Remove the jumper wire from the throttle rotary switch connector.
Check with a multimeter set to resistance (ohms lowest setting) between the John Deere ECU connector pin 36 and a known ground.
The multimeter should display a 1 indicating open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the throttle rotary switch connector terminal C and the John Deere ECU connector pin 36.
Repair or replace the wiring harness.
Install all connectors removed during testing.

Continued



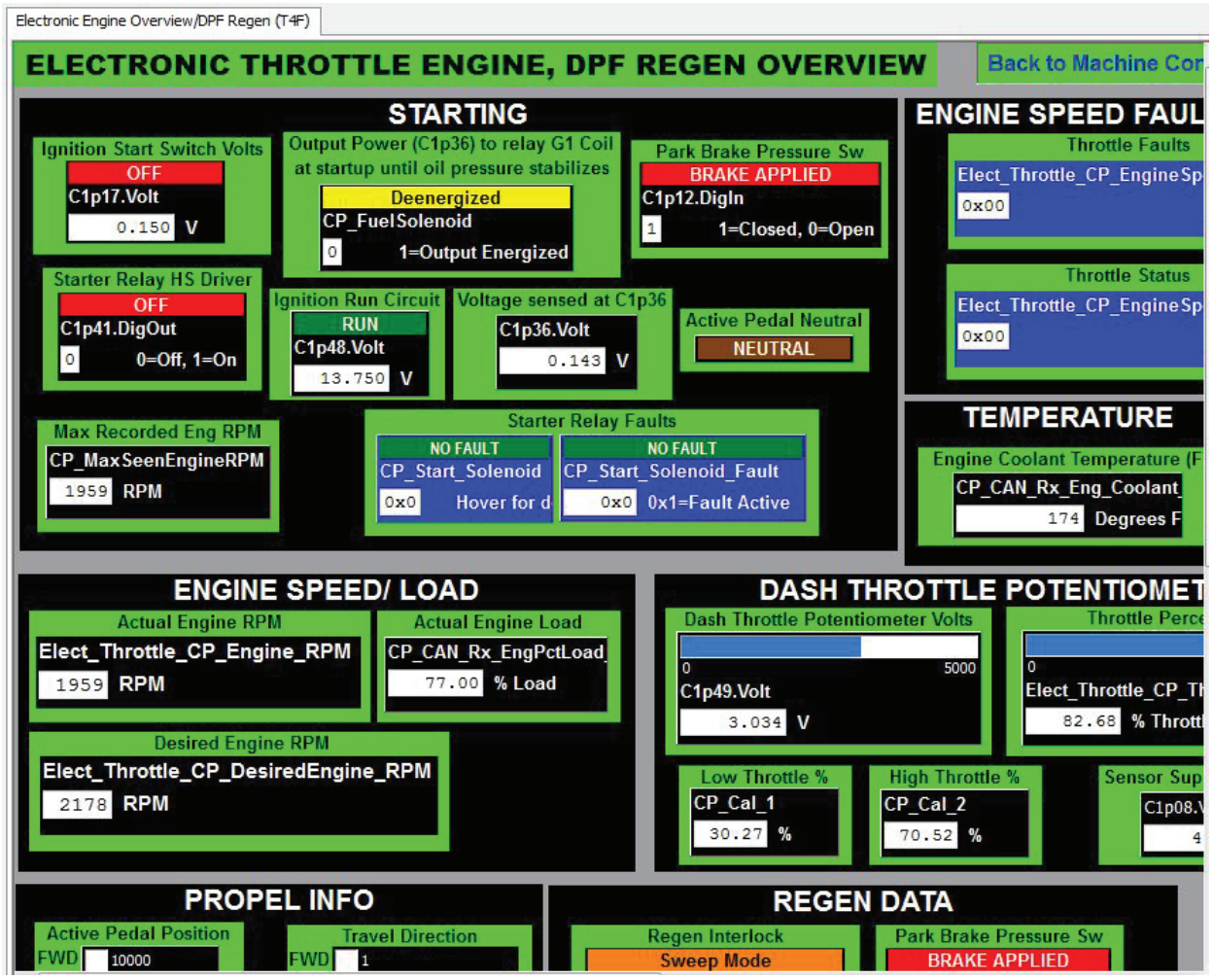
Remove the connector RF-C7 from the raise solenoid coil.
Check with a multimeter set to resistance between the solenoid coil terminal 1 (dark blue wire) & terminal 2 (black wire).
The multimeter should display approximately 7.2 ohms at 68 degrees.
If the multimeter displays an approximate range above or below the specifications the coil is shorted or open.
Replace the solenoid coil or solenoid valve.
Check with a multimeter set to resistance (ohms lowest setting) between the solenoid connector terminal 2 (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
A multimeter display of 1 indicates the solenoid ground wire is open.
Repair or replace the wiring harness between the solenoid terminal 2 and chassis ground RF-S5.

Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the RF-C7 connector from the right broom raise solenoid coil.
Place a jumper wire between the right broom raise solenoid connector terminal 1 (dark blue wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p43 (dark blue wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the controller connector pin C1p43 and the right broom raise solenoid connector terminal 1.
Repair or replace the wiring harness.
Remove the jumper wire from the right broom raise solenoid connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p43 (dark blue wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller connector pin C1p43 and the right broom raise solenoid connector terminal 1. Repair or replace the wiring harness.
Install all connectors removed during testing.

END

SPN 9031
T4F Electronic Engine ***99HP***
Throttle Position Switch

The 9031 error code indicates the throttle position sensor output is greater than 4.7VDC or less than 0.3VDC.
Check throttle position sensor as follows.



Electronic Engine Overview Screen

The service tool electronic engine overview screen can be used to observe throttle operation in real time.
Watch the Dash Throttle Potentiometer Volt and Throttle Percentage while rotating the rotary throttle switch.

Continued

START

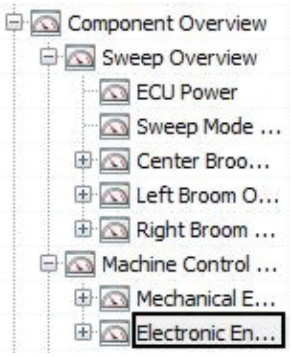
Check that the ignition switch is in the RUN position.
Check that voltage is available from the controller CM-C8 pin C1p08. See the service tool mechanical engine overview screen, sensor supply volts (5V) log function.
The log function should display approximately 5VDC.
Check with a multimeter for 5VDC at the throttle rotary switch terminal A (orange wire).

All preoportional conditions are met?

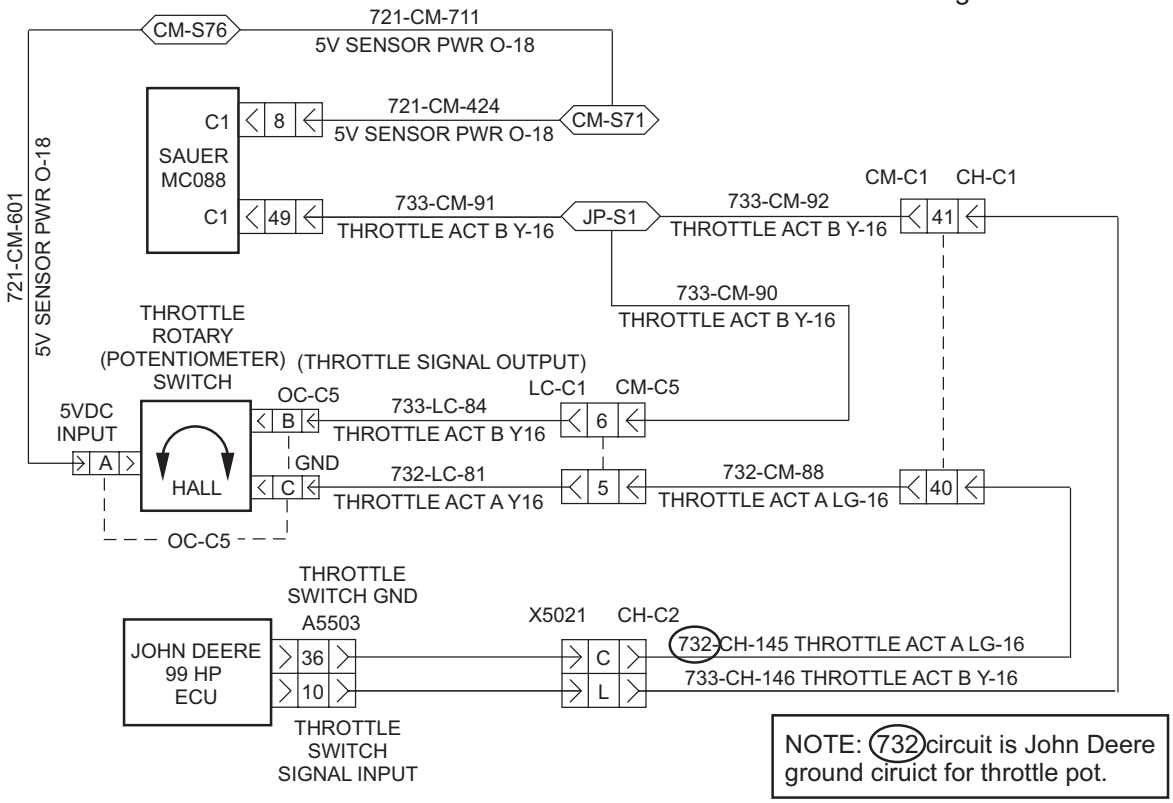
NO

Check ignition switch and circuit for proper operation. If the 5VDC is not available at the throttle rotary switch use the diagnostics steps to ***check*** the controller pin C1p08 to the switch terminal A (orange wire) circuit.

YES



Navigator Box



Pelican T4F 99hp Throttle Position Circuit

Continued

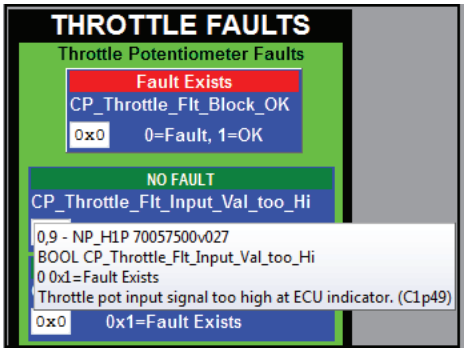
Check the service tool functions:
Component Overview > Machine Control Overview > Electronic Engine Overview, DPF Regen Overivew for throttle status, controller input and fault conditions.
The fault conditions shown on the Electronic Engine Overview log function screen will pinpoint input voltage and circuit problems. The CP_Throttle_Flt_Block_OK (Fault Exist) box will display a fault condition if the SPN 9031 fault is set.
The fault conditions shown on Electronic Engine Overview log function screen will pinpoint input voltage and circuit problems.
The input value too low and too high faults indicate that the signal circuit values are above the calibration thresholds for too long but have not reached the point of being either open circuit (low voltage) or shorted (high voltage). The open circuit and short circuit faults indicate opens, shorts, loss of power or loss of ground in the pot circuitry which will be indicated by a signal voltage value too close to either 0v or 5v.
The CP_Throttle_Flt_Input_Val_too_Hi box on the electronic engine overview screen will display a FAULT condition if the input voltage is to high and the SPN 9031 error code is set.
The CP_Throttle_Flt_Open_Circuit box on the electronic engine overview screen will display a FAULTS condition if the throttle pot input signal has an open circuit. The signal voltage is too close to either open or shorted to ground signal circuit or loss of 5v feed.
The CP_Throttle_Flt_Short_Circuit box on the electronic engine overview screen will display a FAULT condition if the throttle pot input signal is shorted high. The signal voltage is too close to 5v due to either an open ground or signal circuit is shorted to 5v or 12v.
The CP_Throttle_Flt_Val_OOR (Out Of Range) box on the electronic engine overview screen will display a FAULT condition if the throttle pot input signal is out of the normal range at the ECU indicator (C1p49).
The CP_Throttle_Flt_Input_Val_too_Low box on the electronic engine overview screen will display a FAULT condition if the input voltage is to low and the SPN 9031 error code is set.
The SPN 9031 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9031, the number of times the fault has occurred, the first time and last time the fault occurred. This information can be used to help diagnose the fault conditions.
NOTE: Place the cursor over the fault boxes and allow to hover.
Additional information about the fault will be displayed in the information box.
Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems.
In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot throttle position and circuit problems.



Throttle Faults

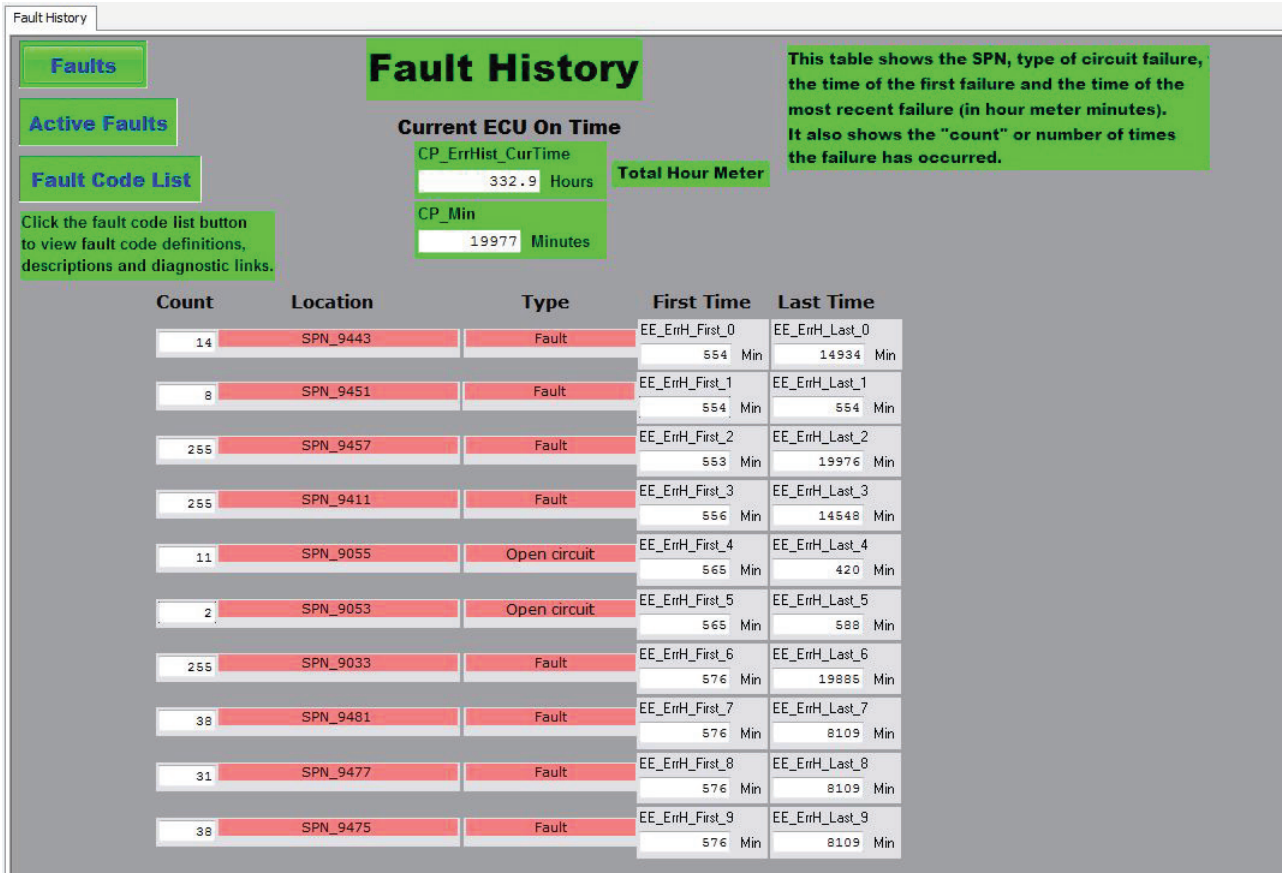


Faults Screen

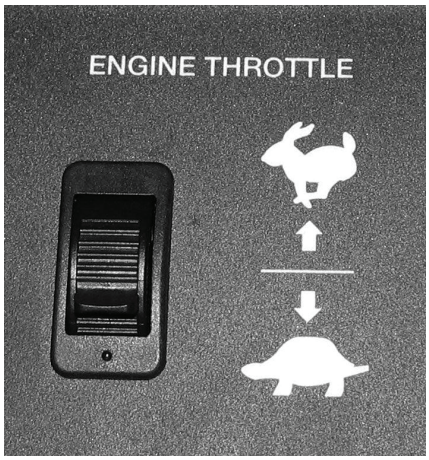


Cursor Hover

Continued



Fault History Screen

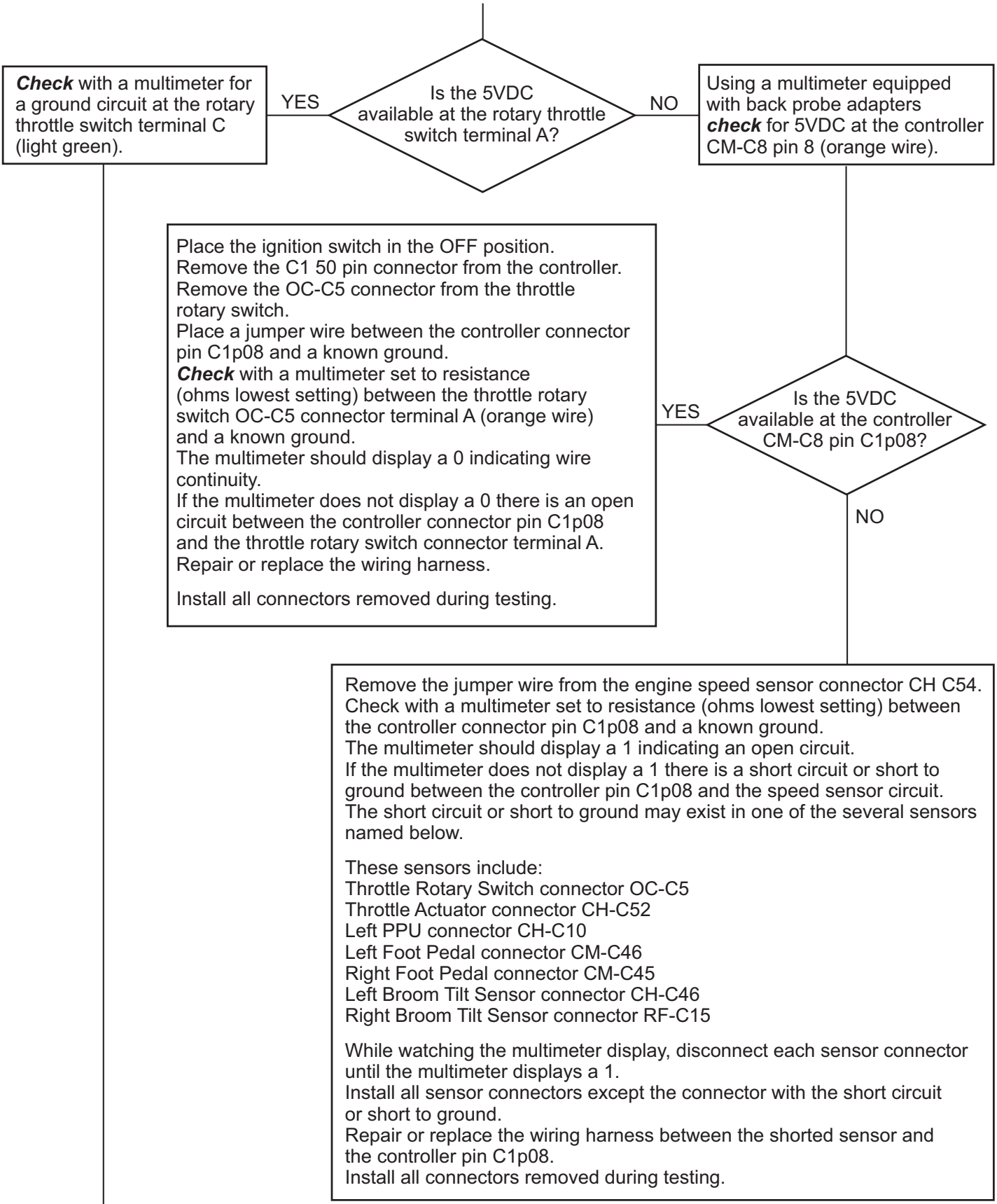


Rotary Throttle Switch

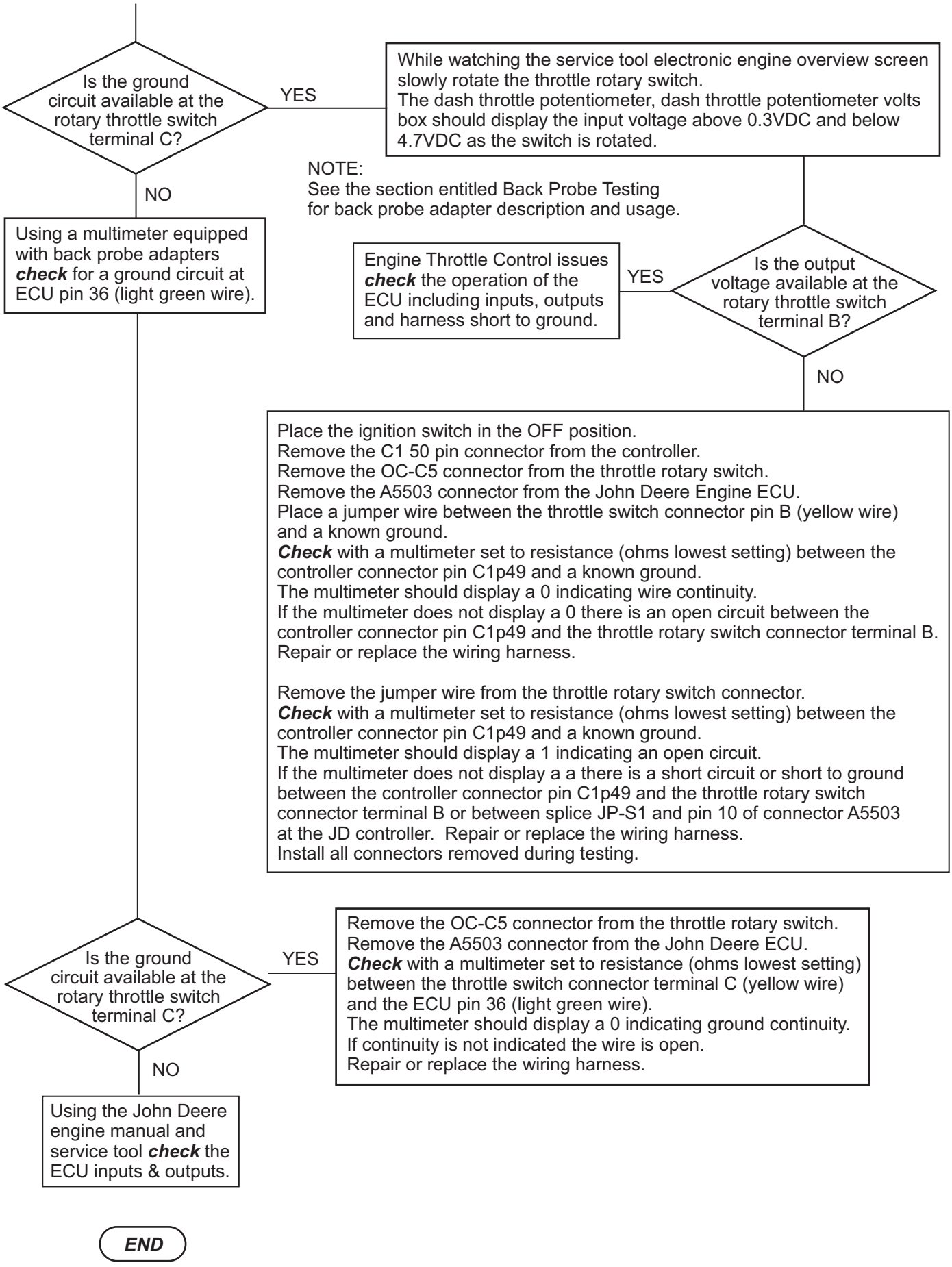
The throttle position is controlled by the John Deere 99HP T4F ECU.
The ECU responds to voltage input from the dash mounted throttle potentiometer (rotary switch).
The 5VDC for operation of the throttle potentiometer is routed from the controller CM-C8 pin 8
to the rotary throttle switch (potentiometer) terminal A.
The potentiometer is grounded at terminal C by a ground circuit routed from the John Deere 99HP ECU pin 36.
When the potentiometer is rotated a voltage signal is routed from the rotary switch terminal B to the John Deere 99HP ECU pin 10.
The input at the JD Controller connector A5503 pin 36 signals the ECU the desired throttle position.
See the John Deere engine manuals for ECU and throttle description and diagnostics.
The throttle (voltage) signal is also routed to the controller CM-C8 pin 49 and used to monitor and control sweeper operations.
This fault code sets when the voltage seen at the MC088 connector C1p49 is either too high or too low.

The rotary throttle sensor is mounted on the control panel and used by the operator to increase or decrease engine speed.
With the ignition switch in the RUN position use a multimeter to ***check*** for 5VDC at the throttle switch OC-C5 terminal A (orange wire).
The controller sensor supply voltage (5VDC) can be checked on the service tool electronic engine overview screen as C1p08 Sensor Supply Voltage.

Continued

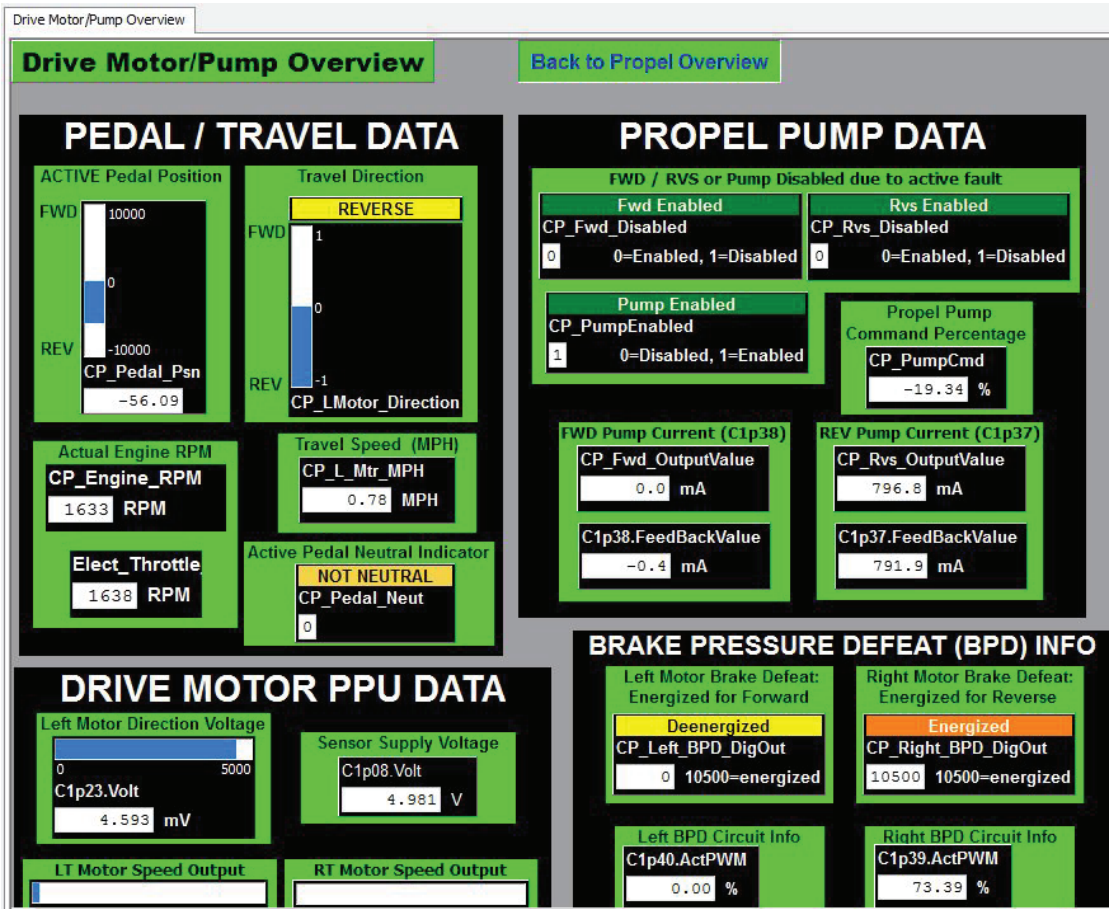

Is the 5VDC available at the rotary throttle switch terminal A?
YES
NO
Check with a multimeter for a ground circuit at the rotary throttle switch terminal C (light green).
Using a multimeter equipped with back probe adapters ***check*** for 5VDC at the controller CM-C8 pin 8 (orange wire).
Is the 5VDC available at the controller CM-C8 pin C1p08?
YES
NO
Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the OC-C5 connector from the throttle rotary switch.
Place a jumper wire between the controller connector pin C1p08 and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the throttle rotary switch OC-C5 connector terminal A (orange wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the controller connector pin C1p08 and the throttle rotary switch connector terminal A.
Repair or replace the wiring harness.
Install all connectors removed during testing.
Remove the jumper wire from the engine speed sensor connector CH C54.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller pin C1p08 and the speed sensor circuit.
The short circuit or short to ground may exist in one of the several sensors named below.
These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15
While watching the multimeter display, disconnect each sensor connector until the multimeter displays a 1.
Install all sensor connectors except the connector with the short circuit or short to ground.
Repair or replace the wiring harness between the shorted sensor and the controller pin C1p08.
Install all connectors removed during testing.

Continued


Is the ground circuit available at the rotary throttle switch terminal C?
YES
While watching the service tool electronic engine overview screen slowly rotate the throttle rotary switch.
The dash throttle potentiometer, dash throttle potentiometer volts box should display the input voltage above 0.3VDC and below 4.7VDC as the switch is rotated.
NOTE:
See the section entitled Back Probe Testing for back probe adapter description and usage.
NO
Using a multimeter equipped with back probe adapters ***check*** for a ground circuit at ECU pin 36 (light green wire).
Engine Throttle Control issues ***check*** the operation of the ECU including inputs, outputs and harness short to ground.
YES
Is the output voltage available at the rotary throttle switch terminal B?
NO
Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the OC-C5 connector from the throttle rotary switch.
Remove the A5503 connector from the John Deere Engine ECU.
Place a jumper wire between the throttle switch connector pin B (yellow wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p49 and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the controller connector pin C1p49 and the throttle rotary switch connector terminal B.
Repair or replace the wiring harness.
Remove the jumper wire from the throttle rotary switch connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p49 and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a a there is a short circuit or short to ground between the controller connector pin C1p49 and the throttle rotary switch connector terminal B or between splice JP-S1 and pin 10 of connector A5503 at the JD controller. Repair or replace the wiring harness.
Install all connectors removed during testing.
Is the ground circuit available at the rotary throttle switch terminal C?
YES
Remove the OC-C5 connector from the throttle rotary switch.
Remove the A5503 connector from the John Deere ECU.
Check with a multimeter set to resistance (ohms lowest setting) between the throttle switch connector terminal C (yellow wire) and the ECU pin 36 (light green wire).
The multimeter should display a 0 indicating ground continuity.
If continuity is not indicated the wire is open.
Repair or replace the wiring harness.
NO
Using the John Deere engine manual and service tool ***check*** the ECU inputs & outputs.
END

SPN 9033
Left PPU

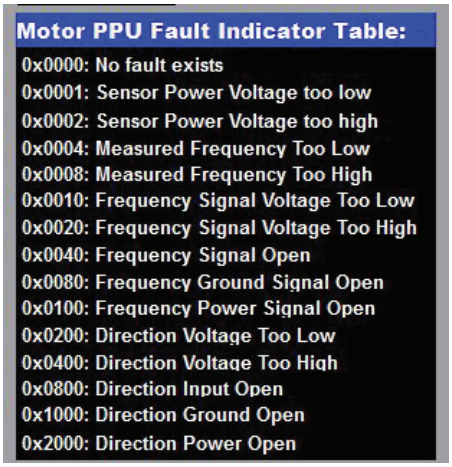
The 9033 error code indicates the controller has detected a problem with the speed portion of the left wheel pickup unit (PPU). The error code can indicate a variety of fault indications.
The service tool motor PPU fault indicator table located on the Drive Motor / Pump screen provides a list of the faults.
The table provides fault indicators for the both the speed (SPN 9033) and direction (SPN 9035) sides of the sensor. The fault indicators 0x0001 through 0x0100 apply to the speed side of the sensor.
The fault indicators 0x0200 through 0x2000 apply to the directions side of the sensor.
See the flowchart entitled SPN 9035 left PPU direction for a description and diagnostics.
When the error code is set use the service tool screen to view the fault indicators and causes.
The fault indicators can be use to ***check*** the circuit and repair circuit malfunctions.
NOTE: The service tool does not include a fault code for the right PPU sensor.
The service tool does include a ***check*** point so that the right PPU sensor speed output, frequency and output volts can be checked for problems.
Any active problems with the right PPU can prevent an EDC calibration.



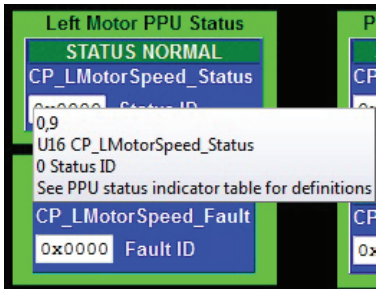
DRIVE MOTOR / PUMP SCREEN

Continued

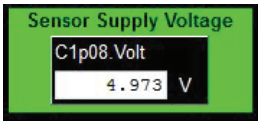
Use the service tool Drive Motor / Pump Overview screen to ***check*** the operation of the left PPU.
The screen allows the operator to ***check*** left motor direction voltage, sensor supply voltage, left motor speed output, left motor PPU Hz, PPU output volts and drive motor faults.



Fault Indicator Table



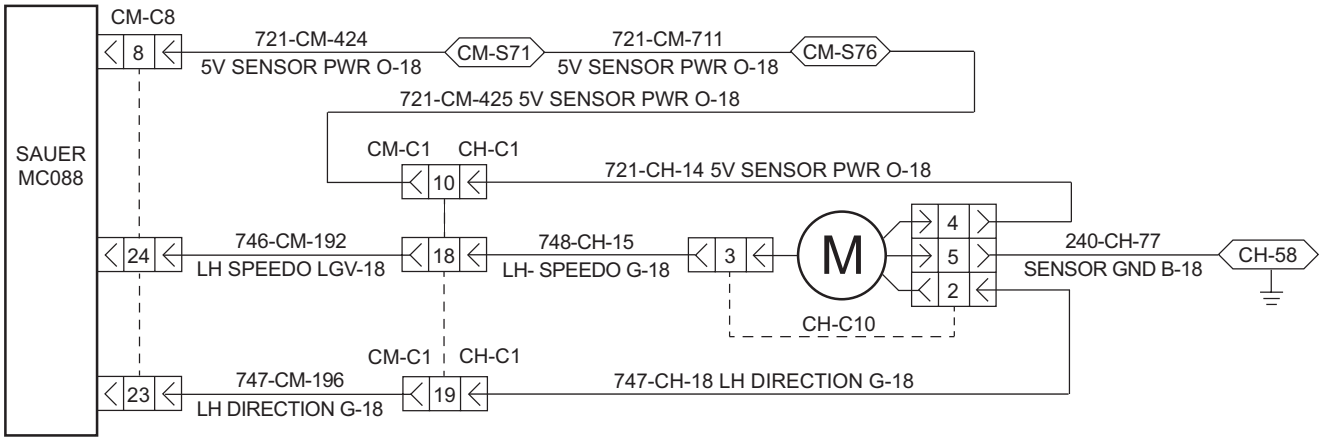
Hover PPU Fault Status



Sensor Supply Volts



Faults Screen



Left PPU Circuit

Continued

START

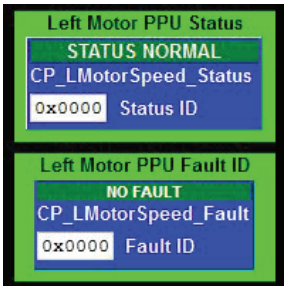
Check that ignition switch is in the RUN position.
Check that 5VDC is available from the controller CM-C8 pin 8.
Use the service tool drive motor/pump screen to ***check*** that approximately 5VDC is available from the controller pin C1p08.
The sensor supply volts box should display approximately 5VDC.

All preoperational conditions are met?

NO

Place the ignition switch in the RUN (IGN) position.
Check the ignition switch for input and output voltage, short circuits and open circuits.
If voltage is not available at controller pin C1p08
check the controller inputs and operation.

YES



Left Motor
PPU Status / Fault ID

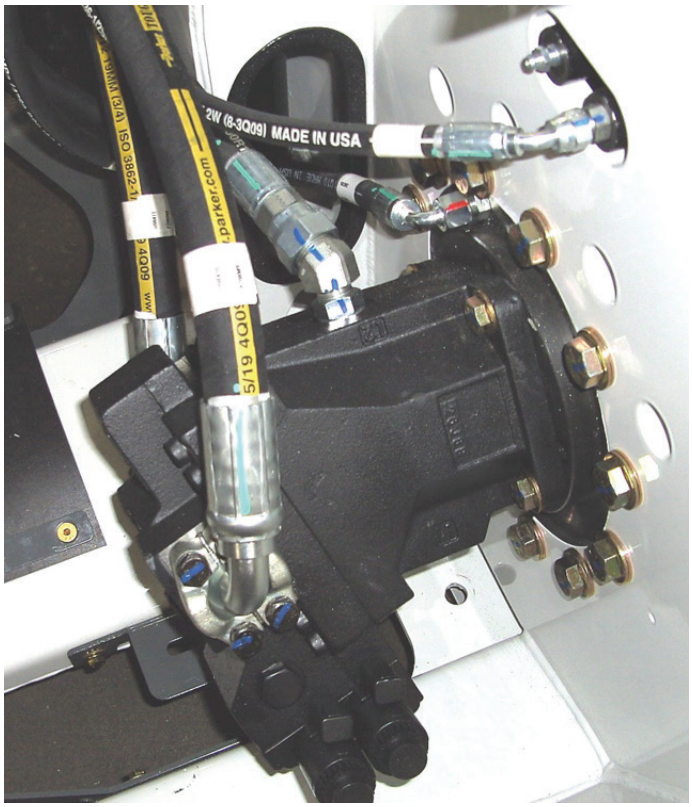
Use the service tool drive motor / pump screen to ***check*** for faults.
The left motor PPU status box and left motor PPU fault ID box will display a fault condition and the status or fault ID.
The SPN 9033 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9033, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions.
NOTE: Place the cursor over the fault boxes and allow to hover.
Additional information about the fault will be displayed in an information box.
This error code applies to the wheel speed side of the PPU.
The left PPU sends a signal to the controller CM-C8 pin 24 indicating wheel speed.
Controller pin 23 indicates direction of wheel rotation.

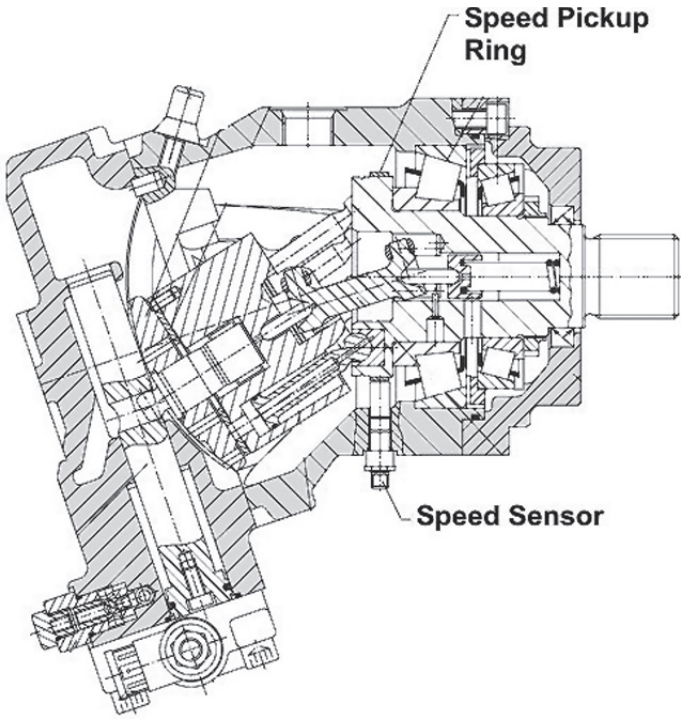
The left wheel pulse pickup unit (PPU) monitors the left wheel rotation speed and direction of rotation. A magnetic speed pickup ring is pressed onto the left drive motor shaft. The speed sensor is mounted in the drive motor housing. The sensor outputs a digital pulse signal in response to the rotation of the ring. The output changes high to low state as the north and south poles of the speed ring pass by the face of the sensor. The rotation of the speed pickup ring and output signals allow controller to determine wheel speed and direction of rotation. A four pin connector supplies 5VDC to the sensor and outputs speed and direction of rotation to the controller.

The 5VDC is routed to the PPU connector pin 4 from the controller CM-C8 pin 8.
The PPU connector is grounded at pin 5. When the drive wheel is in motion the PPU in conjunction with the speed pick-up ring outputs a speed signal to the controller CM-C8 pin 24 and a direction of rotation signal to controller CM-C8 pin 23. The input speed and direction of rotation signals are evaluated by the controller and used for sweeper operation.
NOTE: If the machine is not moving the direction indicator may display the last direction of travel.

Continued

Check that all connectors are fully mated, terminals and pins are installed with no bent pins or broken wires.
Check the EDC connector at the foot pedal is secure and not broken.
Check the CM-C8 connector at the controller pin 8 (orange wire) is secure and not bent or broken.





Typical Wheel Position & Speed Sensor

The PPU sends wheel speed and direction usning the following formula:
Tire Rolling Radius = 19.7 inches
Gear Box Ratio = 25:1
Magnetic Ring = 71 pulses/revolution
Tire Revolutions = Tire Revolutions/Mile = 63360/ (2*?*(19.7) = 512.1 Rev/Mile
Pulses/Mile = 512.14*25*71 = 576157 Pulses/mile

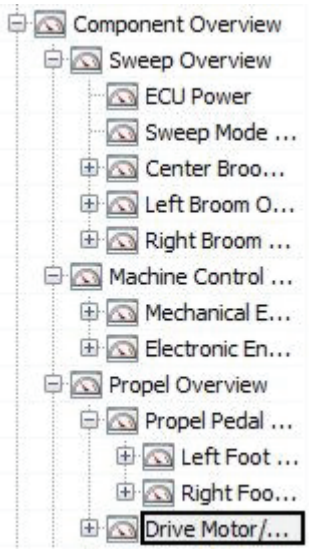
Loose or broken connection or wire?

YES

Repair or replace loose or broken terminal, wire or pin.

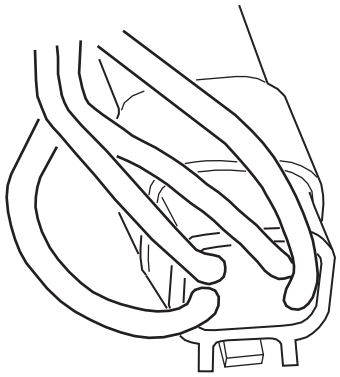
NO

Remove the CH-C10 connector from the left PPU.
Check with a multimeter set for resistance (ohms lowest setting) between the PPU connector pin 5 (black wire)and a known ground.
The multimeter should display a 0 indicating ground continuity.



Navigator Box

Continued



Repair, replace or tighten ground connection.

NO

Ground circuit available at the PPU pin 5?

YES

Check with a multimeter set for 10VDC for approximately 5VDC at the PPU connector pin 4 (orange wire).

NO

The 5VDC available at the PPU connector pin 4?

YES

Place the ignition switch in the ON position.
Check with a multimeter for voltage at the connector pin 4.
The multimeter should display near 5v.
Use the service tool drive pump/motor screen to ***check*** the sensor supply voltage output at the controller pin C1p08.
If the service tool indicates close to 5v but the multimeter displays 0 there is an open circuit between the controller pin C1p08 and the PPU connector pin 4.
If the service tool indicates near 0v and the multimeter displays near 0 volts there is a short to ground between the controller pin C1p08 and the PPU connector pin 4.

Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the CH-C10 connector from the a left PPU.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller pin C1p08 and the speed sensor circuit.
The short circuit or short to ground may exist in any of the sensor power circuits connected to the controller pin C1p08.

These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15

While watching the multimeter display, disconnect each sensor connector until the multimeter displays a 1.
Install all sensor connectors except the connector with the short circuit or short to ground.
Repair or replace the wiring harness between the shorted sensor and the controller pin C1p08.
Install all connectors removed during testing.

Continued

SPN 9033 TEST

Using the service tool Drive Motor/Pump Overview screen
check for PPUcircuit sensor wire for short to ground.
Disconnect the sensor at connector CH-C10 pin 3.
Place the ignition switch in the ON position.
Check the service tool screen Drive Motor PPU DATA Left Motor PPU VoltsOutput C1p24.Volt parameter.
The service tool parameter should display 2.4volts (+/- 0.01 volts).

Does the service tool PPUDATA parameter display 2.4volts?

NO

If the PPU sensor does not display voltage at the input (pin 3 to controller pin C1p24) circuit is shorted to ground.
If the PPU sensor displays more that 2.4v the input (pin 3 to controller pin C1p24) is shorted to power.
NOTE: The service tool will never display more than 5v.
If the circuit is shorted to power the left motor PPU volts output will still display a maximum of 5v.

YES

The PPU sensor input (pin 3) circuit to the controller pin C1p24 is notshorted to ground.
Using the service tool Drive Motor / Pump Overview screen
check the PPU sensor wire for an open circuit.
Place a jumper wire between the PPU sensor output harness wire and a known good ground.
The service tool screen Drive Motor PPU DATA Left Motor PPU Volts C1p24. Volt should display 0 volts.

Does the service tool PPUDATA parameter display 0volts volts?

NO

The PPU sensor input (pin 3) circuit is open.
Repair or replace the wiring harness.

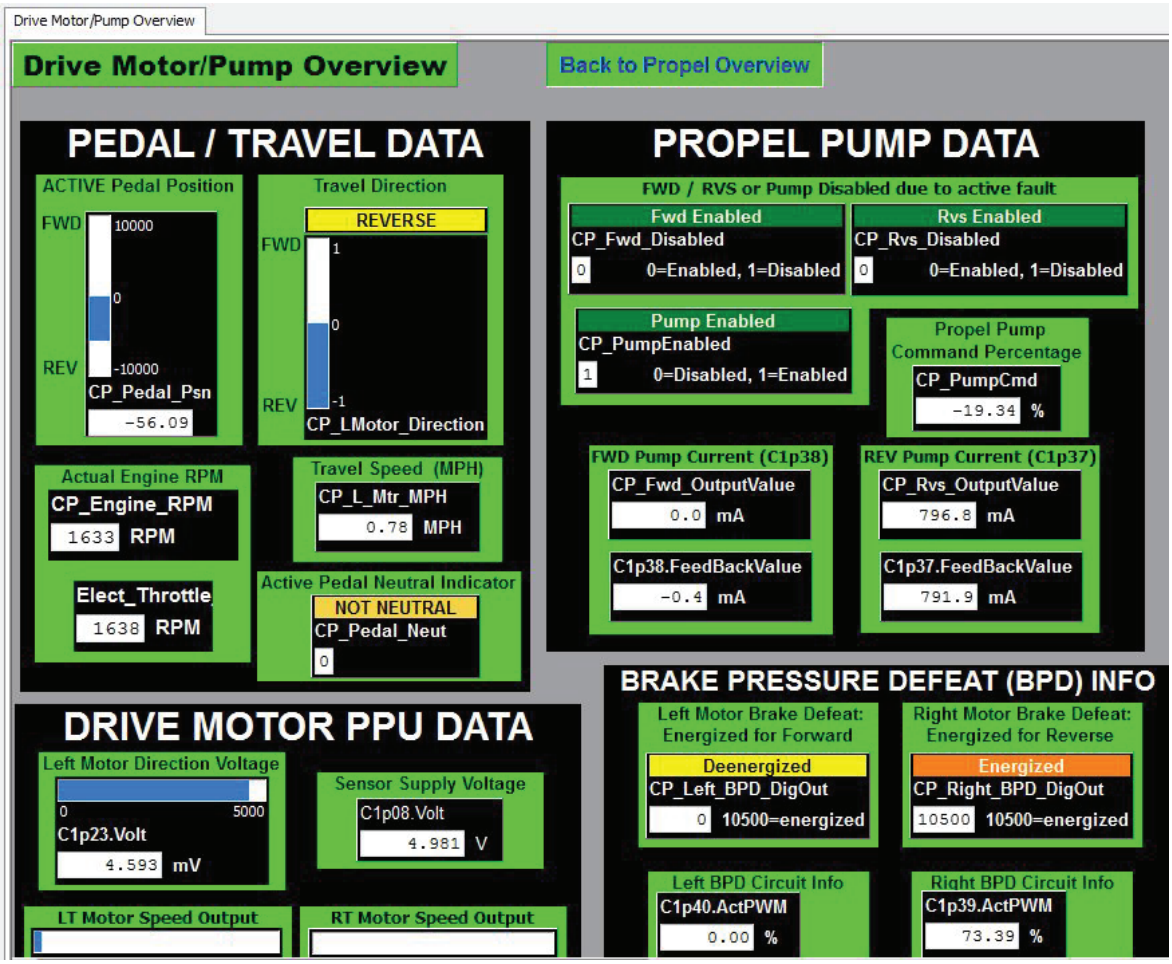
YES

The PPU sensor circuit does not have an open circuit.
The PPU input and controller are operational.
Check the PPU sensor for metal contamination on the sensor tip.
Check the drive motor tone wheel for damage.
Replace the PPU.

END

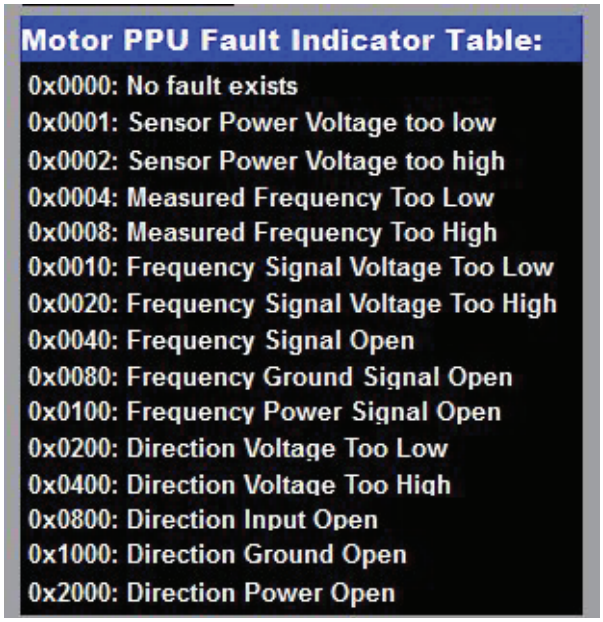
SPN 9035
Left PPU
Direction

The 9035 error code indicates the controller has detected a problem with the direction portion of the left wheel pickup unit (PPU).
The error code can indicate a variety of fault indications.
The service tool motor PPU fault indicator table located on the Drive Motor / Pump screen provides a list of the faults.
The table provides fault indicators for the both the speed (SPN 9033) and direction (SPN 9035) sides of the sensor.
The fault indicators 0x0001 through 0x0100 apply to the speed side of the sensor.
The fault indicators 0x0200 through 0x2000 apply to the directions side of the sensor.
See the flowchart entitled SPN 9035 left PPU for a description and diagnostics.
When the error code is set use the service tool screen to view the fault indicators & causes.
The fault indicators can be used to check the circuit and repair circuit malfunctions.
NOTE: The service tool does not include a fault code for the right PPU sensor.
The service tool does include a check points so that the right PPU sensor speed output, frequency and output volts can be checked for problems.
Any active problems with the right PPU can prevent an EDC calibration.



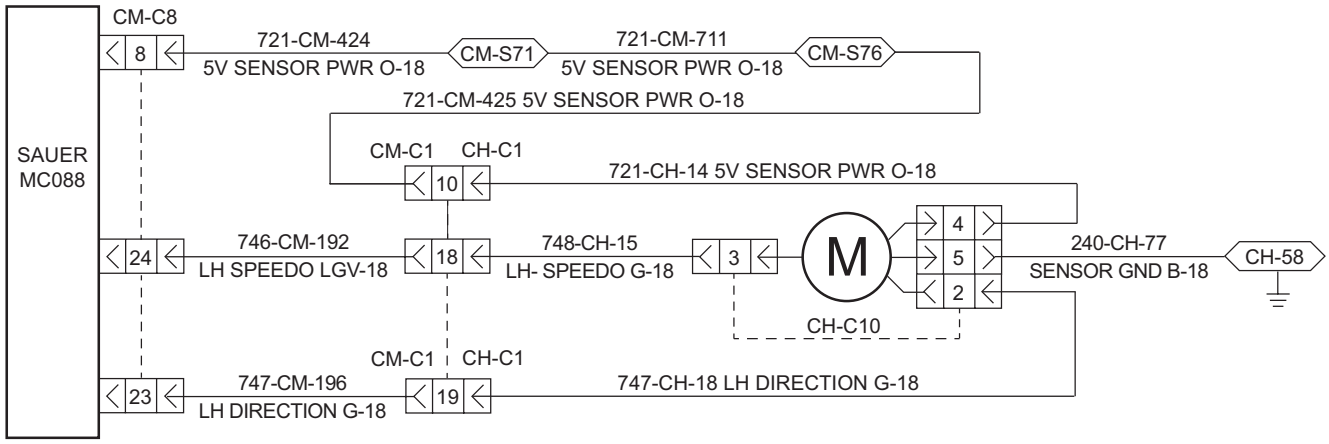
Drive Motor / Pump Overview Screen

Continued



Fault Indicator Table

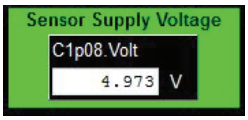
Use the service tool Drive Motor/Pump Overview screen to ***check*** the operation of the left PPU. The screen allows the operator to ***check*** left motor direction voltage, sensor supply voltage, left motor speed output, left motor PPU Hz, PPU output volts and drive motor faults.



Left PPU Circuit

Continued

START



Sensor Supply Volts

Check that ignition switch is in the RUN position.
Check that 5VDC is available from the controller CM-C8 pin 8, 5V Sensor PWR circuit, at PPU connector pin 4 (orange wire).
Use the service tool drive motor/pump screen to ***check*** that approximately 5VDC is available from the controller pin C1p08.
The sensor supply volts box should display approximately 5VDC.



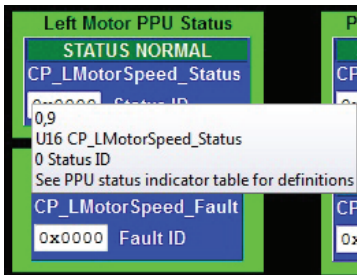
Faults Screen

All preoperational conditions are met?

NO

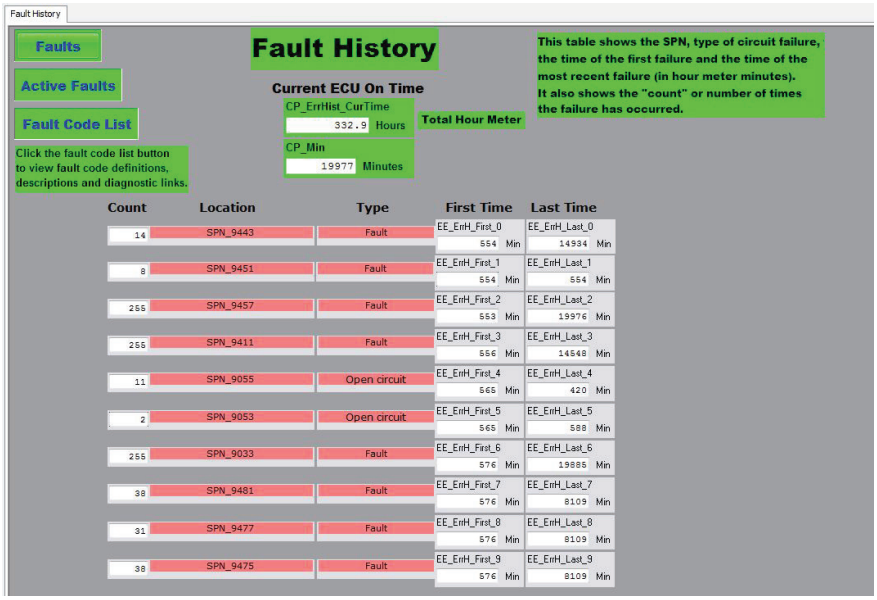
Place the ignition switch in the RUN (IGN) position.
Check the ignition switch for input & output voltage, short circuits & open circuits. If voltage is not available at controller pin C1p08 ***check*** the controller inputs & operation.

YES



Hover PPU Fault Status

Use the service tool drive motor/pump screen to ***check*** for faults.
The left motor PPU status box and left motor PPU fault ID box will display a fault condition and the status or fault ID.
The SPN 9035 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9035, the number of times the fault has occurred, the first time and last time the fault occurred.
This information can be used to help diagnose the fault conditions.
NOTE: Place the cursor over the fault boxes and allow to hover.
Additional information about the fault will be displayed in an information box.
Check the active faults list for current faults in the sweeper controller system.
The left PPU sends a signal to the controller CM-C8 pin 24 indicating wheel speed and controller pin 23 indicating wheel direction of rotation.
This error code applies to the wheel direction side of the PPU.

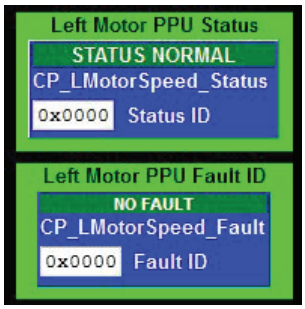


Fault History Screen

Continued

The left wheel pulse pickup unit (PPU) monitors the left wheel rotation speed and direction of rotation.
A magnetic speed pickup ring is pressed onto the left drive motor shaft.
The speed sensor is mounted in the drive motor housing.
The sensor outputs a digital pulse signal in response to the rotation of the ring.
The output changes high to low state as the north and south poles of the speed ring pass by the face of the sensor.
The rotation of the speed pickup ring and output signals allow the controller to determine wheel speed and direction of rotation.

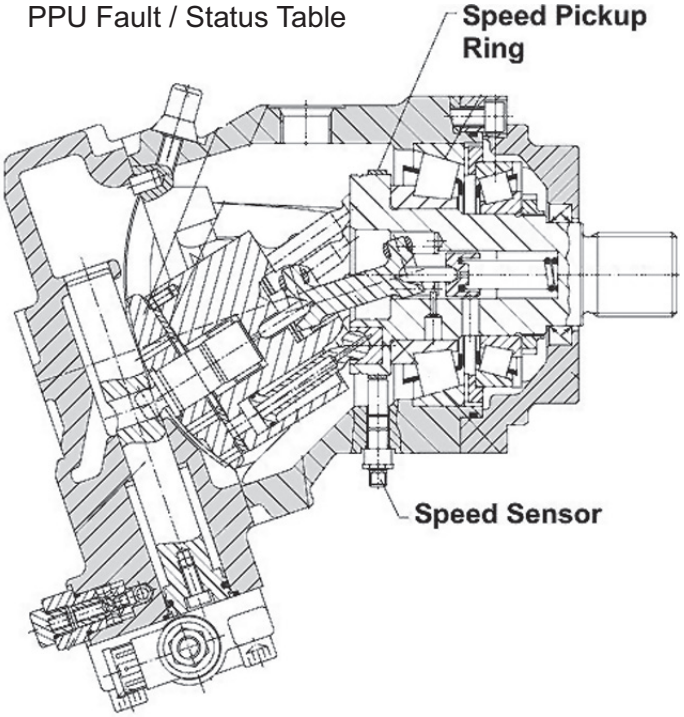
A four pin connector supplies 5VDC to the sensor and outputs speed and direction of rotation to the controller.
The 5VDC is routed to the PPU connector pin 4 from the controller CM-C8 pin 8.
The PPU connector is grounded at pin 5. When the drive wheel is in motion the PPU in conjunction with the speed pick-up ring outputs a speed signal to the controller CM-C8 pin 24 and a direction of rotation signal to controller CM-C8 pin 23.
The input speed and direction of rotation signals are evaluated by the controller and used for sweeper operation.



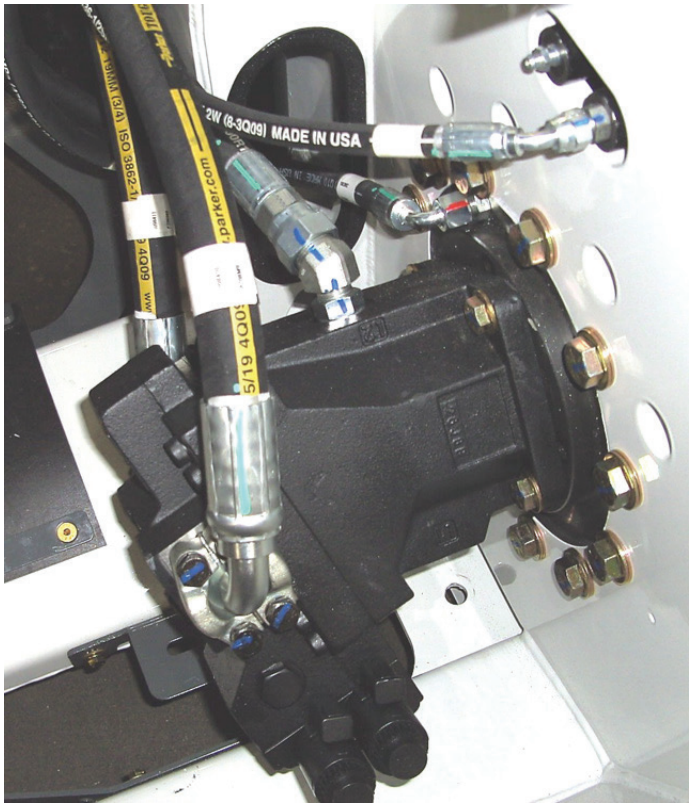
PPU Fault / Status Table

Check the service tool functions:
Component Overview > Drive Motor Overview for motor direction, motor faults, left motor status and motor direction.

Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems.
In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot left PPU direction and circuit problems.



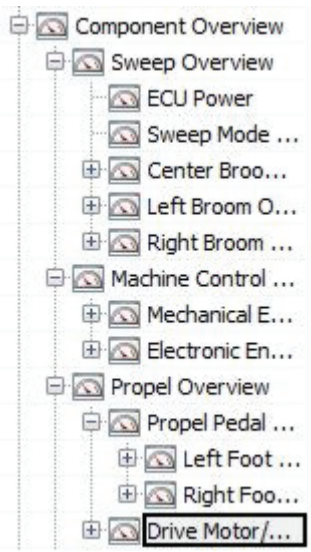
Typical Wheel Position & Speed Sensor



The PPU sends wheel speed and direction usning the following formula:

Tire Rolling Radius = 19.7 inches
Gear Box Ratio = 25:1
Magnetic Ring = 71 pulses/revolution
Tire Revolutions = Tire Revolutions/Mile = 63360/ (2*?*(19.7) = 512.1 Rev/Mile
Pulses/Mile = 512.14*25*71 = 576157 Pulses/mile

Continued



Navigator Box

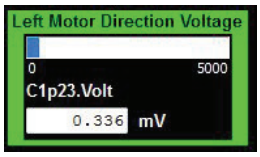
Check that all connectors are fully mated, terminals and pins are installed with no bent pins or broken wires.
Check the EDC connector at the foot pedal is secure and not broken.
Check the CM-C8 connector at the controller pin 8 (orange wire) is secure and not bent or broken.

Loose or broken connection or wire?

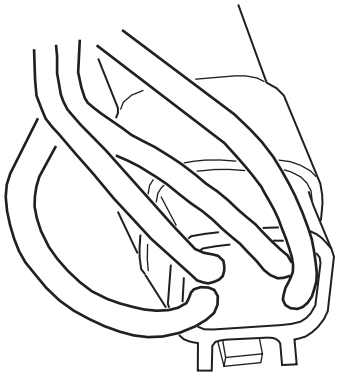
YES → Repair or replace loose or broken terminal, wire or pin

NO

Remove the CH-C10 connector from the left PPU.
Check with a multimeter set for resistance (ohms lowest setting) between the PPU connector pin 5 (black wire) and a known ground. The multimeter should display a 0 indicating ground continuity.



Left Motor Direction Voltage

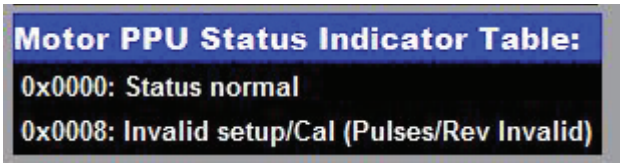


Ground circuit available at the PPU pin 5?

NO → Repair, replace or tighten ground connection.

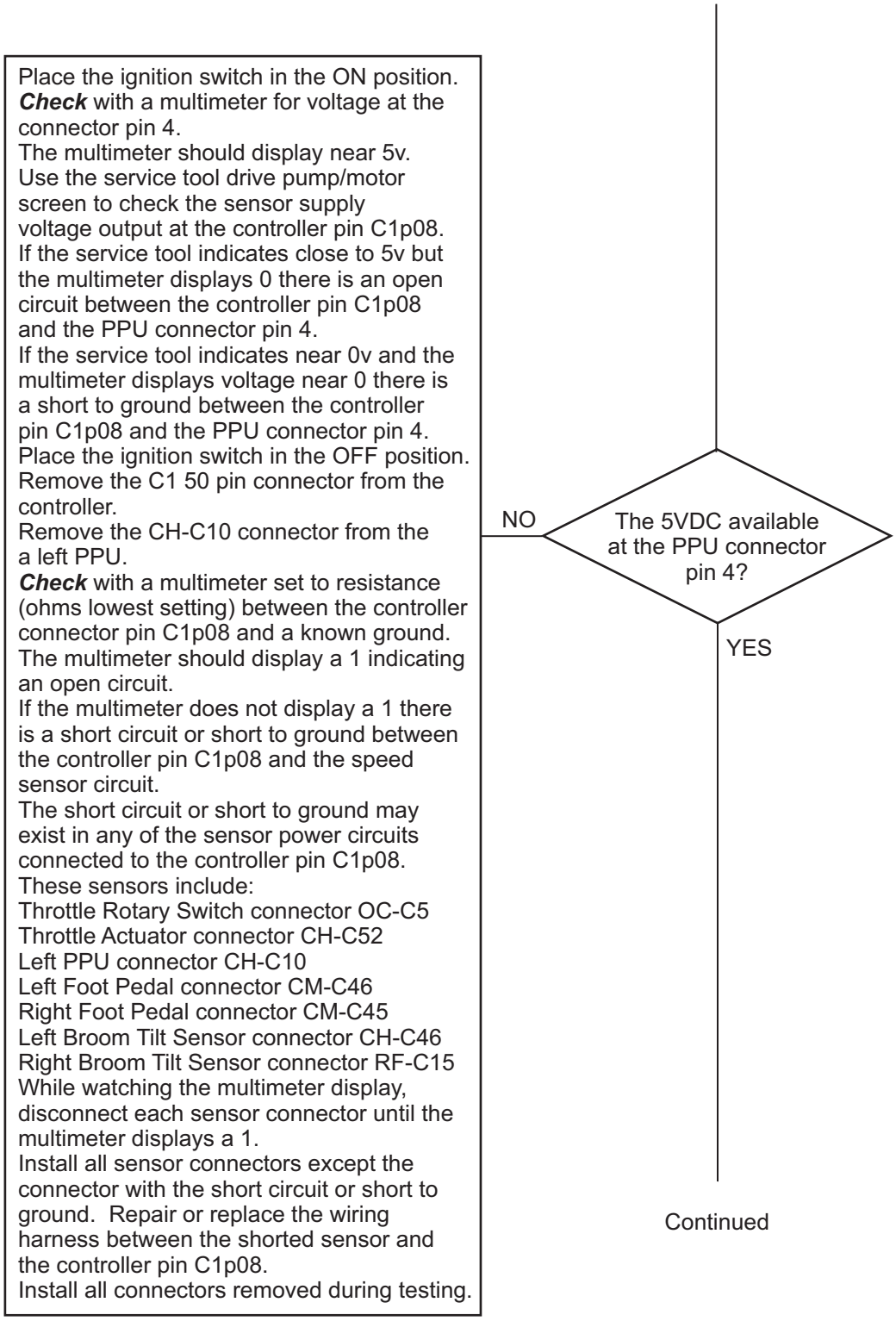
YES

Use a multimeter set for 10 VDC to ***check*** for approximately 5 VDC at the PPU connector pin 4 (orange wire).



Motor PPU Status Indicator Table

Continued


Place the ignition switch in the ON position.
Check with a multimeter for voltage at the connector pin 4.
The multimeter should display near 5v.
Use the service tool drive pump/motor screen to check the sensor supply voltage output at the controller pin C1p08.
If the service tool indicates close to 5v but the multimeter displays 0 there is an open circuit between the controller pin C1p08 and the PPU connector pin 4.
If the service tool indicates near 0v and the multimeter displays voltage near 0 there is a short to ground between the controller pin C1p08 and the PPU connector pin 4.
Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the CH-C10 connector from the a left PPU.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller pin C1p08 and the speed sensor circuit.
The short circuit or short to ground may exist in any of the sensor power circuits connected to the controller pin C1p08.
These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15
While watching the multimeter display, disconnect each sensor connector until the multimeter displays a 1.
Install all sensor connectors except the connector with the short circuit or short to ground. Repair or replace the wiring harness between the shorted sensor and the controller pin C1p08.
Install all connectors removed during testing.
NO
The 5VDC available at the PPU connector pin 4?
YES
Continued

SPN 9035 TEST

Using the service tool Drive Motor/Pump Overview screen
check for PPUcircuit direction input wire for short to ground.
Disconnect the sensor at connector CH-C10 pin 2.
Place the ignition switch in the ON position.
Check the service tool screen Drive Motor PPU DATA
Left Motor Direction Voltage C1p23.Volt parameter.
The service tool parameter should display 2.4volts (+/- 0.1 volts).

Does the service tool PUDATA parameter display 2.4volts?

NO

If the PPU sensor does not display voltage at the input (pin 2 to controller pin C1p23) circuit is shorted to ground.
If the PPU sensor displays more that 2.4v the input (pin 2 to controller pin C1p23) is shorted to power.
NOTE: The service tool will never display more than 5v.
If the circuit is shorted to power the left motor PPU volts output will still display a maximum of 5v.

YES

The PPU sensor input (pin 2) circuit to the controller pin C1p23 is not shorted to ground.
Using the service tool Drive Motor/Pump Overview screen ***check*** the PPU direction input wire for an open circuit.
Place a jumper wire between the PPU output harness wire (pin 2) and aknown good ground.
The service tool screen Drive Motor PPU DATA Left Motor Direction Voltage C1p23.Volt should display 0 volts.

Does the service tool PPUDATA parameter display 0 volts?

NO

The PPU sensor input (pin 2) circuit is open.
Repair or replace the wiring harness.

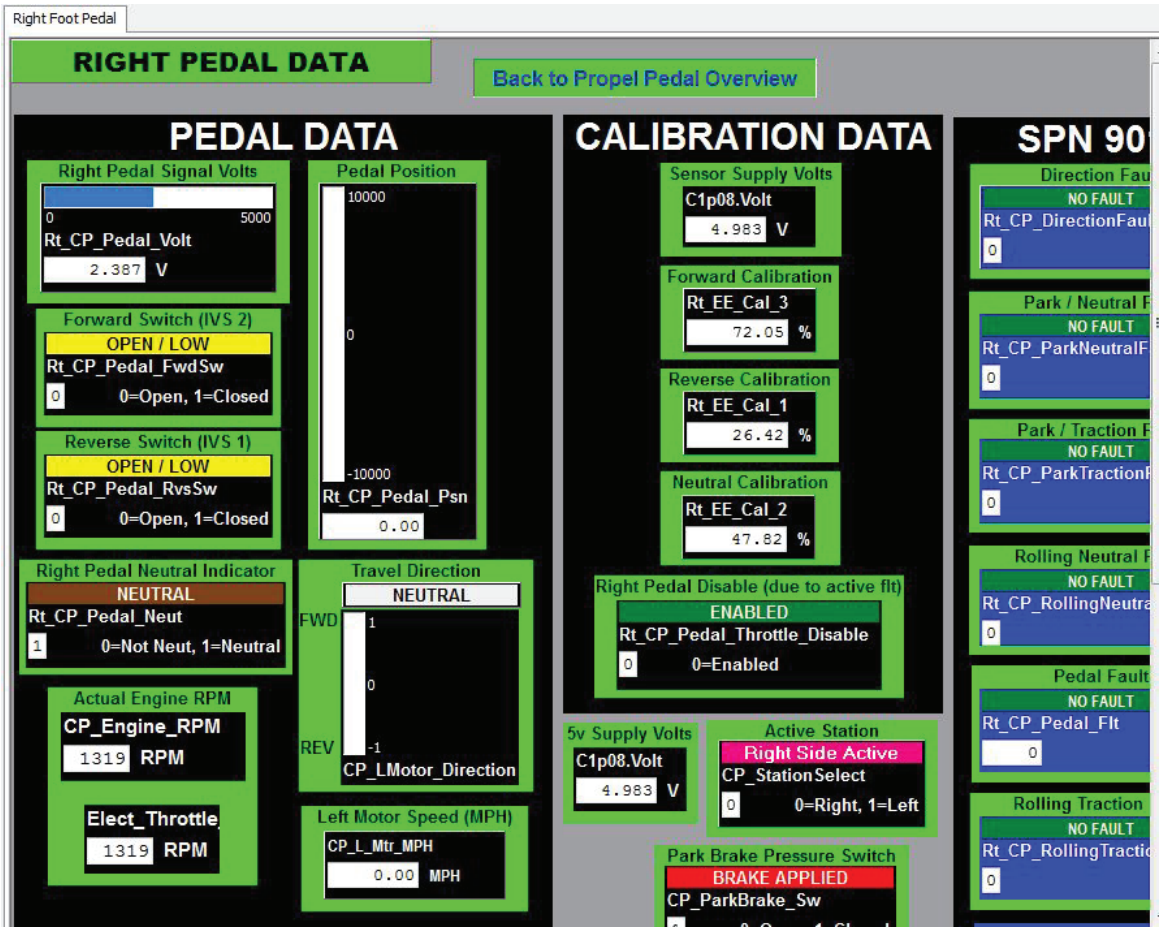
YES

The PPU direction circuit does not have an open circuit.
The PPU input and controller are operation.
Check the PPU sensor for metal contamination on the sensor tip.
Check the drive motor tone wheel for damage.
Replace the PPU.

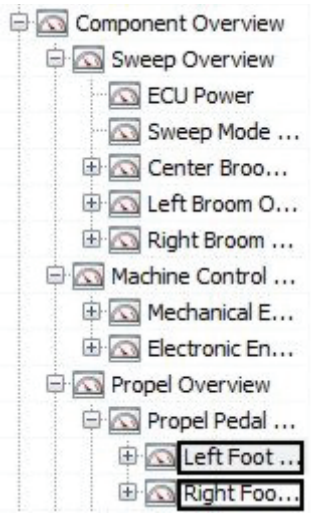
END

SPN 9043
Park Brake Status

The 9043 error code indicates a park brake status fault has been generated.
The fault can be generated for one of three conditions.
The park brake switch is closed but the left drive motor indicates greater that 5 MPH speed.
The park brake is not set (switch open) when an attempt is made to start the engine.
The park brake status fault can also be set (switch open) when the station select switch indicates a station change (left side or right side) has been attempted.

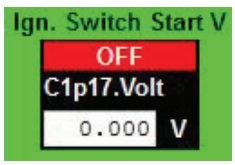


Right Foot Pedal Overview

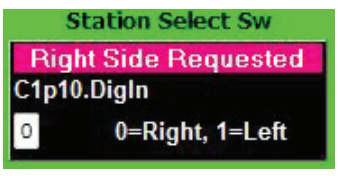


Navigator Box

The park brake status parameters can be viewed on either the left foot pedal overview screen or the right foot pedal overview screen.
The left pedal overview is shown in the illustration.
The service tool Propel Pedal Overview / Left Foot Pedal Overview or Right Foot Pedal Overview screen can be used to ***check*** the park brake brake pressure switch which will indicate park brake status.
The park brake select fault and park brake start fault will also be shown on the service tool screen.

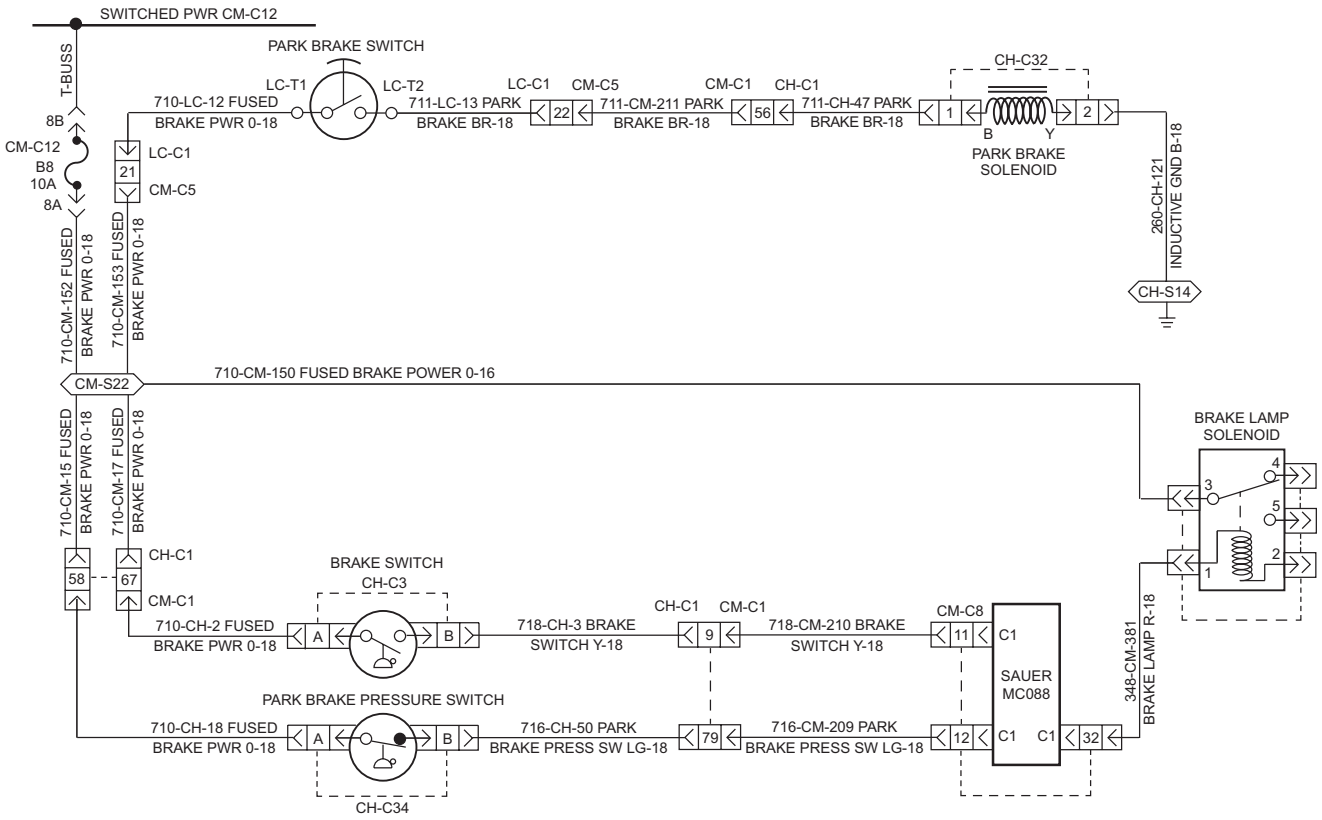


Ignition Switch Voltage

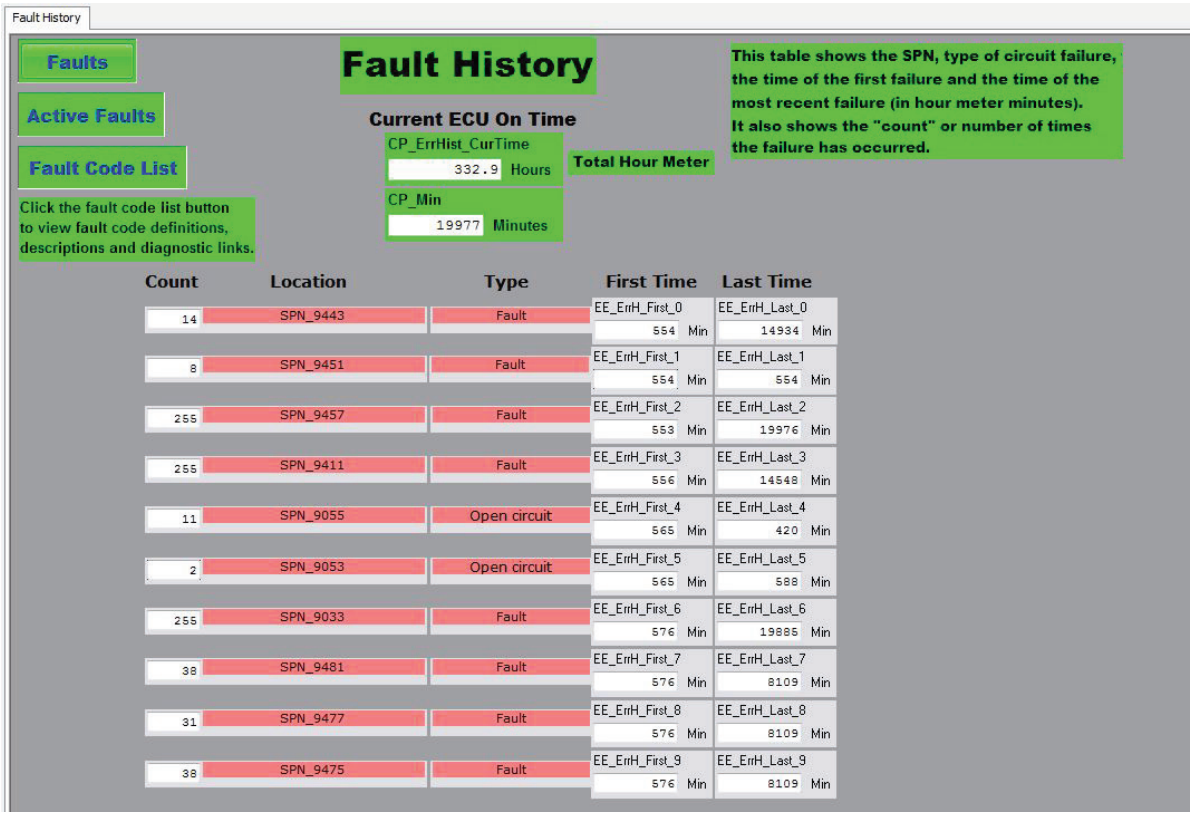


Station Select Switch

Continued

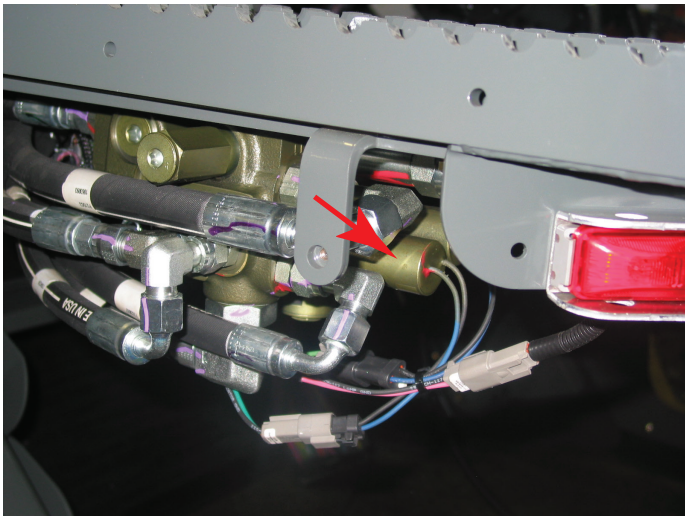


9043 Park Brake Circuit

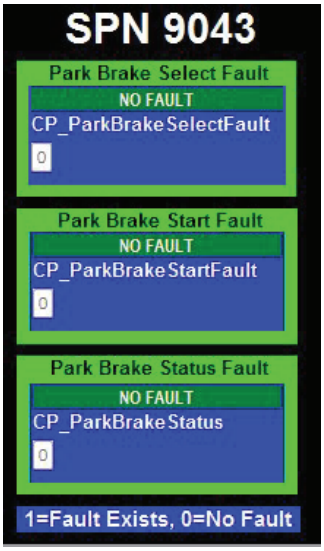


Fault History Screen

Continued



Park Brake Pressure Switch



9043 Fault Indicators

START

Chock (block) the sweeper drive wheels.
Check that the park brake switch is in the OFF (down) position.
Check that operator's foot is not resting on propel pedal.

All preoperational conditions are met?

NO — Correct conditions and continue with diagnostics

YES



Fault Screen

Use the service tool left foot pedal overview or right foot pedal overview screen to ***check*** for faults. The park brake status fault box will display a fault condition. The SPN 9043 fault condition can be verified using the service tool fault history screen.
The fault history screen will display SPN 9043, the number of times the fault has occurred, the first time and last time time the fault occurred.
This information can be used to help diagnose the fault conditions.
NOTE: Place the cursor over the park brake status fault box and allow to hover. Additional information about the fault will be displayed in an information box.

Continued

The parking brakes are spring applied and hydraulic pressure released.
When the parking brake solenoid is deenergized hydraulic pressure is relieved from the park brake pistons back to the tank and the springs apply the parking brake.
When the park brake is pressed (down) the park brake solenoid is energized (park brake off), hydraulic fluid is then routed to the park brake pistons and hydraulic pressure overcomes spring pressure and the park brake is released. The park brake pressure switch is a normally closed switch (no hydraulic pressure applied).
It is closed (voltage high) when the parking brake is applied.
When the switch is closed it routes battery voltage from the Fused Brake Power circuit (circuit 710) to the ECU at C1p12 (CM-C8 pin 12).
When fluid pressure is routed to the park brake release pistons the pressure switch opens and the circuit voltage at C1p12 drops to 0 volts.

The park brake will also set when the hydraulic pressure falls below 40 PSI allowing the internal spring to apply the brake.
When the hydraulic pressure falls below 40 PSI the 40 PSI switch closes and Illuminates the park brake indicator lamp.
The park brake releases when the park brake switch is placed in the OFF (down) position.
The park brake solenoid is activated and hydraulic oil flows to the park brake pistons overriding the internal springs that hold the brake in the applied position. When hydraulic oil is above 40 PSI the park brakes pistons releases the spring pressure on the park brake.
Hydraulic pressure above 40 PSI opens the 40 PSI switch and turn off the park brake indicator lamp.

Check the service tool functions:
Component Overview > Propel Overview > Propel Pedal Overview > Left Foot or Right Foot Overview for park brake switch position and operator station selection.
Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems.
The park brake pressure switch is visible with the service tool.
The manual park brake switch (LC-T1 & T2) are not visible by the service tool.

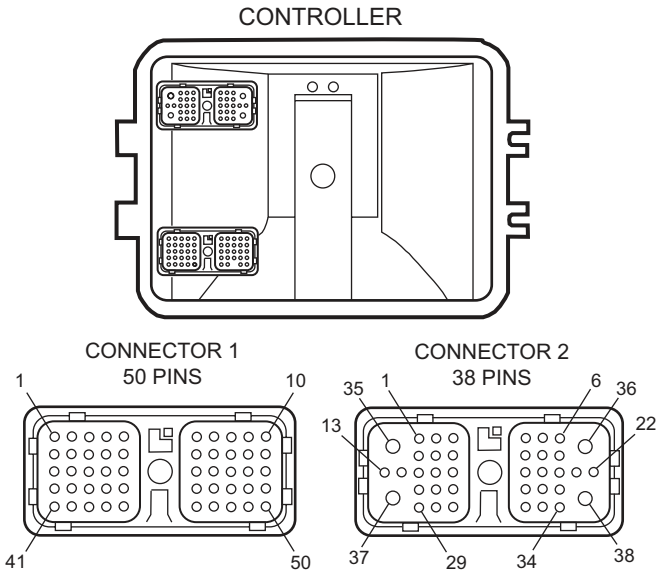
NOTE: The 9043 park brake status ***error code*** is an information code advising the operator that sweeper operation is being attempted with the parking brake set (applied).

The ***error code*** can be caused by pushing the foot pedal with the park brake applied.
The operator needs to push the park brake switch down to the released position before attempting to drive the sweeper.
The ***error code*** can also be caused by the operator resting a foot on the foot pedal which can apply enough pressure to activate the code.
The operator must remove feet from the foot pedal.
The ***error code*** *c*an also be caused by the operator attempting to switch operator positions with the park brake in the released position. This is the park brake select fault.
The operator must apply the park brake before attempting to switch operating position.
The ***error code*** can be caused if the park brake pressure switch is stuck in the closed position.
The ***error code*** can also be caused when the ignition switch is placed in the START position when the park brake is OFF (Released).
Use the pressure switch diagnostics steps to ***check*** switch operation.

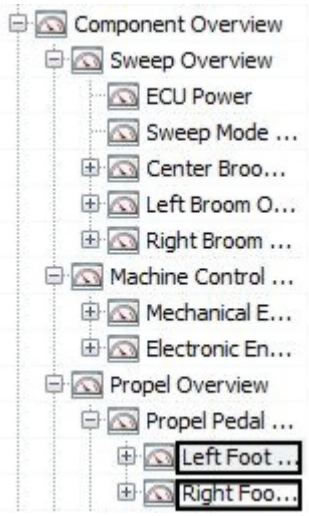
Continued

Manual Park Brake Switch

The 12VDC for operation of the park brake pressure switch is routed from the switched power circuit and fuse B8 (10A) to the pressure switch terminal A. When the park brake switch is placed in the applied position the park deenergized brake solenoid opens allowing hydraulic pressure to exit the pistons and apply the park brake and close the park brake pressure switch. When closed the 12VDC is routed through the pressure switch to the controller CM-C8 pin 12. The 12VDC at pin 12 signals the controller that the park brake is applied.
Check the service tool Log Function > Component Overview > Propel Overview > Left Foot Pedal Overview or Right Foot Pedal Overview > controller park brake pressure switch.
If the park brake pressure switch box indicates BRAKE APPLIED the park brake is operational and has notified the controller at pin 12 of the park brake application.



Controller Pin Locator



Navigator Box

Place the park brake switch in the applied position.
Lift the sweeper drive wheels and support with jack stands or other blocking.
Start the engine to power the controller.
Raise the hopper and engage the hydraulic cylinder safety braces.
Place the park brake switch in the released position.
Remove all pressure from the foot pedal.
Use a multimeter (with connector installed) to ***check*** for 12VDC at the park brake pressure switch terminals A (orange wire) and B (light green wire).
NOTE: If the Park Brake Switch position log function in the brake overview indicates a “1”, the 12VDC is available at the Park Brake Pressure Switch.

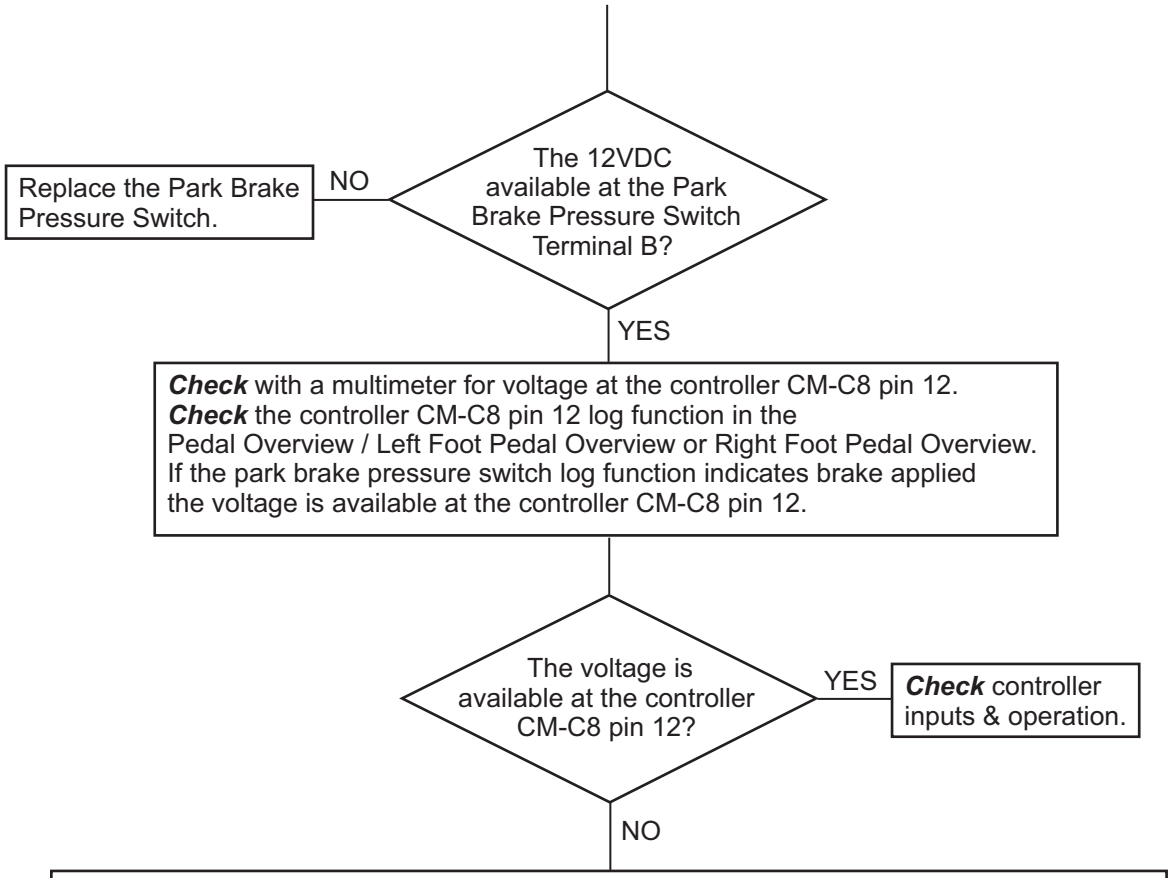
With the park brake set is 12VDC available at the Park Brake Pressure Switch Terminal A?

NO

Check fuse B8 (10A).
Check for a broken wire, open circuit or loose connections between the switch power circuit, fuse B8 and the Park Brake Pressure Switch terminal A.

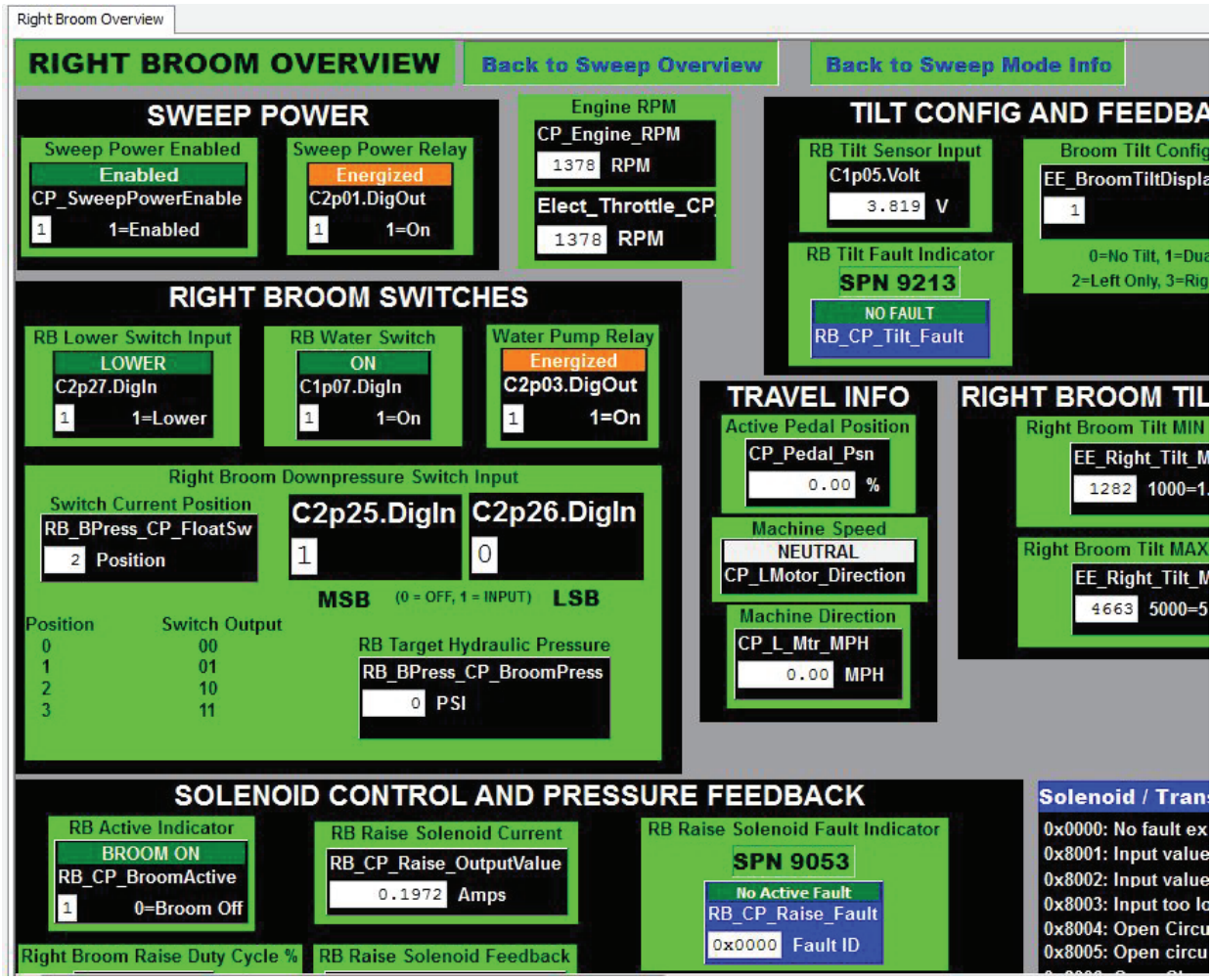
YES

Continued


The 12VDC available at the Park Brake Pressure Switch Terminal B?
NO
Replace the Park Brake Pressure Switch.
YES
Check with a multimeter for voltage at the controller CM-C8 pin 12.
Check the controller CM-C8 pin 12 log function in the Pedal Overview / Left Foot Pedal Overview or Right Foot Pedal Overview.
If the park brake pressure switch log function indicates brake applied the voltage is available at the controller CM-C8 pin 12.
The voltage is available at the controller CM-C8 pin 12?
YES
Check controller inputs & operation.
NO
Remove the controller C1 50 pin connector.
Remove the CH-C34 connector from the park brake pressure switch.
Place a jumper wire between the park brake pressure switch CH-C34 harness for terminal B and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller C1 50 pin connector
pin C1p12 (light green wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
The wire between the park brake pressure switch CH-C34 terminal B and the controller pin C1p12 is not open.
If the multimeter displays a 1 the wiring harness is open. Repair or replace as necessary.
Remove the jumper wire from the park brake pressure switch CH-C34 harness.
Check with a multimeter set to resistance (ohms lowest setting) between the controller C1 50 pin connector pin C1p12 (light green wire) and a known ground.
The multimeter should display a 1 indicating the wiring harness is not shorted to ground between the park brake pressure switch CH-C34 terminal B and the controller pin C1p12.
If the multimeter displays a 0 the wiring harness is shorted to ground.
Repair or replace the wiring harness as necessary.
END

SPN 9053
Right Broom
Raise Solenoid

The 9053 error code indicates too little current flow in the circuit due to an open circuit or too much current in the circuit due to a short to ground in the circuit.
Check the right broom raise solenoid circuit as follows.



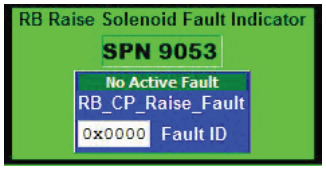
Right Broom Overview Screen

See the service tool right broom overview screen located underneath the component overview and sweep overview.

The service tool Right Broom Overview Screen can be used to ***check*** all right broom functions including right broom switches, solenoid control, pressure feedback and fault conditions.

Continued

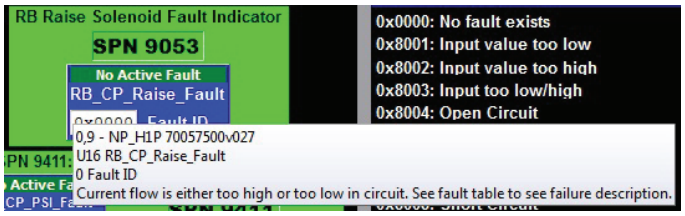
START



Raise Solenoid Fault Indicator

The right broom raise solenoid is energized when:

The mode switch is set to SWEEP.
The right broom switch is set in the DOWN position.
The power is routed to the four-position bin (BCD) switch.
The broom height switch outputs to the controller which sets the broom down pressure.
The controller activates the solenoid based on feedback from the right broom transducer.



Hover SPN 9053 Fault



Faults Screen

All preoperational conditions are met?

NO

Correct preoperational conditions and resume diagnostics.

YES

Use the service tool right broom overview screen to ***check*** the right broom raise fault indicator.
The SPN 9053 fault box will display a fault condition and the fault ID. Place the cursor over the RB raise solenoid fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the solenoid/transducer fault table for fault codes and values.
The SPN 9053 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

Solenoid / Transducer Flt Ind Table:

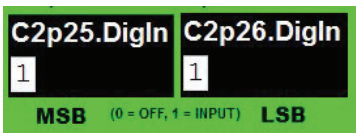
0x8001:	Input value too low
0x8002:	Input value too high
0x8003:	Open circuit
0x8004:	Short circuit (pin overload)
0x8005:	Input value out of range
0x8006:	Open Circuit/Too High
0x8007:	Several Input Faults
0x8008:	Short Circuit
0x8009:	Short Circuit/Too Low
0x800A:	Short Circuit/Too High
0x800B:	Unknown Fault or Combination

Solenoid / Transducer Fault Table

When the right broom switch is placed in the OFF position the 12VDC is removed from the controller CM-C18 pins 25, 26 and 27. The controller then routes 12VDC from CM-C8 pin 43 to one side of the right broom raise solenoid coil causing the solenoid to shift position and allow oil flow to the lift cylinder and lifting the right broom.

The right broom raise solenoid is controlled by the controller. When the right broom switch is placed in the SWEEP position 12VDC is routed from the switch terminal 3 to the right broom lower solenoid, to the bin switch at terminal C and to the controller at CM-C18 pin 27. The voltage at the bin switch terminal C activates the bin switch causing the switch to route LSB signals to the controller CM-C18 pin 26 and MSB signals to the controller pin 25. The signals at controller pins 25 and 26 cause the controller to route voltage to the raise solenoid from CM-C8 pin 43 until the right broom pressure transducer signals the appropriate down pressure at controller CM-C18 pin 8. The controller continues to route voltage to the raise solenoid, as necessary, to maintain the desired broom down pressure.
The voltage at the controller CM-C18 pin 27 signals the controller that the right broom has been lowered.
If there is an active fault on the right broom raise solenoid circuit the controller will stop routing voltage to the circuit. There will be no voltage on the circuit until the ignition switch is turned off and back on.

Continued

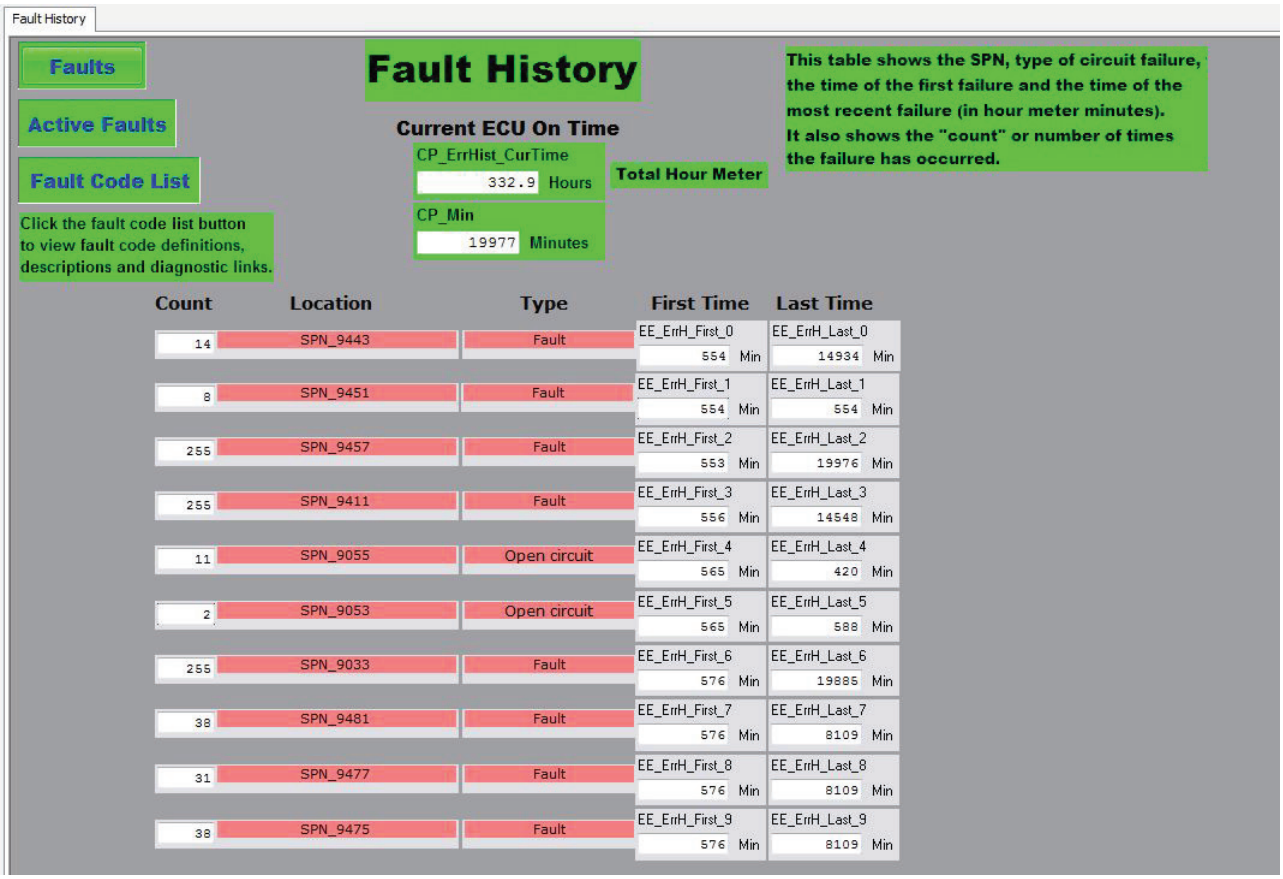


Right Broom Float Switches

Note:
Check the service tool log functions > Component Overview > Sweep Overview > Right Broom Overview log function right broom float C2p25.DigIn / C2p26.DigIn switch status. The MSB and LSB functions should change as shown in the on screen table when the right broom BCD switch is rotated from one position to another.

The position of the bin switch causes the switch to route signals to the controller as follows:

Switch Position	BDC Switch Output
0	00
1	01
2	10
3	11

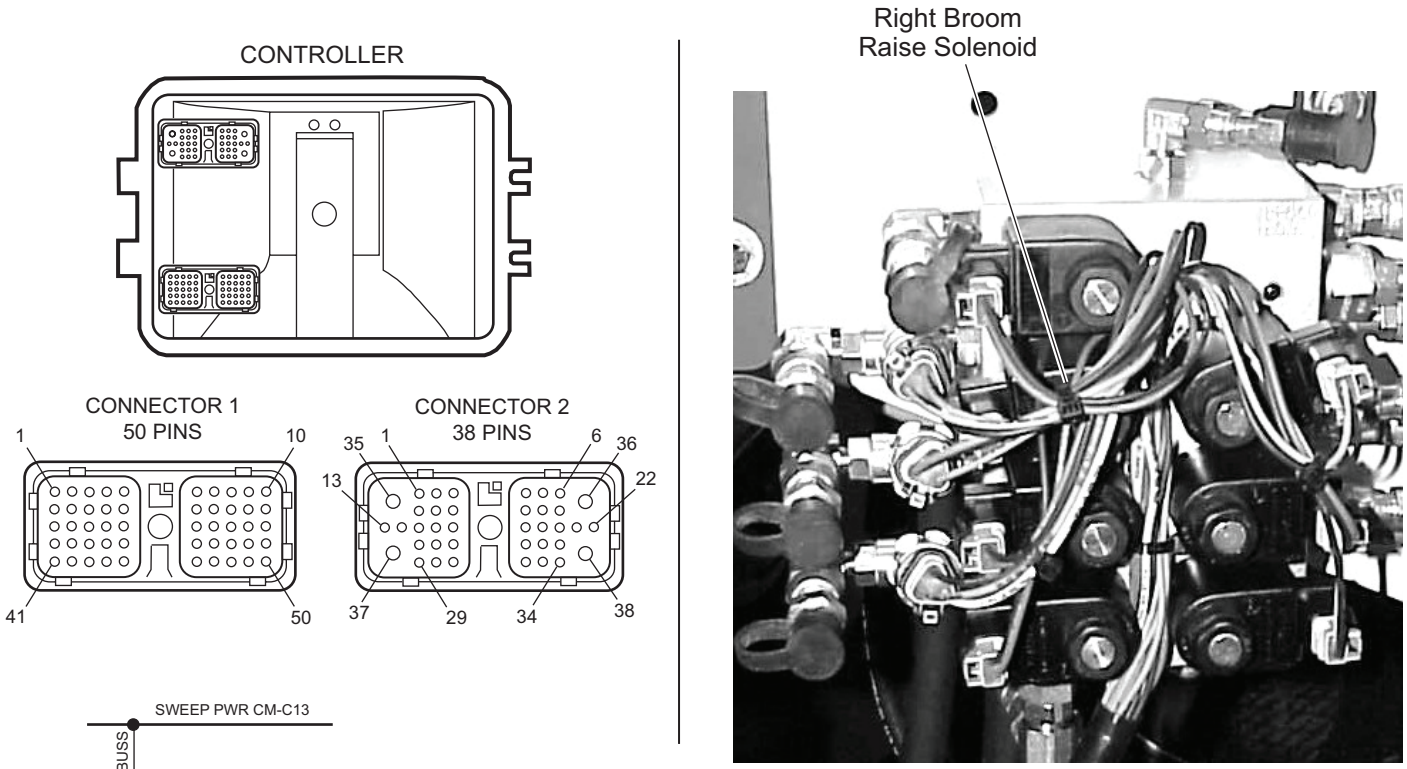


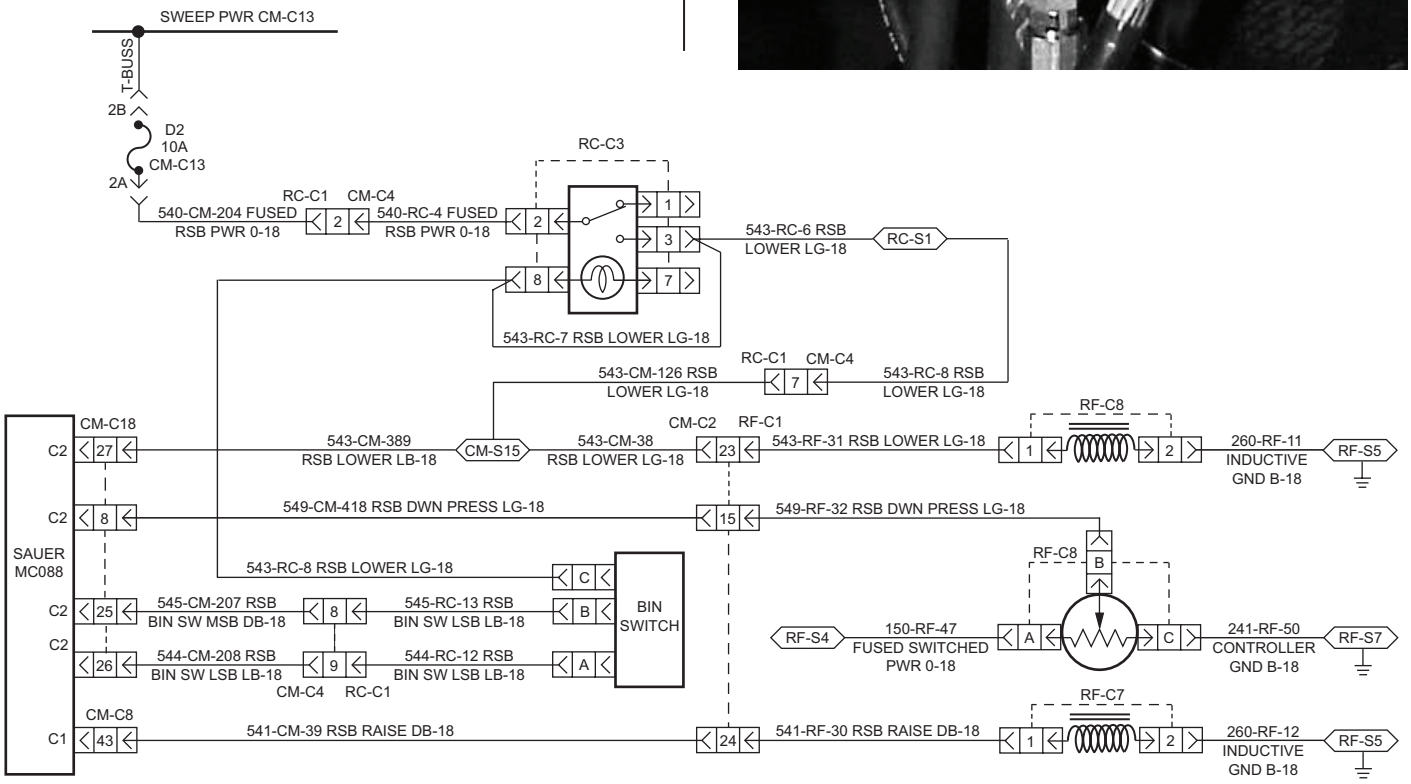
NOTE: The fault history screen will only show 'open circuit' for open circuit, short to ground and short to power. Use the fault indicators on the service tool screens for active faults.

Fault History Screen

Continued

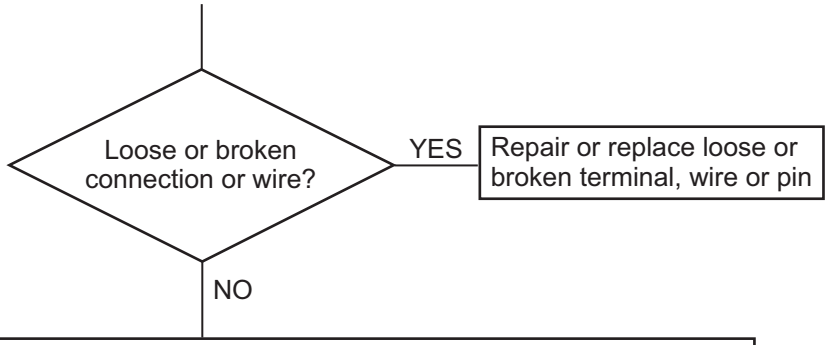
Check right broom raise solenoid for secure or broken connector.
Check Controller CM-C8 for secure or broken connections.
Check harness connectors for secure or broken connections.





Right Side Broom Circuit

Continued



Remove the connector RF-C7 from the raise solenoid coil.
Check with a multimeter set to resistance between the solenoid coil male terminals that correspond to the harness side connector pin 1 (dark blue wire) and pin 2 (black wire).
The multimeter should display approximately 7.2 ohms at 68 degrees.
If the multimeter displays an approximate range above or below the specifications the coil is shorted or open.
Replace the solenoid coil or solenoid valve.
Check with a multimeter set to resistance (ohms lowest setting) between the solenoid connector terminal 2 (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
A multimeter display of 1 indicates the solenoid ground wire is open.
Repair or replace the wiring harness between the solenoid terminal 2 and chassis ground RF-S5.

Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the RF-C7 connector from the right broom raise solenoid coil.
Place a jumper wire between the right broom raise solenoid connector terminal 1 (dark blue wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p43 (dark blue wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the controller connector pin C1p43 and the right broom raise solenoid connector terminal 1. Repair or replace the wiring harness.

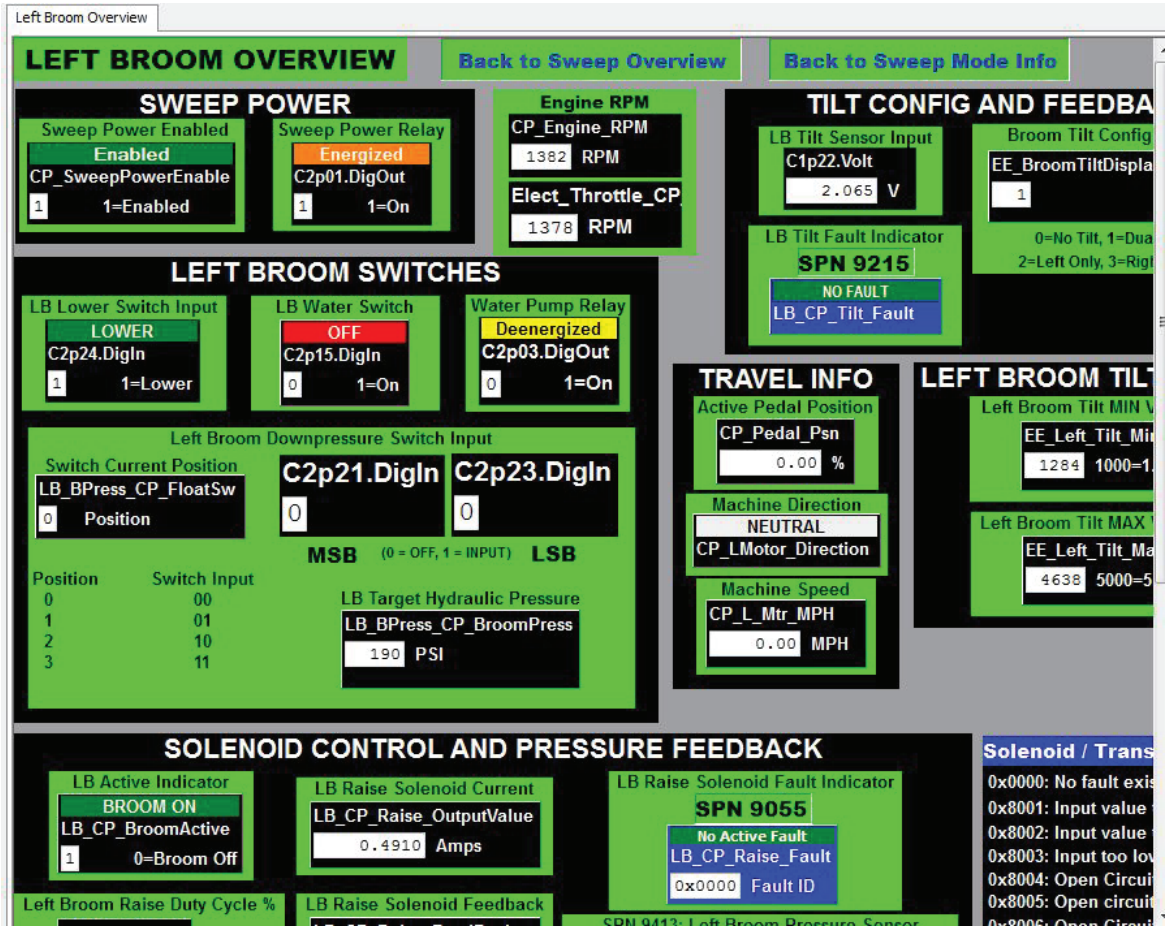
Remove the jumper wire from the right broom raise solenoid connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p43 (dark blue wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller connector pin C1p43 and the right broom raise solenoid connector terminal 1. Repair or replace the wiring harness.
Install all connectors removed during testing.

END

SPN 9055
Left Broom
Raise Solenoid

The 9055 error code indicates too little current flow in the circuit due to an open circuit or too much current in the circuit due to a short to ground in the circuit.

Check the left broom raise solenoid circuit as follows.

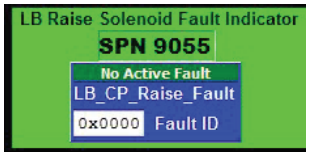


Left Broom Overview Screen

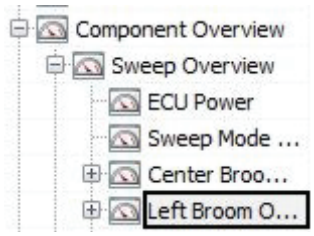
See the service tool left broom overview screen located underneath the component overview and sweep overview.

The service tool left broom overview screen can be used to ***check*** all left broom functions including left broom switches, solenoid control, pressure feedback and fault conditions.

Continued



Left Broom Raise Solenoid Fault Indicator



Faults Screen

Solenoid / Transducer Flt Ind Table:

0x0000: No fault exists
0x8001: Input value too low
0x8002: Input value too high
0x8003: Input too low/high
0x8004: Open Circuit
0x8005: Open circuit/too low
0x8006: Open Circuit/Too High
0x8007: Several Input Faults
0x8008: Short Circuit
0x8009: Short Circuit/Too Low
0x800A: Short Circuit/Too High
0x800B: Unknown Fault or Combination

Solenoid / Transducer Fault Table

START

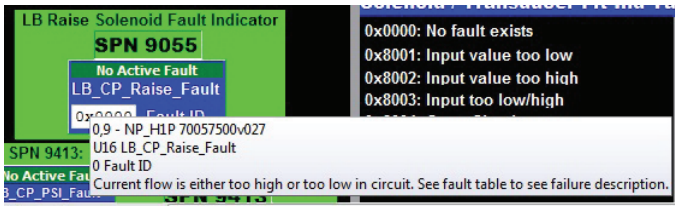
The left broom raise solenoid is energized when:

The mode switch is set to SWEEP.
The left broom switch is set in the DOWN position.
The power is routed to the four-position bin (BCD) switch.
The broom height switch outputs to the controller which sets the broom down pressure.
The controller activates the solenoid based on feedback from the left broom transducer.

All preoperational conditions are met?

NO → Correct preoperational conditions and resume diagnostics.

YES

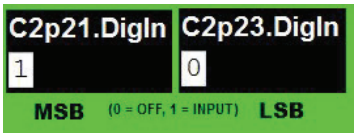


Hover SPN 9055 Fault

Use the service tool left broom overview screen to ***check*** the left broom raise solenoid fault indicator.
The SPN 9055 fault box will display a fault condition and the fault ID.
Place the cursor over the LB raise solenoid fault indicator and allow to hover.
An dialog box will appear with additional fault information.
See the solenoid/transducer fault table for fault codes and values.
The SPN 9055 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

When the left broom switch is placed in the OFF position the 12VDC is removed from the controller CM-C18 pins 21, 23 and 24. The controller then routes 12VDC from CM-C8 pin 44 to one side of the left broom raise solenoid coil causing the solenoid to shift position and allow oil flow to the lift cylinder and lifting the left broom.
The left broom raise solenoid is controlled by the controller. When the left broom switch is placed in the SWEEP position 12VDC is routed from the switch terminal 3 to the left broom lower solenoid, to the bin switch at terminal C and to the controller at CM-C18 pin 24. The voltage at the bin switch terminal C activates the bin switch causing the switch to route LSB signals to the controller CM-C18 pin 23 and MSB signals to the controller pin 21. The signals at controller pins 21 and 23 cause the controller to route voltage to the raise solenoid from CM-C8 pin 44 until the left broom pressure transducer signals the appropriate down pressure at controller CM-C18 pin 9. The controller continues to route voltage to the raise solenoid, as necessary, to maintain the desired broom down pressure.
The voltage at the controller CM-C18 pin 24 signals the controller that the right broom has been lowered.

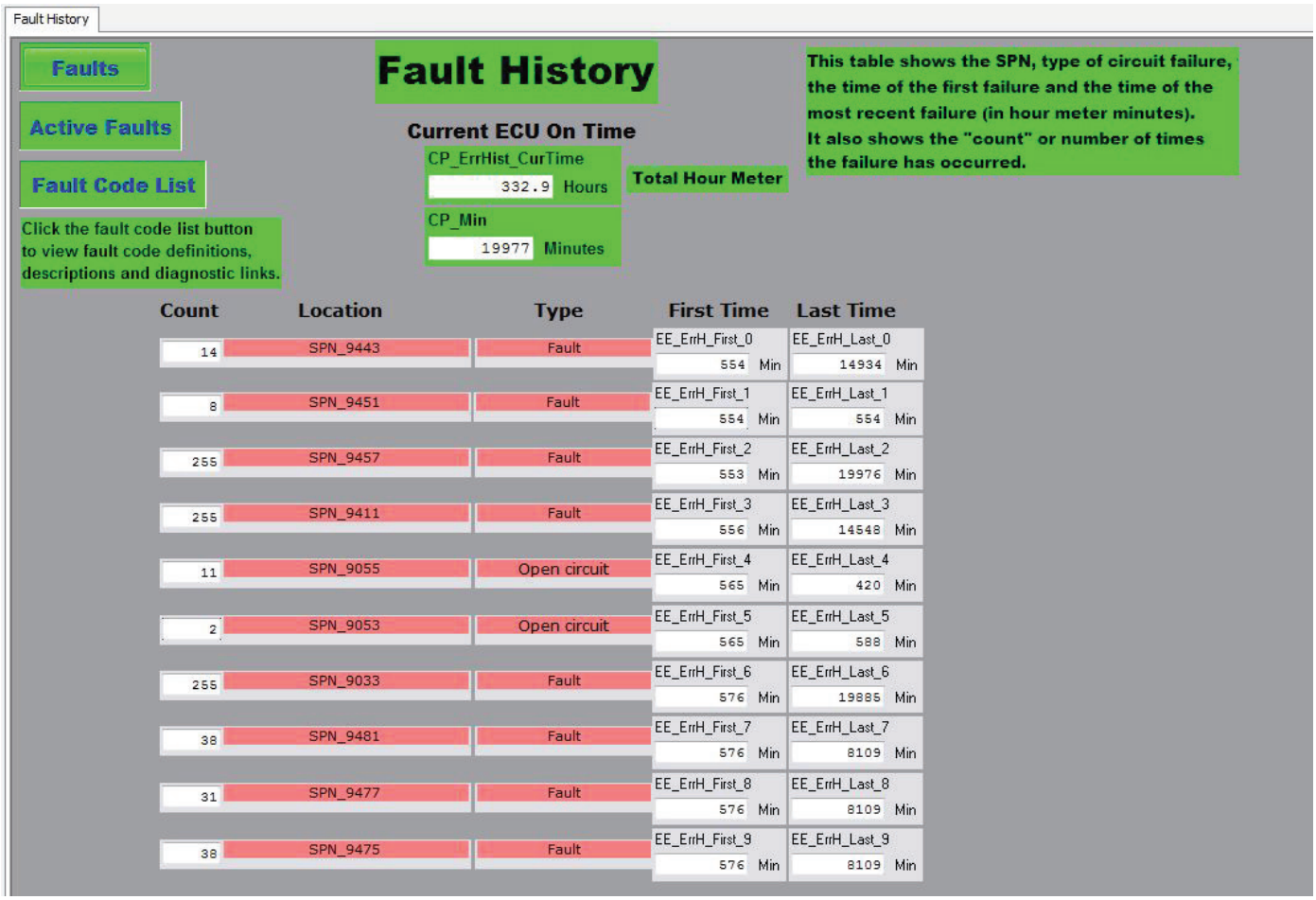
Continued



Left Broom
Float Switches

Note:
Check the service tool log functions > Component Overview > Sweep Overview > Left Broom Overview log function left broom C2p21.DigIn / C2p23.DigIn float switch status. The MSB and LSB functions should change as shown in the on screen table when the left broom BCD switch is rotated from one position to another. The position of the bin switch causes the switch to route signals to the controller as follows:

Switch Position	BDC Switch Output
0	00
1	01
2	10
3	11

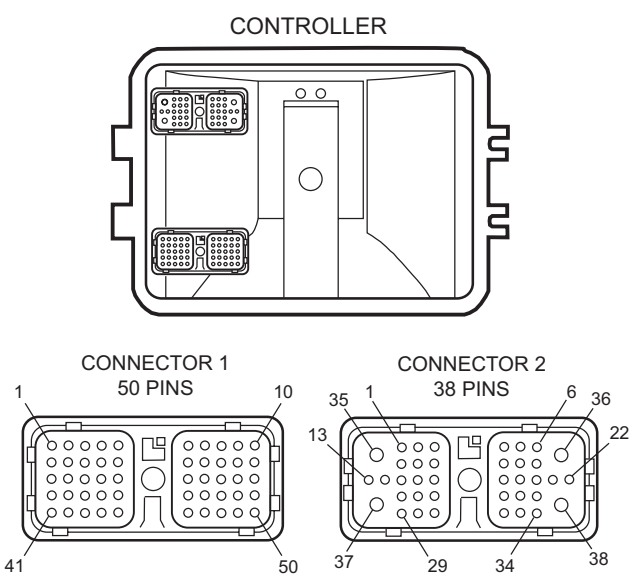


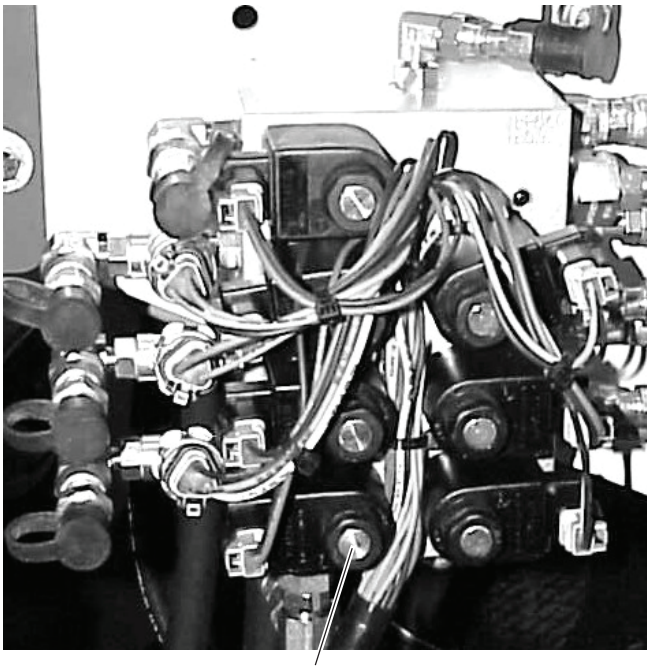
NOTE: The fault history screen will only show 'open circuit' for open circuit, short to ground and short to power. Use the fault indicators on the service tool screens for active faults.

Fault History Screen

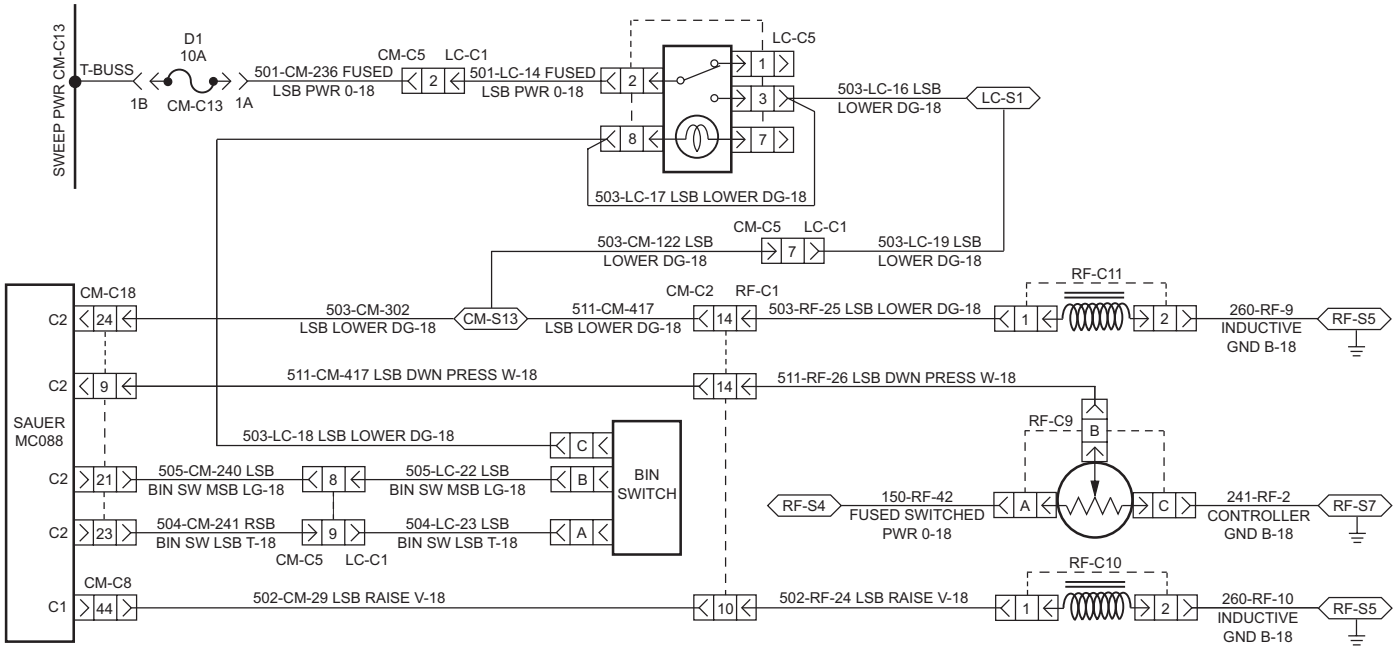
Continued

Check left broom raise solenoid for secure or broken connector.
Check Controller CM-C8 for secure or broken connections.
Check harness connectors for secure or broken connections.



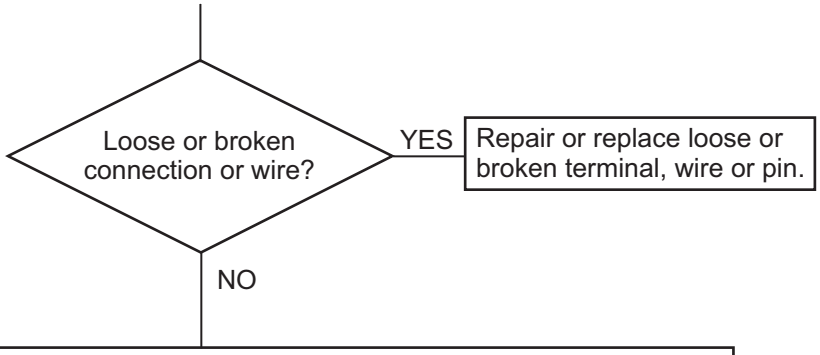


Left Broom
Raise Solenoid



Left Side Broom Circuit

Continued



Remove the connector RF-C10 from the raise solenoid coil.
Check with a multimeter set to resistance between the solenoid coil male terminals that correspond to the harness side connector pin 1 (violet wire) and pin 2 (black wire).
The multimeter should display approximately 7.2 ohms at 68 degrees.
If the multimeter displays an approximate range above or below the specifications the coil is shorted or open. Replace the solenoid coil or solenoid valve.
Check with a multimeter set to resistance (ohms lowest setting) between the solenoid connector terminal 2 (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
A multimeter display of 1 indicates the solenoid ground wire is open.
Repair or replace the wiring harness ground circuit between the solenoid connector terminal 2 and chassis ground RF-S5.

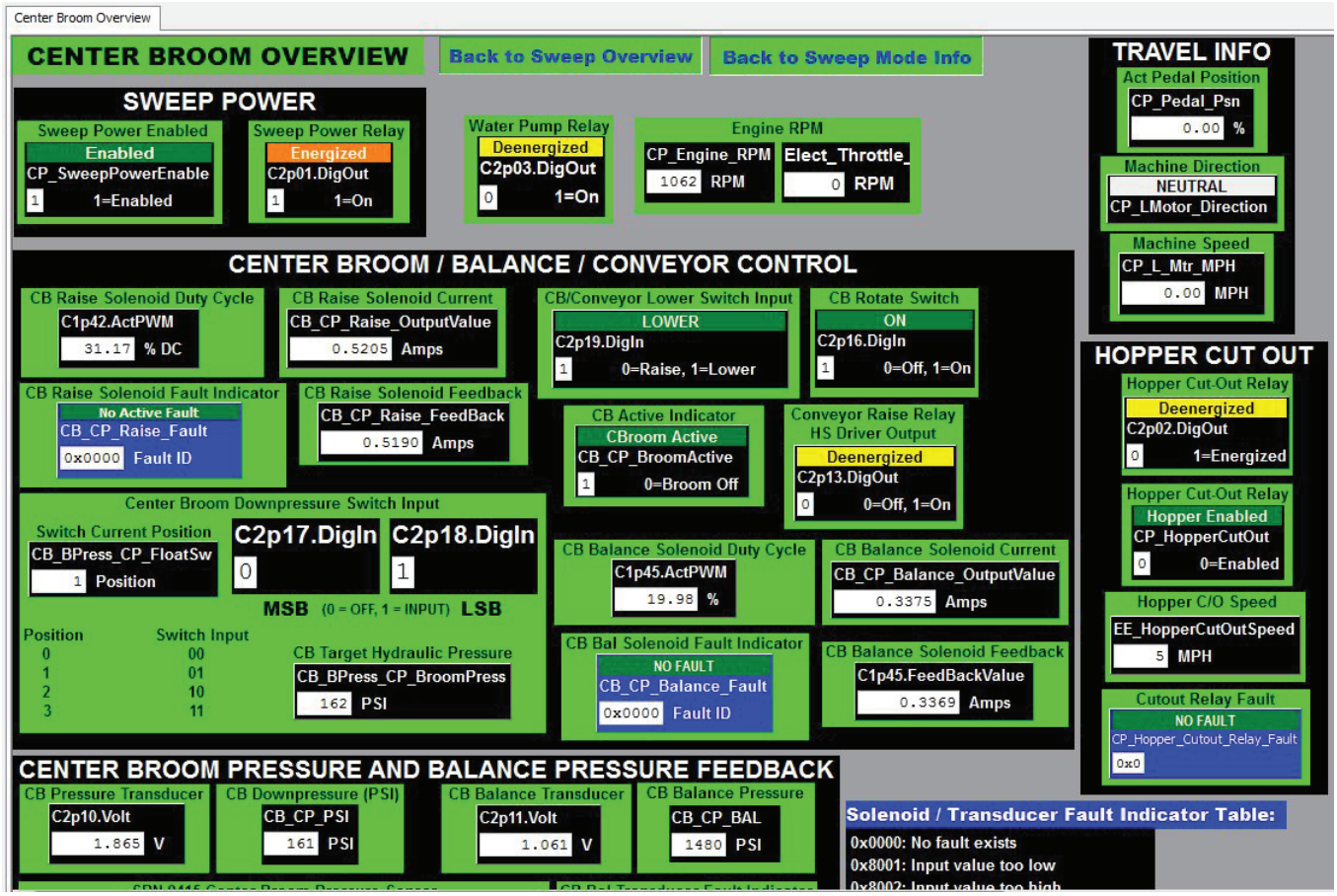
Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the RF-C10 connector from the left broom raise solenoid coil.
Place a jumper wire between the left broom raise solenoid connector terminal 1 (violet wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p44 (violet wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the controller connector pin C1p44 and the left broom raise solenoid connector terminal 1. Repair or replace the wiring harness.

Remove the jumper wire from the left broom raise solenoid connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p44 (violet wire) and a known ground. The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground between the controller connector pin C1p44 and the left broom raise solenoid connector terminal 1. Repair or replace the wiring harness.
Install all connectors removed during testing.

END

SPN 9057
Center Broom
Raise Solenoid

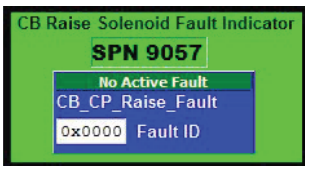
The 9057 error code indicates too little current flow in the circuit due to an open circuit or too much current in the circuit due to a short to ground in the circuit.
Check the center broom raise solenoid circuit as follows.



Center Broom Overview Screen

The service tool center broom overview screen located underneath component overview and sweep overview can be used to ***check*** all center broom functions including center broom switches, solenoid control, pressure feedback and fault conditions.

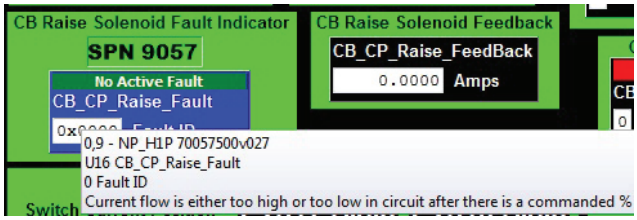
Continued



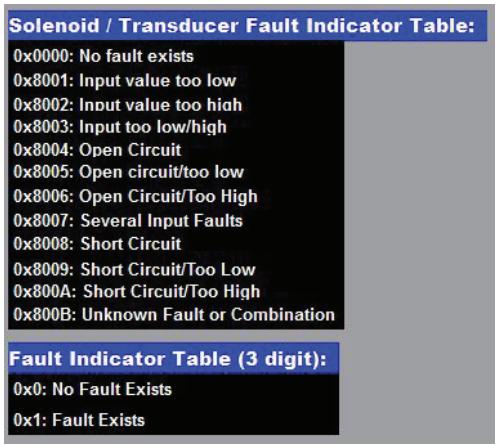
Center Broom Raise Solenoid Fault Indicator



Faults Screen



Hover SPN 9057 Fault



Solenoid / Transducer Fault Table

START

The center broom raise solenoid is energized when:

The mode switch is set to SWEEP.
The center broom switch is set in the DOWN position.
The power is routed to the four-position bin (BCD) switch.
The broom height switch outputs to the controller which sets the broom down pressure.
The controller activates the solenoid based on feedback from the center broom transducer.

All preoperational conditions are met?

NO → Correct preoperational conditions and resume diagnostics.

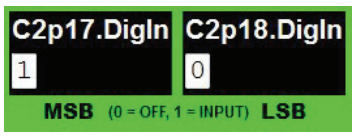
YES

Use the service tool center broom overview screen to ***check*** the center broom raise solenoid fault indicator. The SPN 9057 fault box will display a fault condition and the fault ID. Place the cursor over the CB raise solenoid fault indicator and allow to hover.
A dialog box will appear with additional fault information. See the solenoid / transducer fault table for fault codes and values. The SPN 9057 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

When the center broom switch is placed in the OFF position the 12VDC is removed from the controller CM-C18 pins 17,18 and 19. The controller then routes 12VDC from CM-C8 pin 42 to one side of the center broom raise solenoid coil causing the solenoid to shift position and allow oil flow to the lift cylinder and lifting the center broom.

The center broom raise solenoid is controlled by the controller. When the center broom switch is placed in the SWEEP position 12VDC is routed from the switch terminal 3 to the center broom lower solenoid, to the bin switch at terminal C and to the controller at CM-C18 pin 19. The voltage at the bin switch terminal C activates the bin switch causing the switch to route LSB signals to the controller CM-C18 pin 18 and MSB signals to the controller pin 17. The signals at controller pins 17 and 18 cause the controller to route voltage to the raise solenoid from CM-C8 pin 42 until the center broom pressure transducer signals the appropriate down pressure at controller CM-C18 pin 10. The controller continues to route voltage to the raise solenoid, as necessary, to maintain the desired broom down pressure. The voltage at the controller CM-C18 pin 19 signals the controller that the center broom has been lowered.

Continued

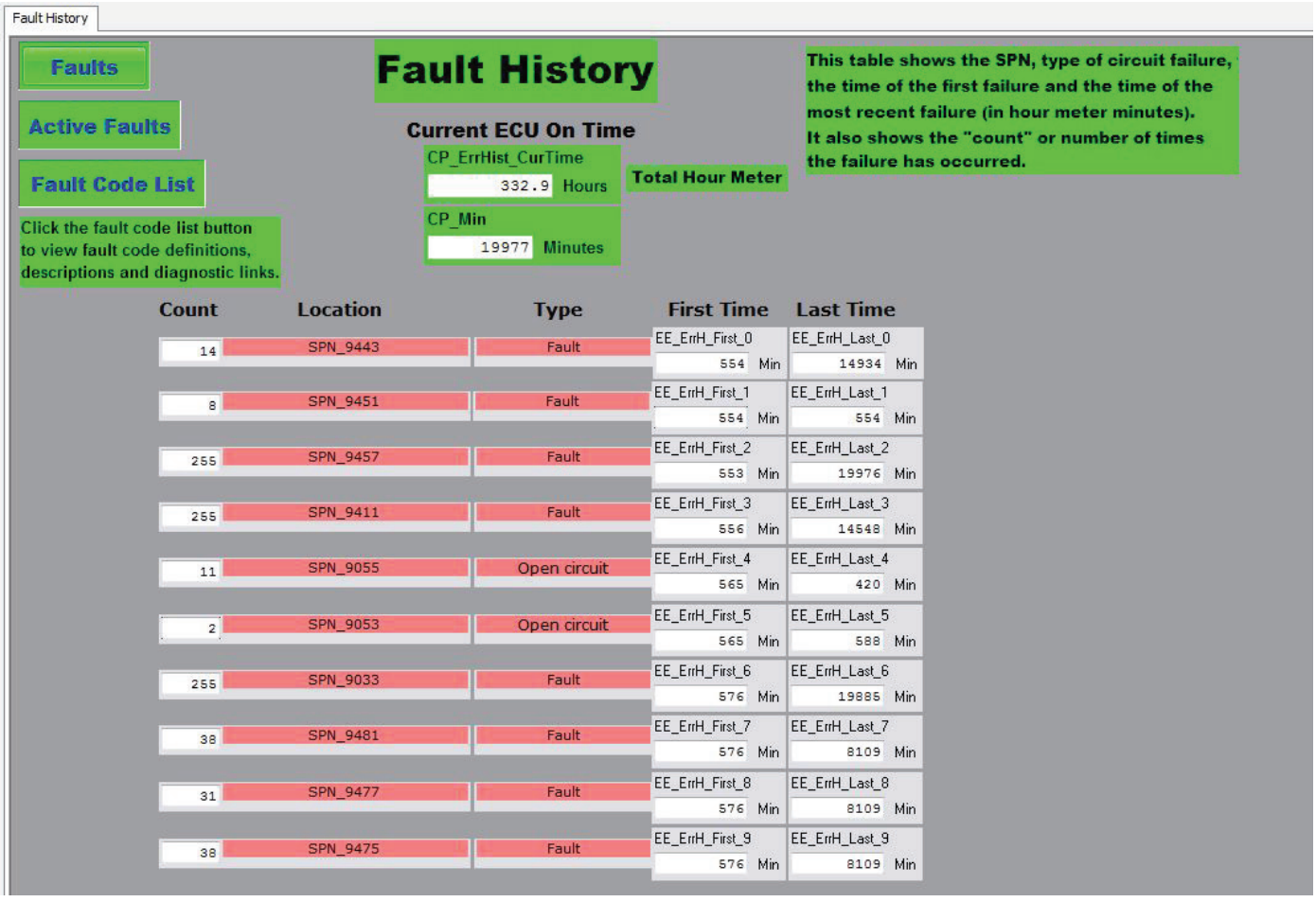


Center Broom Float Switches

Note: ***Check*** the service tool log functions > Component Overview > Sweep Overview > Center Broom Overview log function and center broom float C2p17.DigIn / C2p18.DigIn switch status. The MSB and LSB functions should change as shown in the on screen table when the center broom BCD switch is rotated from one position to another.

The position of the bin switch causes the switch to route signals to the controller as follows:

Switch Position	BDC Switch Output
0	00
1	01
2	10
3	11

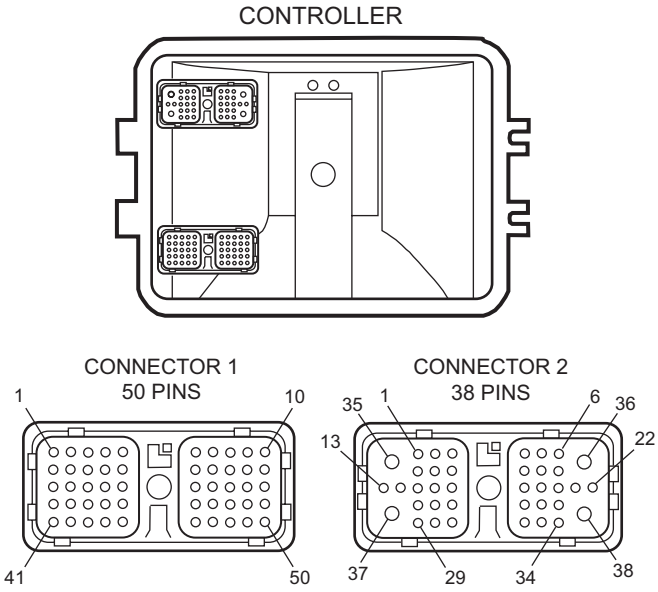


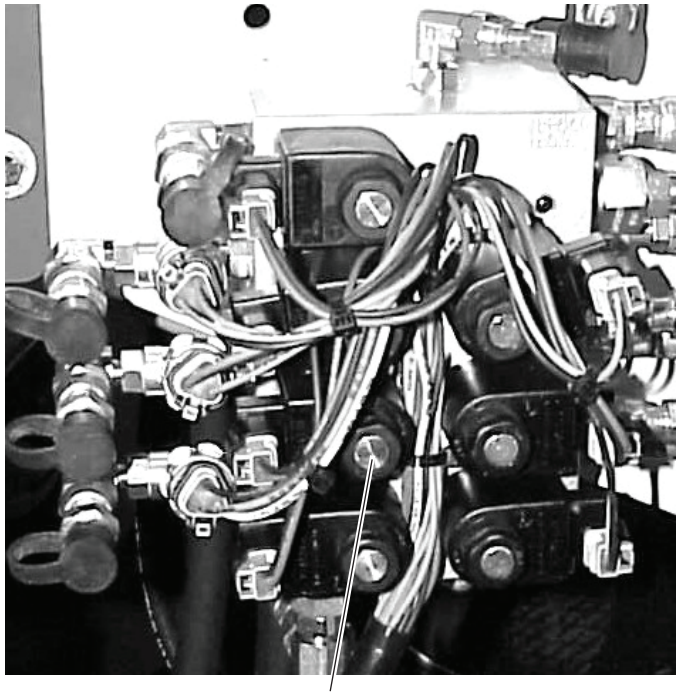
NOTE: The fault history screen will only show 'open circuit' for open circuit, short to ground and short to power. Use the fault indicators on the service tool screens for active faults.

Fault History Screen

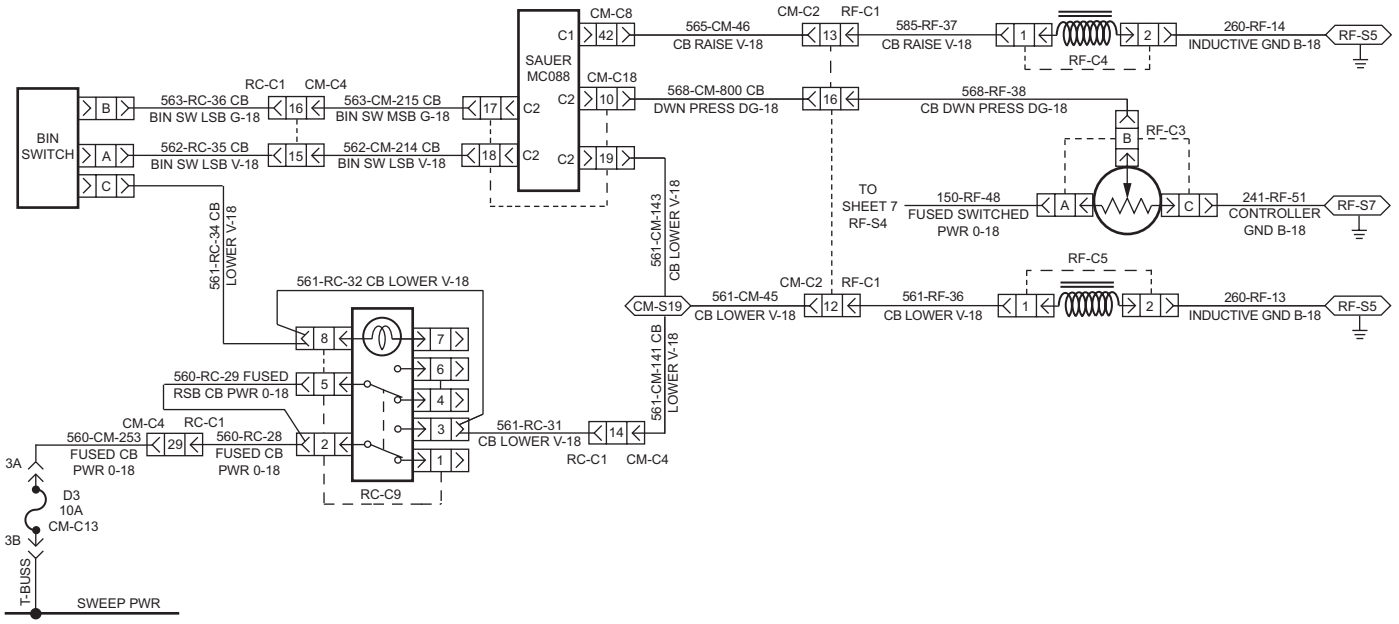
Continued

Check center broom raise solenoid for secure or broken connector.
Check Controller CM-C8 for secure or broken connections.
Check harness connectors for secure or broken connections.



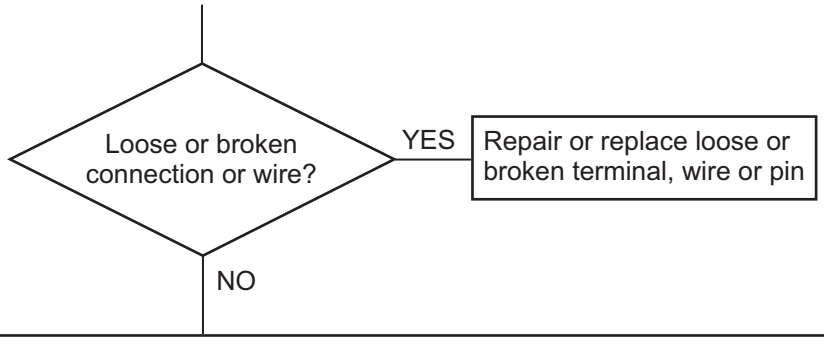


Center Broom
Raise Solenoid



Center Broom Raise Solenoid Circuit

Continued



Remove the connector RF-C4 from the raise solenoid coil.
Check with a multimeter set to resistance between the solenoid coil terminal 1 (violet wire) and terminal 2 (black wire). The multimeter should display approximately 7.2 ohms at 68 degrees.
If the multimeter displays a range well above or below the specification the coil is shorted or open.
Replace the solenoid coil or solenoid valve.
Check with a multimeter set to resistance (ohms lowest setting) between the solenoid harness connector terminal 2 (black wire) and a known ground. The multimeter should display a 0 indicating ground continuity.
A multimeter display of 1 indicates the solenoid ground wire is open.
Repair or replace wiring harness ground circuit between solenoid connector terminal 2 and chassis ground RF-S5.

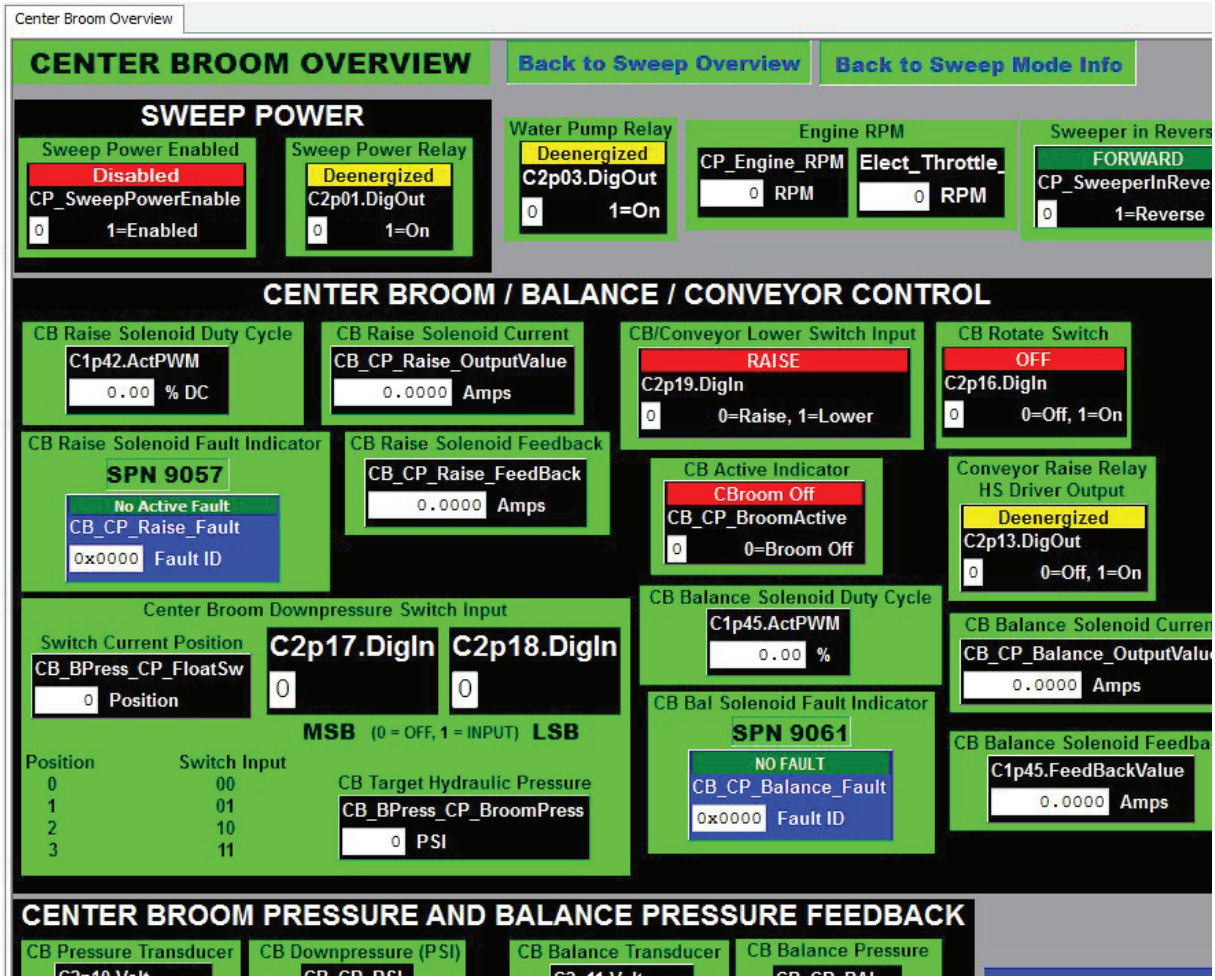
Place the ignition switch in the OFF position.
Remove the C1 50 pin connector from the controller.
Remove the RF-C4 connector from the center broom raise solenoid coil.
Place a jumper wire between the center broom raise solenoid connector terminal 1 (violet wire) & a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p42 (violet wire) and a known ground.
The multimeter should display a 0 indicating wire continuity. If the multimeter does not display a 0 there is an open circuit between the controller connector pin C1p42 and the center broom raise solenoid connector terminal 1.
Repair or replace the wiring harness.

Remove the jumper wire from the center broom raise solenoid connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p42 (violet wire) and a known ground.
The multimeter should display a 1 indicating an open circuit. If the multimeter does not display a 1 there is a short circuit or short to ground between the controller connector pin C1p42 and the center broom raise solenoid connector terminal 1. Repair or replace the wiring harness.
Install all connectors removed during testing.

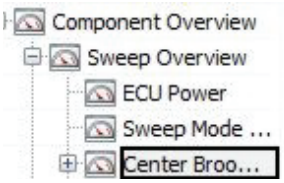
END

SPN 9061
Center Broom
Balance Solenoid

The 9061 error code indicates too little current flow in the circuit due to an open circuit or too much current in the circuit due to a short to ground in the circuit.
Check the center broom balance solenoid circuit as follows.



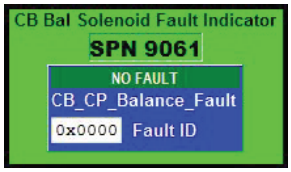
Center Broom Overview Screen



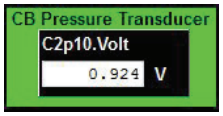
Navigator Box

The center broom overview located underneath component overview and sweep overview can be used to check all center broom functions including center broom switches, solenoid control, pressure feedback, center broom balance and fault conditions.

Continued



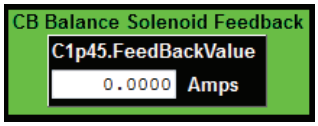
Center Broom
Solenoid Fault Indicator



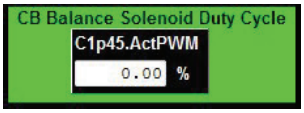
Center Broom
Pressure Transducer



Faults Screen



Center Broom
Balance Solenoid Feedback



Center Broom
Balance Duty Cycle

START

The center broom balance solenoid is energized when:

The mode switch is set to SWEEP position.
The center broom switch is set in the DOWN position.
The center broom rotate switch is in the ON position.
The center broom rotate pressure transducer sends signal (0.5VDC to 4VDC) to the controller.
The CB pressure transducer box on the service tool center broom overview screen will display the center broom motor rotate pressure voltage when the center broom is rotating.
The controller converts the transducer input to PSI and averages for 200 readings to determine the desired PWM signal.
The controller outputs the desired PWM signal to the center broom balance solenoid to offset motor torque induced in the broom assembly.

All preoperational conditions are met?

NO → Correct preoperational conditions and resume diagnostics.

YES



Center Broom Balance Transducer

Use the service tool center broom overview screen to ***check*** the center broom balance solenoid fault indicator. The SPN 9061 fault box will display a fault condition and the fault ID.
Place the cursor over the CB balance solenoid fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the solenoid / transducer fault table for fault codes and values.
The SPN 9061 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.
NOTE: If the center broom is running and the switch is turned OFF the solenoid will continue to operate for five seconds at a high duty cycle percentage and then turn off.

When the center broom is in operation and the balance transducer senses broom operation the controller routes 12VDC from CM-C8 pin 45 to the center broom balance solenoid. The solenoid opens allowing hydraulic oil to flow to the left main broom cylinder retract side to balance center broom operation and prevent broom coning and damage. The center broom balance solenoid duty cycle box on the service tool center broom overview screen displays the balance solenoid percentage of duty cycle and can be used as a ***check*** for solenoid operation. The center broom solenoid feedback box displays the current (amps) being routed to the solenoid coil. The display can be used to check controller pin C1p45 output and the operation of the balance solenoid. The display in the duty cycle percentage and feedback boxes indicates the circuit between the controller pin C1-45 and the coil is operational and not open.

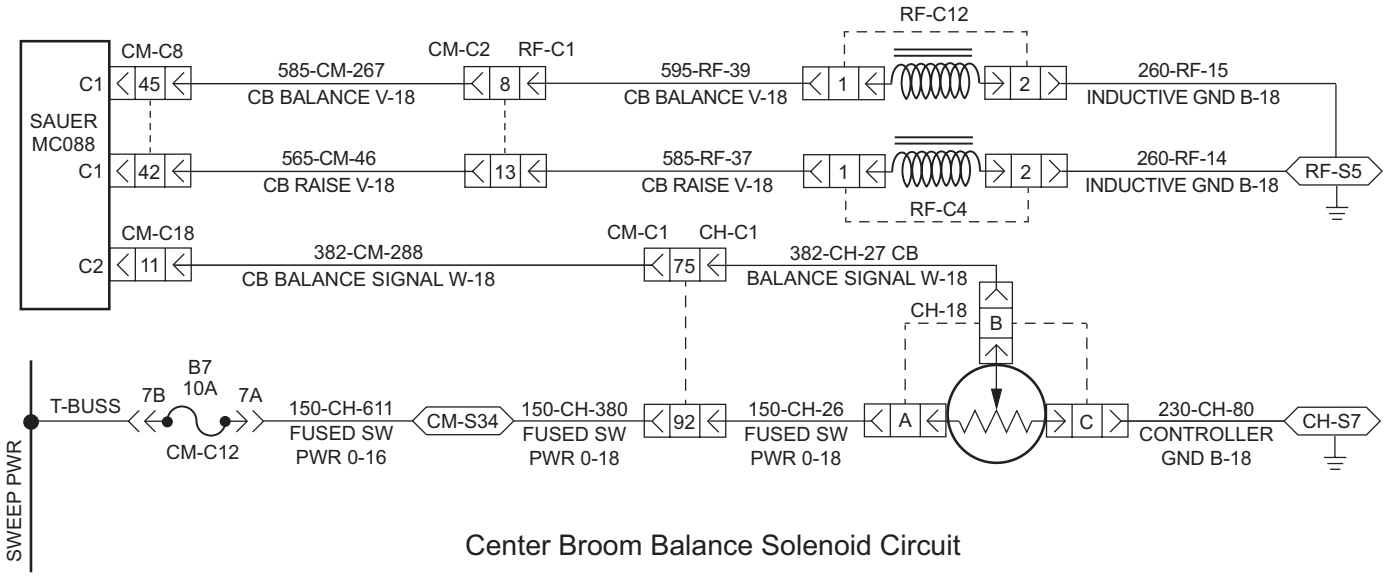
Continued

Count	Location	Type	First Time	Last Time
14	SPN_9443	Fault	EE_ErrH_First_0 554 Min	EE_ErrH_Last_0 14934 Min
8	SPN_9451	Fault	EE_ErrH_First_1 554 Min	EE_ErrH_Last_1 554 Min
255	SPN_9457	Fault	EE_ErrH_First_2 553 Min	EE_ErrH_Last_2 19976 Min
255	SPN_9411	Fault	EE_ErrH_First_3 556 Min	EE_ErrH_Last_3 14548 Min
11	SPN_9055	Open circuit	EE_ErrH_First_4 565 Min	EE_ErrH_Last_4 420 Min
2	SPN_9053	Open circuit	EE_ErrH_First_5 565 Min	EE_ErrH_Last_5 588 Min
255	SPN_9033	Fault	EE_ErrH_First_6 576 Min	EE_ErrH_Last_6 19885 Min
38	SPN_9481	Fault	EE_ErrH_First_7 576 Min	EE_ErrH_Last_7 8109 Min
31	SPN_9477	Fault	EE_ErrH_First_8 576 Min	EE_ErrH_Last_8 8109 Min
38	SPN_9475	Fault	EE_ErrH_First_9 576 Min	EE_ErrH_Last_9 8109 Min

Fault History Screen

When the center broom drive motor is rotating additional down pressure is applied to the left side of the center broom which can cause coning and damage. The balance transducer senses the hydraulic pressure applied to the drive motor for rotation and signals for pressure compensation from the left side broom lift cylinder circuit.

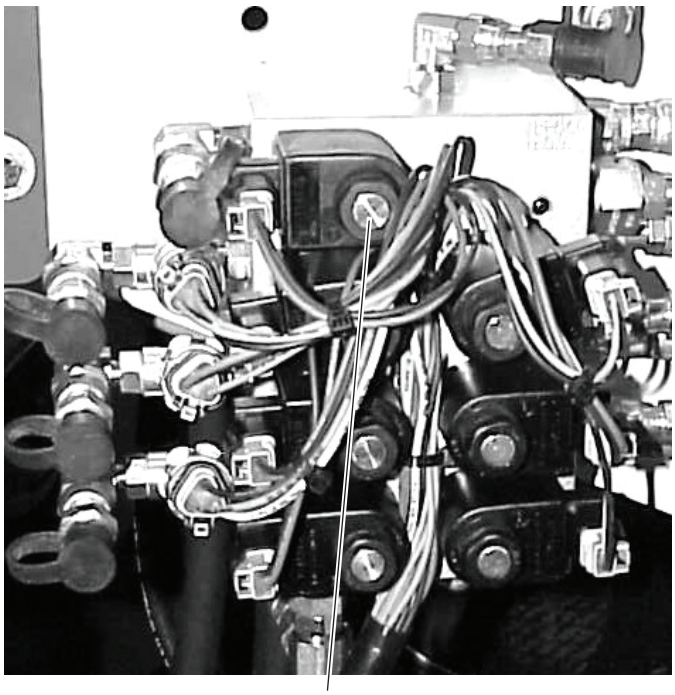
The transducer is connected to the fused switch power circuit (12VDC) at the transducer connector CH-C18 pin A. The transducer is grounded at pin C. When the transducer senses hydraulic pressure the internal potentiometer moves across a resistor creating an output voltage which is routed from pin B to the controller CM-C18 pin 11. The voltage acts as a signal that the left center broom down pressure needs to compensate for center broom drive motor operation. A calculation is performed based on the transducer input and voltage is routed to the balance solenoid causing the solenoid valve to open allowing hydraulic oil to flow to the left center broom cylinder raising the lift cylinder slightly to compensate for drive motor operation.



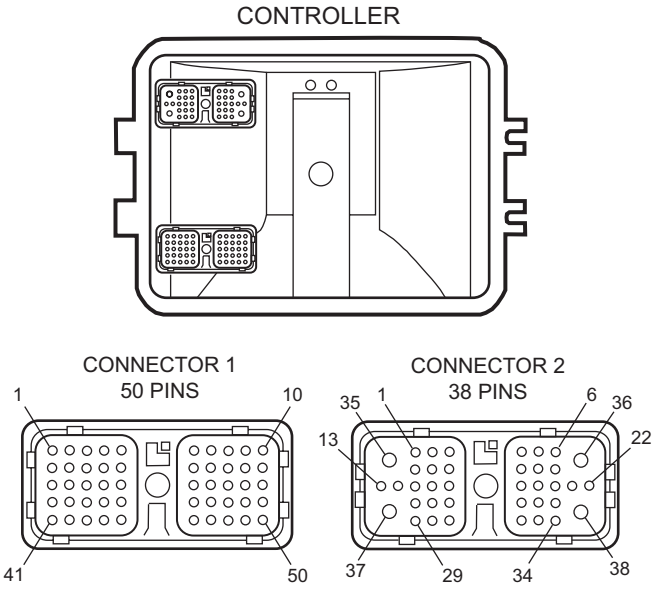
Center Broom Balance Solenoid Circuit

Continued

Check center broom balance solenoid for secure or broken connector.
Check Controller CM-C8 for secure or broken connections.
Check harness connectors for secure or broken connections.



Center Broom
Balance Solenoid



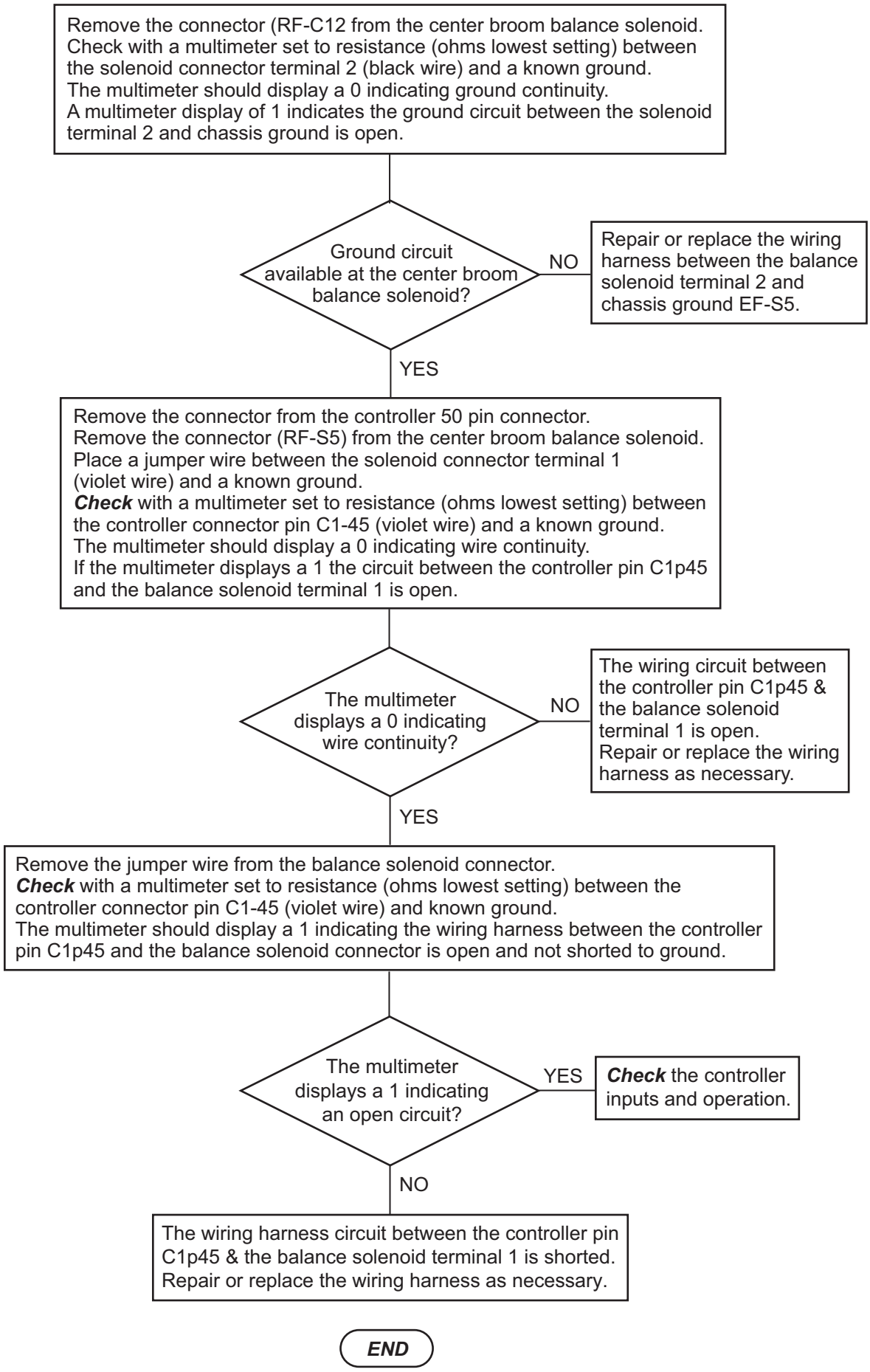
Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin

NO

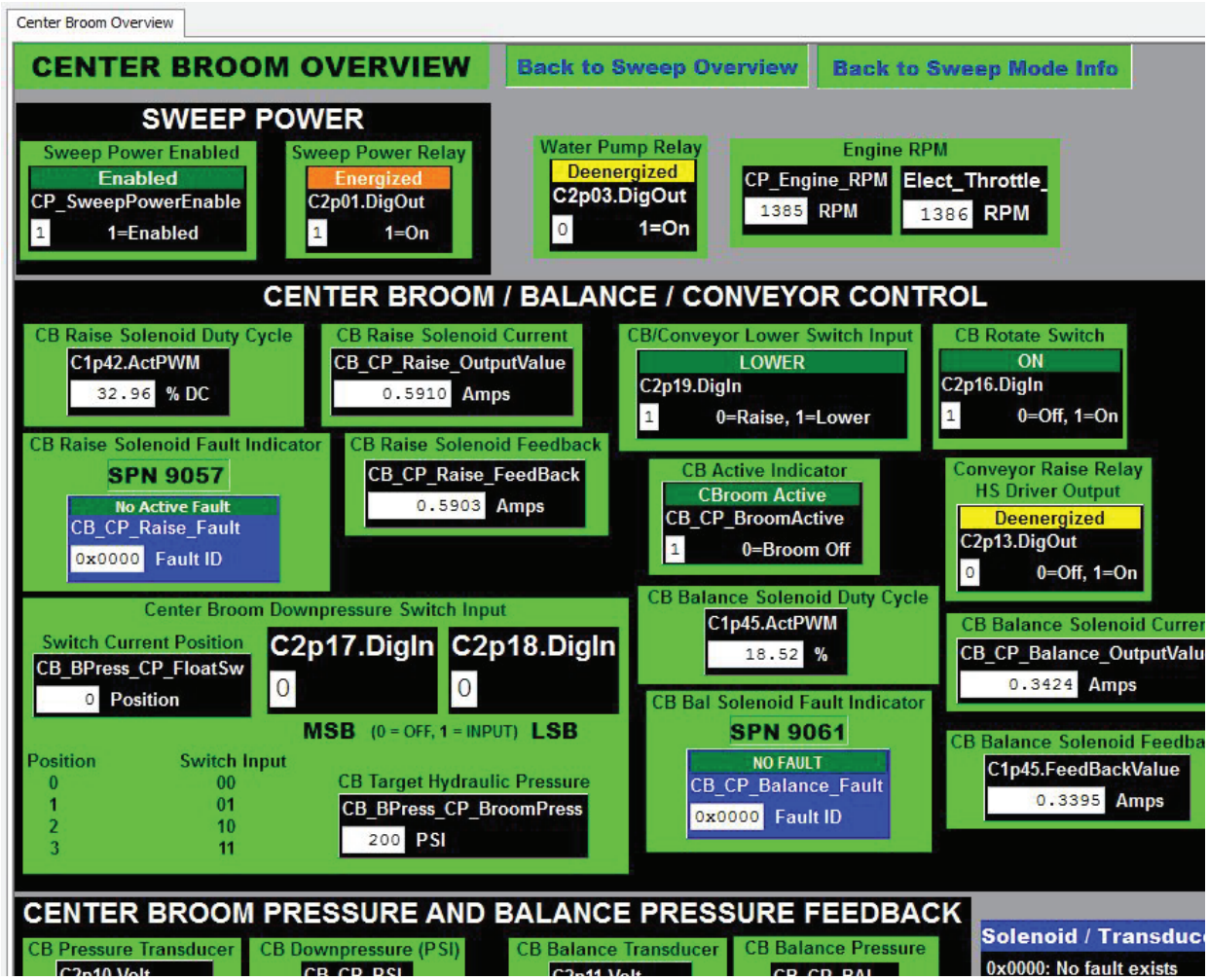
Remove the connector (RF-C12) from the center broom balance solenoid.
Check with a multimeter set to resistance between the solenoid coil terminal 1 and terminal 2.
The multimeter should display approximately 7.2 ohms are 68 degrees.
If the multimeter displays an approximate value above or below the 7.2 ohms the solenoid coil is shorted or open.
Replace the balance solenoid coil or solenoid valve.

Continued

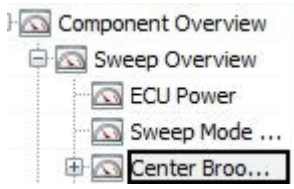

Remove the connector (RF-C12 from the center broom balance solenoid.
Check with a multimeter set to resistance (ohms lowest setting) between the solenoid connector terminal 2 (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
A multimeter display of 1 indicates the ground circuit between the solenoid terminal 2 and chassis ground is open.
Ground circuit available at the center broom balance solenoid?
NO
Repair or replace the wiring harness between the balance solenoid terminal 2 and chassis ground EF-S5.
YES
Remove the connector from the controller 50 pin connector.
Remove the connector (RF-S5) from the center broom balance solenoid.
Place a jumper wire between the solenoid connector terminal 1 (violet wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1-45 (violet wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter displays a 1 the circuit between the controller pin C1p45 and the balance solenoid terminal 1 is open.
The multimeter displays a 0 indicating wire continuity?
NO
The wiring circuit between the controller pin C1p45 & the balance solenoid terminal 1 is open.
Repair or replace the wiring harness as necessary.
YES
Remove the jumper wire from the balance solenoid connector.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1-45 (violet wire) and known ground.
The multimeter should display a 1 indicating the wiring harness between the controller pin C1p45 and the balance solenoid connector is open and not shorted to ground.
The multimeter displays a 1 indicating an open circuit?
YES
Check the controller inputs and operation.
NO
The wiring harness circuit between the controller pin C1p45 & the balance solenoid terminal 1 is shorted.
Repair or replace the wiring harness as necessary.
END

SPN 9063
Center Broom
Balance Transducer

The 9063 error code indicates possible open circuit, short to ground or short to power in the center broom balance transducer circuit. ***Check*** the center broom balance transducer circuit as follows.



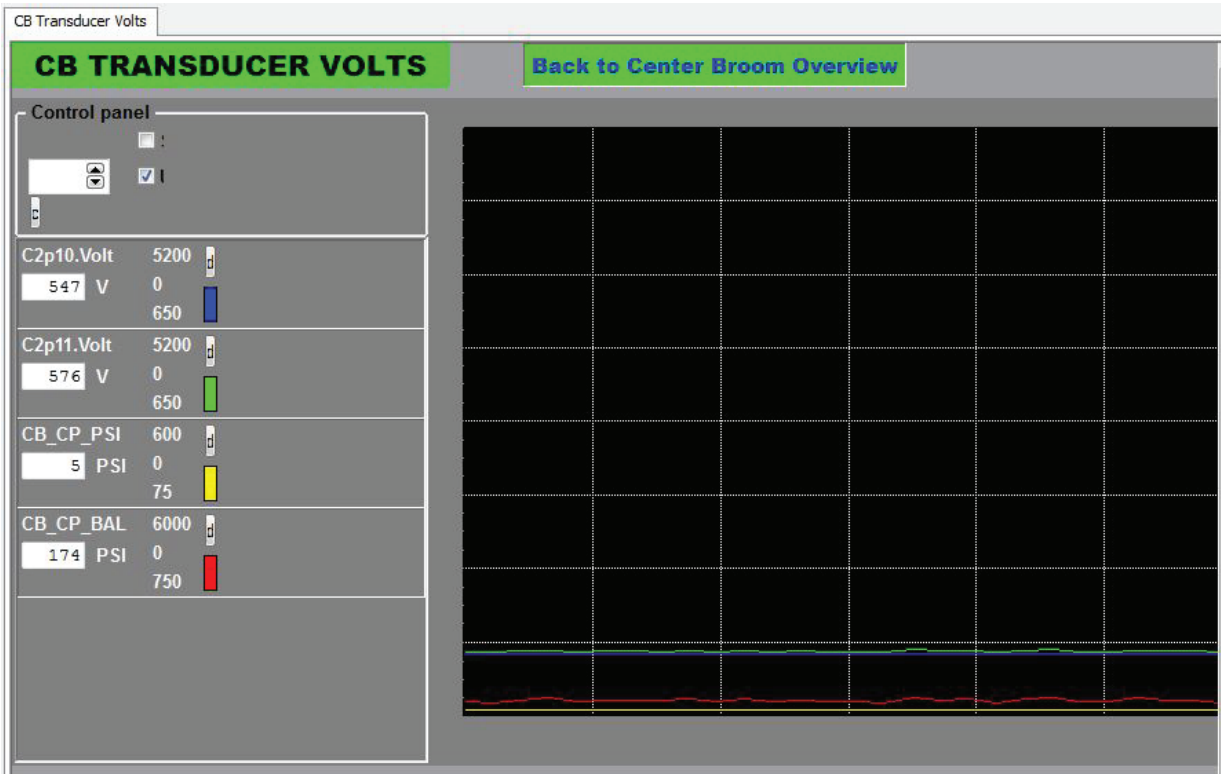
Center Broom Overview Screen



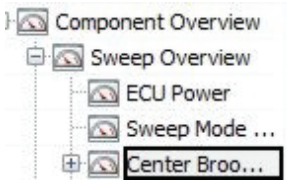
Navigator Box

The center broom overview screen can be used to ***check*** the operation of the center broom. The screen provides monitoring for the center broom including sweep power, center broom, center broom /balance/conveyor control, main broom pressure and balance pressure feedback.
Use the screen to monitor all center broom operations.

Continued

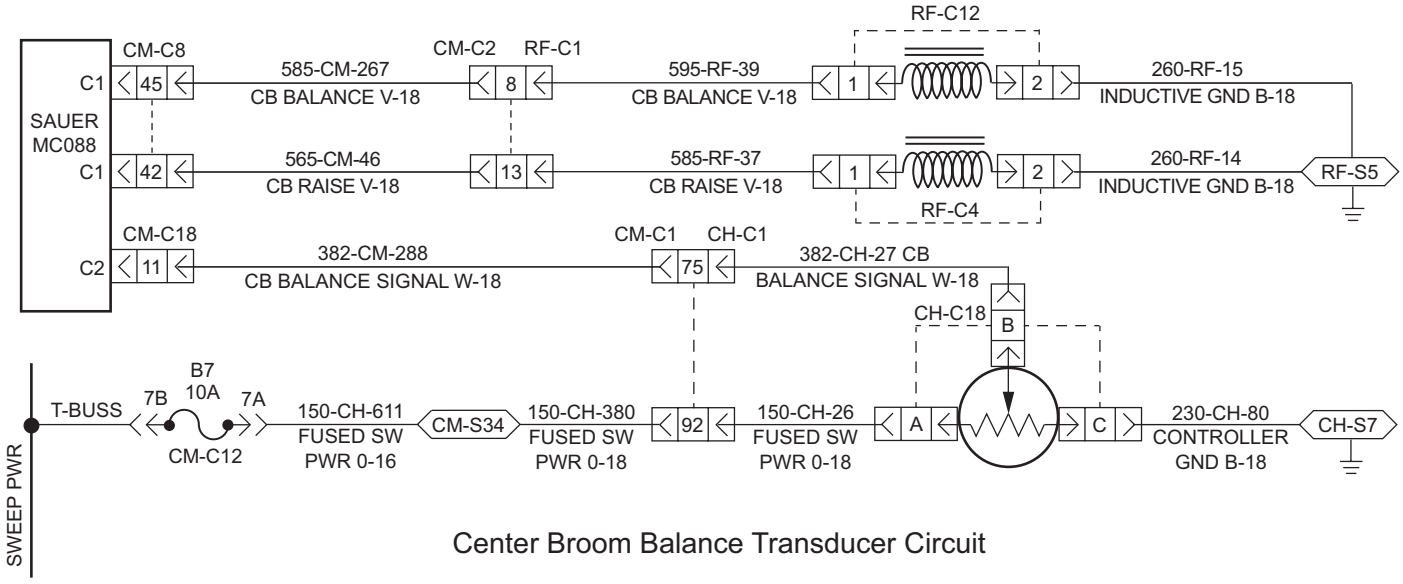


Center Broom Transducer Volts Screen



Navigator Box

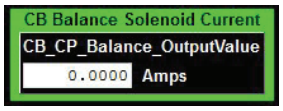
The Center Broom Transducer Volts screen provides log functions for the center broom balance transducer signal input voltage, main broom pressure, center broom raise solenoid duty cycle %, center broom balance pressure and center broom balance pressure output duty cycle.
Use the screen to monitor the transducer input signal.
If the C2p11.Volt function indicates input voltage the transducer circuits are operational. Use the screen and diagnostics steps to ***check*** the transducer circuit for opens, short to ground and short to power.



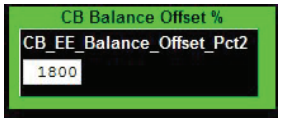
Center Broom Balance Transducer Circuit

Continued

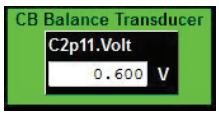
START



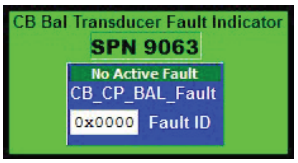
Center Broom
Balance Solenoid Current



Center Broom
Balance Offset %



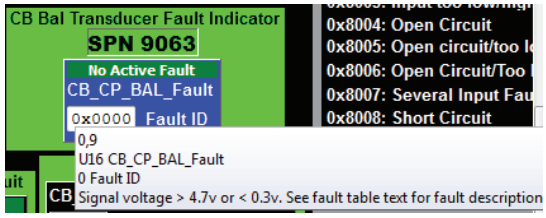
Center Broom
Pressure Transducer



Center Broom Balance
Transducer Fault Indicator

The center broom transducer is energized when:

The key is in the on position.
The mode switch is set to SWEEP position.
The center broom switch is set in the DOWN position.
The center broom rotate switch is in the ON position.
The center broom rotate pressure transducer sends signal (0.5VDC to 4VDC) to the controller CM-C18 pin 11. The CB pressure transducer box on the center broom overview screen will display the center broom pressure signal being routed to the controller. The controller converts the transducer input to PSI average for 200 readings to determine the desired PWM signal to the center broom balance solenoid from controller CM-C8 pin 45. The controller outputs the desired PWM signal to the center broom balance solenoid to offset motor torque induced in the broom assembly.
The CB balance solenoid current box on the center broom overview screen will display the signal being routed to the center broom balance solenoid.
The CB balance offset percentage box displays the offset percentage routed to the balance solenoid.

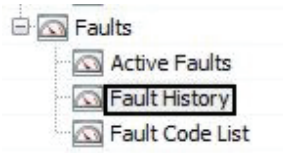


Hover Center Broom Balance
Transducer Fault Indicator

All preoperational conditions are met?

NO → Correct preoperational conditions and resume diagnostics.

YES



Faults Screen

Use the service tool center broom overview screen to ***check*** the center broom balance transducer fault indicator.
The SPN 9063 fault box will display a fault condition and the fault ID.
Place the cursor over the CB balance transducer fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the solenoid/transducer fault table for fault codes and values.
The SPN 9063 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

When the center broom is in operation the balance transducer senses broom operation and routes voltage from controller CM-C8 pin 45 to the center broom balance solenoid. The controller output is PWM voltage needed to open the balance solenoid. The solenoid allows hydraulic oil to flow to the left main broom cylinder retract side enough to balance center broom operation and prevent broom coning and damage.
The PWM voltage may be less than 12VDC. The actual voltage routed to balance solenoid can be viewed on the center broom overview screen using the center broom balance transducer box for voltage and the center broom balance solenoid current for amperage.

Continued

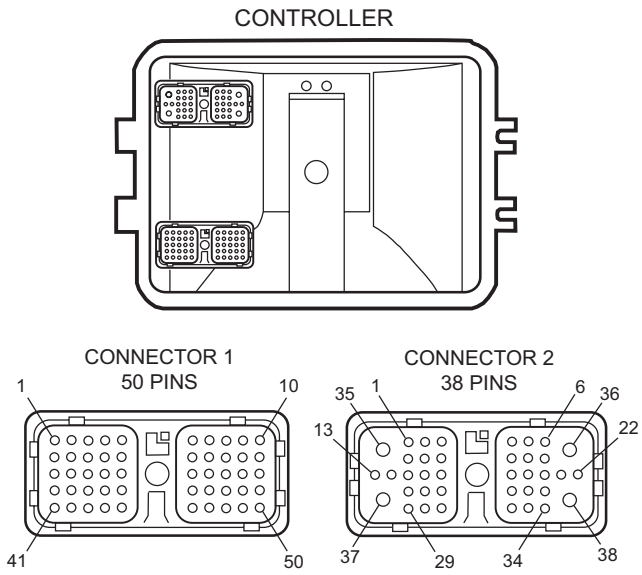
Count	Location	Type	First Time	Last Time
14	SPN_9443	Fault	EE_ErrH_First_0 554 Min	EE_ErrH_Last_0 14934 Min
8	SPN_9451	Fault	EE_ErrH_First_1 554 Min	EE_ErrH_Last_1 554 Min
255	SPN_9457	Fault	EE_ErrH_First_2 553 Min	EE_ErrH_Last_2 19976 Min
255	SPN_9411	Fault	EE_ErrH_First_3 556 Min	EE_ErrH_Last_3 14548 Min
11	SPN_9055	Open circuit	EE_ErrH_First_4 565 Min	EE_ErrH_Last_4 420 Min
2	SPN_9053	Open circuit	EE_ErrH_First_5 565 Min	EE_ErrH_Last_5 588 Min
255	SPN_9033	Fault	EE_ErrH_First_6 576 Min	EE_ErrH_Last_6 19885 Min
38	SPN_9481	Fault	EE_ErrH_First_7 576 Min	EE_ErrH_Last_7 8109 Min
31	SPN_9477	Fault	EE_ErrH_First_8 576 Min	EE_ErrH_Last_8 8109 Min
38	SPN_9475	Fault	EE_ErrH_First_9 576 Min	EE_ErrH_Last_9 8109 Min

Fault History Screen

When the center broom drive motor is rotating additional down pressure is applied to the left side of the center broom which can cause broom coning and damage. The balance transducer senses the hydraulic pressure applied to the drive motor for rotation and signals for pressure compensation from the left side broom lift circuit. The transducer is connected to the fused switched power circuit (12VDC) at the transducer connector CH-C18 pin A. The transducer is grounded at pin C.



Center Broom Balance Solenoid



Controller Pin Locator

Continued

When the transducer senses hydraulic pressure the internal potentiometer moves across a resistor creating an output voltage which is routed from pin B to controller CM-C18 pin 11. The voltage acts as a signal that the left center broom down pressure needs to compensate for center broom drive motor operation; the higher the pressure, the higher the voltage on the signal circuit.
A calculation is performed based on the transducer input and PWM voltage is routed from the controller to the balance solenoid causing the solenoid valve to open allowing hydraulic oil to flow to the retract side of the left center broom cylinder raising the lift cylinder slightly to compensate for drive motor operation.
NOTE: See the SPN 9061 center broom balance solenoid for solenoid description and diagnostics.



Center Broom
Balance Transducer

Check center broom balance transducer for secure or broken connector.
Check controller CM-C8 and CH-C18 for secure or broken connections.
Check harness connectors for secure or broken connections.
Check harness wiring of broken wires, damage causing ground to short or ground to power (voltage).

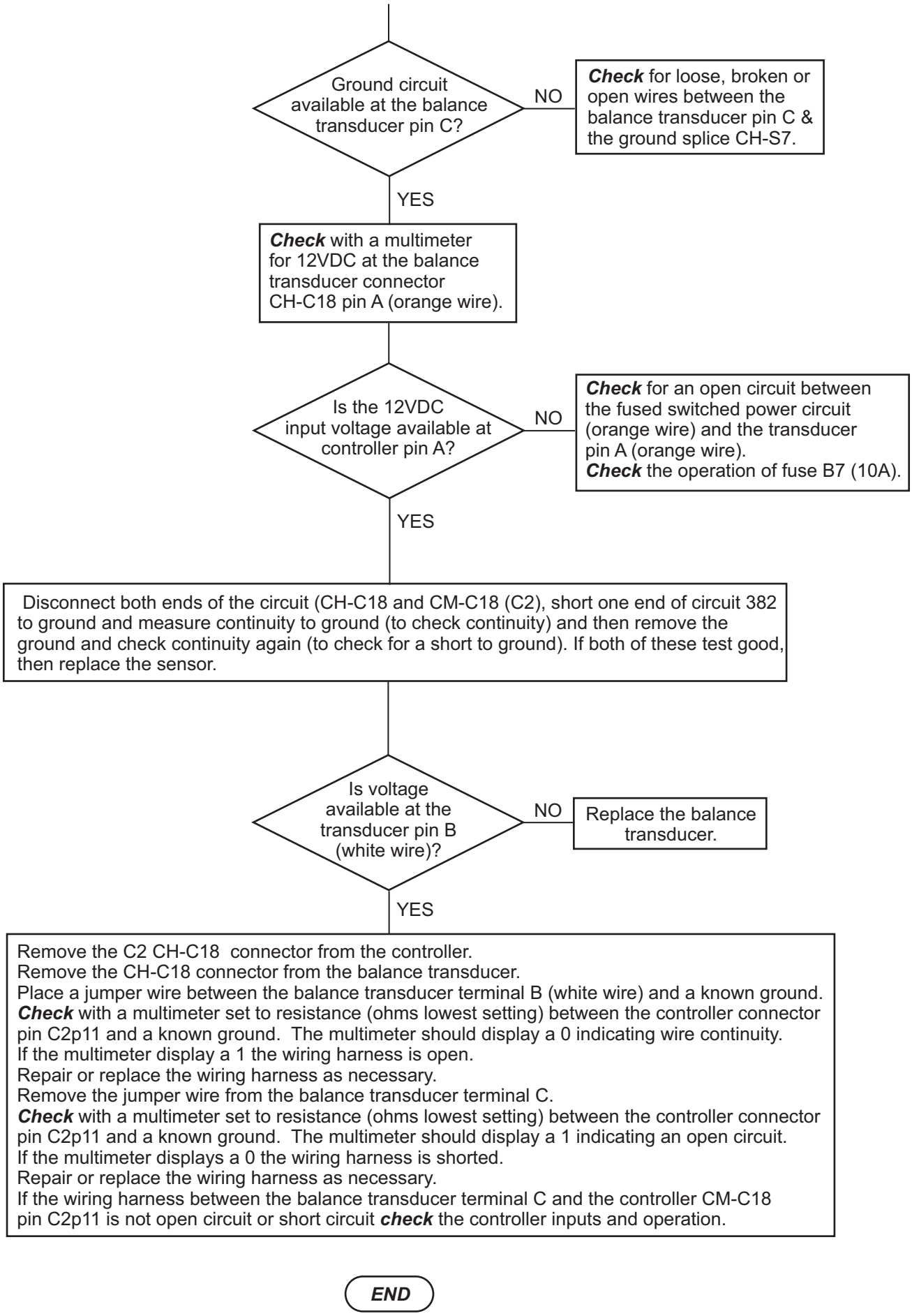
Loose, broken or damaged wires or connectors?

YES → Repair or replace loose or broken harness, terminal, wire or pin.

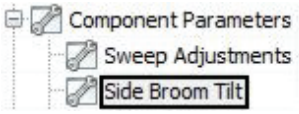
NO

Remove the connector CH-C18 from the balance transducer.
Check with a multimeter set to resistance (ohms lowest setting) between the connector terminal C (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
A 0 indicates a ground circuit.

Continued

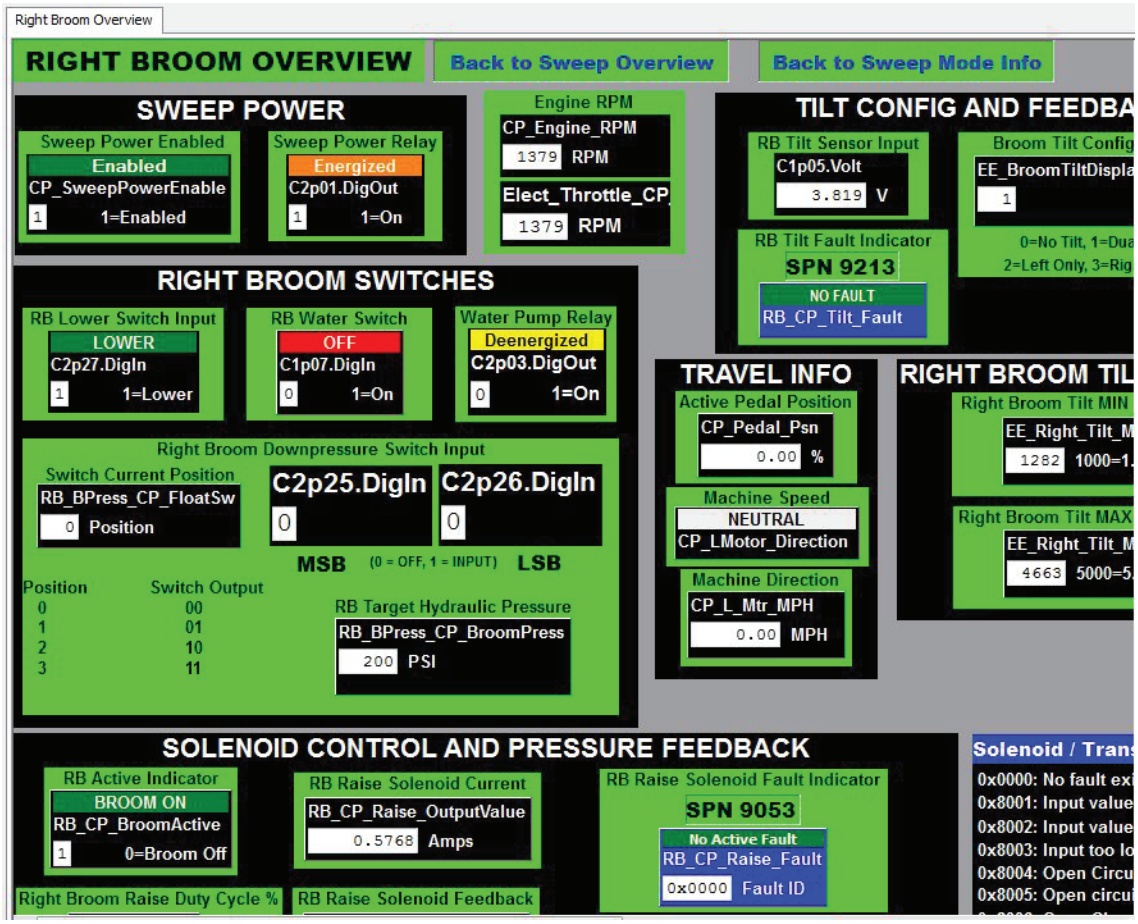

Ground circuit available at the balance transducer pin C?
NO
Check for loose, broken or open wires between the balance transducer pin C & the ground splice CH-S7.
YES
Check with a multimeter for 12VDC at the balance transducer connector CH-C18 pin A (orange wire).
Is the 12VDC input voltage available at controller pin A?
NO
Check for an open circuit between the fused switched power circuit (orange wire) and the transducer pin A (orange wire).
Check the operation of fuse B7 (10A).
YES
Disconnect both ends of the circuit (CH-C18 and CM-C18 (C2), short one end of circuit 382 to ground and measure continuity to ground (to check continuity) and then remove the ground and check continuity again (to check for a short to ground). If both of these test good, then replace the sensor.
Is voltage available at the transducer pin B (white wire)?
NO
Replace the balance transducer.
YES
Remove the C2 CH-C18 connector from the controller.
Remove the CH-C18 connector from the balance transducer.
Place a jumper wire between the balance transducer terminal B (white wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C2p11 and a known ground. The multimeter should display a 0 indicating wire continuity.
If the multimeter display a 1 the wiring harness is open.
Repair or replace the wiring harness as necessary.
Remove the jumper wire from the balance transducer terminal C.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C2p11 and a known ground. The multimeter should display a 1 indicating an open circuit.
If the multimeter displays a 0 the wiring harness is shorted.
Repair or replace the wiring harness as necessary.
If the wiring harness between the balance transducer terminal C and the controller CM-C18 pin C2p11 is not open circuit or short circuit check the controller inputs and operation.
END

SPN 9213
Right Tilt Sensor



Parameters Navigator Box

The 9213 error code indicates the right broom tilt sensor voltage is out of range. The voltages can be adjusted using service tool Side Broom Tilt screen. The screen is located underneath Parameter Pages and Component Parameters in the system navigator listings. The minimum and maximum voltages can be viewed on the right broom overview screen and Right Broom Tilt Settings log. If the tilt sensor senses voltage approximately four percent higher or lower than the set voltages the error will be generated.
NOTE: *Any time a tilt actuator, equipped with a tilt sensor, is replaced the tilt angle sensor must be calibrated in the system using the Side Broom Tilt parameter page. The complete instructions are included on that page.*



Right Broom Overview Screen

The right tilt sensor sends a signal to the controller CM-C8 pin 5 indicating right broom tilted position. The service tool right broom tilt volts box located below component parameters and side broom tilt displays the voltage being routed from the right broom tilt sensor to the controller pin C1p05. The fault generated by error code 9213 is associated with the potentiometer feedback in the tilt actuator.

The right broom tilt linear actuator is controlled using the right broom tilt switch pins 2 and 5. When the switch is held in the DOWN position 12VDC is routed from switch terminal 5 and 6 to the linear actuator connector RF-C16 pin B. At the same time a ground is routed from switch terminals 2 and 3 to the linear actuator connector RF-C16 pin A. The linear actuator rotates down tilting the right side broom.

When the switch is held in the UP position 12VDC is routed from switch terminals 1 and 2 to the linear actuator connector RFC16 pin A. At the same time a ground is routed from switch terminals 4 and 5 to the linear actuator connector RF-C16 pin B. The linear actuator rotates up tilting the right side broom.

Continued

Continued

Side Broom Tilt

Side Broom Tilt

Back to Component Parameters

NOTE: If the side broom tilt settings are not properly set, the angle displayed in the Actia gauge will be inaccurate. Erroneous tilt sensor fault codes may also set.

Tilt Adjustments

Broom Tilt Display

Download

EE_BroomTiltDisplayPresent

0

0 - No tilt sensors or tilt not being displayed
1 - Both left and right broom tilt displayed.
2 - Left broom tilt displayed.
3 - Right broom tilt displayed.

Tilt Display Current Setting

EE_BroomTiltDisplayPresent

1

Left Side Broom Settings:

--Start the sweeper engine and place sweep/transport switch in the SWEEP position.
--Place left side broom in the ON position.

LEFT BROOM TILT

Left Broom Tilt Volts

C1p22.Volt

0.000 V

Left Broom Tilt/Fault Status

STATUS NORMAL

LB_CP_Tilt_Status

0x0000 Status ID

FAULT ACTIVE

LB_CP_Tilt_Fault

0x1 0x1=Fault Active

Set Left Tilt Minimum Volts:

--Push the left side broom tilt switch to the RIGHT until the tilt actuator ratchets (indicating the actuator rod is fully extended and the potentiometer voltage will be at its LOWEST reading).
--Subtract 0.05 volts from the value displayed in the Left Broom Tilt Volts and enter that value in the Left Broom Tilt MIN Volts gray parameter box below.

Set Left Tilt Maximum Volt

--Push the left side broom tilt switch to the LEFT until the tilt actuator ratchets (indicating the actuator rod is fully retracted and the potentiometer voltage will be at its HIGHEST reading).
--Add 0.05 volts to the value displayed in the Left Broom Tilt Volts and enter that value in the Left Broom Tilt MAX Volts gray parameter box below.
--Ensure there is a checkmark in BOTH Download boxes and press the F4 key to download the new values to the ECU.
--Turn the left broom to the off position.

Right Side Broom Settings:

--Start the sweeper engine and place sweep/transport switch in the SWEEP position.
--Place right side broom in the ON position.

RIGHT BROOM TILT

Right Broom Tilt Volts

C1p05.Volt

0.000 V

Right Broom Tilt/Fault Status

STATUS NORMAL

RB_CP_Tilt_Status

0x0000 Status ID

FAULT ACTIVE

RB_CP_Tilt_Fault

0x1 0x1=Fault Active

Set Right Tilt Minimum Volts:

--Push the right side broom tilt switch to the LEFT until the tilt actuator ratchets (indicating the actuator rod is fully extended and the potentiometer voltage will be at its LOWEST reading).
--Subtract 0.05 volts from the value displayed in the Right Broom Tilt Volts and enter that value in the Right Broom Tilt MIN Volts gray parameter box below.

Set Right Tilt Maximum Volts:

--Push the right side broom tilt switch to the RIGHT until the tilt actuator ratchets (indicating the actuator rod is fully retracted and the potentiometer voltage will be at its HIGHEST reading).
--Add 0.05 volts to the value displayed in the Right Broom Tilt Volts and enter that value in the Right Broom Tilt MAX Volts gray parameter box below.
--Ensure there is a checkmark in BOTH Download boxes and press the F4 key to download the new values to the ECU.
--Turn the right broom to the off position.

Status Indicator Table:

0x0000: Status normal
0x8001 -Block is not calibrated.
0x8002 -Block is partially calibrated.
0x8004 -Parameters are corrupted.
0x8008 -Invalid parameters.

Fault Indicator Table (3 digit):

0x0: No Fault Exists
0x1: Fault Exists



--After entering all 4 settings below and pressing F4, be sure to turn the ignition switch off to save the new parameter settings.

LEFT BROOM TILT SETTINGS

Left Broom Tilt MIN Volts Setting

Download

EE_Left_Tilt_Min_mV

1000 1000=1.000v

Current Setting

EE_Left_Tilt_Min_mV

0.293

Left Broom Tilt MAX Volts Setting

Download

EE_Left_Tilt_Max_mV

5000 5000=5.000v

Current Setting

EE_Left_Tilt_Max_mV

3.683

5v Supply Volts

C1p08.Volt

4.993 V

RIGHT BROOM TILT SETTINGS

Right Broom Tilt MIN Volts Setting

Download

EE_Right_Tilt_Min_mV

1000 1000=1.000v

Current Setting

EE_Right_Tilt_Min_mV

1.145

Right Broom Tilt MAX Volts Setting

Download

EE_Right_Tilt_Max_mV

5000 5000=5.000v

Current Setting

EE_Right_Tilt_Max_mV

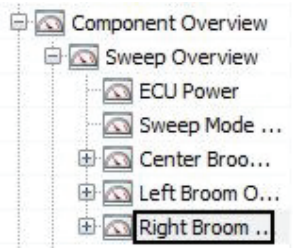
4.490

Connected CG150-2 #0 (Channel 0) 250k

Side Broom Tilt Screen



Right Broom Tilt Volts



Navigator Box

The tilt sensor power (5VDC) is routed from the 5V sensor power circuit (controller CM-C8 pin 8) to the sensor connector RF-C15 pin C.
The 5V SupplyVolts C1p08.Volt on the service tool side broom tilt screen displays the voltage being routed from the controller pin C1p08 to the right broom tilt sensor pin C. The sensor is grounded at pin A.

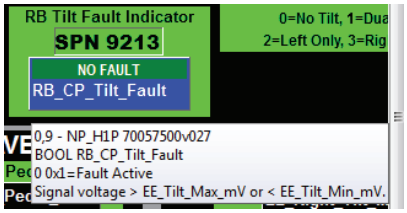
The sensor is a potentiometer that moves the third leg across an internal resistor as the linear actuator moves up or down.
The output of the potentiometer is connected to connector RF-C15 pin B.
The resistance value of the 5VDC input voltage is routed from pin B to the controller CM-C8 pin 5 as a signal indicating tilt position.

The tilt linear actuator indicates less than 7 degrees with the actuator fully retracted. If the actuator shaft has been rotated free of the side broom, the actuator feedback will not indicate less than 7 degrees and will generate an error code.

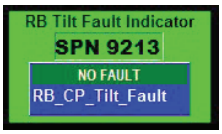
Adjust the actuator by removing the pin from the end of the shaft and rotate the shaft to a fully retracted position. The tilt switch can also be used to retract the shaft after the pin is removed. After adjustment, install the pin in the actuator shaft.



5V Supply Volts



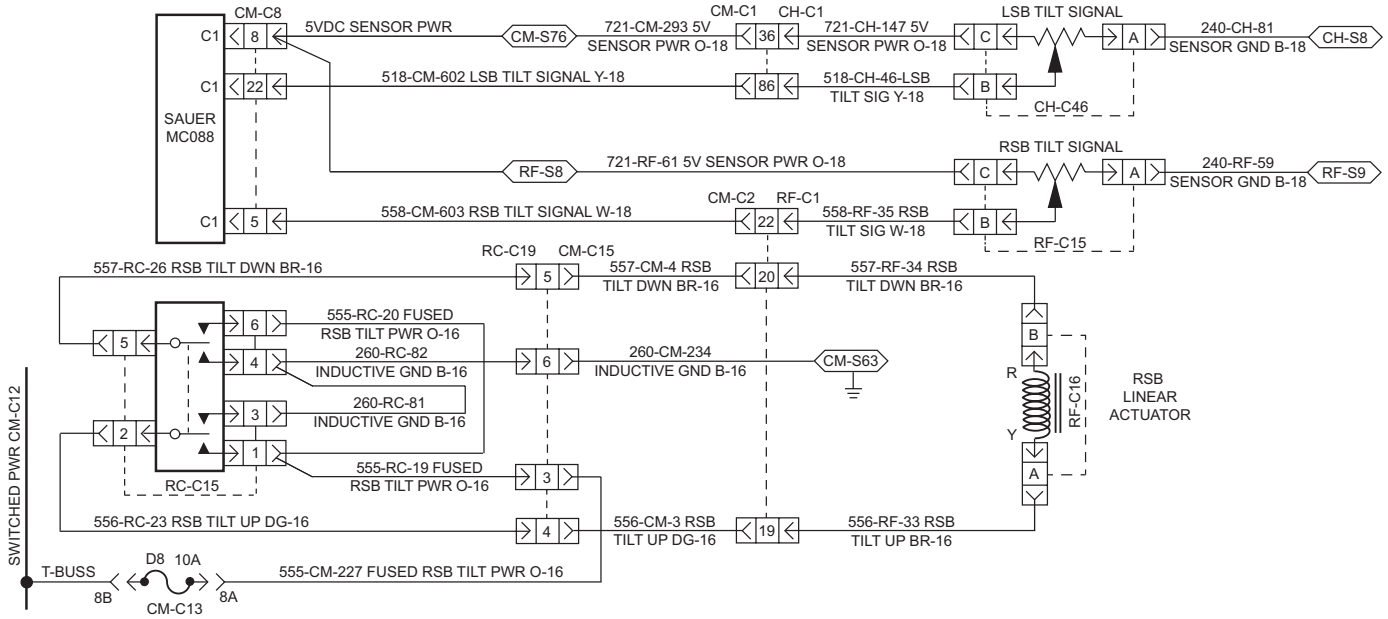
Hover RB Tilt Fault Indicator



Right Broom
Tilt Fault Indicator



Faults Screen

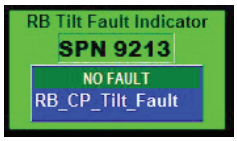


Right Tilt Sensor Circuit

Continued

START

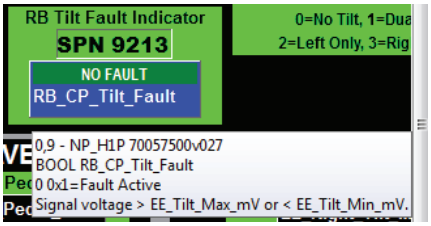
Use the service tool right broom overview screen to check the right broom tilt fault indicator.
The SPN 9213 fault box will display a fault condition and the fault ID.
Place the cursor over the SPN 9213 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the solenoid/transducer fault table for fault codes and values.
The SPN 9213 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.



Right Broom
Tilt Fault Indicator



Faults Screen

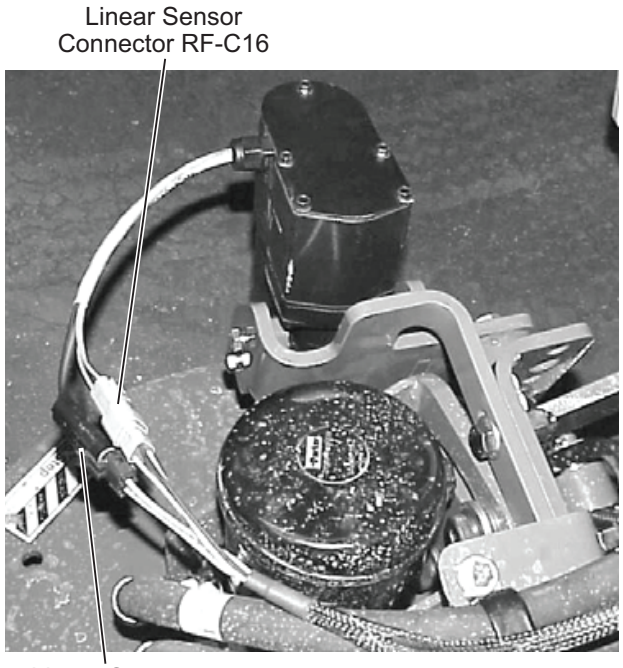


Hover RB Tilt Fault Indicator

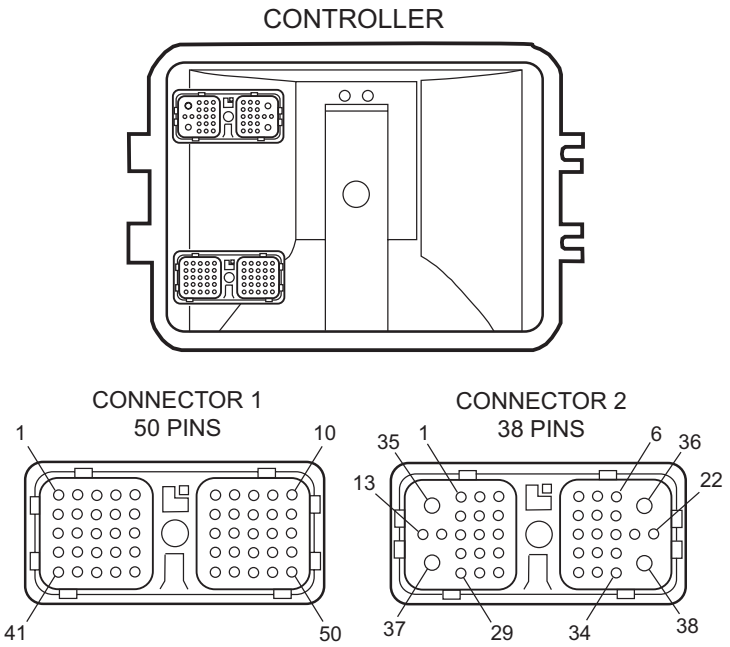
Count	Location	Type	First Time	Last Time
14	SPN_9443	Fault	EE_ErrH_First_0 554 Min	EE_ErrH_Last_0 14934 Min
8	SPN_9451	Fault	EE_ErrH_First_1 554 Min	EE_ErrH_Last_1 554 Min
255	SPN_9457	Fault	EE_ErrH_First_2 553 Min	EE_ErrH_Last_2 19976 Min
255	SPN_9411	Fault	EE_ErrH_First_3 556 Min	EE_ErrH_Last_3 14548 Min
11	SPN_9055	Open circuit	EE_ErrH_First_4 565 Min	EE_ErrH_Last_4 420 Min
2	SPN_9053	Open circuit	EE_ErrH_First_5 565 Min	EE_ErrH_Last_5 588 Min
255	SPN_9033	Fault	EE_ErrH_First_6 576 Min	EE_ErrH_Last_6 19885 Min
38	SPN_9481	Fault	EE_ErrH_First_7 576 Min	EE_ErrH_Last_7 8109 Min
31	SPN_9477	Fault	EE_ErrH_First_8 576 Min	EE_ErrH_Last_8 8109 Min
38	SPN_9475	Fault	EE_ErrH_First_9 576 Min	EE_ErrH_Last_9 8109 Min

Fault History

Continued



Right Broom Tilt Sensor



Controller Pin Locator

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the right broom connector for secure or broken connector.
Check the right broom tilt switch for secure or broken connector.
Check harness connectors CM-C8 & RF-C15 for secure or broken connector.

Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin.

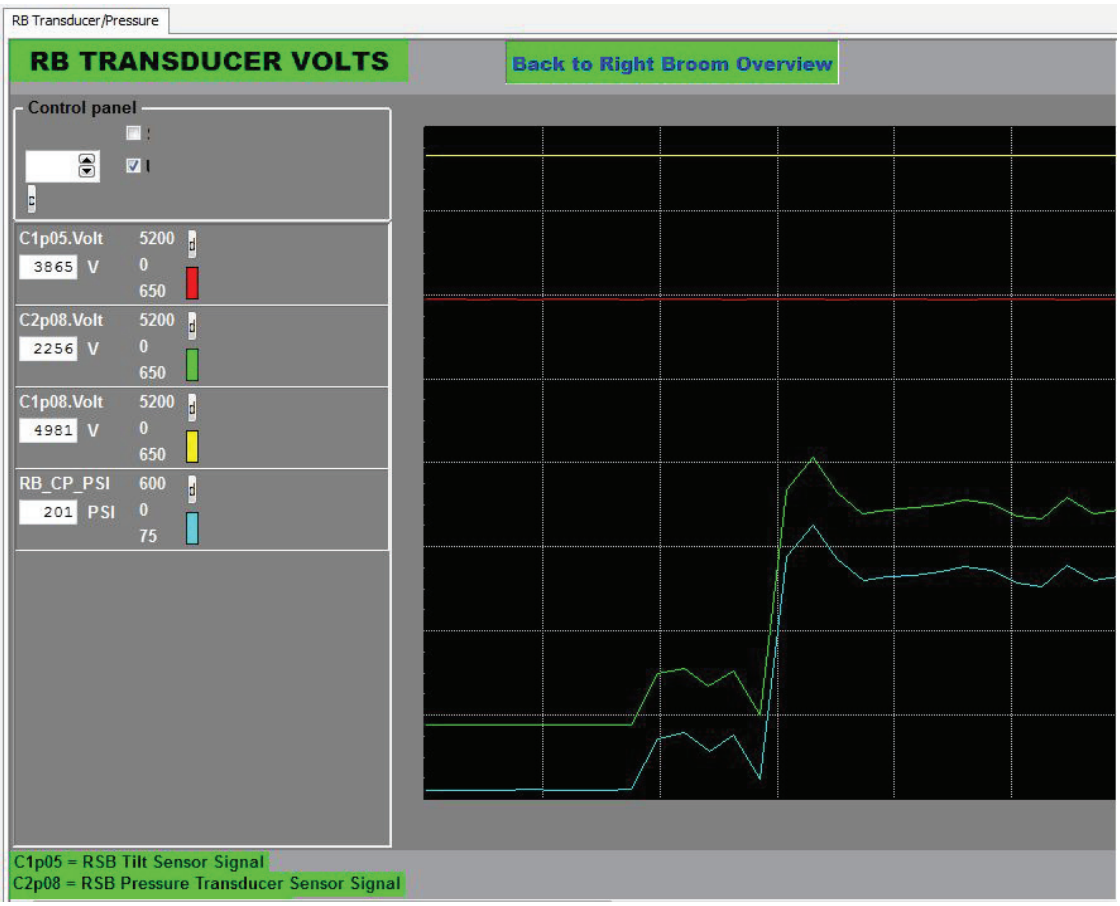
NO

Check the service tool log functions:
Component Overview > Sweep Overview > Right Broom Overview for right broom tilt sensor input C1p05.Volt. While actuating the righr broom tilt the RB tilt sensor input should display the sensor input voltage from pin B to the controller pin C1p05.
The display indicates the 5V sensor supply has been routed from the controller pin C1p08 to the sensor (circuit not open or shorted to ground), the sensor is grounded at pin A and the sensor is routing output voltage to the controller pin C1p05 (circuit not open or shorted to ground.

Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems.
The right broom tilt sensor voltages can be monitored using the oscilloscope on the service tool right broom overview > RB transducer / pressure screen.
The screen allows the operator to view the right broom tilt sensor C1p05 input signal the tilt sensor input supply voltage C1p08 during tilt operations.

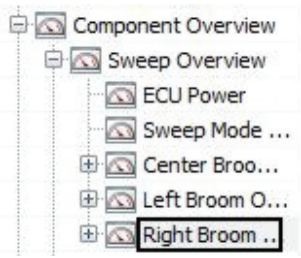
Continued

Check with a multimeter for 5VDC
at the right broom tilt sensor RF-C15 pin C.



Right Broom Transducer Volts

Remove the connector RF-C15 from the right broom sensor. While watching the service tool right broom overview screen, RB tilt sensor input (C1p05) place a jumper wire between the connector RF-C15 pin C cavity and pin B cavity. The RB tilt sensor input (C1p05) should display approximately 5VDC.



Navigator Box

Does the RB tilt sensor input box display approximately 5VDC?

YES

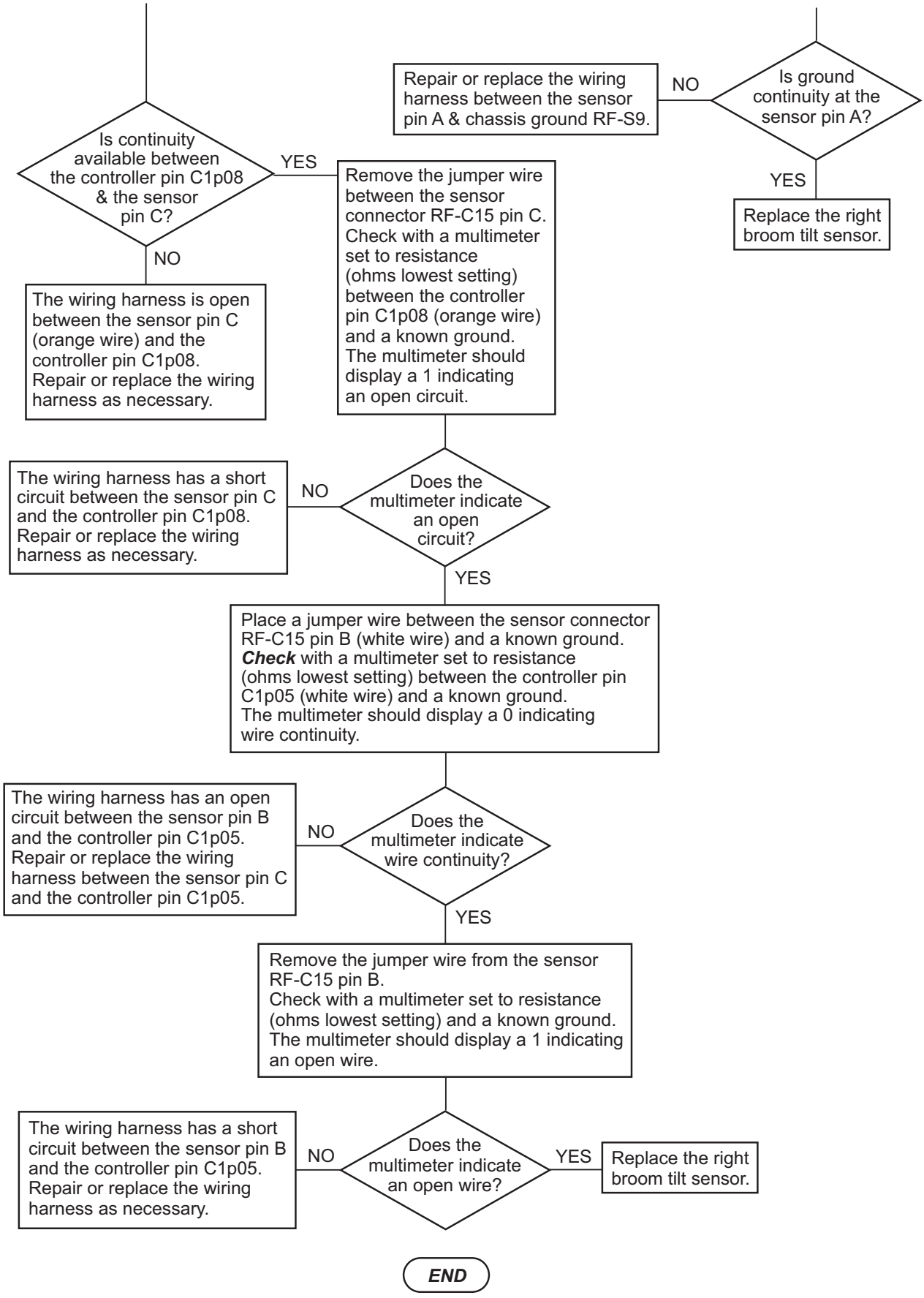
The sensor supply voltage has been routed to the sensor from the controller pin C1p08 and is not open or shorted to ground.
The sensor output voltage has been routed from the sensor to the controller pin C1p05 and is not open or shorted to ground.
Check with a multimeter set to resistance (ohms lowest setting) between the connector pin A cavity and a known ground. The multimeter should display a 0 indicating ground continuity.

Continued

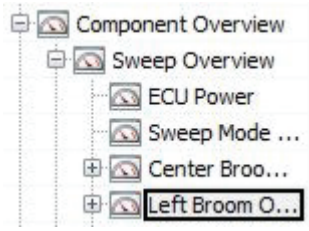
NO

Remove the C1 50 pin connector from the controller. Place a jumper wire between the connector RF-C15 pin C (orange wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 (orange wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

Continued


Is ground continuity at the sensor pin A?
NO
Repair or replace the wiring harness between the sensor pin A & chassis ground RF-S9.
YES
Replace the right broom tilt sensor.
Is continuity available between the controller pin C1p08 & the sensor pin C?
YES
Remove the jumper wire between the sensor connector RF-C15 pin C. Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p08 (orange wire) and a known ground. The multimeter should display a 1 indicating an open circuit.
NO
The wiring harness is open between the sensor pin C (orange wire) and the controller pin C1p08. Repair or replace the wiring harness as necessary.
Does the multimeter indicate an open circuit?
NO
The wiring harness has a short circuit between the sensor pin C and the controller pin C1p08. Repair or replace the wiring harness as necessary.
YES
Place a jumper wire between the sensor connector RF-C15 pin B (white wire) and a known ground. ***Check*** with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p05 (white wire) and a known ground. The multimeter should display a 0 indicating wire continuity.
Does the multimeter indicate wire continuity?
NO
The wiring harness has an open circuit between the sensor pin B and the controller pin C1p05. Repair or replace the wiring harness between the sensor pin C and the controller pin C1p05.
YES
Remove the jumper wire from the sensor RF-C15 pin B. Check with a multimeter set to resistance (ohms lowest setting) and a known ground. The multimeter should display a 1 indicating an open wire.
Does the multimeter indicate an open wire?
NO
The wiring harness has a short circuit between the sensor pin B and the controller pin C1p05. Repair or replace the wiring harness as necessary.
YES
Replace the right broom tilt sensor.
END

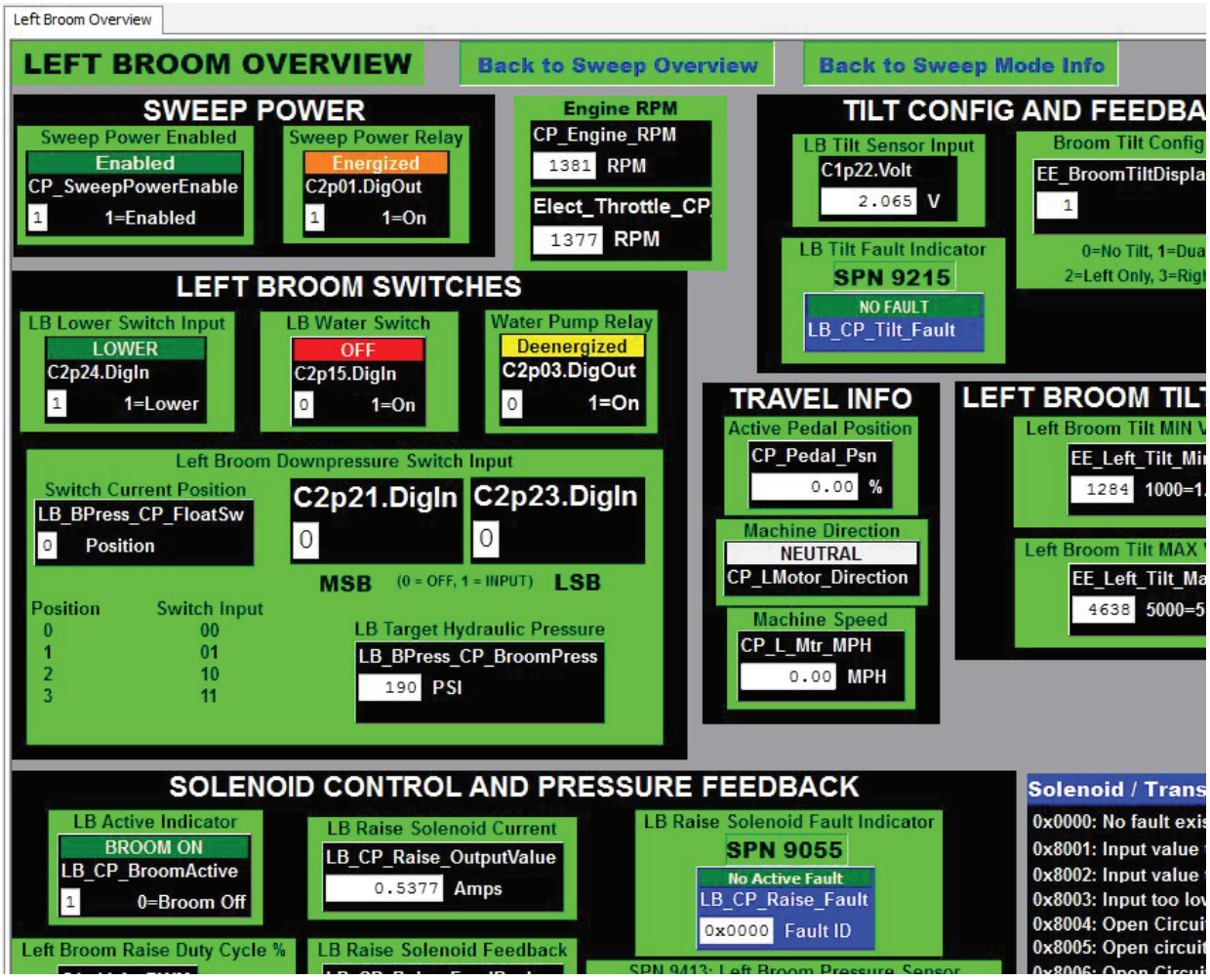
SPN 9215
Left Tilt Sensor



Navigator Box

The 9215 error code indicates the left broom tilt sensor voltage is out of range.
The voltages can be adjusted using service tool Side Broom Tilt screen.
The screen is located underneath Parameter Pages & Component Parameters in the system navigator listings.
The minimum and maximum voltages can be viewed on the left broom overview screen and Left Broom Tilt Settings log.
If the tilt sensor senses voltage approximately four percent higher or lower than the set voltages the error will be generated.

Note: Any time a tilt actuator, equipped with a tilt sensor, is replaced the tilt angle sensor must be calibrated in the system using the Side Broom Tilt parameter page. The complete instructions are included on that page.



Left Broom Overview Screen

Continued

Continued

Side Broom Tilt

Side Broom Tilt

Back to Component Parameters

NOTE: If the side broom tilt settings are not properly set, the angle displayed in the Actia gauge will be inaccurate. Erroneous tilt sensor fault codes may also set.

Tilt Adjustments

Broom Tilt Display

Download

EE_BroomTiltDisplayPresent

0

0 - No tilt sensors or tilt not being displayed
1 - Both left and right broom tilt displayed.
2 - Left broom tilt displayed.
3 - Right broom tilt displayed.

Tilt Display Current Setting

EE_BroomTiltDisplayPresent

1

Left Side Broom Settings:

--Start the sweeper engine and place sweep/transport switch in the SWEEP position.
--Place left side broom in the ON position.

LEFT BROOM TILT

Left Broom Tilt Volts

C1p22.Volt

0.000 V

Left Broom Tilt/Fault Status

STATUS NORMAL

LB_CP_Tilt_Status

0x0000 Status ID

FAULT ACTIVE

LB_CP_Tilt_Fault

0x1 0x1=Fault Active

Set Left Tilt Minimum Volts:

--Push the left side broom tilt switch to the RIGHT until the tilt actuator ratchets (indicating the actuator rod is fully extended and the potentiometer voltage will be at its LOWEST reading).
--Subtract 0.05 volts from the value displayed in the Left Broom Tilt Volts and enter that value in the Left Broom Tilt MIN Volts gray parameter box below.

Set Left Tilt Maximum Volt

--Push the left side broom tilt switch to the LEFT until the tilt actuator ratchets (indicating the actuator rod is fully retracted and the potentiometer voltage will be at its HIGHEST reading).
--Add 0.05 volts to the value displayed in the Left Broom Tilt Volts and enter that value in the Left Broom Tilt MAX Volts gray parameter box below.
--Ensure there is a checkmark in BOTH Download boxes and press the F4 key to download the new values to the ECU.
--Turn the left broom to the off position.

Right Side Broom Settings:

--Start the sweeper engine and place sweep/transport switch in the SWEEP position.
--Place right side broom in the ON position.

RIGHT BROOM TILT

Right Broom Tilt Volts

C1p05.Volt

0.000 V

Right Broom Tilt/Fault Status

STATUS NORMAL

RB_CP_Tilt_Status

0x0000 Status ID

FAULT ACTIVE

RB_CP_Tilt_Fault

0x1 0x1=Fault Active

Set Right Tilt Minimum Volts:

--Push the right side broom tilt switch to the LEFT until the tilt actuator ratchets (indicating the actuator rod is fully extended and the potentiometer voltage will be at its LOWEST reading).
--Subtract 0.05 volts from the value displayed in the Right Broom Tilt Volts and enter that value in the Right Broom Tilt MIN Volts gray parameter box below.

Set Right Tilt Maximum Volts:

--Push the right side broom tilt switch to the RIGHT until the tilt actuator ratchets (indicating the actuator rod is fully retracted and the potentiometer voltage will be at its HIGHEST reading).
--Add 0.05 volts to the value displayed in the Right Broom Tilt Volts and enter that value in the Right Broom Tilt MAX Volts gray parameter box below.
--Ensure there is a checkmark in BOTH Download boxes and press the F4 key to download the new values to the ECU.
--Turn the right broom to the off position.

Status Indicator Table:

0x0000: Status normal
0x8001 -Block is not calibrated.
0x8002 -Block is partially calibrated.
0x8004 -Parameters are corrupted.
0x8008 -Invalid parameters.

Fault Indicator Table (3 digit):

0x0: No Fault Exists
0x1: Fault Exists



--After entering all 4 settings below and pressing F4, be sure to turn the ignition switch off to save the new parameter settings.

LEFT BROOM TILT SETTINGS

Left Broom Tilt MIN Volts Setting

Download

EE_Left_Tilt_Min_mV

1000 1000=1.000v

Current Setting

EE_Left_Tilt_Min_mV

0.293

Left Broom Tilt MAX Volts Setting

Download

EE_Left_Tilt_Max_mV

5000 5000=5.000v

Current Setting

EE_Left_Tilt_Max_mV

3.683

5v Supply Volts

C1p08.Volt

4.993 V

RIGHT BROOM TILT SETTINGS

Right Broom Tilt MIN Volts Setting

Download

EE_Right_Tilt_Min_mV

1000 1000=1.000v

Current Setting

EE_Right_Tilt_Min_mV

1.145

Right Broom Tilt MAX Volts Setting

Download

EE_Right_Tilt_Max_mV

5000 5000=5.000v

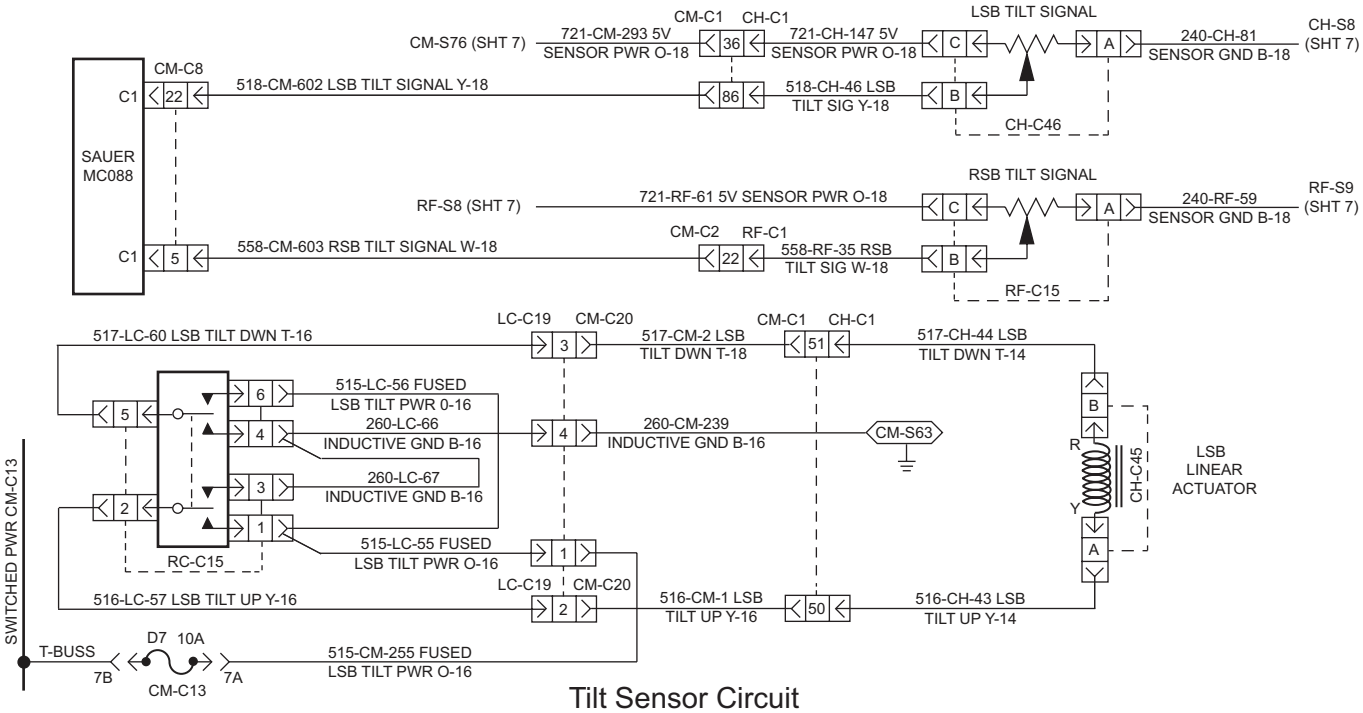
Current Setting

EE_Right_Tilt_Max_mV

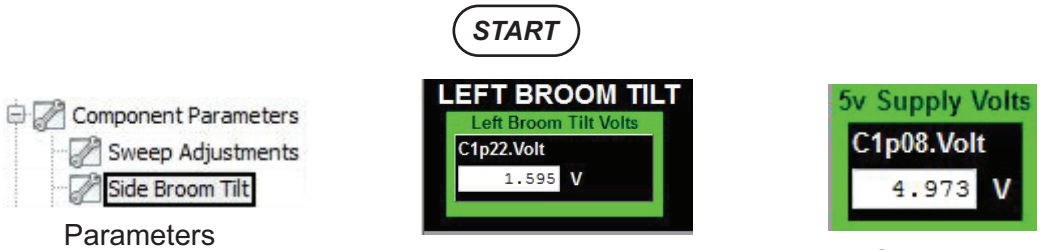
4.490

Connected CG150-2 #0 (Channel 0) 250k

Side Broom Tilt Screen



Tilt Sensor Circuit



Parameters Navigator Box

Left Broom Tilt Volts

5V Supply Volts

The left tilt sensor sends a signal to the controller CM-C8 pin 22 indicating left broom tilted position. The service tool left broom tilt volts box located below component parameters and side side broom tilt displays the voltage being routed from the left broom tilt sensor to the controller pin C1022. The fault generated by error code 9215 is associated with the potentiometer feedback in the tilt actuator.

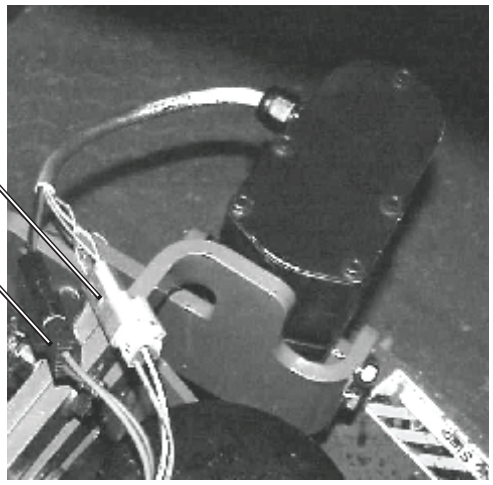
The left broom tilt linear actuator is controlled using the left broom tilt switch pins 2 and 5. When the switch is held in the DOWN position 12VDC is routed from switch terminal 5 and 6 to the linear actuator connector CH-C45 pin B. At the same time a ground is routed from switch terminals 2 & 3 to the linear actuator connector CH-C45 pin A. The linear actuator rotates down tilting the right side broom.

When the switch is held in the UP position 12VDC is routed from switch terminals 1 and 2 to the linear actuator connector CH-C45 pin A. At the same time a ground is routed from switch terminals 4 and 5 to the linear actuator connector CH-C45 pin B. The linear actuator rotates up tilting the right side broom.

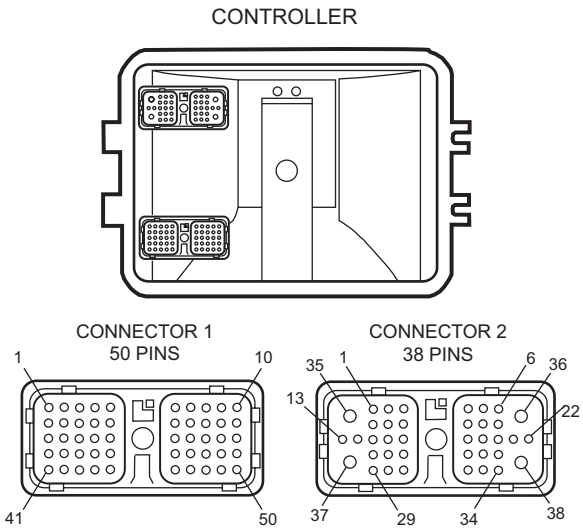
The tilt sensor power (5VDC) is routed from the 5V sensor power circuit (controller CM-C8 pin 8) to the sensor connector CH-C46 pin C. The 5V Supply Volts C1p08.Volt box on the service tool side broom tilt screen displays the voltage being routed from the controller pin C1p08 to the left broom tilt sensor pin C. The sensor is grounded at pin A. The sensor is a potentiometer that moves the third leg across an internal resistor as the linear actuator moves up or down.
The output of the potentiometer is connected to connector CH-C46 pin B. The resistance value of the 5VDC input voltage is routed from pin B to the controller CM-C8 pin 22 as a signal indicating tilt position.

The tilt linear actuator indicates less than 7 degrees with the actuator fully retracted.
If the actuator shaft has been rotated free of the side broom, the actuator feedback will not indicate less than 7 degrees and will generate an error code. Adjust the actuator by removing the pin from the end of the shaft and rotate the shaft to a fully retracted position. The tilt switch can also be used to retract the shaft after the pin is removed. After adjustment, install the pin in the actuator shaft.

Continued

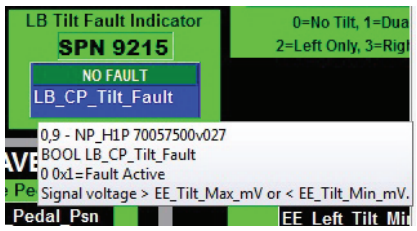


Left Broom Tilt Sensor

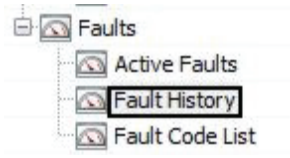


Controller Pin Locator

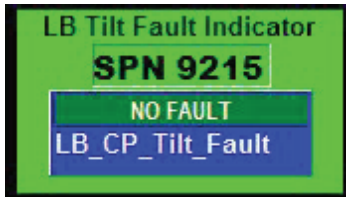
Use the service tool left broom overview screen to ***check*** the left broom tilt fault indicator.
The SPN 9215 fault box will display a fault condition and the fault ID.
Place the cursor over the SPN 9215 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the solenoid/transducer fault table for fault codes and values.
The SPN 9215 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.



Hover LB Tilt Fault Indicator



Faults Screen

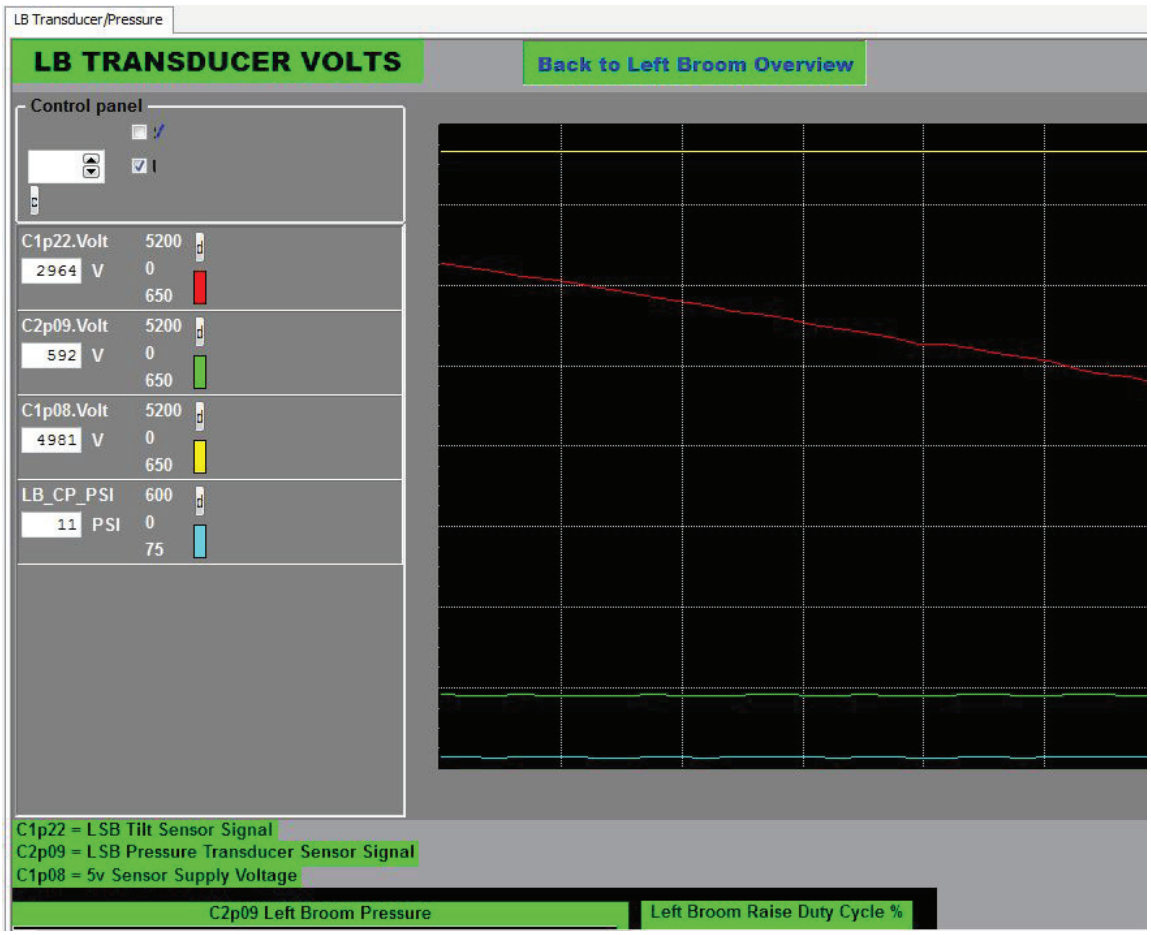


Left Broom Tilt Fault Indicator

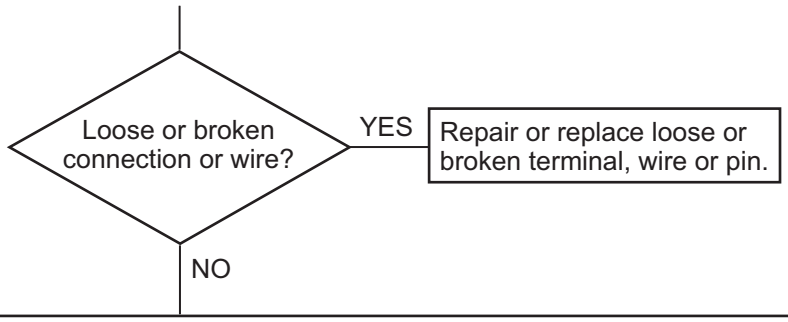
Count	Location	Type	First Time	Last Time
14	SPN_9443	Fault	EE_ErrH_First_0 554 Min	EE_ErrH_Last_0 14934 Min
8	SPN_9451	Fault	EE_ErrH_First_1 554 Min	EE_ErrH_Last_1 554 Min
255	SPN_9457	Fault	EE_ErrH_First_2 553 Min	EE_ErrH_Last_2 19976 Min
255	SPN_9411	Fault	EE_ErrH_First_3 556 Min	EE_ErrH_Last_3 14548 Min
11	SPN_9055	Open circuit	EE_ErrH_First_4 565 Min	EE_ErrH_Last_4 420 Min
2	SPN_9053	Open circuit	EE_ErrH_First_5 565 Min	EE_ErrH_Last_5 588 Min
255	SPN_9033	Fault	EE_ErrH_First_6 576 Min	EE_ErrH_Last_6 19885 Min
38	SPN_9481	Fault	EE_ErrH_First_7 576 Min	EE_ErrH_Last_7 8109 Min
31	SPN_9477	Fault	EE_ErrH_First_8 576 Min	EE_ErrH_Last_8 8109 Min
38	SPN_9475	Fault	EE_ErrH_First_9 576 Min	EE_ErrH_Last_9 8109 Min

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the left broom connector for secure or broken connector.
Check the left broom tilt switch for secure or broken connector.
Check harness connectors CM-C8 & CH-C46 for secure or broken connector.

Continued



Left Broom Transducer Volts

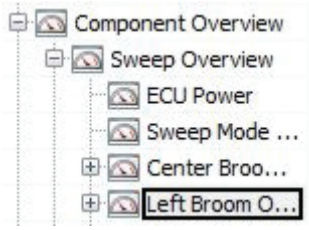


Check the service tool log functions:
Component Overview > Sweep Overview > Right Broom Overview left tilt sensor input C1-p22.Volts. While actuating the left broom tilt the LB tilt sensor input should display the sensor input voltage from pin B to the controller pin C1p22. The display indicates the 5V sensor supply has been routed from the controller pin C1p08 to the sensor (circuit not open or shorted to ground), the sensor is grounded at pin A and the sensor is routing output voltage to the controller pin C1p22, (circuit not open or shorted to ground).

The left broom tilt sensor voltages can be monitored using the oscilloscope on the service tool right broom overview>LB transducer/pressure screen.
The screen allows the operator to view the left broom tilt sensor C1p22 input signal and the tilt sensor input supply voltage C1p08 during tilt operations.

Continued

Check with a multimeter equipped with back probe adapters for 5VDC at the left broom tilt sensor RF-C15 connector pin C.



Navigator Box

Remove the connector CH-C46 from the left broom sensor.
While watching the service tool left broom overview screen, LB tilt sensor input (C1p22) place a jumper wire between the connector CH-C46 pin C cavity & pin B cavity. The LB tilt sensor input (C1p22) should display approximately 5VDC.

Does the Left Broom tilt sensor input box display approximately 5VDC?

NO

Remove the C1 50 pin connector from the controller.
Place a jumper wire between the connector CH-C46 pin C (orange wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 (orange wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

Is continuity available between controller pin C1p08 & the sensor pin C?

NO

The wiring harness is open between the sensor pin C (orange wire) and the controller pin C1p08.
Repair or replace the wiring harness as necessary

YES

Remove the jumper wire from the sensor connector CH-C46 pin C.
Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p08 (orange wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.

Does the multimeter indicate an open circuit?

NO

The wiring harness has a short circuit between the sensor pin C and the controller pin C1p08.
Repair or replace the wiring harness as necessary.

YES

Place a jumper wire between the sensor connector CH-C46 pin B (white wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller pin C1p22 (white wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

YES

The sensor supply voltage has been routed to the sensor from the controller pin C1p08 and is not open or shorted to ground.
The sensor output voltage has been routed from the sensor to the controller pin C1p22 and is not open or shorted to ground.
Check with a multimeter set to resistance (ohms lowest setting) between the connector pin A cavity and a known ground.
The multimeter should display a 0 indicating ground continuity.

Is ground continuity at the sensor pin A?

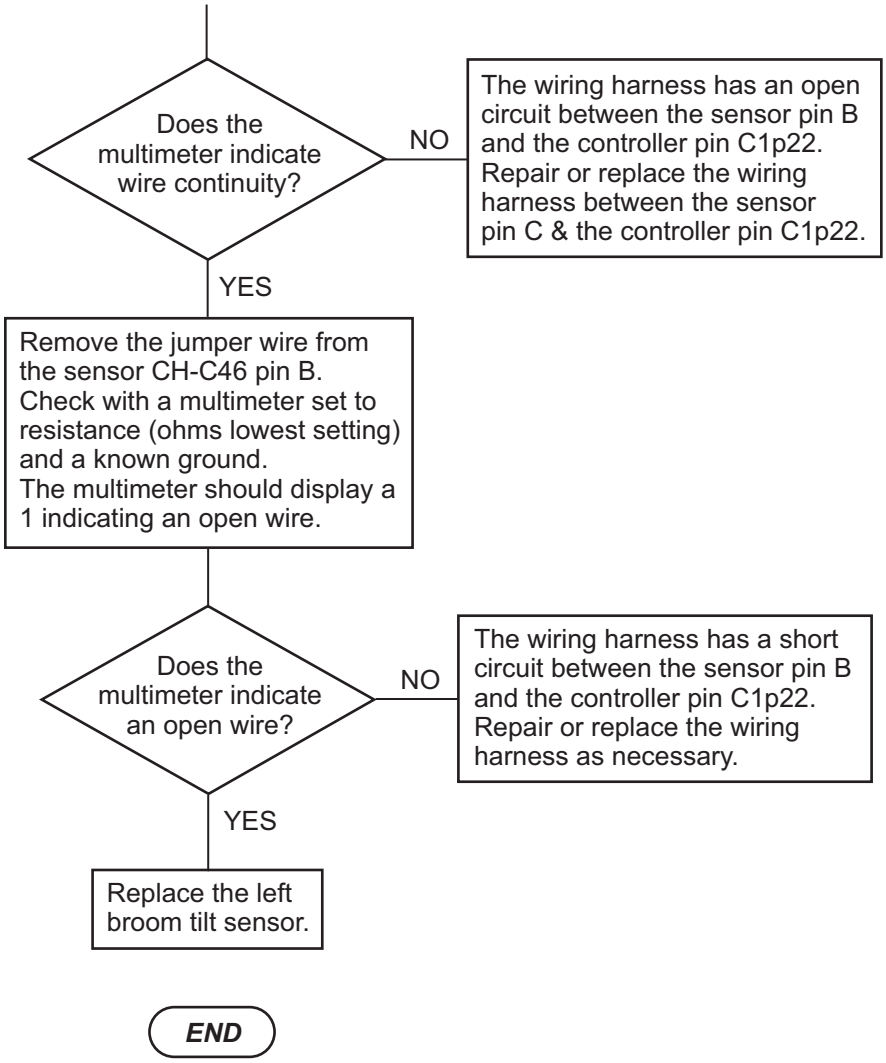
YES

Replace the left broom tilt sensor.

NO

Repair or replace the wiring harness between the sensor pin A & chassis ground RF-S8.

Continued

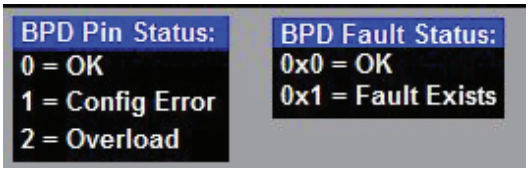

Does the multimeter indicate wire continuity?
NO
The wiring harness has an open circuit between the sensor pin B and the controller pin C1p22. Repair or replace the wiring harness between the sensor pin C & the controller pin C1p22.
YES
Remove the jumper wire from the sensor CH-C46 pin B. Check with a multimeter set to resistance (ohms lowest setting) and a known ground. The multimeter should display a 1 indicating an open wire.
Does the multimeter indicate an open wire?
NO
The wiring harness has a short circuit between the sensor pin B and the controller pin C1p22. Repair or replace the wiring harness as necessary.
YES
Replace the left broom tilt sensor.
END

SPN 9221
Brake Defeat
Left / Forward

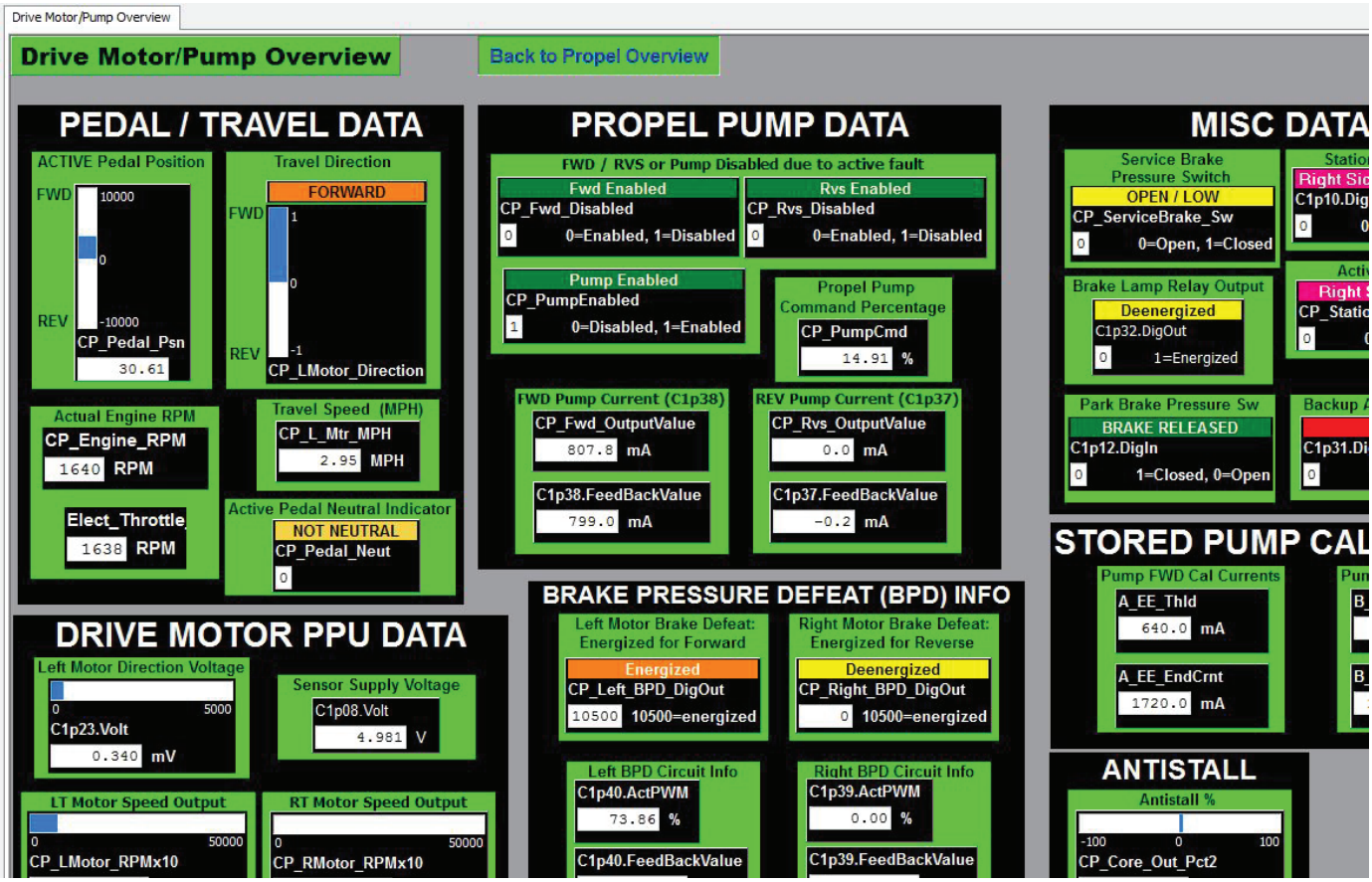
The 9221 error code indicates too little current flow in the circuit due to an open circuit or too much current in the circuit due to a short or short to ground. When all conditions are met the controller routes voltage from CM-C8 pin 40 to one side of the left brake defeat solenoid.
The other side of the solenoid is grounded by a ground circuit from ground splice CH-S12.
The fault generated by error code 9221 indicates the solenoid has not activated.
A short/short to ground will be indicated on the Drive Motor / Pump Overview screen.
The BPD pin status (C1p40.PinStatus) box will display a 2 if a short or short to ground is present.
See the BPD pin status and BPD fault status tables.
NOTE: The Motor Pilot Selector (Brake Defeat Valves) are used in conjunction with a pressure compensator (drive motor shift control) to provide appropriate shifting of the hydrostatic drive motors. The brake defeat valves "defeat" the severe hydrostatic braking (inappropriate shifting) during deceleration and permit downshift/upshift in the direction that is selected by the operator.
The left brake defeat solenoid valve is activated by voltage from the controller during forward operation.
The right brake defeat solenoid valve is activated by voltage from the controller during reverse operation.



Pin Status



BPD Fault_Pin Status Table



Drive Motor / Pump Overview

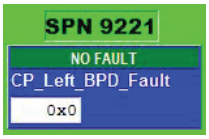
Continued

START

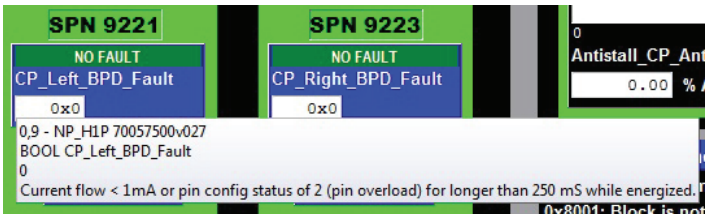
The left motor direction (from the PPU) is used to determine which brake defeat solenoid to energize when RPM is less than 1000. In the event of a PPU failure (fault) the operator intended direction (as determined by the pedal position) is then used. The left / forward brake defeat solenoid is energized when wheel direction as indicated by the left wheel PPU is traveling forward (CW drive motor shaft rotation). The proportional (PWM) voltage is routed from the controller CM-C8 pin 40 to the left brake defeat solenoid and 0VDC at the right brake defeat solenoid. The foot pedal voltage is between 2.8VDC and 3.62 VDC at the controller CM-C8 pin 18 (right foot pedal) or pin 19 (left foot pedal) or if the wheels are traveling forward above an Elgin definable speed (default 5MPH).



Faults Screen



Fault Status



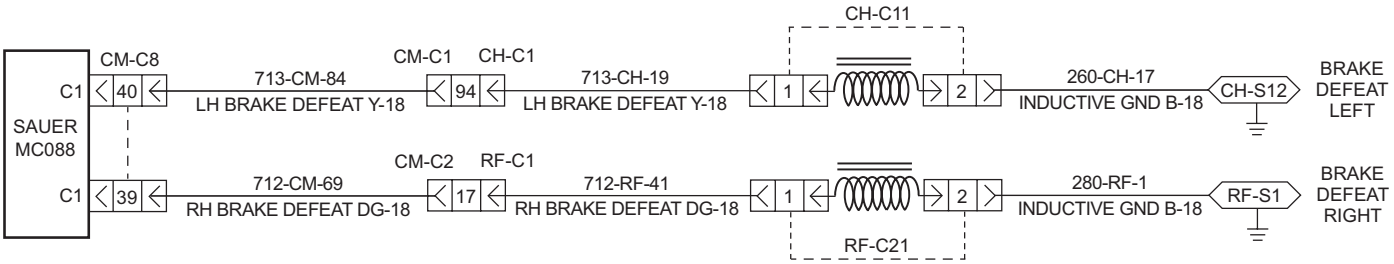
SPN 9221 Fault Status

Use the service tool drive motor/pump overview screen to check the left BPD fault indicator. The SPN 9221 fault box will display a fault condition and the fault ID.
Place the cursor over the SPN 9221 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the BPD fault / status tables for fault codes and values.
The SPN 9221 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

Count	Location	Type	First Time	Last Time
14	SPN_9443	Fault	EE_ErrH_First_0 554 Min	EE_ErrH_Last_0 14934 Min
8	SPN_9451	Fault	EE_ErrH_First_1 554 Min	EE_ErrH_Last_1 554 Min
255	SPN_9457	Fault	EE_ErrH_First_2 553 Min	EE_ErrH_Last_2 19976 Min
255	SPN_9411	Fault	EE_ErrH_First_3 556 Min	EE_ErrH_Last_3 14548 Min
11	SPN_9055	Open circuit	EE_ErrH_First_4 565 Min	EE_ErrH_Last_4 420 Min
2	SPN_9053	Open circuit	EE_ErrH_First_5 565 Min	EE_ErrH_Last_5 588 Min
255	SPN_9033	Fault	EE_ErrH_First_6 576 Min	EE_ErrH_Last_6 19885 Min
38	SPN_9481	Fault	EE_ErrH_First_7 576 Min	EE_ErrH_Last_7 8109 Min
31	SPN_9477	Fault	EE_ErrH_First_8 576 Min	EE_ErrH_Last_8 8109 Min
38	SPN_9475	Fault	EE_ErrH_First_9 576 Min	EE_ErrH_Last_9 8109 Min

Fault History

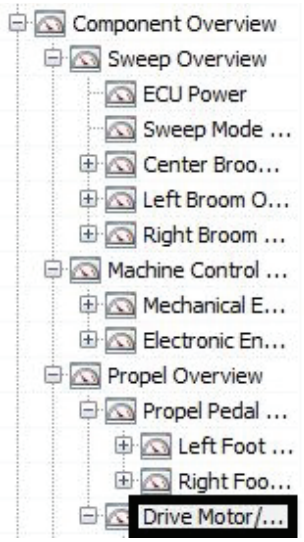
Continued



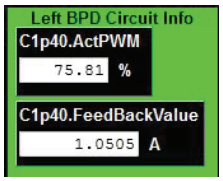
Brake Defeat Left / Forward Circuit

Check the service tool functions:
Propel Overview . Drive Motor / Pump Overview for voltage at the controller pin C1p40.
The left motor brake defeat: energized for forward box will display Energized when the voltage has been routed from the controller (C1p40) to the left brake defeat solenoid terminal 1.
Place the foot pedal in forward. The left BPD circuit info boxes will display the voltage (PWM) (C1p40.ActPWM) percentage routed to the solenoid and the pin C1p40 current feedback (C1p40.FeedBackValue).

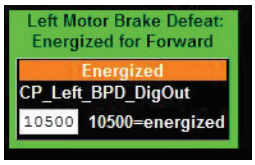
Use the service tool screens in conjunction with the diagnostic steps to locate & repair circuit problems.
In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot brake status and circuit problems.



Navigator Box



Left BPD Circuit Info



Left Motor Brake Defeat

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the left brake defeat connector CH-C11 for secure or broken connection.
Check controller connector CM-C8 for secure or broken connector.
Check harness connectors CM-C1 & CH-C1 for secure or broken connector.

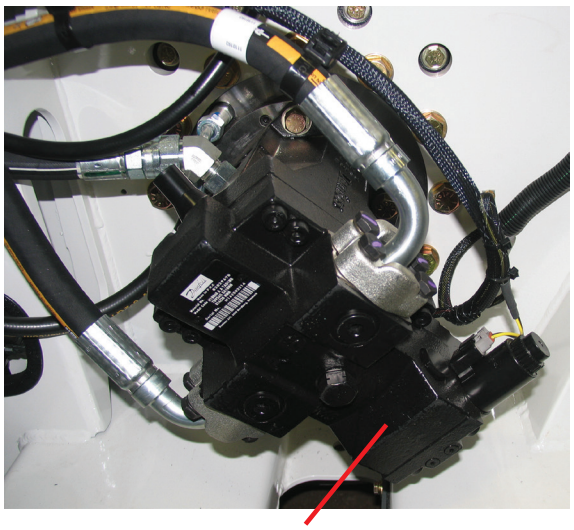
All operational conditions are met?

NO → Correct conditions and continue with diagnostics

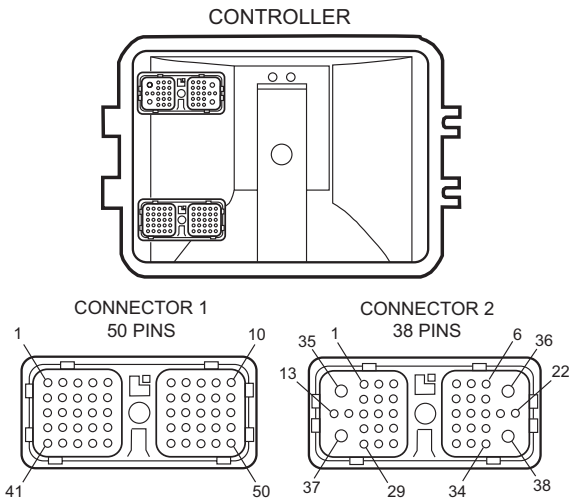
YES

Place the foot pedal in the forward position.
Check the service tool drive motor / pump overview screen SPN 9221 C1p40.Pin Status box. The box will display a 0 if the controller C1p40 pin to left brake defeat solenoid terminal 1 circuit has an open circuit. The box will display a 2 if the circuit is shorted to ground.
NOTE: The SPN 9221 (CP-Left_BPD_Fault) BPD fault status box will display a fault condition and display fault code.

Continued



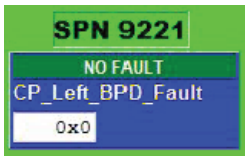
LEFT BRAKE DEFEAT SOLENOID



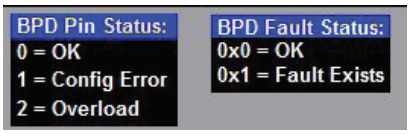
COLLROLLER PIN LOCATOR



C1p40.Pin Status



SPN 9221 Fault Status



BPD Fault_Pin Status Table

Remove the CH-C11 connector from the left brake defeat solenoid.
Check with a multimeter set for resistance between the terminal 1 and terminal 2 on the left brake defeat solenoid coil.
The multimeter should display approximately 8.4 ohms at 68 degrees.

The brake defeat solenoid coil resistance is within the nominal resistance range?

NO → The brake defeat solenoid coil is either open or shorted. Replace the solenoid coil or valve assembly.

YES

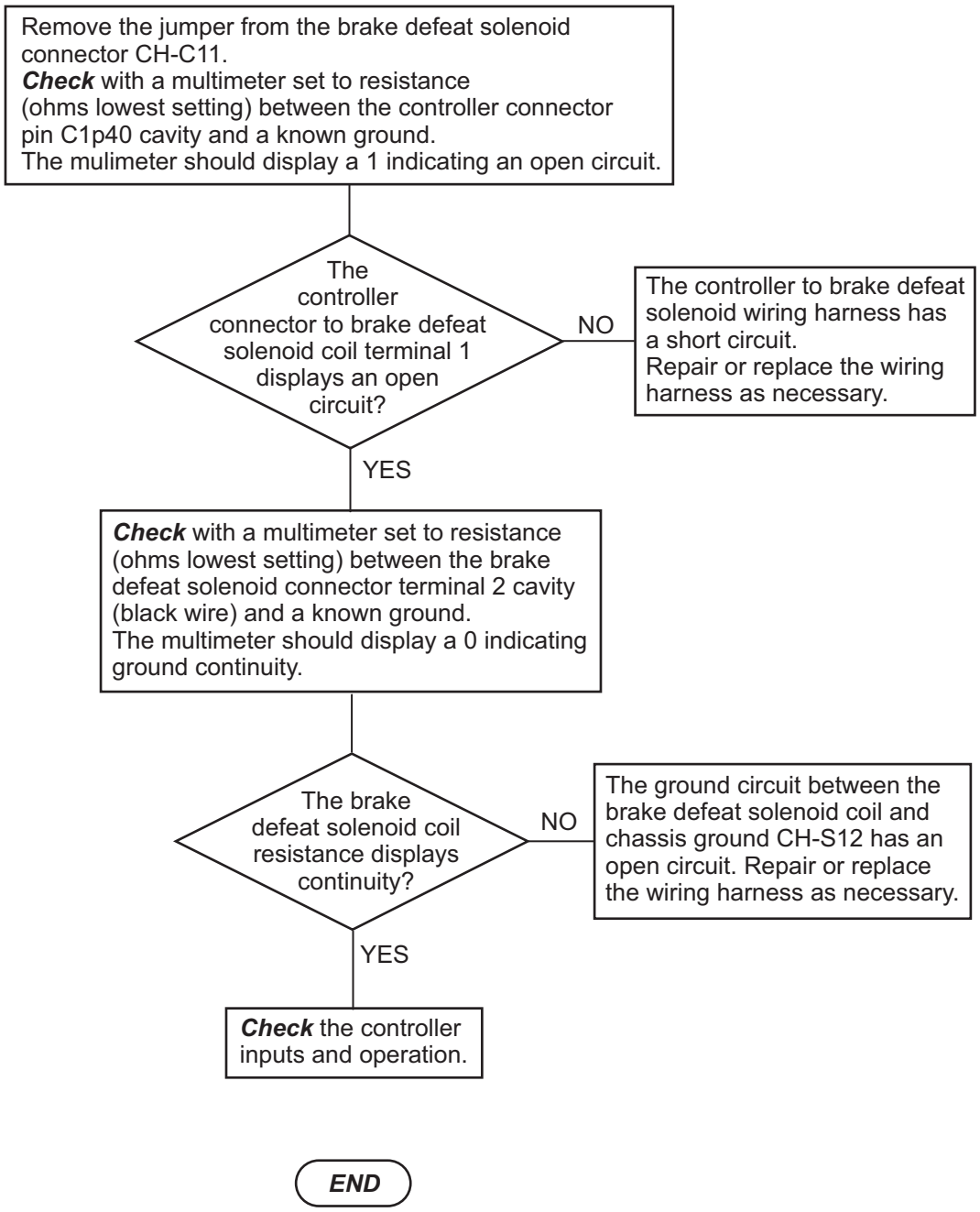
Remove the C1 50 pin connector from the controller.
Remove the CH-C11 connector from the left brake defeat solenoid.
Place a jumper wire between the solenoid connector CH-C11 terminal 1 cavity (yellow wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p40 cavity (yellow wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

The controller to brake defeat solenoid circuit displays continuity?

NO → The wiring harness between the controller pin C1p40 & the brake defeat solenoid coil has an open circuit. Repair or replace the wiring harness.

YES

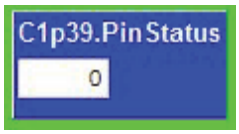
Continued


Remove the jumper from the brake defeat solenoid connector CH-C11.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p40 cavity and a known ground.
The mulimeter should display a 1 indicating an open circuit.
The controller connector to brake defeat solenoid coil terminal 1 displays an open circuit?
NO
The controller to brake defeat solenoid wiring harness has a short circuit.
Repair or replace the wiring harness as necessary.
YES
Check with a multimeter set to resistance (ohms lowest setting) between the brake defeat solenoid connector terminal 2 cavity (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
The brake defeat solenoid coil resistance displays continuity?
NO
The ground circuit between the brake defeat solenoid coil and chassis ground CH-S12 has an open circuit. Repair or replace the wiring harness as necessary.
YES
Check the controller inputs and operation.
END

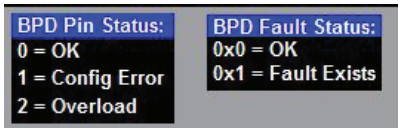
SPN 9223
Brake Defeat
Right / Reverse

The 9223 error code indicates too little current flow in the circuit due too an open circuit or too much current in the circuit due to a short or short to ground. When all conditions are met the controller routes voltage from CM-C8 pin 39 to one side of the right brake defeat solenoid. The other side of the solenoid is grounded by a ground circuit from ground splice RF-S1. The fault generated by error code 9223 indicates the solenoid has not activated. A short/short to ground will be indicated on the Drive Motor / Pump Overview screen.
The BPD pin status (C1p39.PinStatus) box will display a 2 if a short or short to ground is present.
See the BPD pin status and BPD fault status tables.

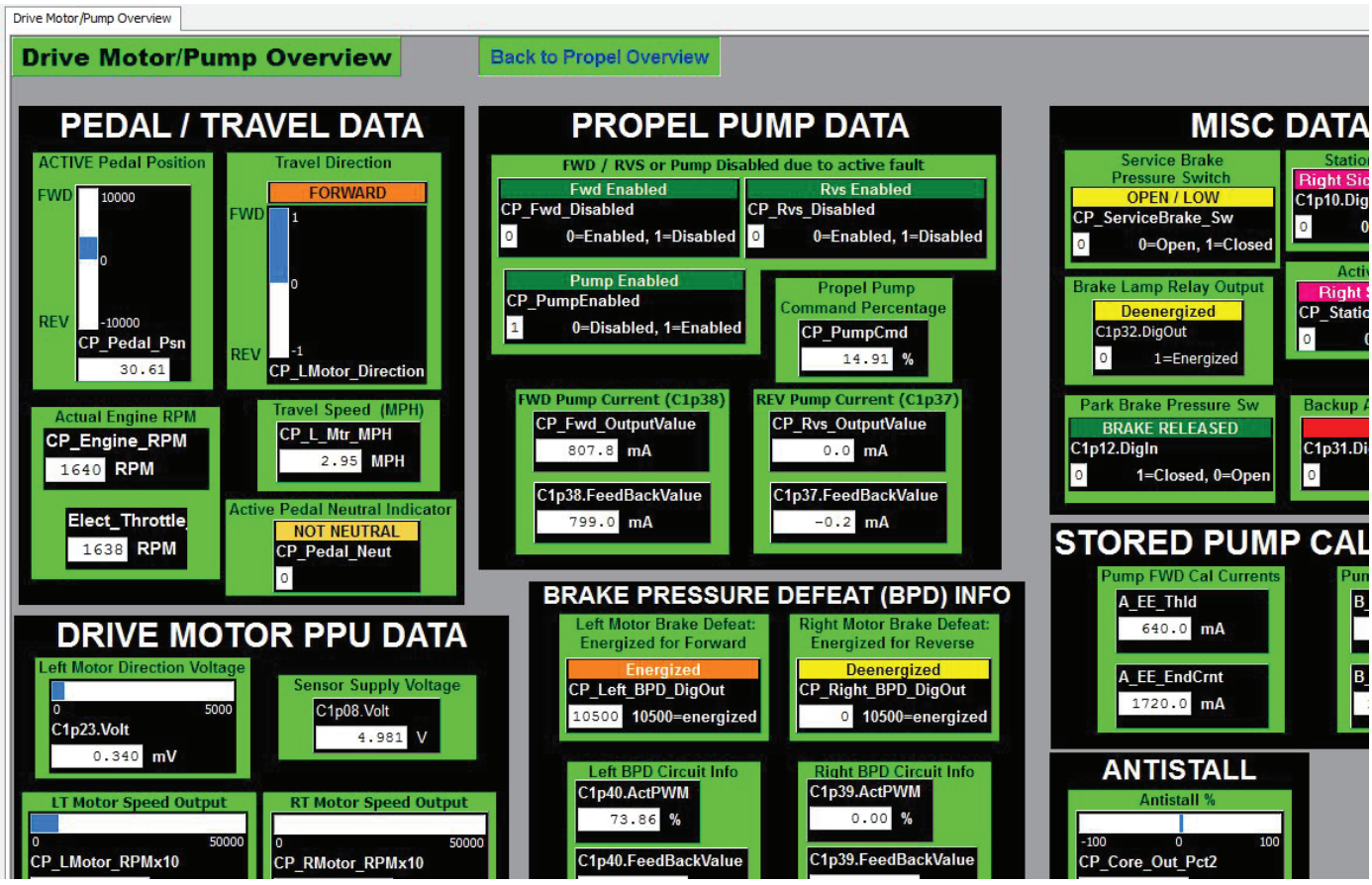
NOTE: The Motor Pilot Selector (Brake Defeat Valves) are used in conjunction with a pressure compensator (drive motor shift control) to provide appropriate shifting of the hydrostatic drive motors.
The brake defeat valves "defeat" the severe hydrostatic braking (inappropriate shifting) during deceleration and permit downshift/upshift in the direction that is selected by the operator.
The left brake defeat solenoid valve is activated by voltage from the controller during forward operation.
The right brake defeat solenoid valve is activated by voltage from the controller during reverse operation.



BPD Pin Status



BPD Fault Pin Status Table



Drive Motor / Pump Overview Screen

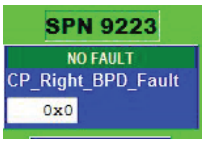
Continued

START

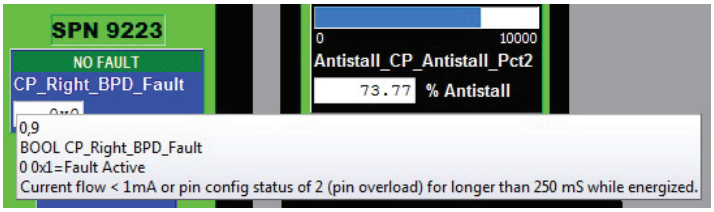
The right / reverse brake defeat solenoid is energized when wheel direction as indicated by the right wheel PPU is traveling in reverse (CCW drive motor shaft rotation). The proportional (PWM) voltage is routed from the controller CM-C8 pin 39 to the right brake defeat solenoid and 0VDC at the left brake defeat solenoid. The foot pedal voltage is between 1.38VDC and 2.2VDC at the controller CM-C8 pin 18 (right foot pedal) or pin 19 (left foot pedal) or if the wheels are traveling in reverse.



Faults Screen



SPN 9223 Fault Status



Hover SPN 9223 Fault Status

Use the service tool drive motor/pump overview screen to check the right BPD fault indicator.
The SPN 9223 fault box will display a fault condition and the fault ID.
Place the cursor over the SPN 9223 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the BPD fault status tables for fault codes and values.
The SPN 9223 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

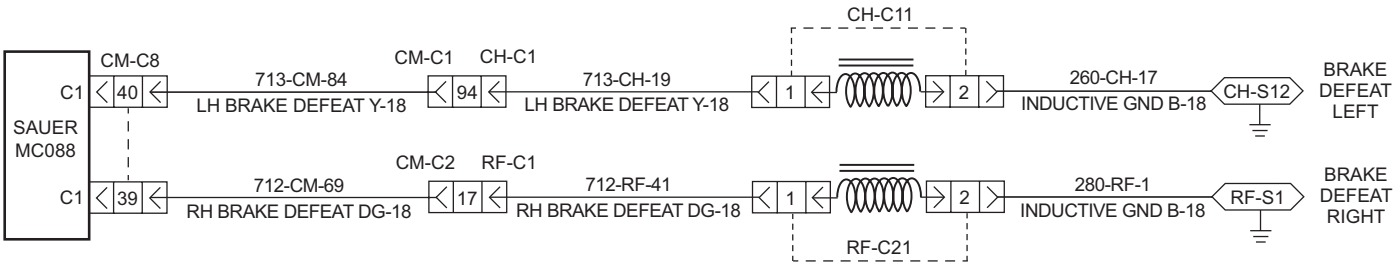
Count	Location	Type	First Time	Last Time
14	SPN_9443	Fault	EE_ErrH_First_0 554 Min	EE_ErrH_Last_0 14934 Min
8	SPN_9451	Fault	EE_ErrH_First_1 554 Min	EE_ErrH_Last_1 554 Min
255	SPN_9457	Fault	EE_ErrH_First_2 553 Min	EE_ErrH_Last_2 19976 Min
255	SPN_9411	Fault	EE_ErrH_First_3 556 Min	EE_ErrH_Last_3 14548 Min
11	SPN_9055	Open circuit	EE_ErrH_First_4 565 Min	EE_ErrH_Last_4 420 Min
2	SPN_9053	Open circuit	EE_ErrH_First_5 565 Min	EE_ErrH_Last_5 588 Min
255	SPN_9033	Fault	EE_ErrH_First_6 576 Min	EE_ErrH_Last_6 19885 Min
38	SPN_9481	Fault	EE_ErrH_First_7 576 Min	EE_ErrH_Last_7 8109 Min
31	SPN_9477	Fault	EE_ErrH_First_8 576 Min	EE_ErrH_Last_8 8109 Min
38	SPN_9475	Fault	EE_ErrH_First_9 576 Min	EE_ErrH_Last_9 8109 Min

Fault History

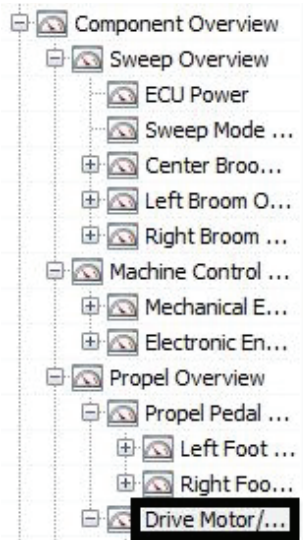
Continued

Check the service tool functions:
Machine Control Overview > Brakes/Brake Defeat Overview for voltage at the controller pin C1p39. The right motor brake defeat energized for reverse box will display Engerized when the voltage has been routed from the controller (C1p39) to the right brake defeat solenoid terminal 1.

Use the service tool screens in conjunction with the diagnostic steps to locate & repair circuit problems. In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot brake status and circuit problems.

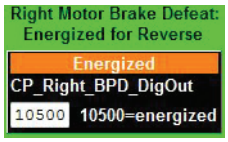


Brake Defeat Right / Forward Circuit



Navigator Box

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the right brake defeat connector RF-C21 for secure or broken connection.
Check controller connector CM-C8 for secure or broken connector.
Check harness connectors CM-C1 & CH-C1 for secure or broken connector.

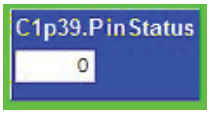


Right Motor Brake Defeat

All operational conditions are met?

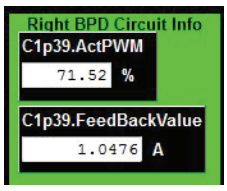
NO → Correct conditions and continue with diagnostics

YES

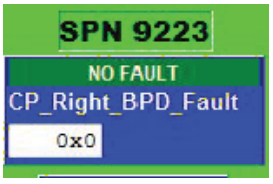


Pin Status Box

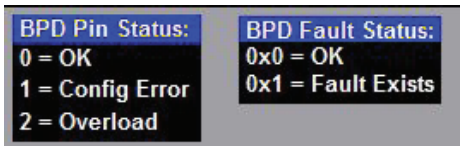
Place the foot pedal in the reverse position.
Check the service tool drive motor/pump overview screen SPN 9223 C1p39.Pin Status box. The box will display a 0 if the controller C1p39 pin to left brake defeat solenoid terminal 1 circuit has an open circuit. The box will display a 2 if the circuit is shorted to ground.
NOTE: The SPN 9223 (CP-Right_BPD_Fault) BPD fault status box will display a fault condition and display fault code.



Right BPD Circuit

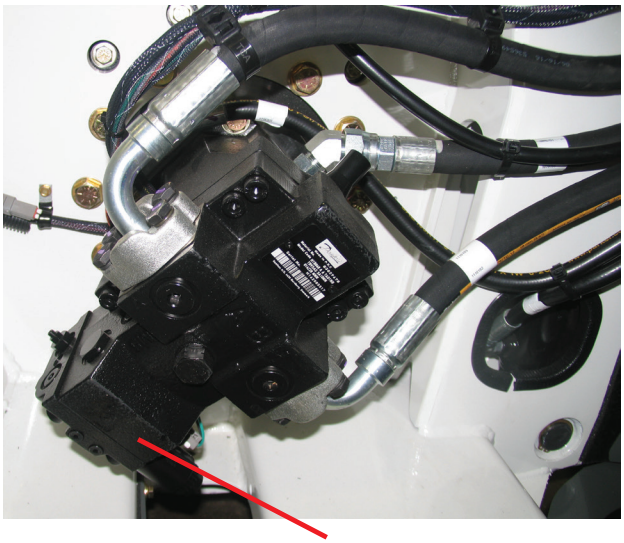


SPN 9223 Fault Status

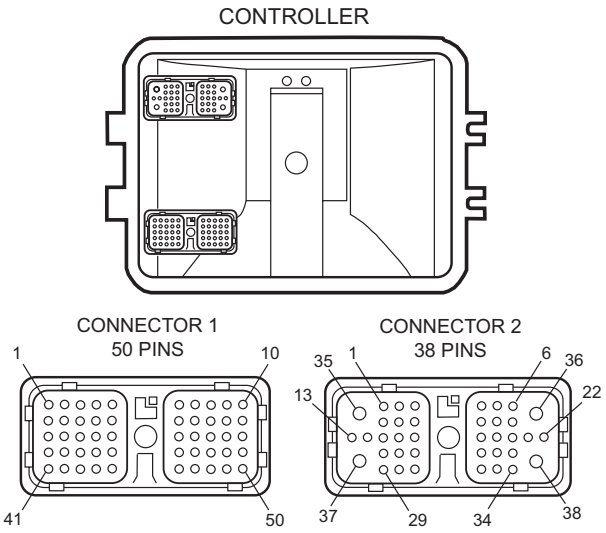


BPD Fault Pin Status Table

Continued



RIGHT BRAKE DEFEAT SOLENOID



COLLROLLER PIN LOCATOR

Remove the RF-C21 connector from the right brake defeat solenoid.
Check with a multimeter set for resistance between the terminal 1 and terminal 2 on the right brake defeat solenoid coil.
The multimeter should display approximately 8.4 ohms at 68 degrees.

The brake defeat solenoid coil resistance is within the nominal resistance range?

NO → The brake defeat solenoid coil is either open or shorted. Replace the solenoid coil or valve assembly.

YES

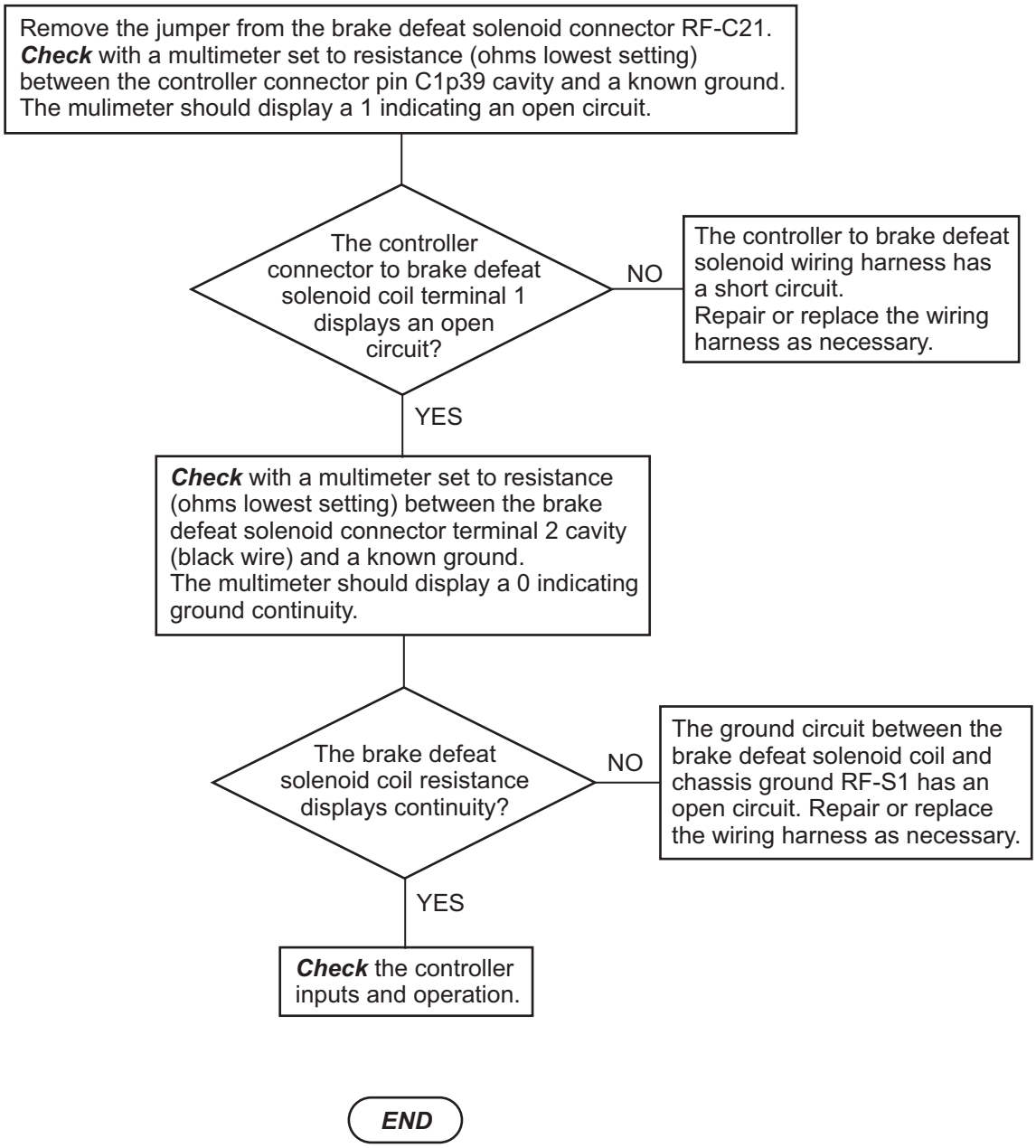
Remove the C1 50 pin connector from the controller.
Remove the RF-C21 connector from the right brake defeat solenoid.
Place a jumper wire between the solenoid connector RF-C21 terminal 1 cavity (dark green wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p39 cavity (dark green wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

The controller to brake defeat solenoid circuit displays continuity?

NO → The wiring harness between the controller pin C1p39 and the brake defeat solenoid coil has an open circuit.
Repair or replace the wiring harness.

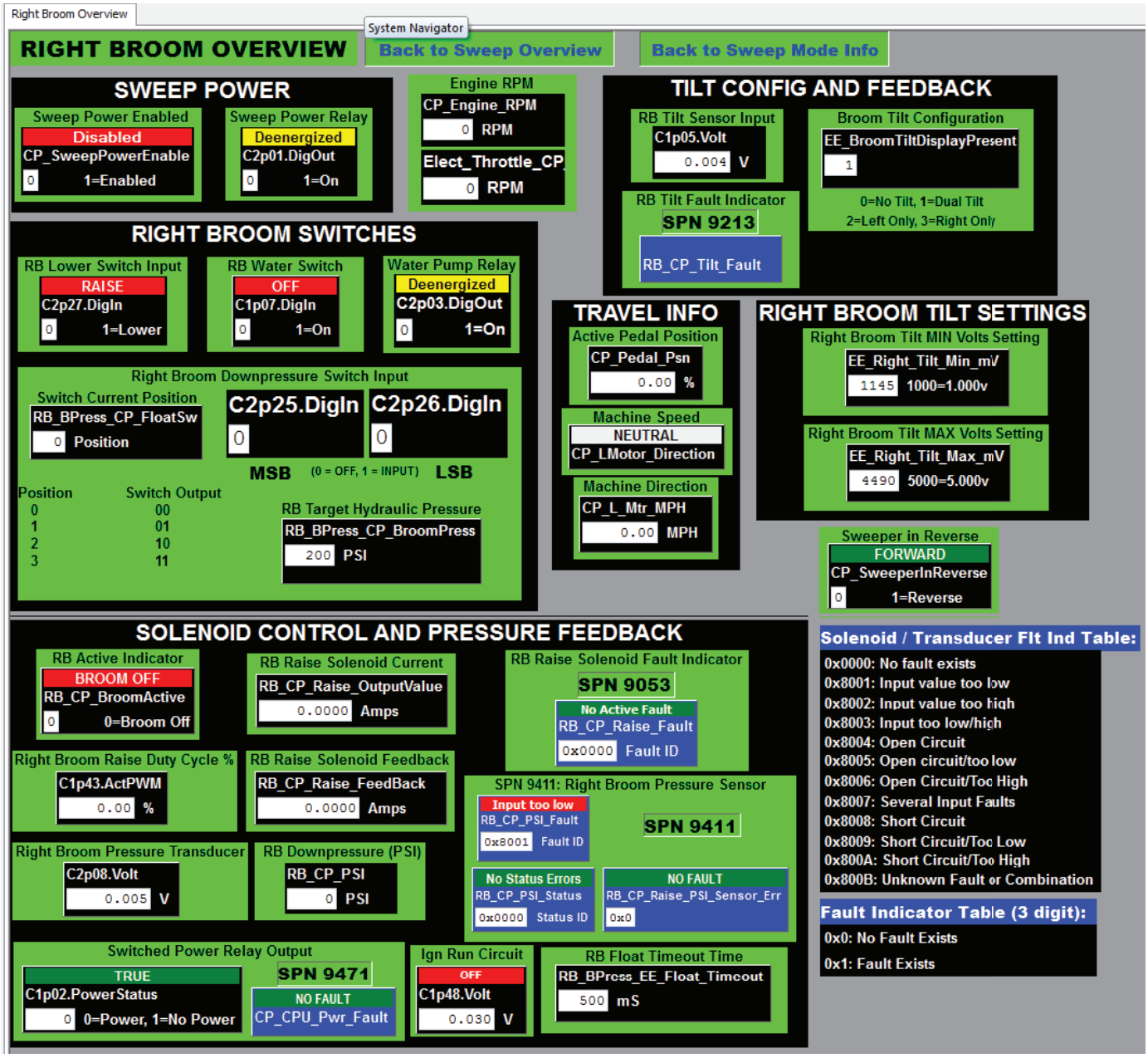
YES

Continued


Remove the jumper from the brake defeat solenoid connector RF-C21.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p39 cavity and a known ground.
The mulimeter should display a 1 indicating an open circuit.
The controller connector to brake defeat solenoid coil terminal 1 displays an open circuit?
NO
The controller to brake defeat solenoid wiring harness has a short circuit.
Repair or replace the wiring harness as necessary.
YES
Check with a multimeter set to resistance (ohms lowest setting) between the brake defeat solenoid connector terminal 2 cavity (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
The brake defeat solenoid coil resistance displays continuity?
NO
The ground circuit between the brake defeat solenoid coil and chassis ground RF-S1 has an open circuit. Repair or replace the wiring harness as necessary.
YES
Check the controller inputs and operation.
END

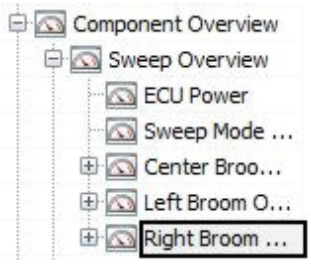
SPN 9411
Right Side Broom
Transducer

The 9411 error code indicates the right side broom pressure transducer voltage is out of range either greater than 4.7VDC or less than 0.3VDC. The SPN 9411 error code can be set by an electrical problem in the circuit. The code can also be set by a large difference between the right broom down target pressure and actual pressure seen at the sensor.



Right Broom Overview Screen

Continued



Navigator Box



RB Fault Indicator

START

The right broom Transducer is energized when:

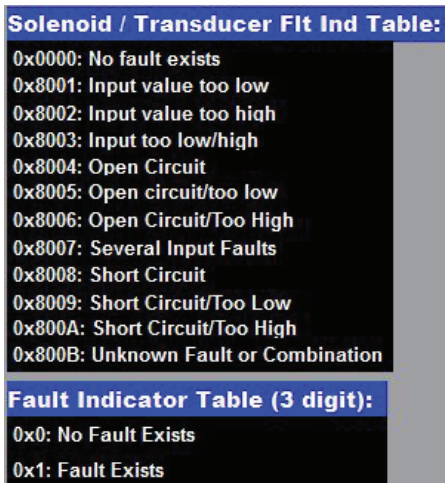
The ignition is in the RUN position.
The controller activates the side broom solenoid based on feedback from the right broom transducer.

All preoperational conditions are met?

NO → Correct conditions and continue with diagnostics

YES

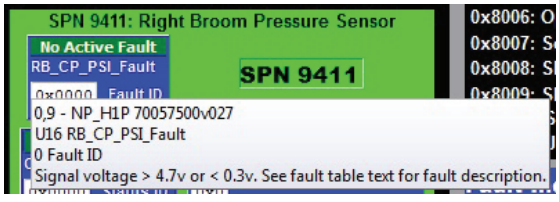
Use the service tool right broom overview screen to ***check*** the right broom pressure sensor (RB_CP_PSI_Fault) fault indicator.
The SPN 9411 fault box will display a fault condition and the fault ID.
Place the cursor over the right broom pressure sensor fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the fault indicator table for fault codes and values.
The RB_CP_PSI_Status box will display any status errors and the status ID code for the error.
The ID code can be checked on the solenoid/transducer fault indicator table for the cause of the status error.
The RB_CP_Raise_PSI_Sensor_Err box will display a fault condition and code if the actual PSI is too far from the target PSI sensor or there is unwanted resistance in the sensor circuitry.
The SPN 9411 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault,
the first time and last time the fault occurred.
NOTE: If the RB_CP_Raise_PSI_Sensor_Err box displays an error ***check*** for unwanted resistance in the circuit.
If unwanted resistance is not found contact Elgin Sweeper Service Department for assistance.



Fault Indicator Tables

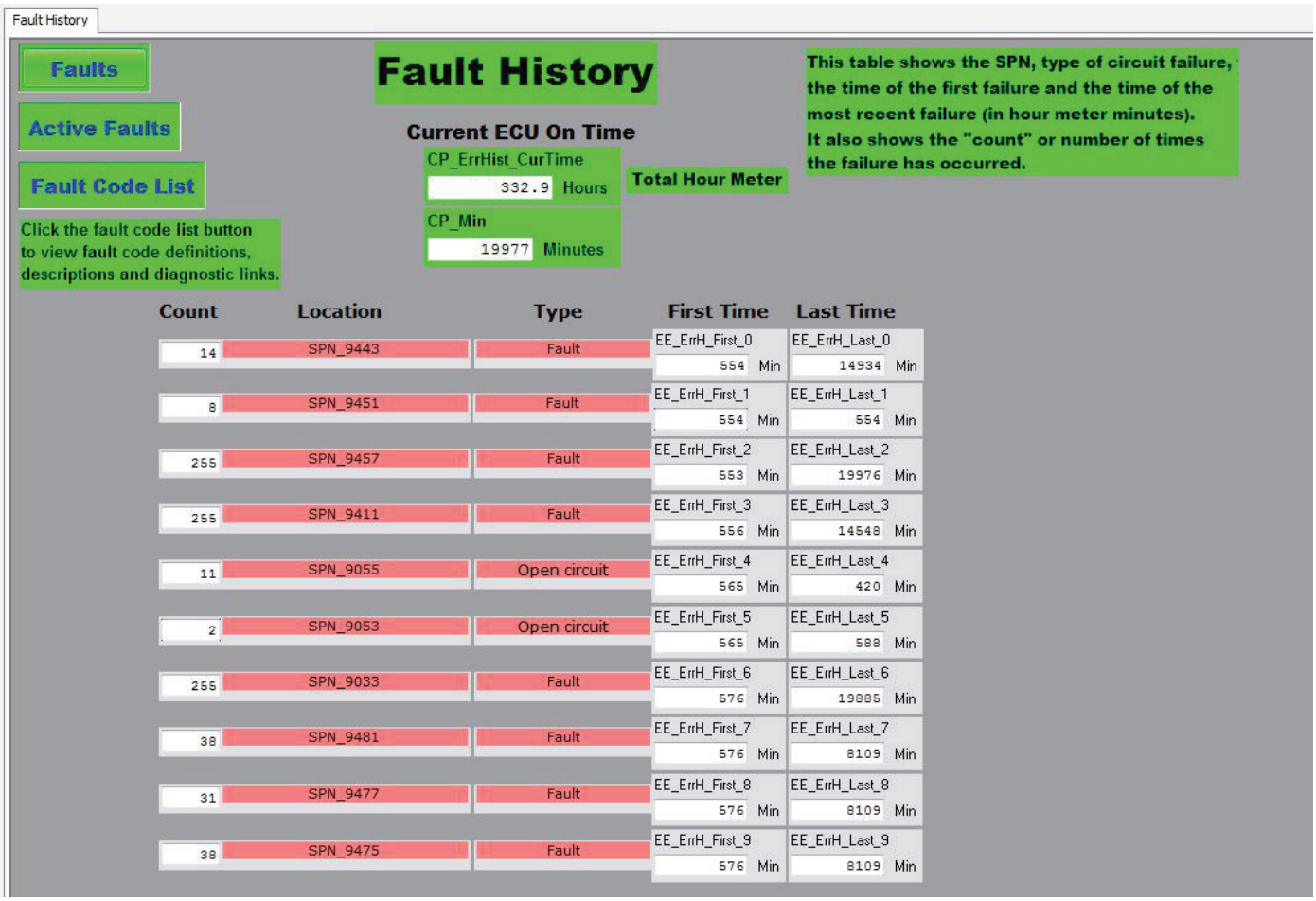


Faults Screen



Hover RB Fault Indicator

Continued



Fault History Screen

The right side broom transducer monitors right broom down pressure and converts the pressure reading into an electrical signal. The 12VDC is routed from the fused switched power circuit, splice RF-S4 and fuse B7 (10A) to the transducer connector RF-C6 pin A. The transducer is grounded at connector pin C.

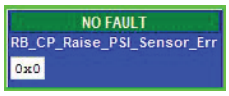
As the down pressure moves the transducer internal potentiometer a signal is generated at connector pin B and transmitted to the controller CM-C18 pin 8. The feedback from the transducer is used to adjust the down pressure based on the bin switch selection.

The service tool right broom overview screen can be used to ***check*** the transducer operation. See the Right Broom Pressure Transducer log function to ***check*** the controller C2p08.Volt input.

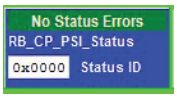
The position of the bin switch causes the switch to route signals to the controller as follows:

Switch Position	BCD Switch Output	Broom Pressure
0	00	100% Float Pressure
1	01	(90% of position 0)
2	10	(80% of position 0)
3	11	(50% of position 0)

Continued

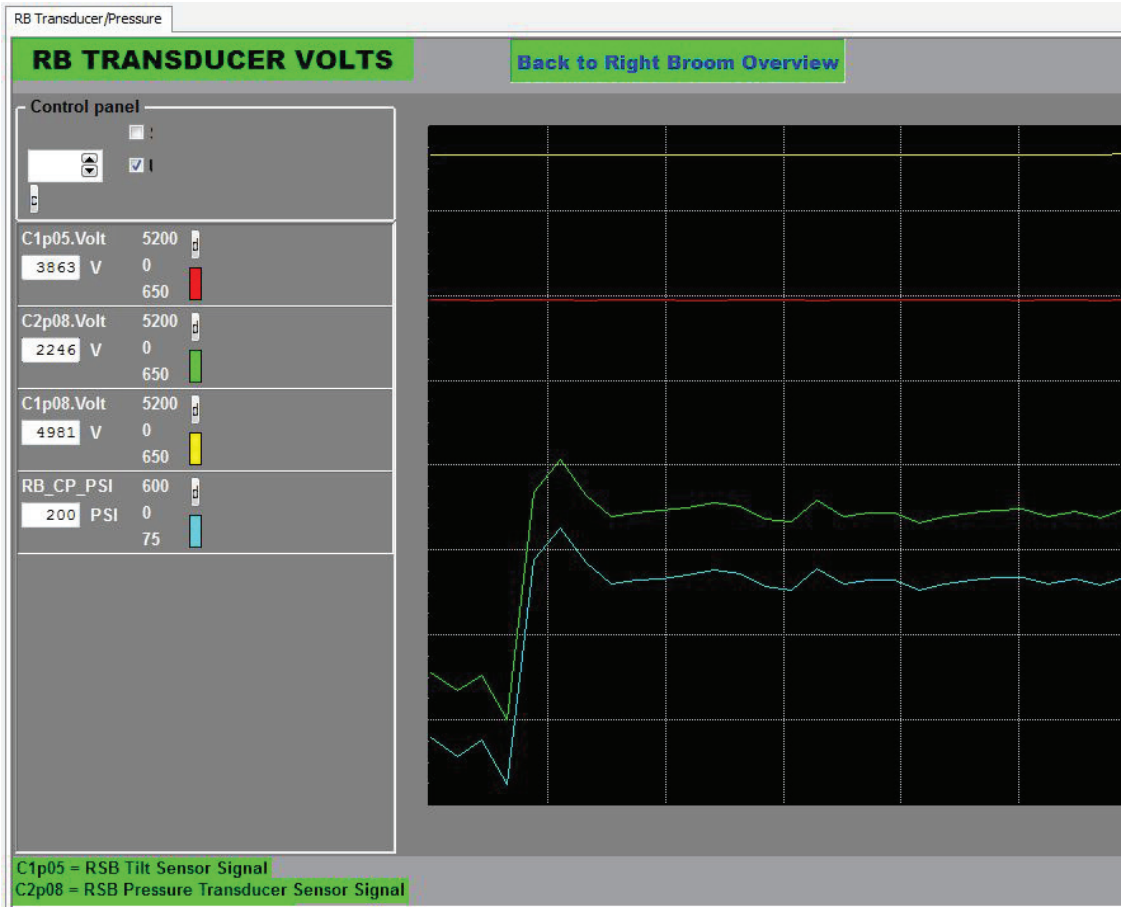


RB PSI Sensor Error



RB PSI Status

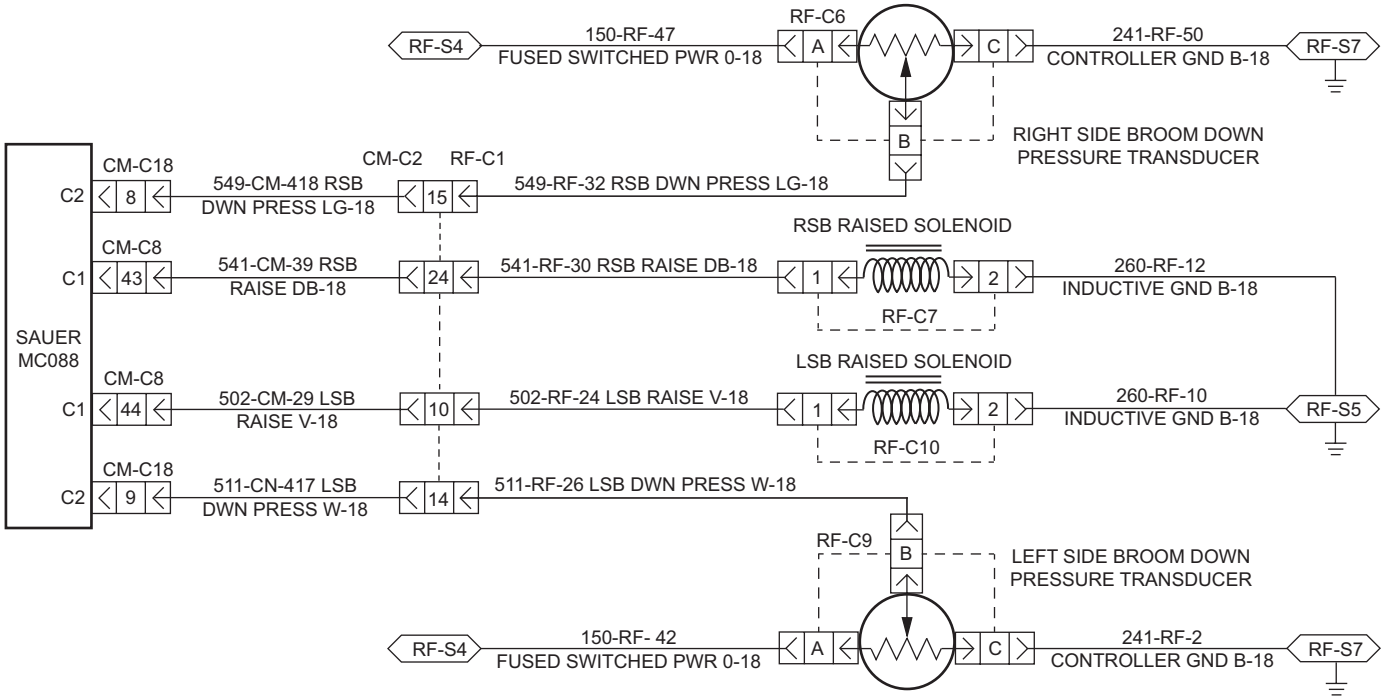
The service tool RB transducer/pressure screen located below the right broom overview screen can be used to watch the right broom transducer volts in operation.
The C2p08 right side broom pressure transducer sensor signal is displayed on the screen oscilloscope.
The C2p08 voltage line on the oscilloscope can be used to check the transducer input signal.
An active voltage line indicates the transducer is routing a signal to the controller at pin C2p08.
The voltage being routed to the controller is displayed in the C2p08 V box.
The voltage must be within the 0.3VDC - 4.7VDC range.A voltage display outside this range may indicate transducer/pressure open circuits or short circuits.



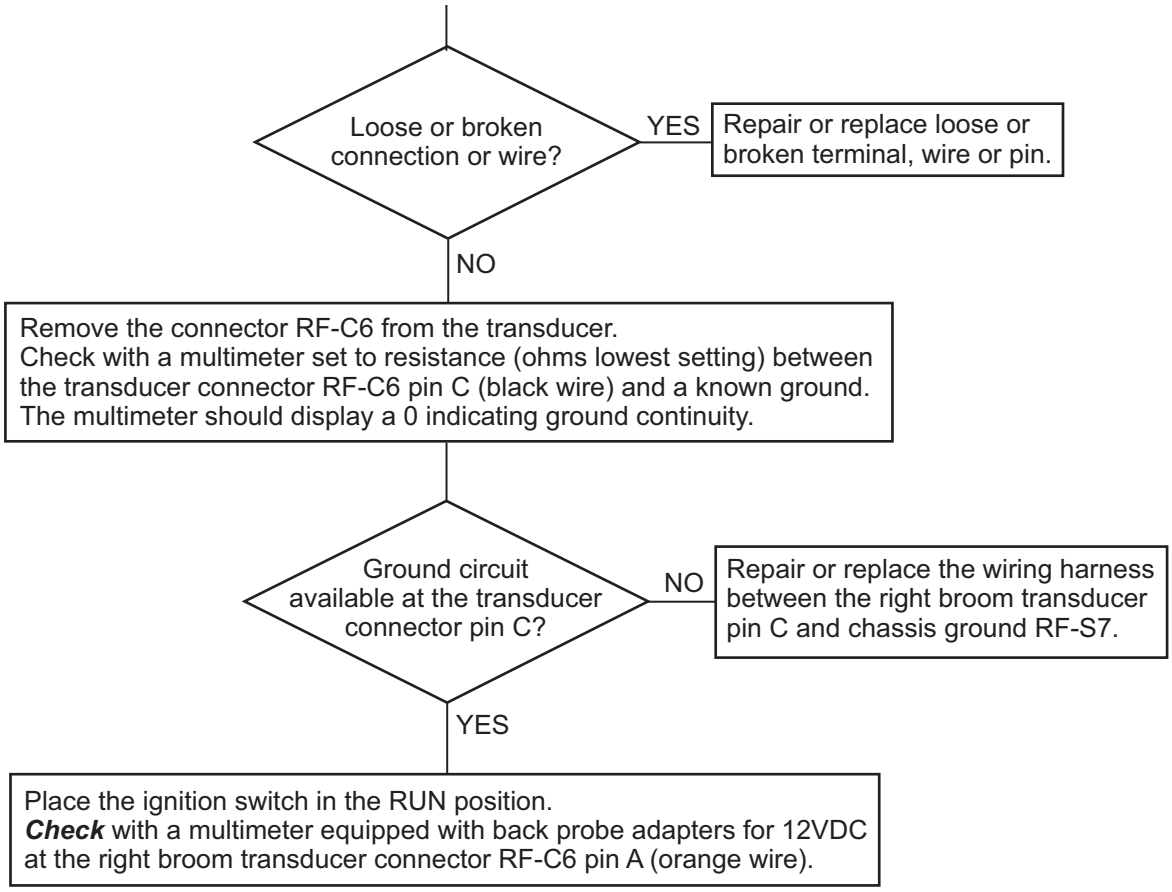
RB Transducer / Pressure Screen

Check the service tool functions:
Sweep Overview > Right Broom Overview for voltage at the controller CM-C18 pin 8.
Check the right broom float switch for MSB and LSB indications.
Check right broom transducer for secure or broken connector.
Check Controller CM-C2 and RF-C1 for secure or broken connections.
Check harness connectors for secure or broken connections.
Check controller CM-C8 and CM-C18 connectors for secure or broken connector.
NOTE: ***Check*** the service tool right broom overview screen with the right broom ON and operating.
If the RB Active Indicator box displays BROOM ON and number 1 and the Right Broom Pressure Transducer box displays volts within the 4.7 - 0.3VDC range the transducer is operational, the transducer ground at pin C is available and the transducer sensor input to controller pin C2p08 is operational with no open circuits or short circuits.

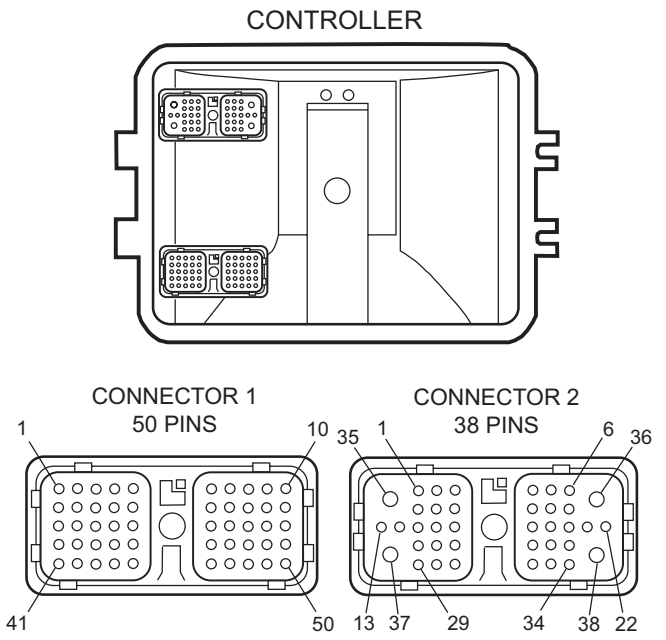
Continued



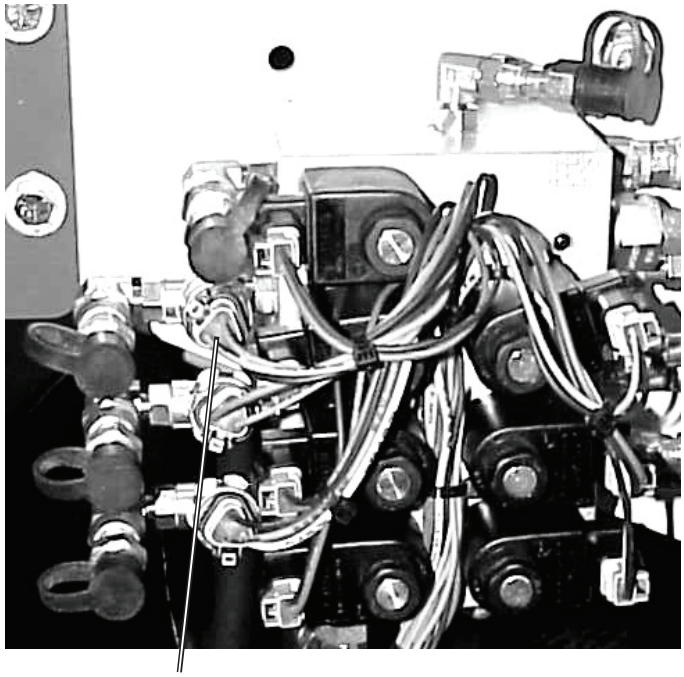
Right Side Broom Transducer Circuit



Continued



Controller Pin Locator



Right Broom Transducer

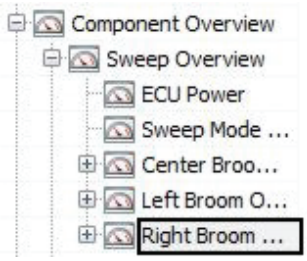
12VDC available at the transducer connector pin A?

NO

Check or replace fuse B7 (10A).
Check for open circuit between fuse B7 (10A) and splice RF- S4 and the transducer connector pin A.

YES

Reconnect connector RF-C6 on the transducer.
Place right broom in the ON position.
Check with a multimeter equipped with back probe adapters for voltage output at the transducer connector RF-C6 pin B (light green wire).



Navigator Box

Voltage between 0.3VDC & 4.7VDC available at the transducer connector pin B?

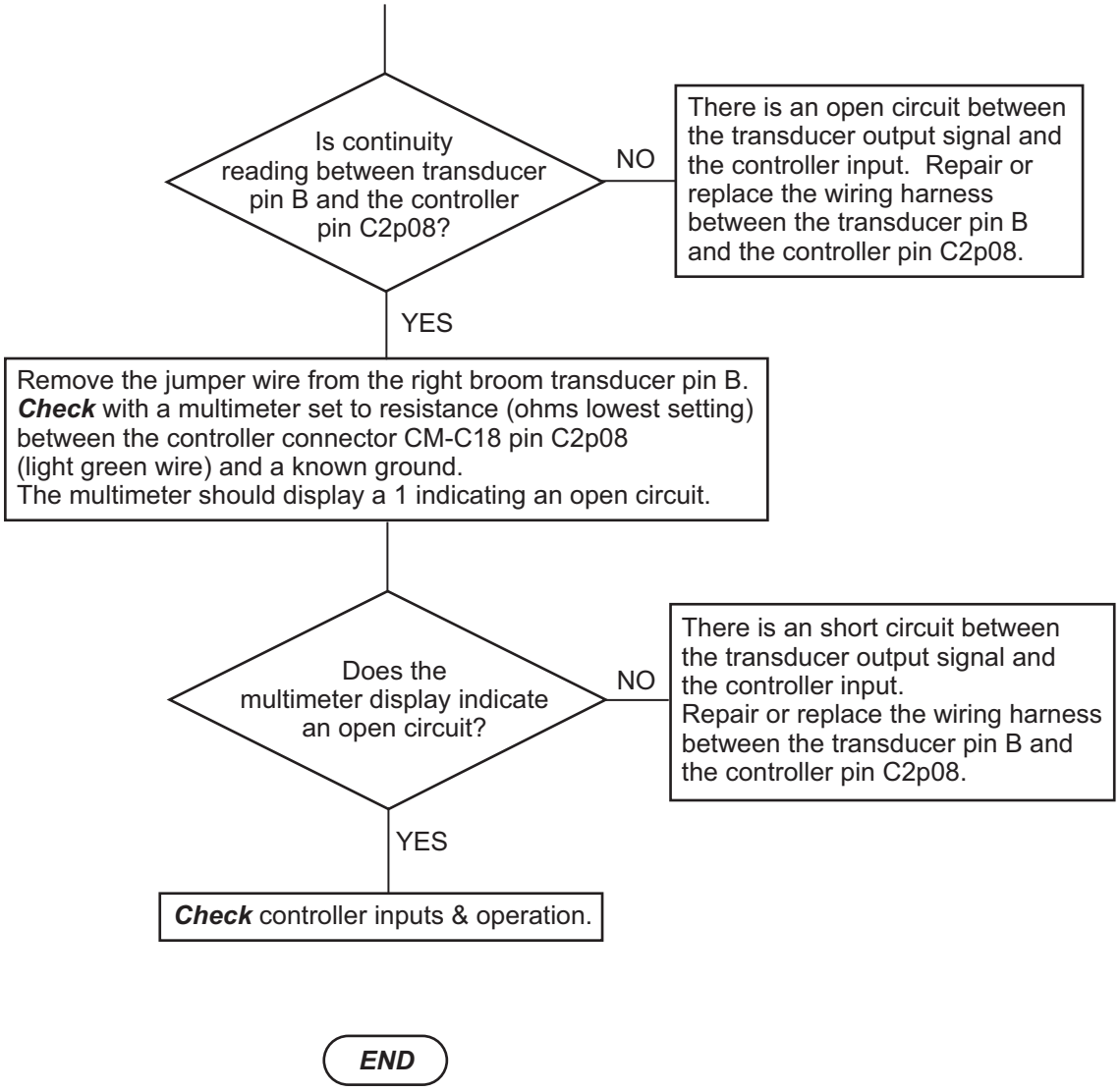
NO

Replace the right broom pressure transducer.

YES

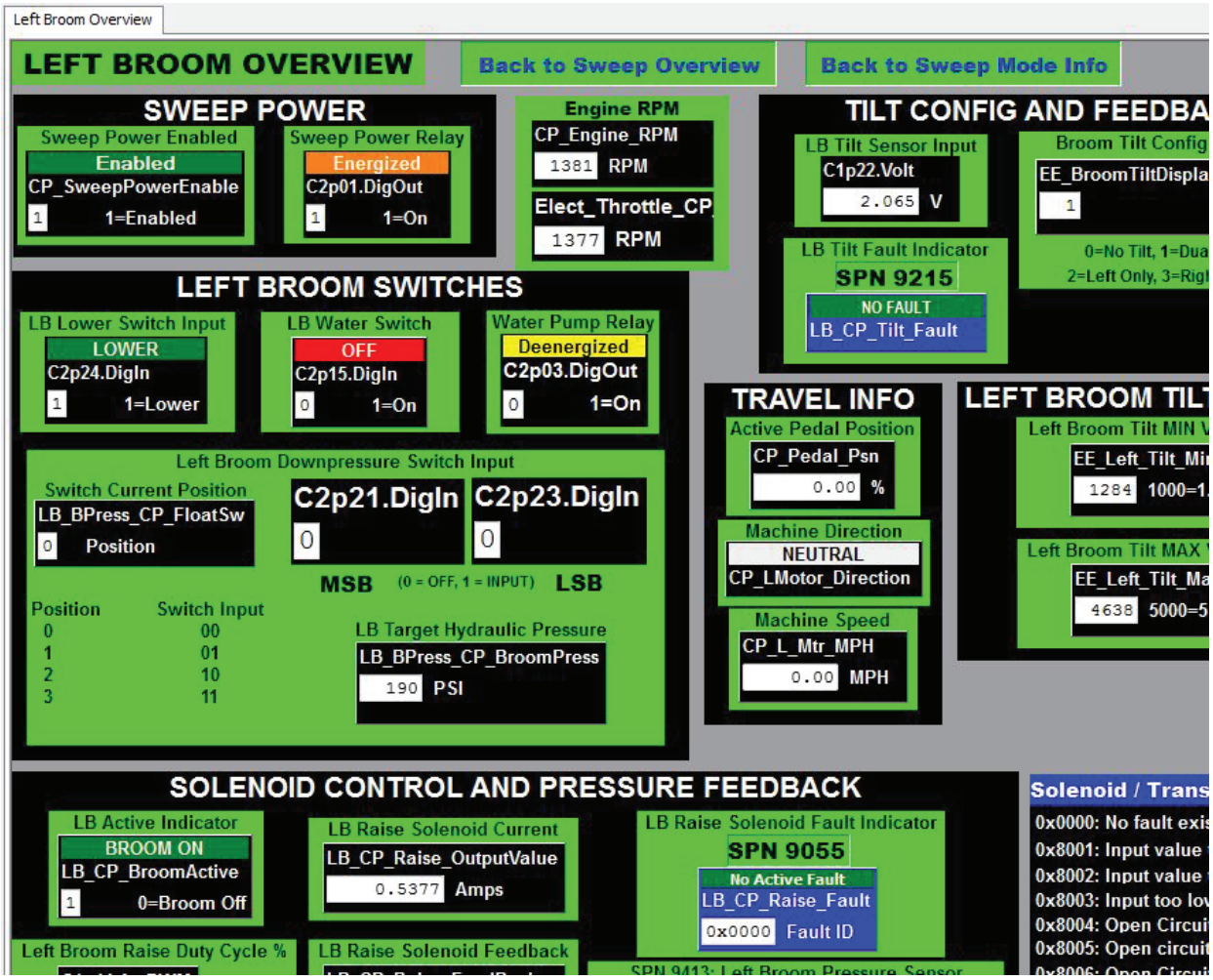
Remove the connector RF-C6 from the right broom transducer.
Remove the CM-C18 connector from the controller.
Place a jumper wire between the transducer connector RF-C6 pin B (light green wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller CM-C18 connector pin 8 (light green wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

Continued


Is continuity reading between transducer pin B and the controller pin C2p08?
NO
There is an open circuit between the transducer output signal and the controller input. Repair or replace the wiring harness between the transducer pin B and the controller pin C2p08.
YES
Remove the jumper wire from the right broom transducer pin B.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CM-C18 pin C2p08 (light green wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.
Does the multimeter display indicate an open circuit?
NO
There is an short circuit between the transducer output signal and the controller input.
Repair or replace the wiring harness between the transducer pin B and the controller pin C2p08.
YES
Check controller inputs & operation.
END

SPN 9413
Left Side Broom
Transducer

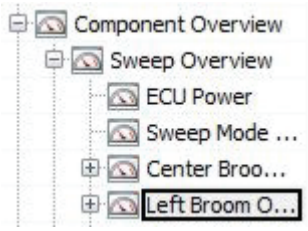
The 9413 error code indicates the left side broom pressure transducer voltage is out of range either greater than 4.7VDC or less than 0.3VDC. The SPN 9413 error code can be set by an electrical problem in the circuit. The code can also be set by a large difference between the left broom down target pressure and actual pressure seen at the sensor.



Left Broom Overview Screen

Continued

START



Navigator Box

The left broom transducer is energized when:

The ignition switch is in the RUN position.

The controller activates the side broom solenoid solenoid based on feedback from the left broom transducer.



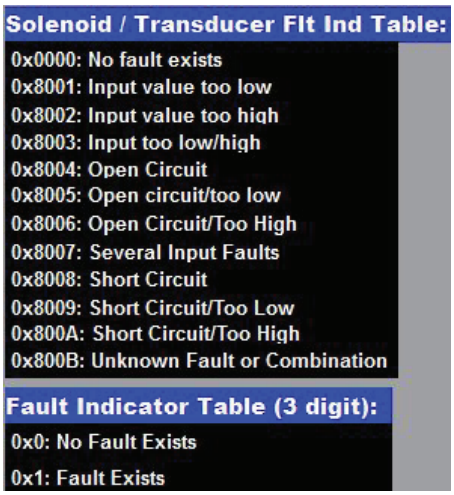
LB Fault Indicator

All preoperational conditions are met?

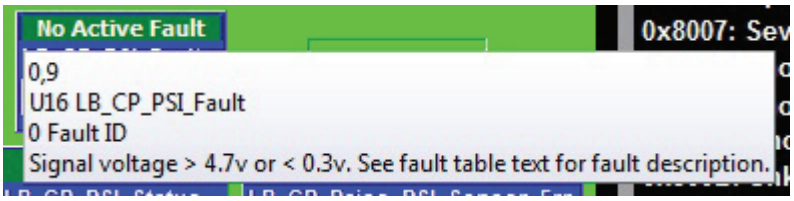
NO → Correct conditions and continue with diagnostics

YES

Use the service tool left broom overview screen to ***check*** the left broom pressure sensor (LB_CP_PSI_Fault) fault indicator. The SPN 9413 fault box will display a fault condition and the fault ID.
Place the cursor over the left broom pressure sensor fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the fault indicator table for fault codes and values.
The LB_CP_PSI_Status box will display any status errors and the status ID code for the error.
The ID code can be checked on the solenoid/transducer fault indicator table for the cause of the status error.
The LB_CP_Raise_PSI_Sensor_Err box will display a fault condition and code if the actual PSI is too far from the target PSI sensor or there is unwanted resistance in the sensor circuitry.
The SPN 9413 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.
NOTE:
If the LB_CP_Raise_PSI_Sensor_Err box displays an error ***check*** for unwanted resistance in the circuit.
If unwanted resistance is not found contact Elgin Sweeper Service Department for assistance.



Fault Indicator Tables

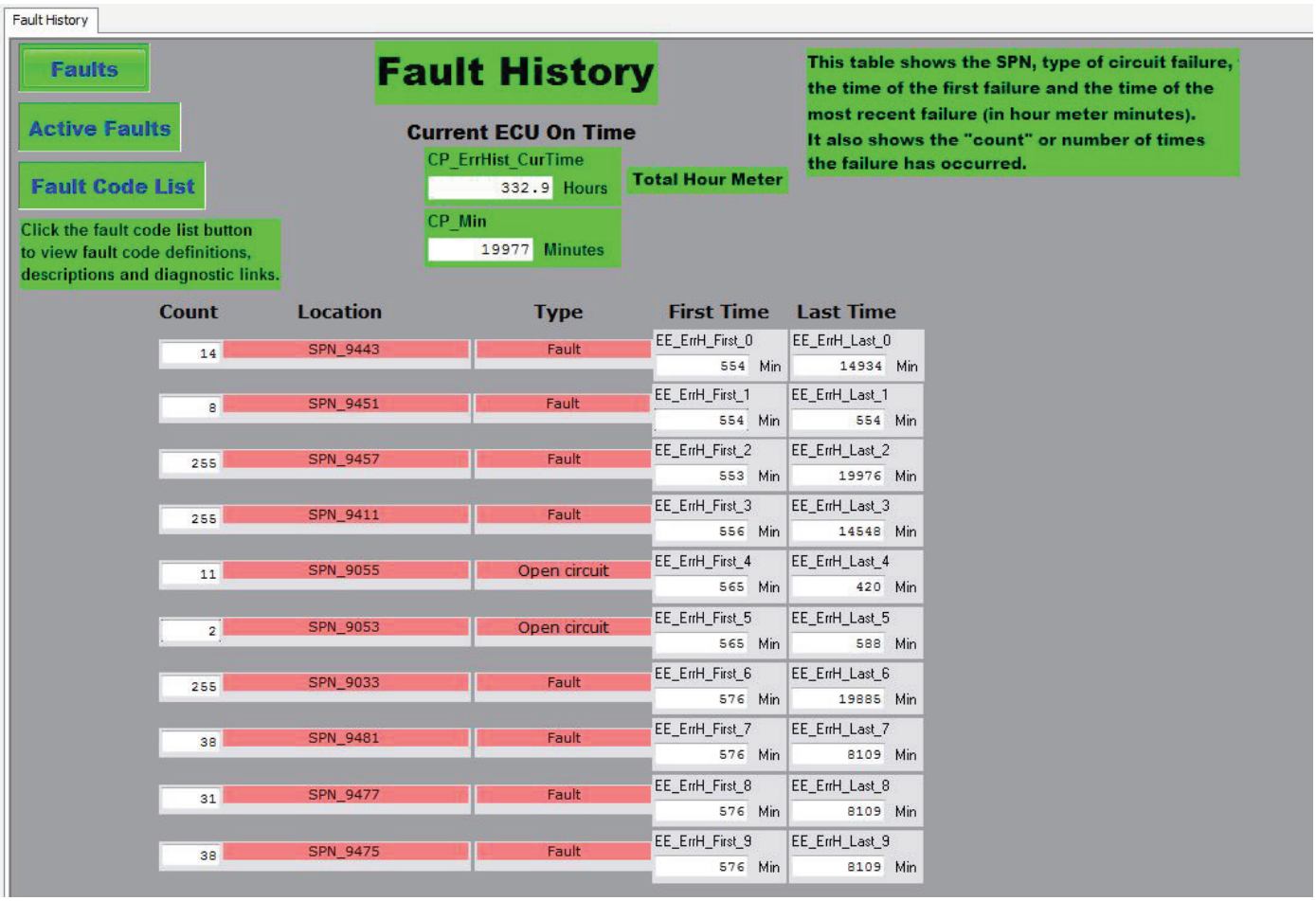


Hover LB Fault Indicator



Faults Screen

Continued



Fault History Screen

The left side broom transducer monitors left broom down pressure and converts the pressure reading into an electrical signal. The 12VDC is routed from the fused switched power circuit, splice RF-S4 and fuse B7 (10A) to the transducer connector RF-C9 pin A. The transducer is grounded at connector pin C.

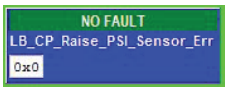
As the down pressure moves the transducer internal potentiometer a signal is generated at connector pin B and transmitted to the controller CM-C18 pin 9. The feedback from the transducer is used to adjust the down pressure based on the bin switch selection.

The service tool left broom overview screen can be used to ***check*** the transducer operation. See the Left Broom Pressure Transducer log function to ***check*** the controller C2p09.Volt input.

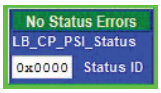
The position of the bin switch causes the switch to route signals to the controller as follows:

Switch Position	BCD Switch Output	Broom Pressure
0	00	100% Float Pressure
1	01	(90% of position 0)
2	10	(80% of position 0)
3	11	(50% of position 0)

Continued

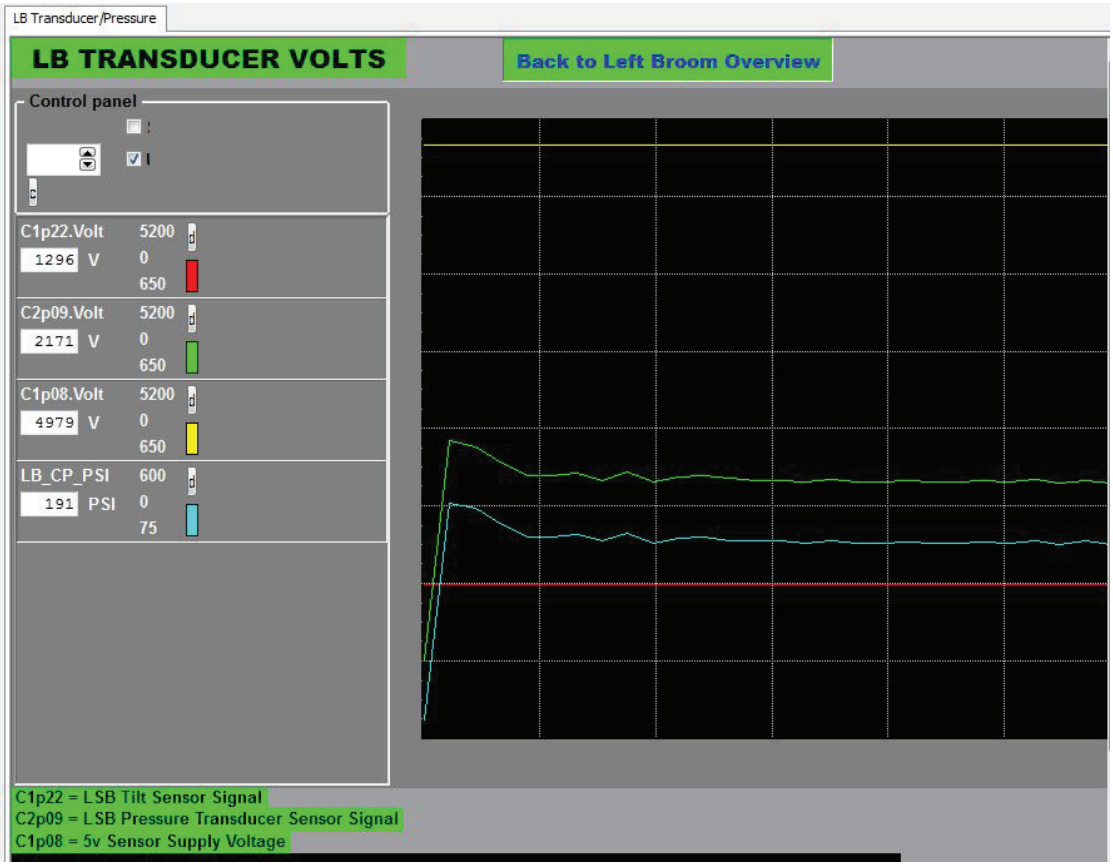


LB PSI
Sensor Error



LB PSI Status

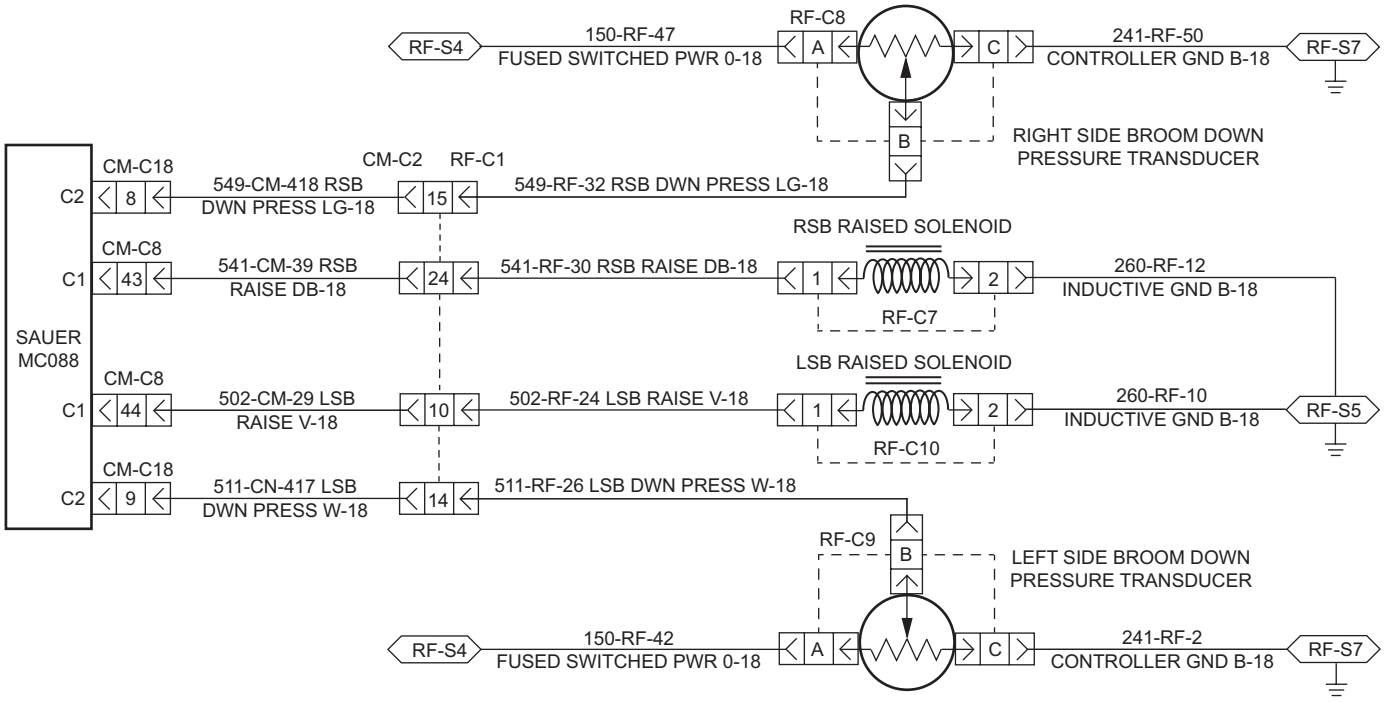
The service tool LB transducer/pressure screen located below the left broom overview screen can be used to watch the left broom transducer volts in operation.
The C2p09 left side broom pressure transducer sensor signal is displayed on the screen oscilloscope.
The C2p09 voltage line on the oscilloscope can be used to ***check*** the transducer input signal.
An active voltage line indicates the transducer is routing a signal to the controller at pin C2p09.
The voltage being routed to the controller is displayed in the C2p09 V box.
The voltage must be within the 0.3VDC - 4.7VDC range.
A voltage display outside this range may indicate transducer / pressure open circuits or short circuits.



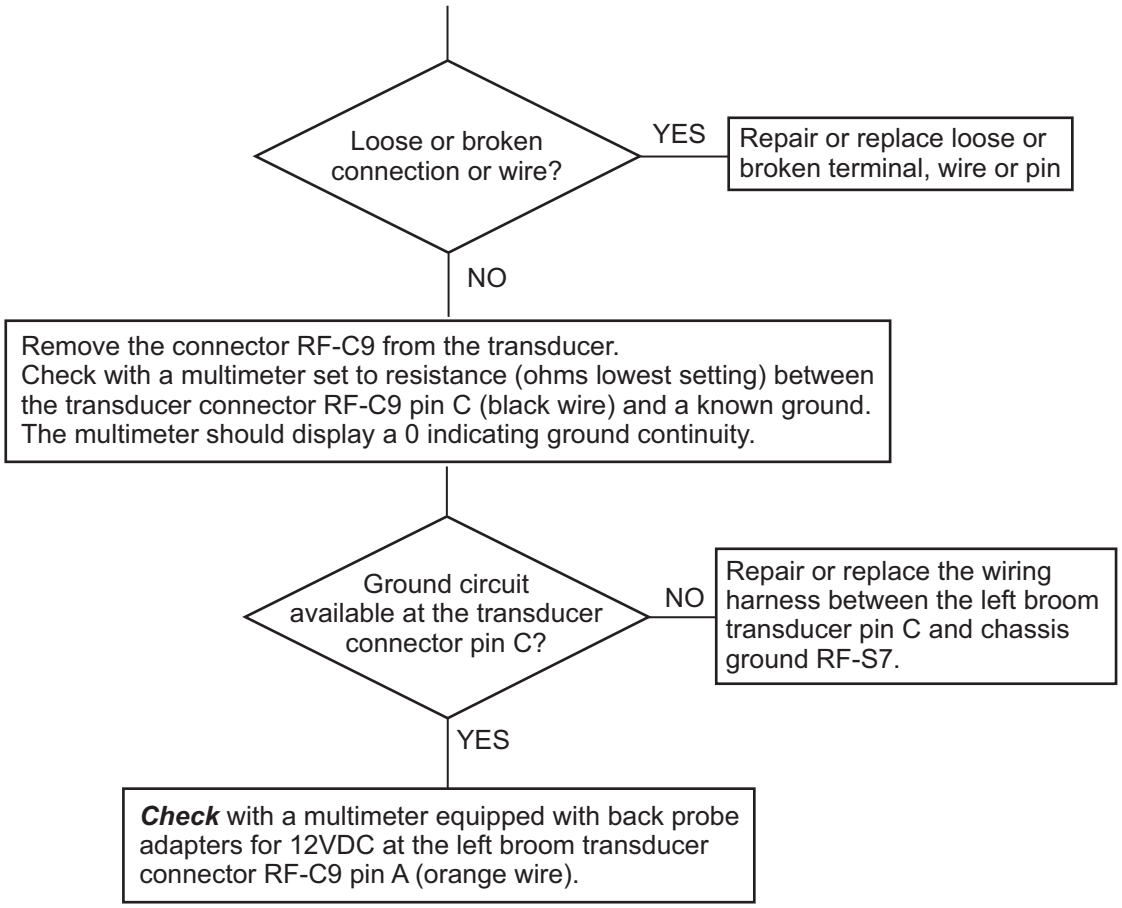
LB Transducer/Pressure

Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems. In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot brake defeat status and circuit problems.
Check the service tool log functions: Component Overview > Sweep Overview > Left Broom Overview for voltage at the controller CM-C18 pin 9.
Check the left broom float switch for MSB and LSB indications.
Check left broom transducer for secure or broken connector.
Check Controller CM-C2 and RF-C1 for secure or broken connections.
Check harness connectors for secure or broken connections.
Check controller CM-C8 and CM-C18 connectors for secure or broken connector.
NOTE: ***Check*** the service tool left broom overview screen with the left broom ON and operating.
If the LB Active Indicator box displays BROOM ON and number 1 & the Left Broom Pressure Transducer box displays volts within the 4.7 - 0.3VDC range the transducer is operational, the transducer ground at pin C is available and the transducer sensor input to controller pin C2p09 is operational with no open circuits or short circuits.

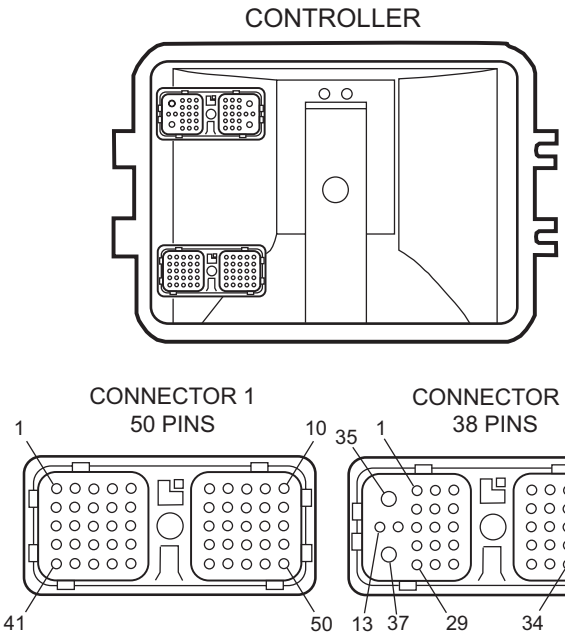
Continued



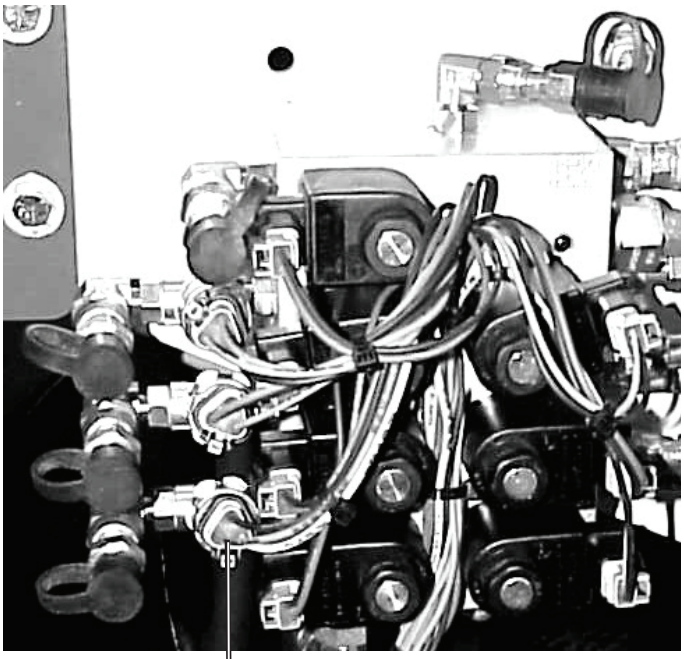
Left Side Broom Transducer Circuit



Continued



Controller Pin Locator



Left Broom Transducer

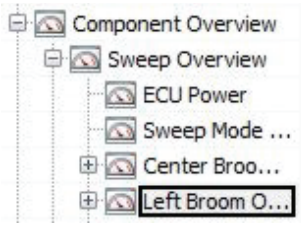
12VDC available at the transducer connector pin A?

NO

Check or replace fuse B7 (10A). ***Check*** for open circuit in the switch power circuit between fuse B7 (10A), splice RF- S4 and the transducer connector pin A.

YES

Reconnect the RF-C9 connector on the transducer.
Place the left broom in the ON position.
Check with a multimeter equipped with back probe adapters for voltage output at the transducer connector RF-C9 pin B (white wire).



Navigator Box

Voltage between 0.3VDC & 4.7VDC available at the transducer connector pin B?

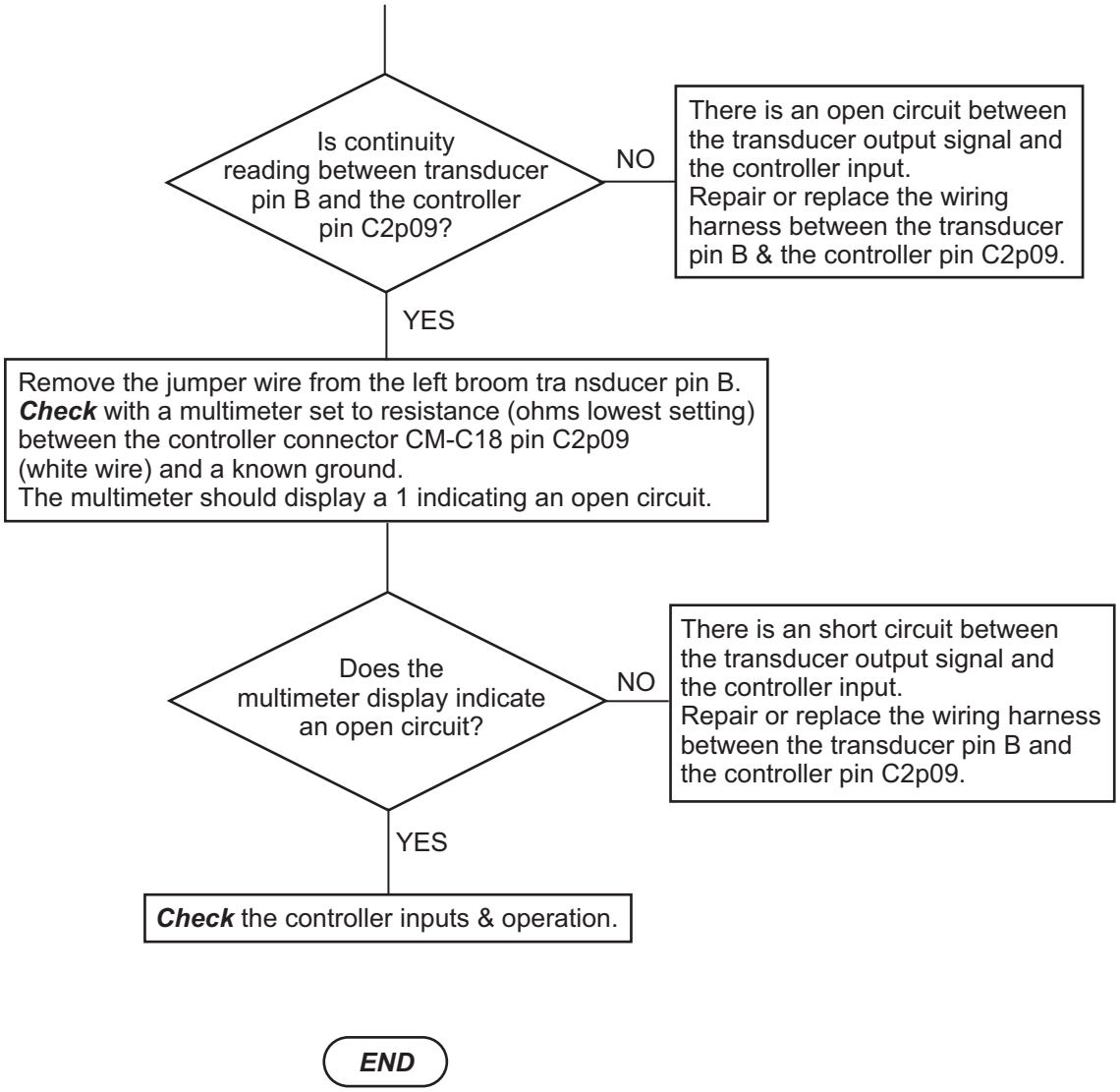
NO

Replace the left broom pressure transducer.

YES

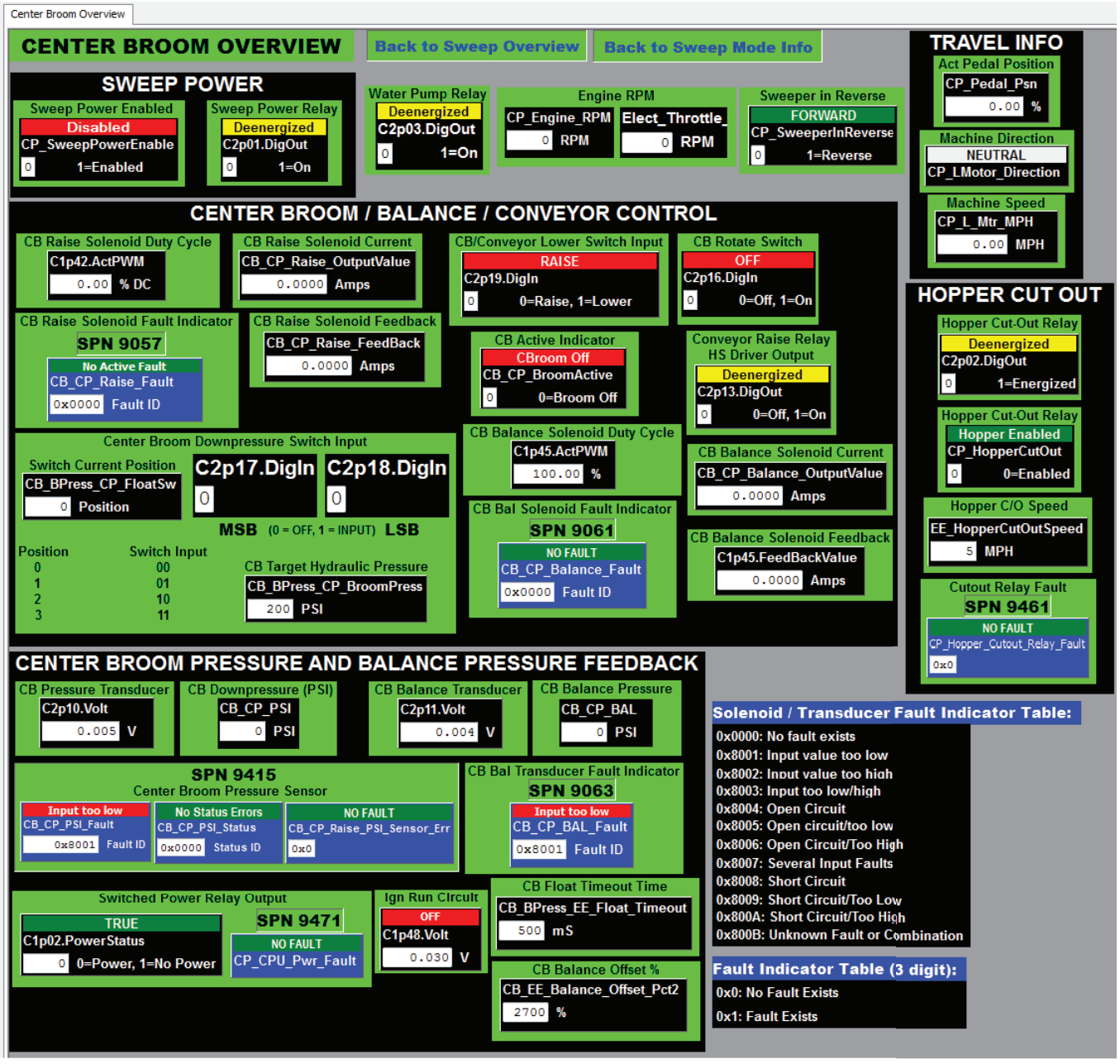
Remove the connector RF-C9 from the left broom transducer.
Remove the CM-C18 connector from the controller.
Place a jumper wire between the transducer connector RF-C9 pin B (white wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller CM-C18 connector pin 9 (white wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

Continued


Is continuity reading between transducer pin B and the controller pin C2p09?
NO
There is an open circuit between the transducer output signal and the controller input.
Repair or replace the wiring harness between the transducer pin B & the controller pin C2p09.
YES
Remove the jumper wire from the left broom tra nsducer pin B.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CM-C18 pin C2p09 (white wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.
Does the multimeter display indicate an open circuit?
NO
There is an short circuit between the transducer output signal and the controller input.
Repair or replace the wiring harness between the transducer pin B and the controller pin C2p09.
YES
Check the controller inputs & operation.
END

SPN 9415
Center Broom
Transducer

The 9415 error code indicates the center broom pressure transducer voltage is out of range either greater than 4.7VDC or less than 0.3VDC. The SPN 9415 error code can be set by an electrical problem in the circuit. The code can also be set by a large difference between the center broom down target pressure and actual pressure seen at the sensor.



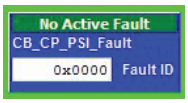
Center Broom Overview Screen

Continued

START



Faults Screen



CB Fault Indicator

The center broom transducer is energized when:

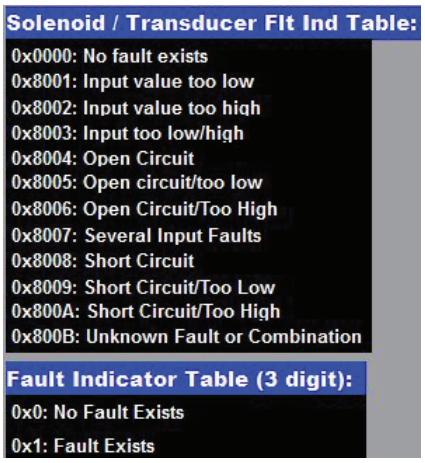
The ignition switch is in the RUN position.
The controller activates the center broom solenoid based on feedback from the right broom transducer.

All preoperational conditions are met?

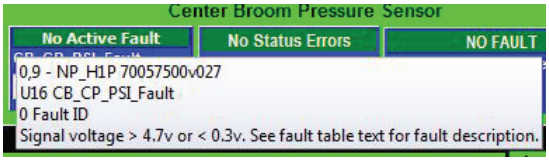
NO → Correct conditions and continue with diagnostics.

YES

Use the service tool center broom overview screen to ***check*** the center broom pressure sensor (CB_CP_PSI_Fault) fault indicator. The SPN 9415 fault box will display a fault condition and the fault ID.
Place the cursor over the center broom pressure sensor fault indicator and allow to hover.
A dialog box will appear with additional fault information. See the fault indicator table for fault codes and values.
The CB_CP_PSI_Status box will display any status errors and the status ID code for the error.
The ID code can be checked on the solenoid / transducer fault indicator table for the cause of the status error.
The CB_CP_Raise_PSI_Sensor_Err box will display a fault condition and code if the actual PSI is too far from the target PSI sensor or there is unwanted resistance in the sensor circuitry.
The SPN 9415 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.
NOTE: If the CB_CP_Raise_PSI_Sensor_Err box displays an error ***check*** for unwanted resistance in the circuit. If unwanted resistance is not found contact Elgin Sweeper Service Department for assistance.

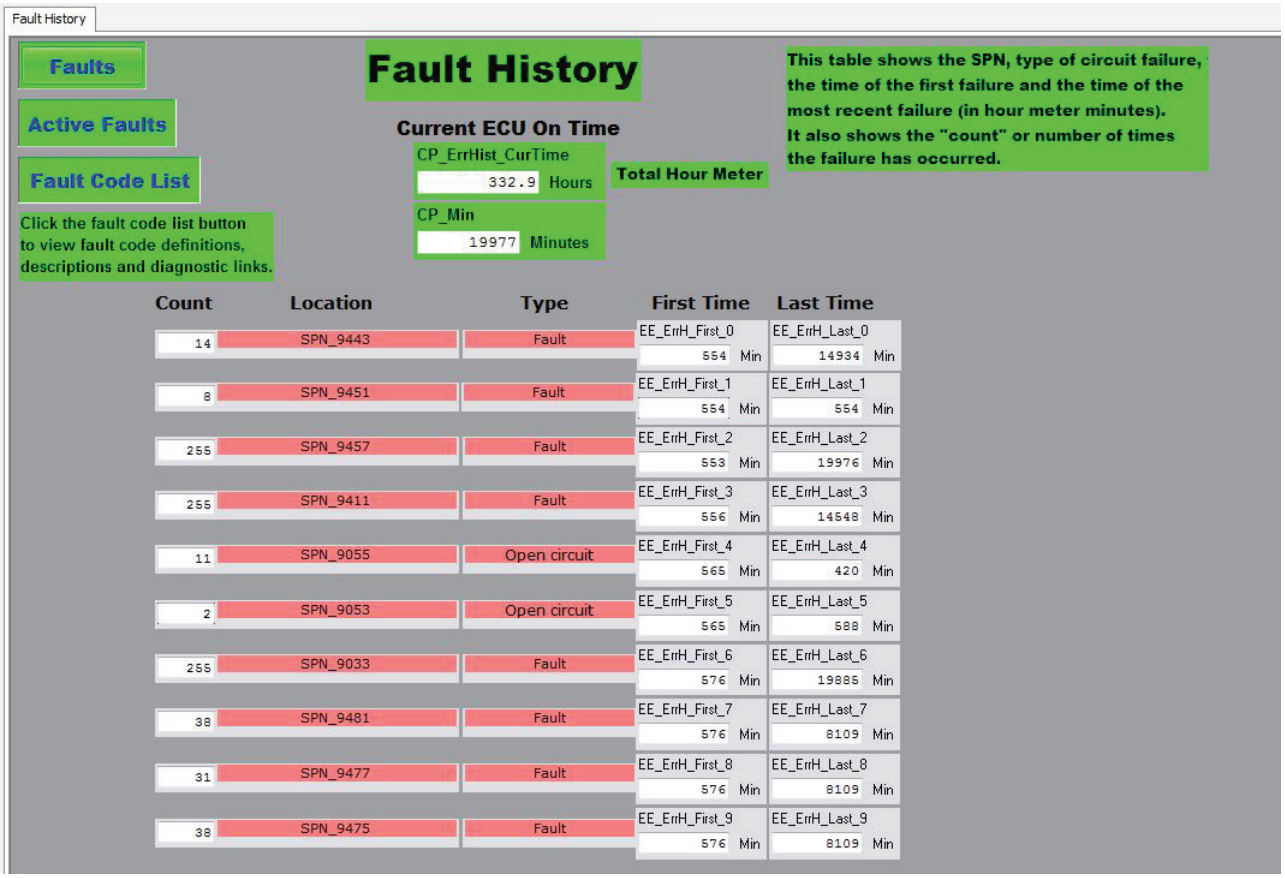


Fault Indicator Tables



Hover CB Fault Indicator

Continued



Fault History Screen

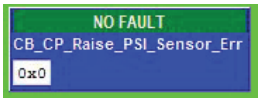
The center side broom transducer monitors center broom down pressure and converts the pressure reading into an electrical signal. The 12VDC is routed from the fused switched power circuit, splice RF-S4 & fuse B7 (10A) to the transducer connector RF-C3 pin A. The transducer is grounded at connector pin C.

As the down pressure moves the transducer internal potentiometer a signal is generated at connector pin B and transmitted to the controller CM-C18 pin 10. The feedback from the transducer is used to adjust the down pressure based on the bin switch selection.

The service tool center broom overview screen can be used to check the transducer operation. See the CB Pressure Transducer log function to check the controller C2p10.Volt input.

The position of the bin switch causes the switch to route signals to the controller as follows:

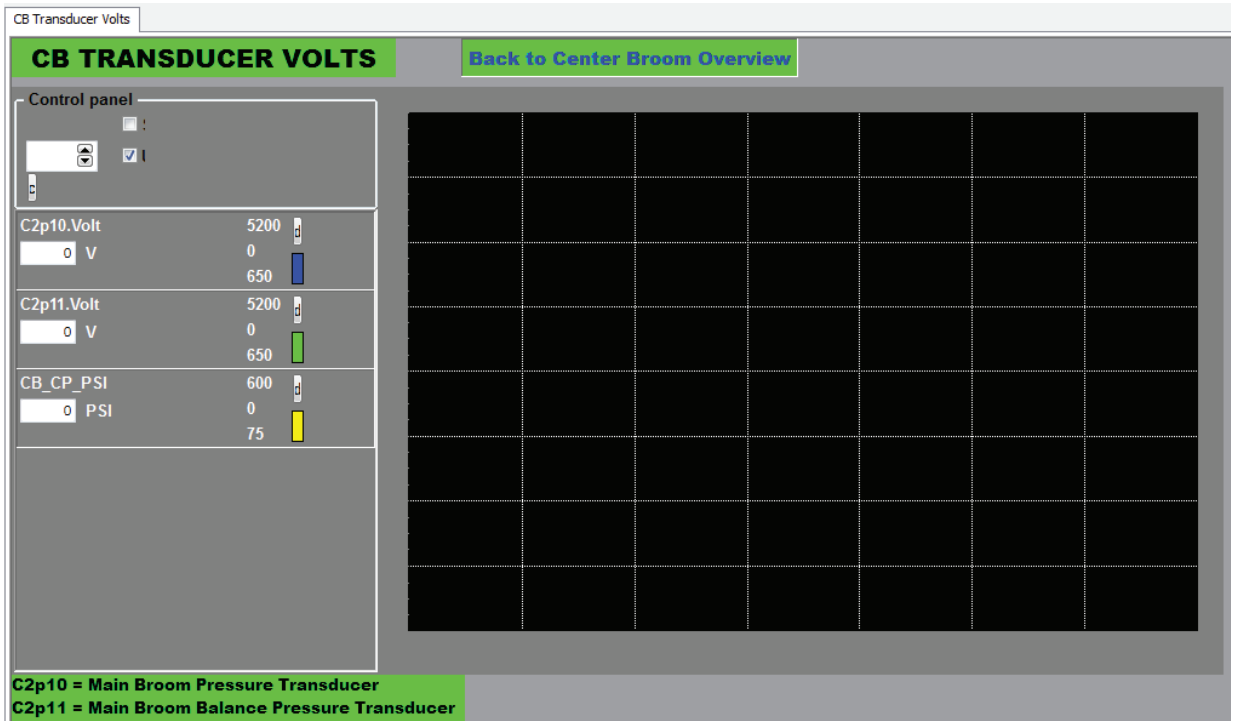
Switch Position	BCD Switch Output	Broom Pressure
0	00	100% Float Pressure
1	01	(90% of position 0)
2	10	(80% of position 0)
3	11	(50% of position 0)



Sensor Error

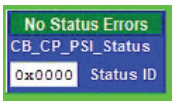
The service tool CB transducer/pressure screen located below the left broom overview screen can be used to watch the center broom transducer volts in operation.
The C2p10 center side broom pressure transducer sensor signal is displayed on the screen oscilloscope. The C2p10 voltage line on the oscilloscope can be used to ***check*** the transducer input signal. An active voltage line indicates the transducer is routing a signal to the controller at pin C2p10.
The voltage being routed to the controller is displayed in the C2p10 V box.
The voltage must be within the 0.3VDC - 4.7VDC range.
A voltage display outside this range may indicate transducer/pressure open circuits or short circuits.

Continued



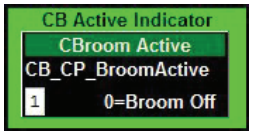
CB Transducer / Pressure Screen

Use the service tool screens in conjunction with the diagnostic steps to locate and repair circuit problems. In case the service tool screens are not active or display conflicting data use the diagnostic steps to troubleshoot brake defeat status and circuit problems.
Check the service tool log functions: Component Overview > Sweep Overview > Center Broom Overview for voltage at the controller CM-C18 pin 10.
Check the center broom float switch for MSB and LSB indications.
Check center broom transducer for secure or broken connector.
Check controller CM-C2 and RF-C1 for secure or broken connections.
Check harness connectors for secure or broken connections.
Check controller CM-C8 and CM-C18 connectors for secure or broken connector.



CB PSI Status

NOTE: ***Check*** the service tool center broom overview screen with the center broom ON and operating. If the Active Indicator box displays BROOM ON and number 1 and the Center Broom Pressure Transducer box displays volts within the 4.7 - 0.3VDC range the transducer is operational, the transducer ground at pin C is available and the transducer sensor input to controller pin C2p10 is operational with no open circuits or short circuits.



CB Active Indicator

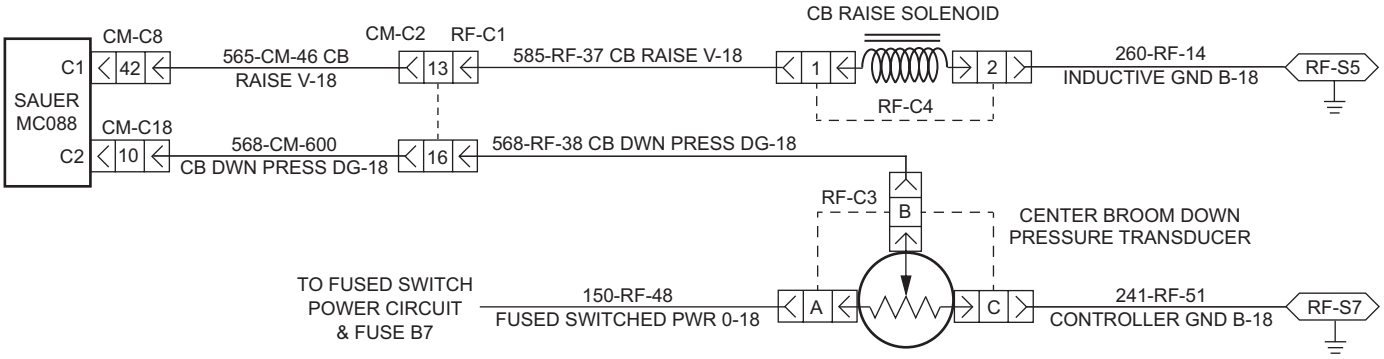
Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin

NO

Remove the connector RF-C3 from the transducer.
Check with a multimeter set to resistance (ohms lowest setting) between the transducer connector RF-C3 pin C (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.

Continued



Center Broom Transducer Circuit

Ground circuit available at the transducer connector pin C?

NO → Repair or replace the wiring harness between the center broom transducer pin C and chassis ground RF-S7.

YES

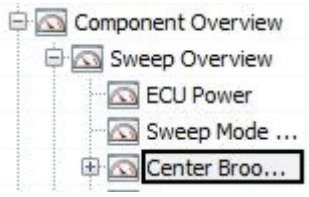
Check with a multimeter equipped with back probe adapters for 12VDC at the center broom transducer connector RF-C3 pin A (orange wire).

12VDC available at the transducer connector pin A?

NO → ***Check*** or replace fuse B7 (10A). ***Check*** for open circuit in the switch power circuit between fuse B7 (10A), splice RF- S4 and the transducer connector pin A.

YES

Reconnect the connector RF-C3.
Place the center broom in the ON position.
Check with a multimeter equipped with back probe adapters for voltage output at the transducer connector RF-C6 pin B (dark green wire).



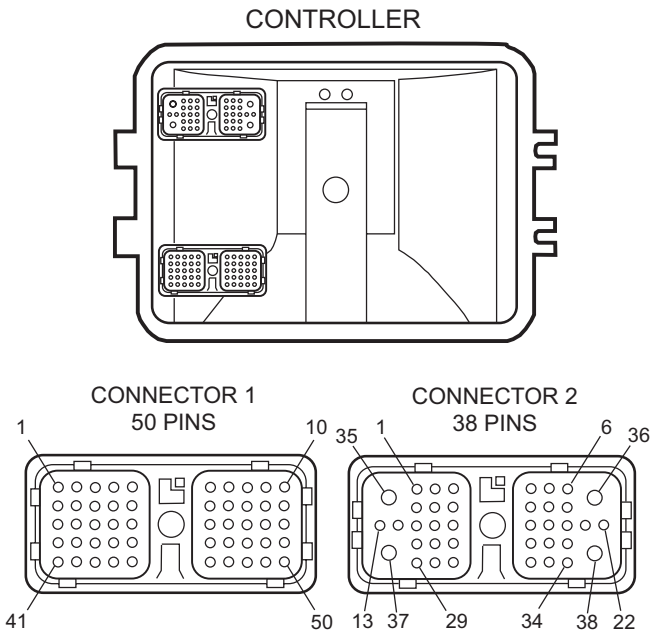
Navigator Box

Voltage between 0.3VDC & 4.7VDC available at the transducer connector pin B?

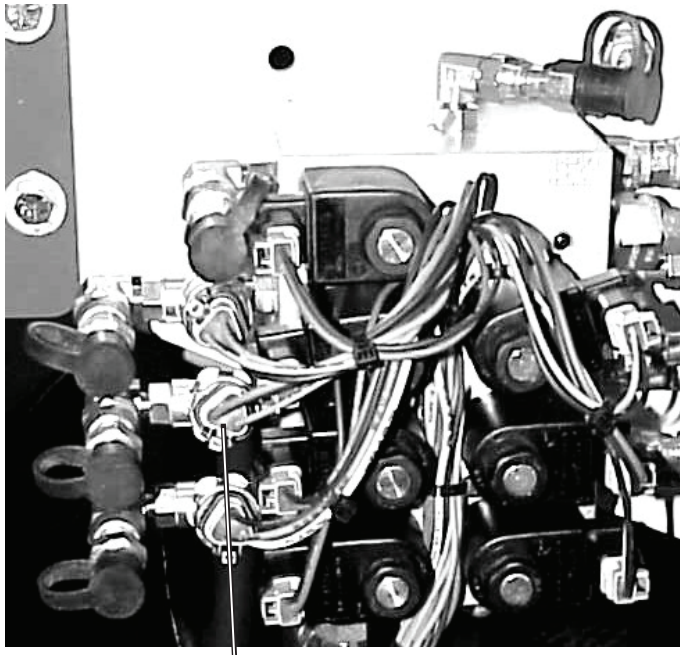
NO → Replace the center broom pressure transducer.

YES

Continued



Controller Pin Locator



Center Broom Transducer

Remove the connector RF-C3 from the center broom transducer.
Remove the CM-C18 connector from the controller.
Place a jumper wire between the transducer connector RF-C3 pin B (dark green wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller CM-C18 connector pin 10 (dark green wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.

Is continuity reading between transducer pin B and the controller pin C2p10?

NO → There is an open circuit between the transducer output signal and the controller input.
Repair or replace the wiring harness between the transducer pin B & the controller pin C2p10.

YES

Remove the jumper wire from the center broom transducer pin B.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CM-C18 pin C2p10 (dark green wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.

Does the multimeter display indicate an open circuit?

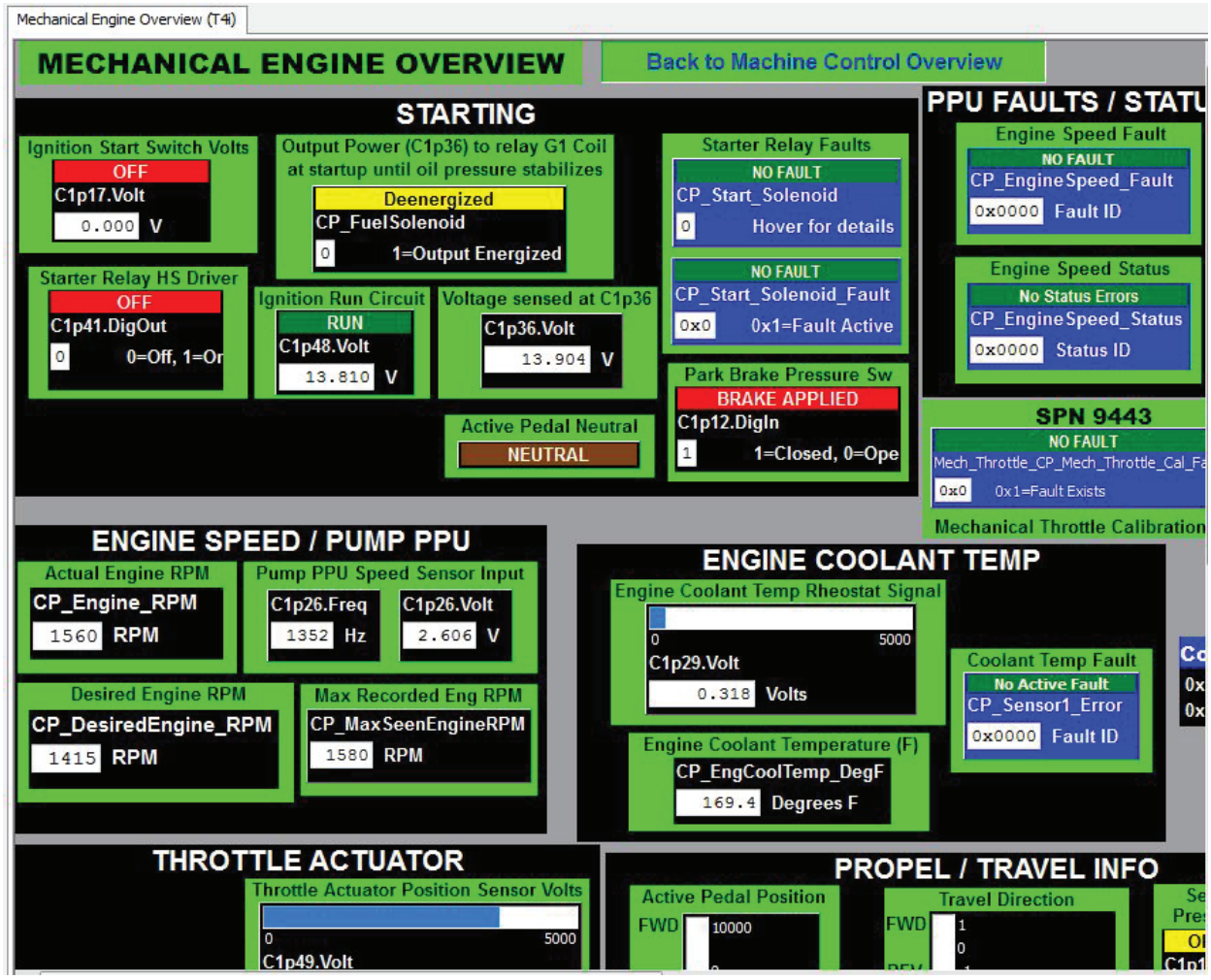
YES → ***Check*** the controller inputs & operation.

NO → There is an short circuit between the transducer output signal and the controller input.
Repair or replace the wiring harness between the transducer pin B and controller pin C2p10.

END

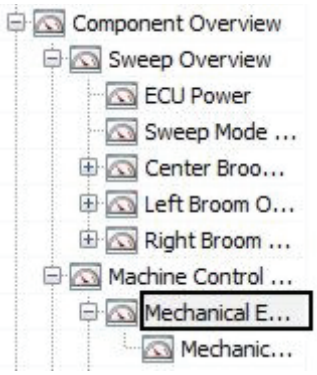
SPN 9443
Throttle Calibration
Error T4i ONLY

The SPN 9443 error code indicates the actual engine RPM is too far from the desired engine RPM. The error code will normally appear when the ignition switch is placed in the ON position with the engine OFF. As an example, when the ignition switch is placed in the ON (RUN) position and the engine is not running the actual engine RPM is 0 but the desired engine RPM is 1076 RPM (as seen on the CP_DesiredEngine_RPM box on the mechanical engine overview screen). The difference between the actual RPM and desired RPM causes the SPN 9443 error code to set.

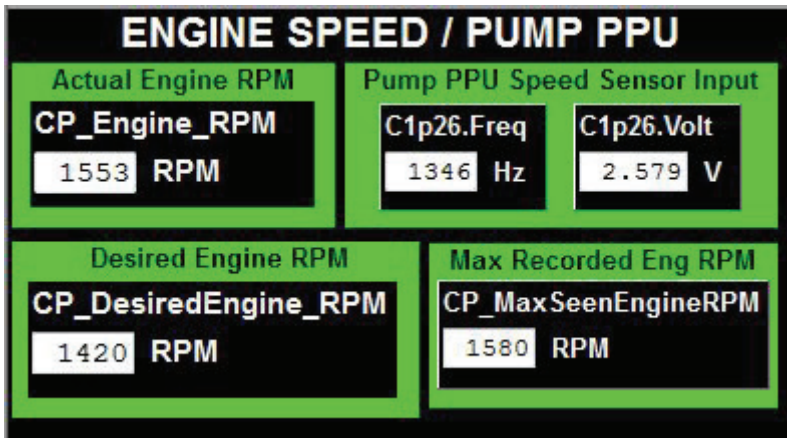


Mechanical Engine Overview Screen

Continued

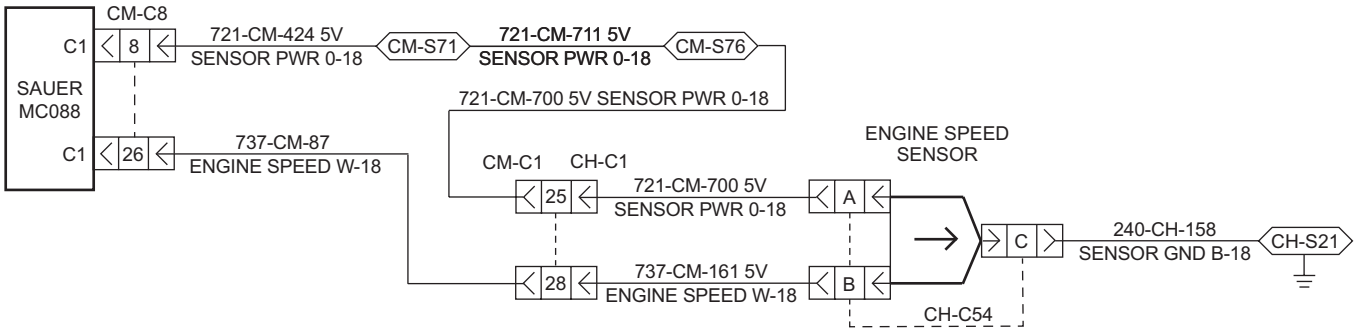


Navigator Box



Actual / Desired Engin RPM

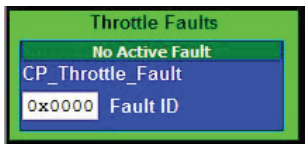
The engine speed (actual and desired) can be checked using the service tool Mechanical Engine Overview > Engine Speed/Pump PPU > Actual Engine RPM > Desired Engine RPM.



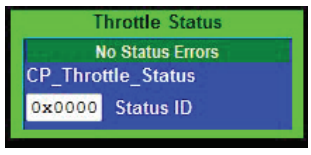
T4i Engine Speed Sensor Circuit

START

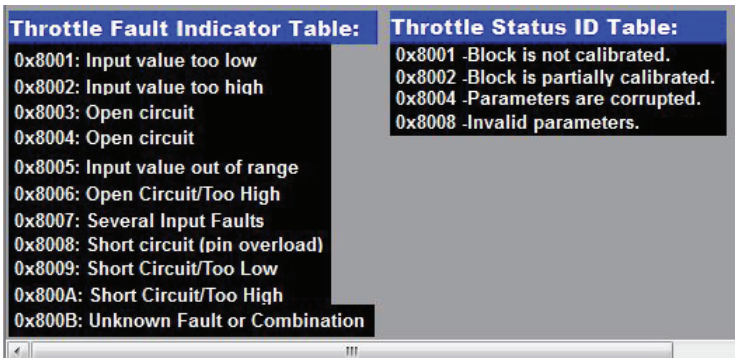
The engine speed sensor is mounted on the hydrostatic drive system pump.
The 12VDC input to the controller is converted to 5VDC and routed to the engine speed sensor connector CH-C54 pin A from the controller CM-C8 pin 8. The engine sensor is grounded at pin C by the sensor ground circuit and ground splice CH-S21. As the pump shaft rotates a signal is generated and transmitted from the sensor pin B to the controller CM-C8 pin 26.
The controller converts the speed sensor inputs signals into engine speed (RPM).
The engine speed is used by the controller for sweeper operation and throttle calibration.



Throttle Fault Indicator



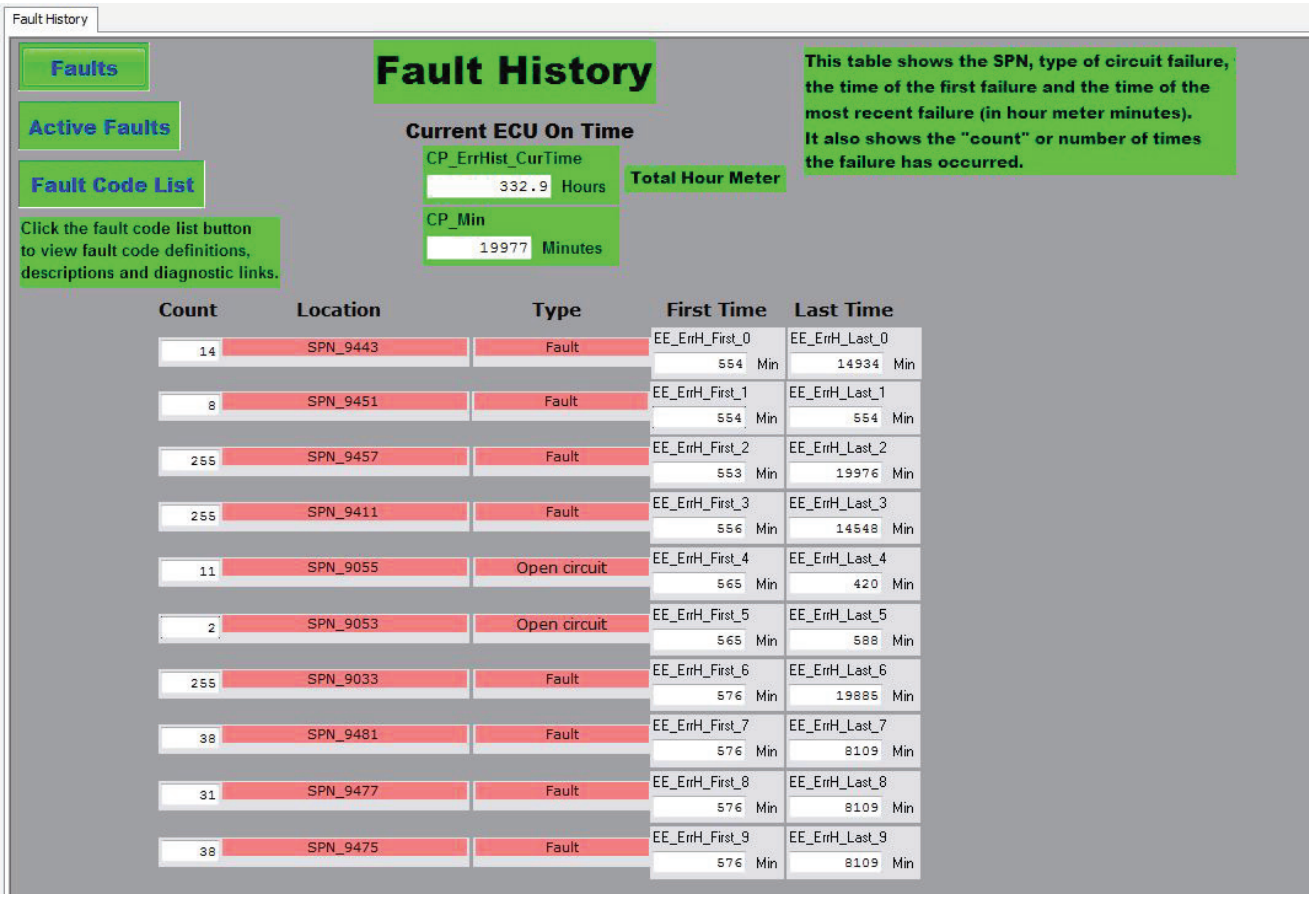
Throttle Fault Status



Throttle Fault/Status ID Tables

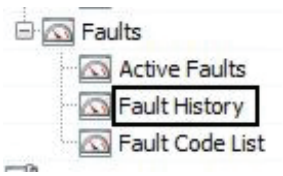
Continued

Use the service tool mechanical engine overview screen to ***check*** the throttle (CB_ThrottleFault) fault indicator. The SPN 9443 fault box will display a fault condition and the fault ID.
Place the cursor over the center broom pressure sensor fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the fault indicator table for fault codes and values.
The CP_ThrottleI_Status box will display any status errors and the status ID code for the error.
The ID code can be checked on the throttle fault indicator table for the cause of the status error.
The SPN 9443 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

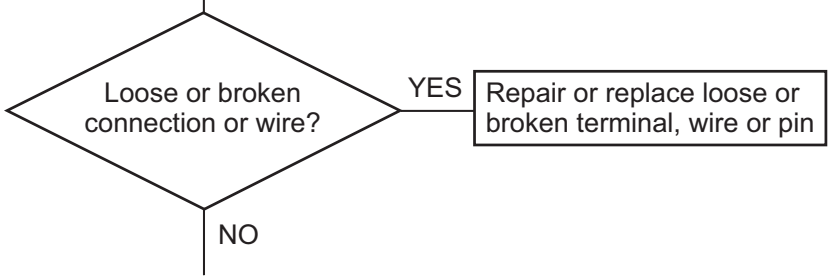


Fault History Screen

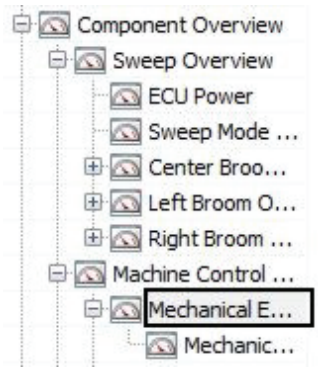
Check connectors not mated fully, terminals or pins not installed fully bent pin or broken wire.
Check the engine speed sensor for secure or loose mounting.
Check the sensor connector for secure or broken connection.
Check controller connectors CM-C8 and CM-C18 for secure or broken connector.



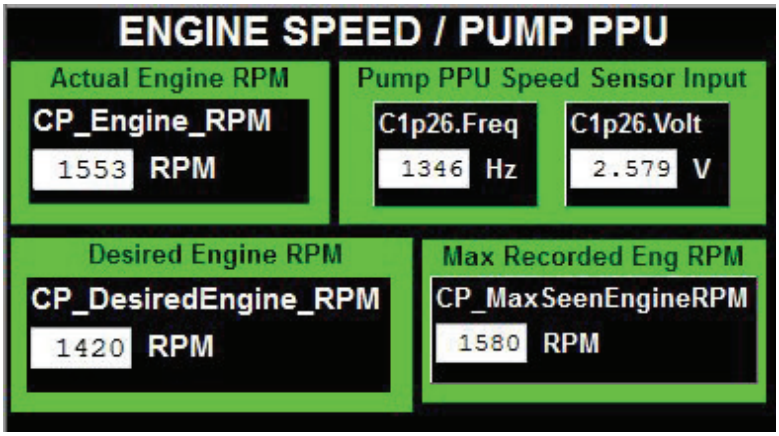
Faults Screen



Continued



Navigator Box



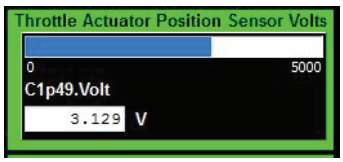
Engine Speed / Pump PPU

Use the service tool mechanical engine overview screen, sensor supply volt (5V) (C1p08.Volt) box for available voltage at the controller pin C1p08.
Use the service tool engine speed/pump PPU for actual engine RPM (CP_Engine_RPM) and desired engine RPM (CP_DesiredEngine_RPM).
The SPN 9443 error code will set when the difference between the actual engine speed and desired engine speed is excessive. If the throttle actual engine speed and desired engine speed are active with the engine running and within range the engine speed sensor is operational with sensor volts available and not open circuits of short circuits.
The throttle actuator position can be checked using the service tool mechanical engine overview screen, throttle actuator position sensor volts (C1p49.Volt) input.
The position signal is routed from the throttle linear actuator to the controller at pin C1p49.

The 5VDC available at the controller CM-C8 pin 8?

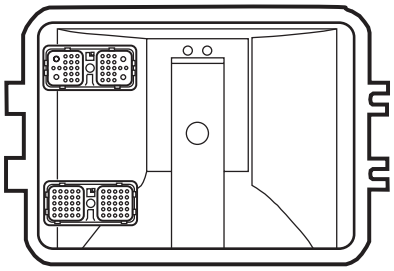
NO → **Check** the controller inputs & operation.

YES

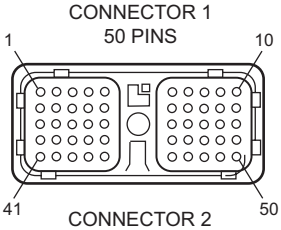


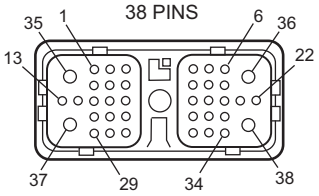
Throttle Actuator Position Sensor Volts

CONTROLLER



Check with a multimeter equipped with back probe adapters for 5VDC at the engine speed sensor connector CH-C54 pin A (orange wire).





The 5VDC available at the speed sensor pin A?

NO → Remove the connector CM-C8 from the controller. Remove all sensor power circuits (connectors) connected to the controller pin C1p08.
These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15
Engine Speed Sensor CH-C54
Place a jumper wire between the speed sensor pin A (orange wire) and a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CM-C8 pin C1p08 and a known ground.
The multimeter should display a 0 indicating wire continuity.

YES

Continued

Continued

Remove the connector CH-C54 from the speed sensor.
Check with a multimeter set to resistance between the speed sensor connector pin C (black wire) and a known ground.
The multimeter should display a 0 indicating ground contiuity.

A ground circuit is available at the speed sensor pin C?

NO

Check for an open circuit in the sensor ground circuit between the speed sensor connector CH-C54 pin C (black wire) and chassis ground CH-S21.

YES

Remove the CH-C54 connector from the engine speed sensor.
Make sure the ignition switch is in the ON (engine off) position.
Check with a multimeter for voltage at the engine speed sensor connector terminal B (white wire).
The multimeter and the pump PPU speed sensor input voltage in the service tool should display approximately 2.4v.
If the multimeter displays 0 volts there is an open circuit between the controller connector pin C1p26 and the engine speed sensor connector terminal B.
Use the service tool mechanical engine overview screen to check the Pump PPS Sensor Speed Sensor Input - C1p26.Volts box.
If the box displays 0 and the multimeter displays 0 there is a short circuit or short to ground in the circuit between the controller connector pin C1p26 & the engine speed sensor connector terminal B or the ECU is bad.
Repair or replace the wiring harness.
Install all connectors removed during testing.

END

The multimeter displays wire continuity between the speed sensor and controller?

NO

There is an open circuit between the controller pin C1p08 and the engine speed sensor pin A.
Repair or replace the wiring harness between the controller pin C1p08 & speed sensor pin A.

YES

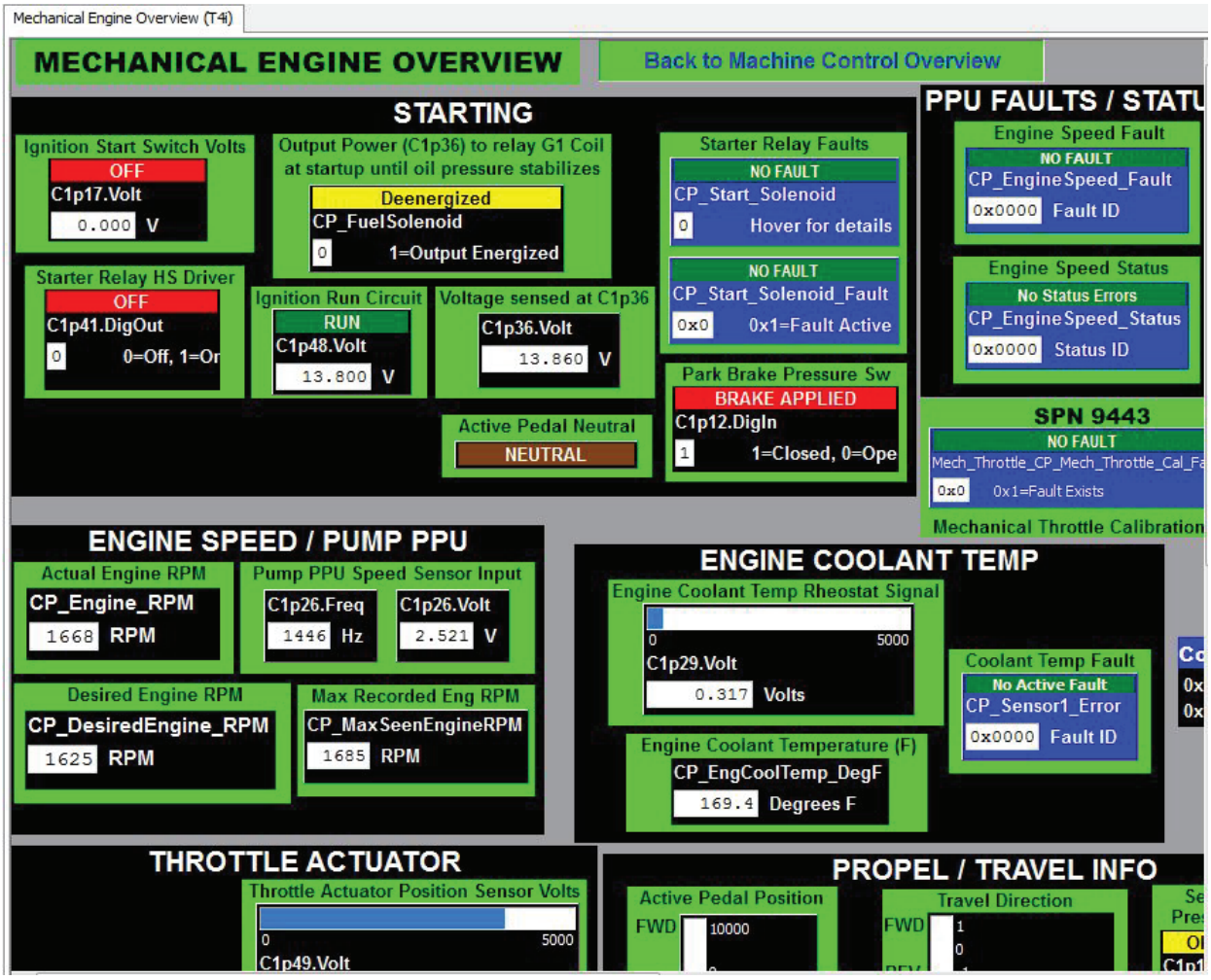
Remove the jumper wire from the engine speed sensor connector CH C54.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector pin C1p08 and a known ground.
The multimeter should display a 1 indicating an open circuit. If the multimeter does not display a 1 there is a short circuit or short to ground between the controller pin C1p08 and one of the several sensors named below.
These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15
Engine Speed Sensor CH-C54

The short circuit or short to ground may exist in any of the sensor power circuits connected to the controller pin C1p08.
These sensors include:
Throttle Rotary Switch connector OC-C5
Throttle Actuator connector CH-C52
Left PPU connector CH-C10
Left Foot Pedal connector CM-C46
Right Foot Pedal connector CM-C45
Left Broom Tilt Sensor connector CH-C46
Right Broom Tilt Sensor connector RF-C15

While watching the multimeter display, disconnect each sensor connector until the multimeter displays a 1.
Install all sensor connectors except the connector with the short circuit or short to ground.
Repair or replace the wiring harness between the shorted sensor and the controller pin C1p08.
Install all connectors removed during testing.

SPN 9451
Engine Coolant
Temperature Sensor

The 9451 error code only applies to the Pelican T4i circuits. The 9451 error code indicates the engine coolant temperature sensor output resistance is too high or too low.



Mechanical Engine Overview Screen

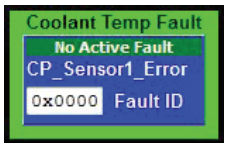
Continued

START



Engine Coolant
Temperature Sensor

The coolant temperature sensor is mounted on the engine in a coolant port.
The sensor is a type of variable resistor that acts as a variable path to ground.
When the engine is running the sensor offers resistance to ground providing a mid-range reading on the gauge. If the sensor wire was removed from the sensor the gauge would read off the scale to the high side.
The coolant temperature sensor is grounded to the engine block through the installation threads.
The coolant sensor sends a resistance signal to the controller CM-C8 pin 29 (C1p29).
The signal is routed from the controller to the speedometer and transferred through the LinBus to the temperature gauge.
Use the mechanical engine overview screen, engine coolant temp rheostat signal (C1p29.Volt) box to ***check*** the input signal from the temperature sender to the controller pin C1p29.
Use the mechanical engine overview screen , engine coolant temperature (F) (CP_EngCoolRemp_DegF) box to ***check*** the engine coolant temperature.



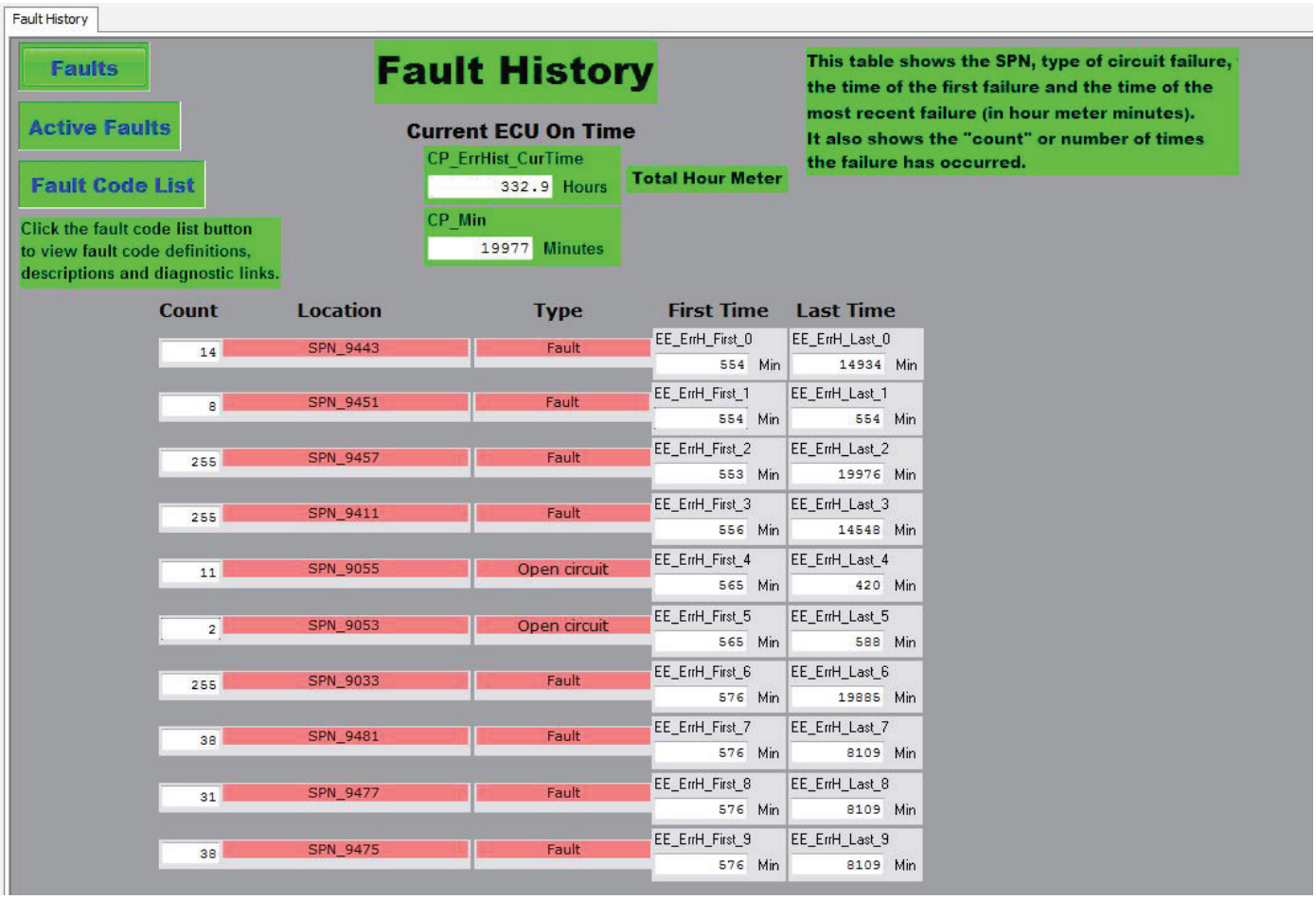
Coolant Temperature Fault



Faults Screen

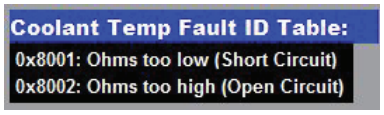
Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the coolant temperature sensor for secure or loose mounting.
Check the sensor connector for secure or broken connection.
Check controller connectors CM-C8 and CM-C18 for secure or broken connector.

Continued

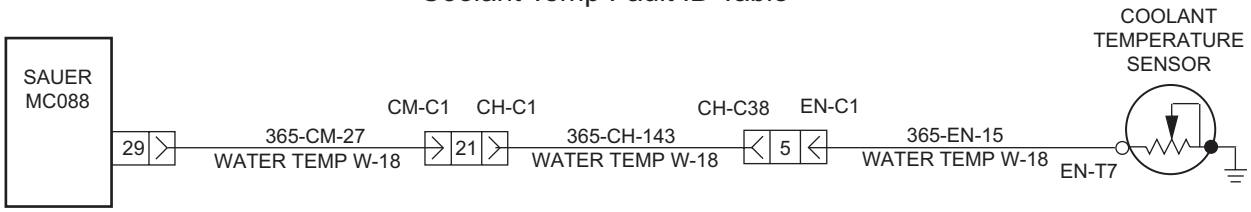


Fault History Screen

Use the service tool mechanical engine overview screen to ***check*** the coolant temperature fault indicator.
The coolant temp fault box will display a fault condition and the fault ID.
Place the cursor over the coolant temp fault indicator and allow to hover.
A dialog box will appear with additional fault information.
See the coolant temperature fault ID table for fault codes and values.
The SPN 9451 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.



Coolant Temp Fault ID Table



Engine Coolant Temperature Sensor Circuit

Continued

Loose or broken connection or wire? YES → Repair or replace loose or broken terminal, wire or pin.

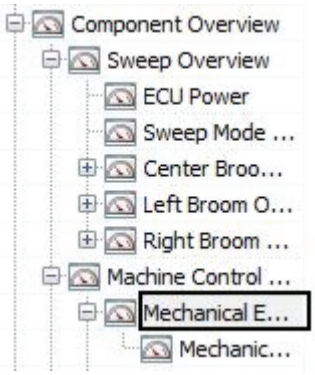
NO

Remove the wire and connector from the coolant temperature sensor. Using a multimeter set for resistance (ohms) place one lead on the sensor connector. Place the other lead on a good ground. Start the engine and allow the engine to warm up while watching the multimeter readings. The ohms reading should indicate the resistance shown in the following typical temperature to ohms readings:

+33^{O} F - 9600 ohms	+143^{O} F - 835 ohms
+57^{O} F - 4095 ohms	+163^{O} F - 432 ohms
+78^{O} F - 2975 ohms	+186^{O} F - 305 ohms
+100^{O} F - 1800 ohms	+210^{O} F - 185 ohms
+120^{O} F - 1350 ohms	+234^{O} F - 60 ohms

As the engine temperature increases the sensor resistance to ground drops. If the sensor readings are far different from the above typical readings, replace the coolant termperature sensor.

Note: ***Check*** the service tool engine overview coolant temperature log function. A temperature reading indicates the temperature sensor is routing signals to the linbus and speedometer.



Navigator Box

The coolant temperature sensor readings are close to chart listings? NO → Replace the engine coolant temperature sensor.

YES

The coolant temperature sensor is operational.
Check for open, short or short to ground circuits between the sensor and the controller CM-C8 pin 29 (C1p29) (white wire).
Remove the CM-C8 connector from the controller.
Remove the output wire from the coolant temperature sensor.
Place a jumper wire between the coolant temperature sensor output wire and a known ground.
Check with a multimeter set for resistance (ohms lowest setting) between the controller connector pin C1p29 (white wire) and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter displays a 1 the wire has an open circuit.
Repair or replace the wiring harness between the controller pin C1p29 and the coolant temperature sensor.
Remove the jumper from the coolant temperature sensor.
Check with a multimeter set for resistance (ohms lowest setting) between the controller pin C1p29 (white wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter displays a 0 the wire has short circuit.
Repair or replace the wiring harness between the controller pin c1p29 and the coolant temperature sensor.

END

SPN 9453
T4i Starter
Solenoid Relay

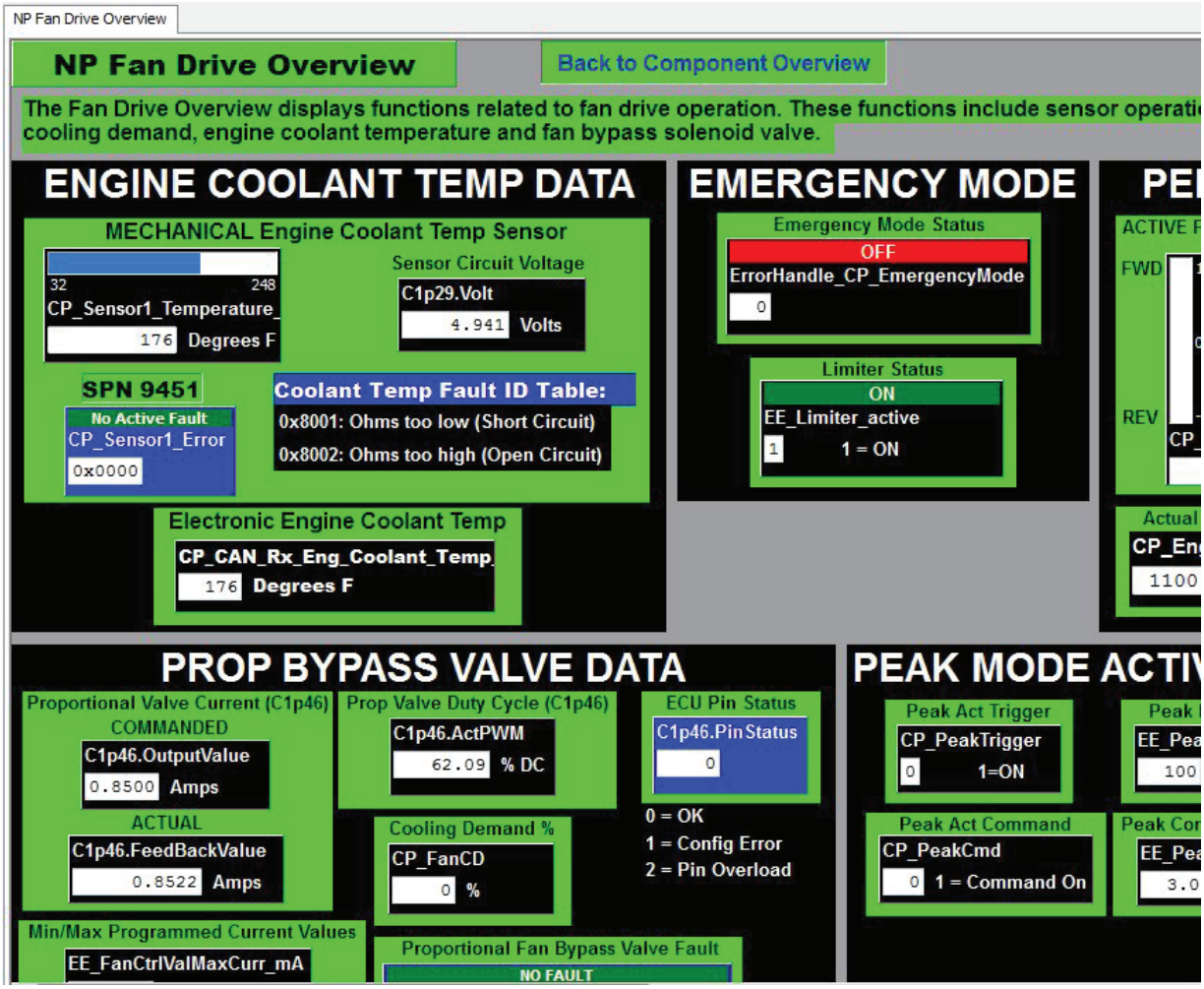
THIS CODE IS NOT USED AT THIS TIME.

SPN 9453
T4F Starter Solenoid
Relay 74hp/99hp

THIS CODE IS NOT USED AT THIS TIME.

SPN 9455
Proportional Fan
Bypass Valve

The SPN 9455 error code indicates the hydraulic oil fan bypass valve output is in error.

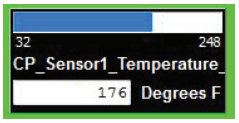


NP Fan Drive Overview Screen

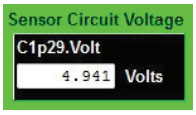
The proportional fan bypass valve is controlled by the controller based on input from the engine coolant temperature sensor. See the service tool NP fan drive overview screen, coolant temperature sensor input box CP_Sensor1_Temperature-DegreesF. The input from the temperature sensor is used to close the fan bypass valve as needed to run the hydraulic radiator fan motor.
As the temperature cools the controller compensates by opening the valve.
See error code SPN 9451 for diagnostics on the engine coolant temperature sensor.

The engine coolant temperature sensor sends coolant temperature signals to the controller.
The controller uses the sensor input signals to generate output voltage from CM-C8 pin C1p46.
See the service tool NP fan drive overview screen, sensor circuit voltage box C1p29.Volt.
The voltage from pin 46 is routed to one side of the radiator fan motor bypass valve coil.
See the service tool NP fan drive overview screen, proportional valve current (C1p46).
Because the other side of the valve coil is grounded the the valve is opened proportionally to the voltage routed from the controller.
If the controller senses a engine coolant temperature sensor failure or error the bypass valve will be closed to protect the engine from excessively high temperatures.

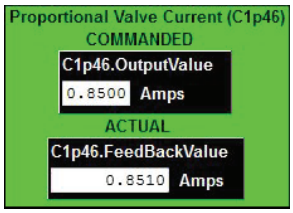
Continued



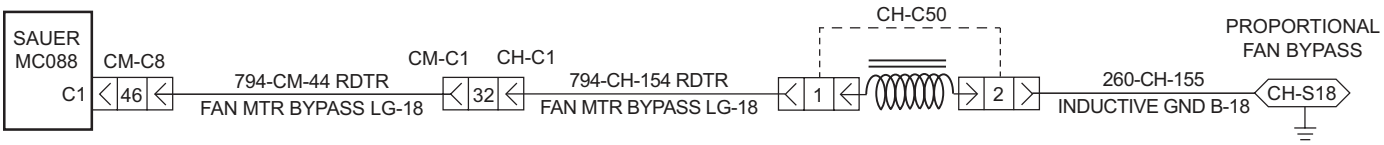
Coolant Temperature Sensor



Sensor Circuit Voltage



Proportional Valve Current

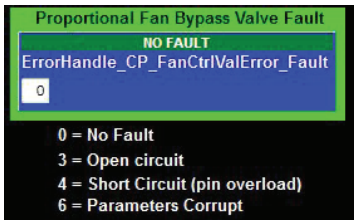


Proportional Fan Bypass Valve Circuit



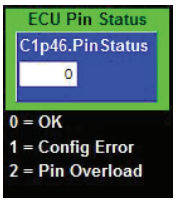
Faults Screen

START

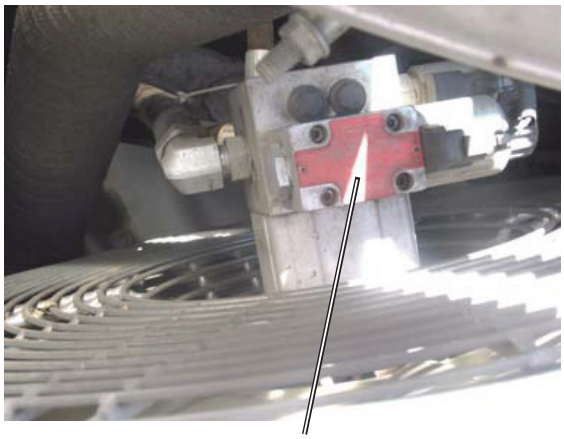


Proportional Fan Bypass Valve Fault / Table

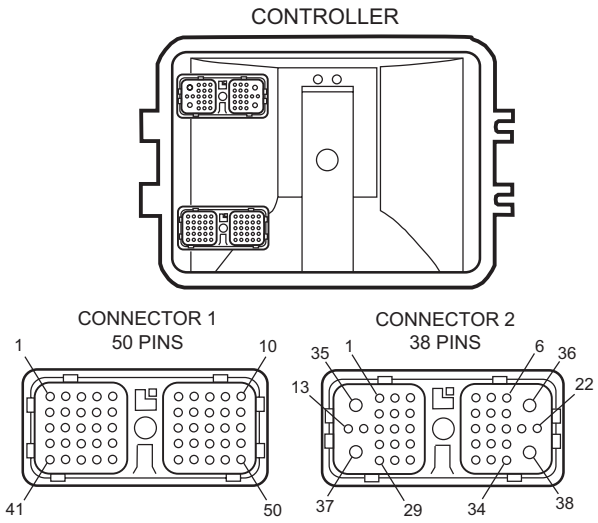
Use the service tool NP fan drive overview screen to ***check*** the proportional fan bypass valve fault indicator.
The ErrorHandle_CP_FanCtrlValError_Fault fault box will display a 0 when there are no faults, a 3 when the ECU pin has an open circuit, a 4 if the ECU pin has a short circuit (pin overvloaded) or a 6 if the pin parameters are corrupt.
The ECU pin status box (c1p46.PinStatus will display a status condition and ID code when a fault is set.
See the fault indicator table for fault codes and values.
The SPN 9455 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.



ECU Pin Status

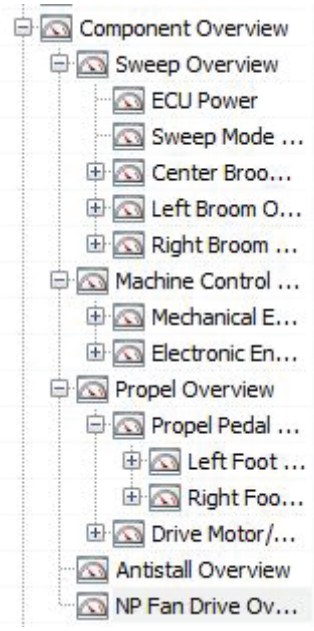


Fan Motor Bypass Valve and Motor



Controller Pin Locator

Continued



Navigator Box

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the proportional fan motor bypass valve connector for secure or broken connection.
Check controller connectors CM-C8 and CM-C18 for secure or broken connector.

Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin.

NO

Remove the connector (CH-C50) from the proportional fan bypass valve.
Check with a multimeter set to resistance (ohms lowest setting) between the valve connector pin2 (black wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.

A ground circuit is available at fan motor bypass coil terminal 2?

NO → There is an open circuit between the valve connector pin 2 & chassis ground CH-S18. Repair or replace the wiring harness between the valve connector pin 2 and chassis ground Ch-S18.

YES

Remove the connector CH-C50 from the proportional fan bypass valve.
Check with a multimeter set to resistance between the bypass valve pins 1 & 2.
The multimeter should display approximately 9.0 ohms at 70 degrees.

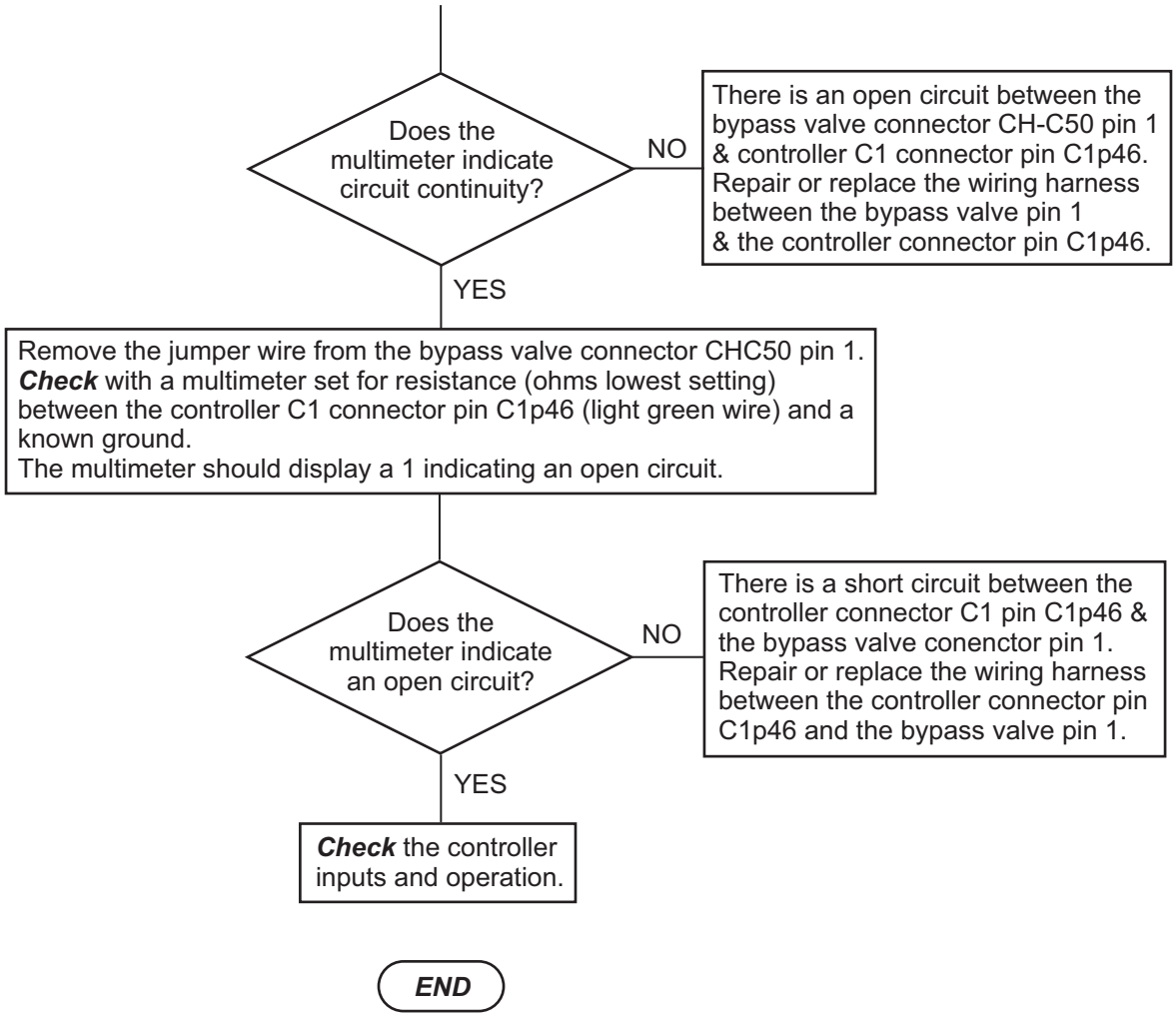
The coil resistance is 9.0 ohms / 70 degrees.

NO → The bypass valve has either an open circuit or short circuit. Replace the proportional fan bypass coil / valve.

YES

Remove the connector CH-C50 from the bypass valve.
Remove the C1 connector from the controller.
Place a jumper wire between the bypass connector pin 1 (light green wire) and a known ground.
Check with a multimeter set for resistance (ohms lowest setting) between the controller connector pin C1p46) and a know ground.
The multimeter should display a 0 indicating wire continuity.

Continued


Does the multimeter indicate circuit continuity?
NO
There is an open circuit between the bypass valve connector CH-C50 pin 1 & controller C1 connector pin C1p46. Repair or replace the wiring harness between the bypass valve pin 1 & the controller connector pin C1p46.
YES
Remove the jumper wire from the bypass valve connector CHC50 pin 1. Check with a multimeter set for resistance (ohms lowest setting) between the controller C1 connector pin C1p46 (light green wire) and a known ground.
The multimeter should display a 1 indicating an open circuit.
Does the multimeter indicate an open circuit?
NO
There is a short circuit between the controller connector C1 pin C1p46 & the bypass valve conenctor pin 1. Repair or replace the wiring harness between the controller connector pin C1p46 and the bypass valve pin 1.
YES
Check the controller inputs and operation.
END

SPN 9461
Hopper
Cut-Out Relay

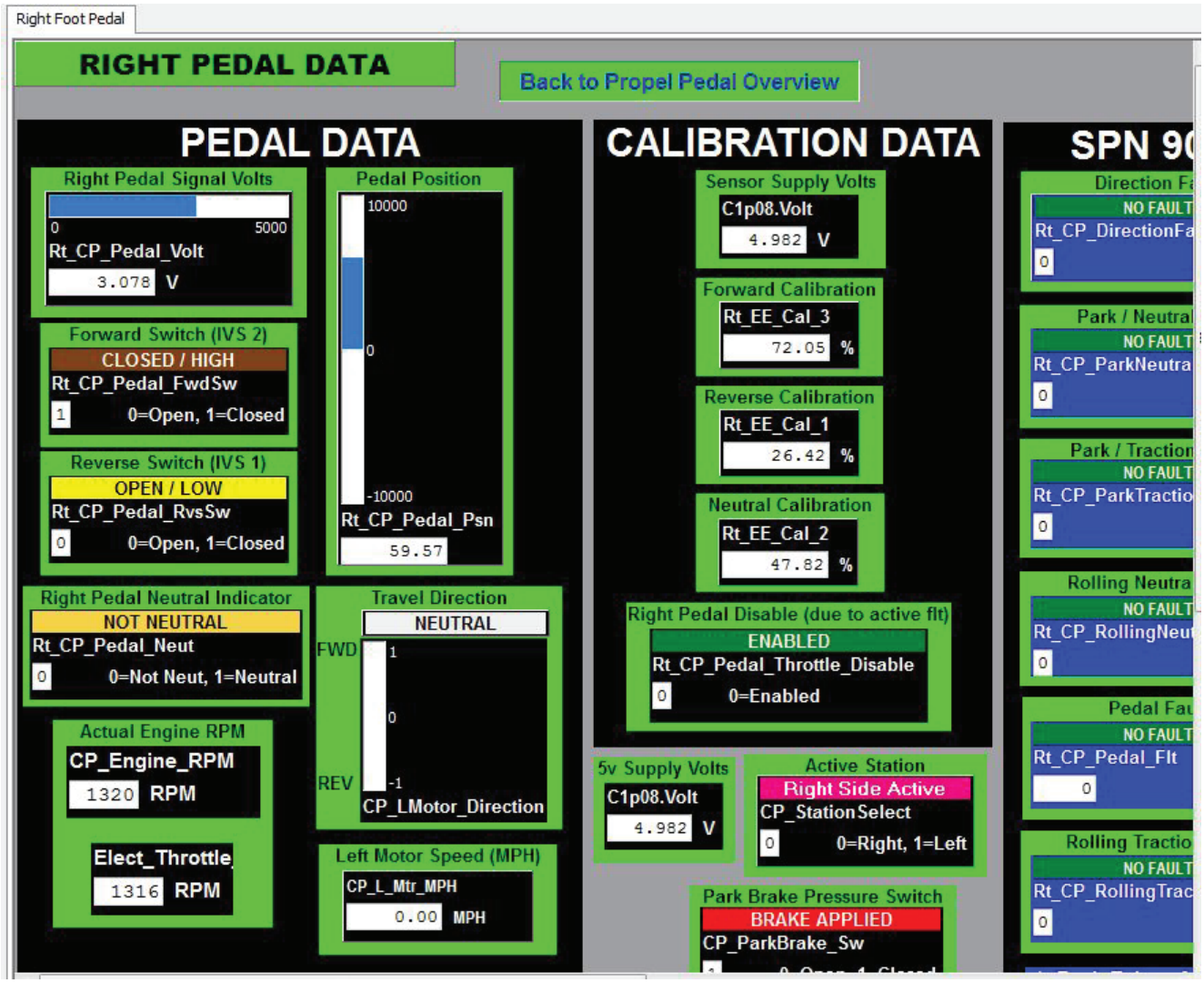
THIS CODE IS NOT USED AT THIS TIME.

SPN 9463
Water
Pump Relay

THIS CODE IS NOT USED AT THIS TIME.

SPN 9467
Park Brake
Applied

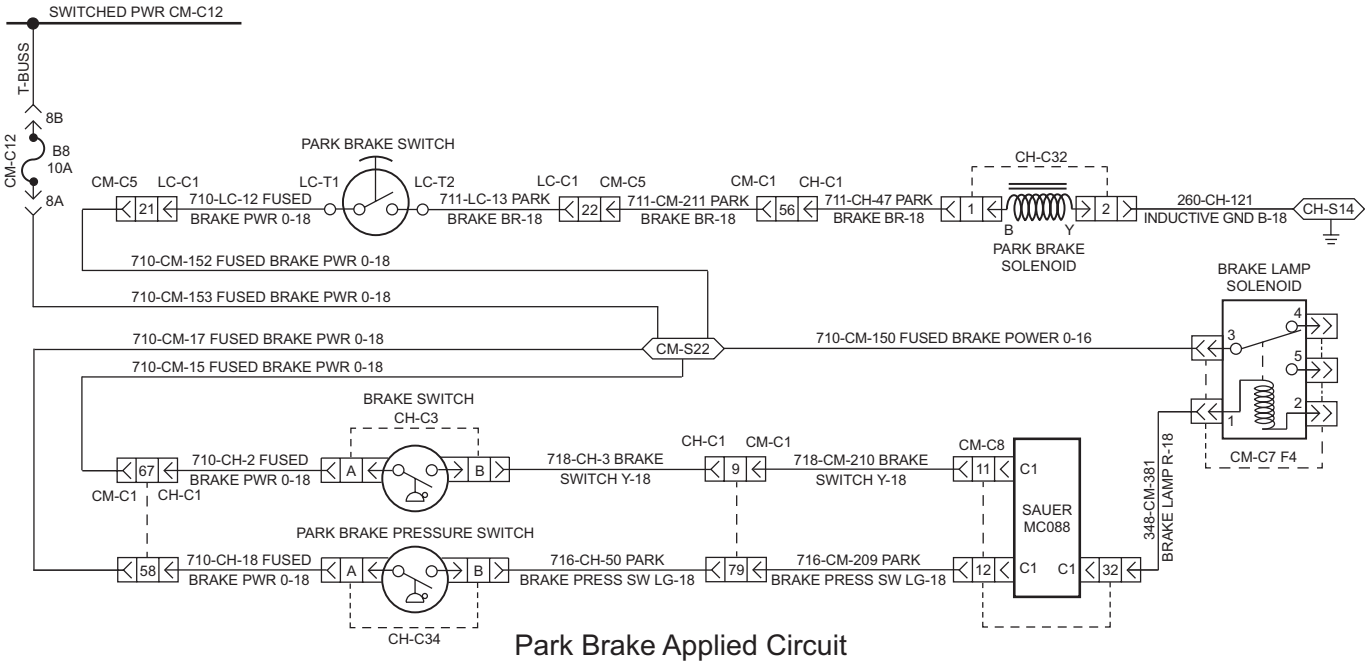
The 9467 error code indicates the park brake has been applied during operation. ***Check*** the park circuit as follows.



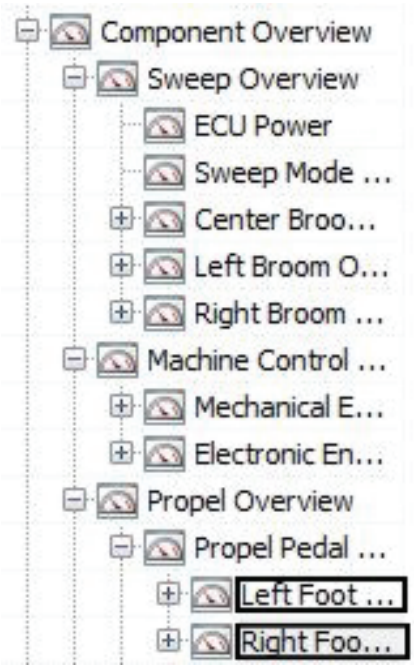
Right Foot Pedal Screen

The service tool right foot pedal screen or left foot pedal screen can be used to monitor the park brake pressure switch, park brake status and park brake faults.

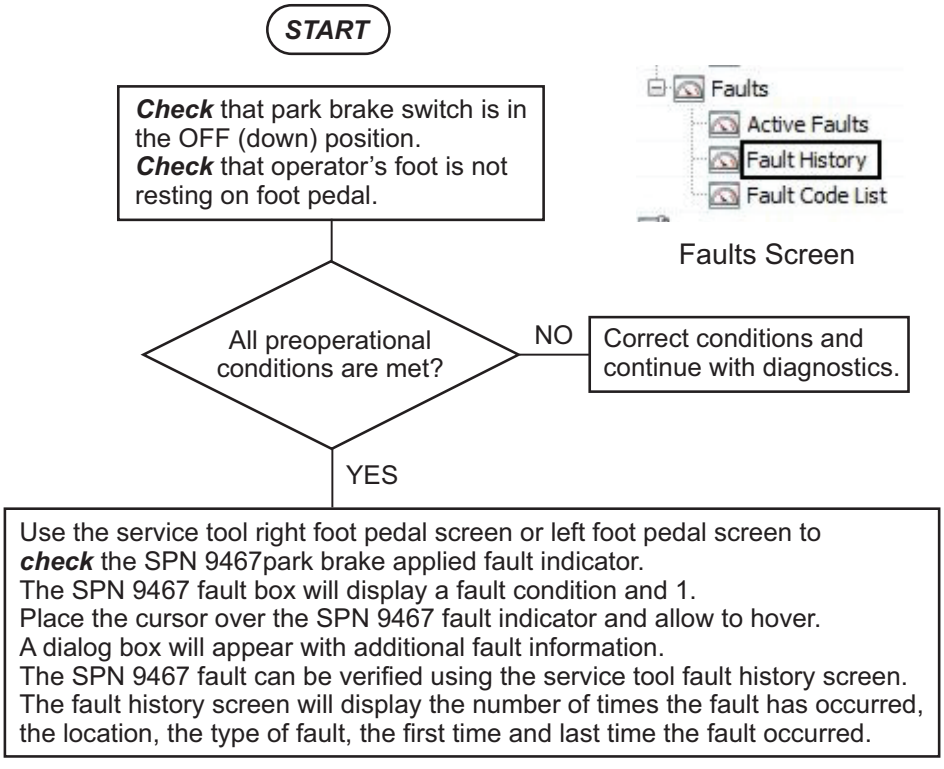
Continued



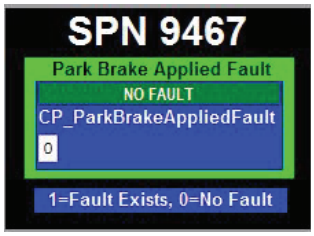
Park Brake Applied Circuit



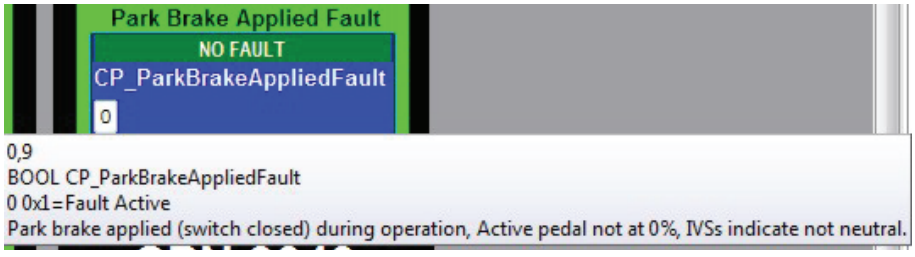
Navigator Box



Faults Screen

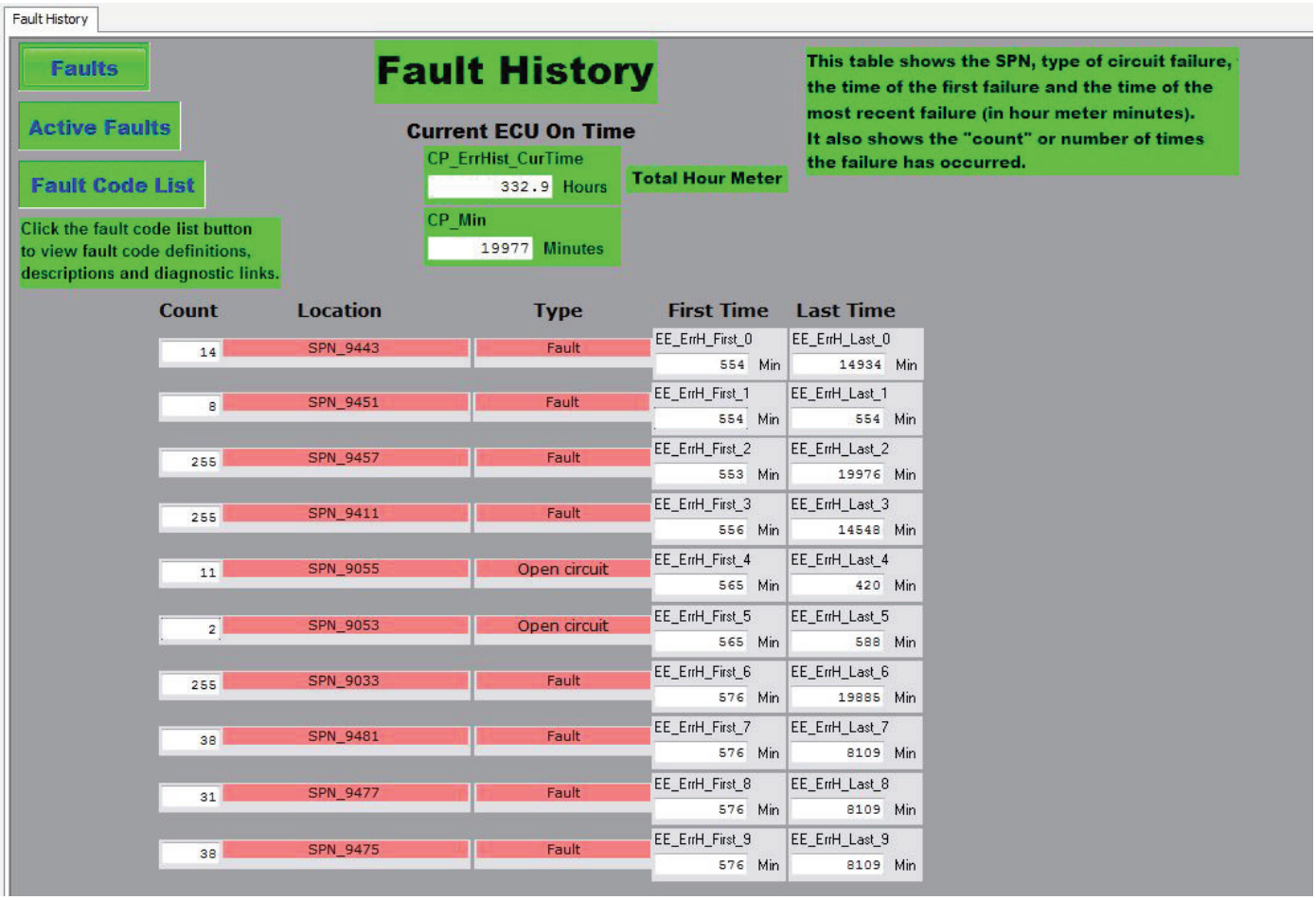


SPN 9467 Fault Indicator



Hover SPN 9467 Fault Indicator

Continued



Fault History Screen

When the park brake switch is placed in the ON (applied) position the solenoid is deenergized and opens allowing hydraulic oil to flow back to the hydraulic reservoir from the park brake piston.
The internal parking brake springs apply the brake. The park brake pressure switch routes 12VDC to the controller CM-C8 pin 12 indicating the park brake is set.

The park brake automatically sets when the park brake switch is placed in the ON (up) position.
The park brake solenoid is closed (deactivated) blocking the flow of hydraulic oil to the park brake pistons.
The park brake will also set when the hydraulic pressure falls below 40 PSI allowing the internal springs to apply the brake. When the hydraulic pressure falls below 40 PSI the 40 PSI switch closes and illuminates the park brake indicator lamp.

The park brake releases when the park brake switch is placed in the OFF (down) position.
The park brake solenoid is activated and hydraulic oil flows to the park brake pistons overriding the internal springs that hold the brake in the applied position. When hydraulic oil is above 40 PSI the park brakes pistons releasing the spring pressure on the park brake.
Hydraulic pressure above 40 PSI opens the 40 PSI switch and turn off the park brake indicator lamp.

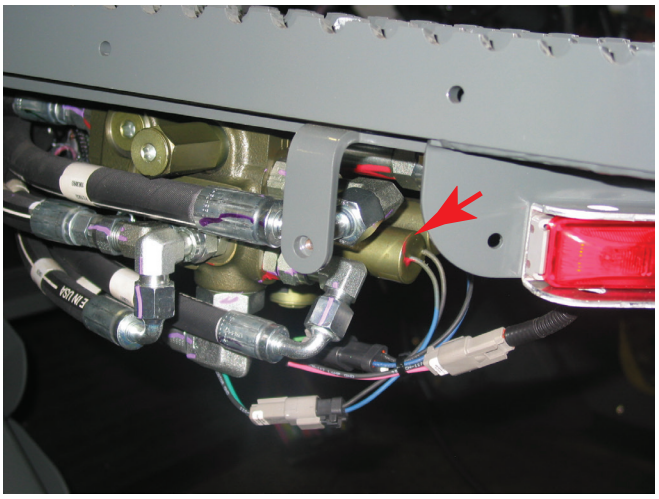
Continued

NOTE: The 9467 park brake error code is an information code advising the operator that the park brake has been applied, with the drive pedal not in neutral.

The ***error code*** can be caused by pushing the foot pedal with the park brake applied. The operator needs to push the park brake switch down to the released position before attempting to drive the sweeper.

The ***error code*** can also be caused by the operator resting a foot on the foot pedal which can apply enough pressure to activate the code.
The operator must remove feet from the foot pedal.

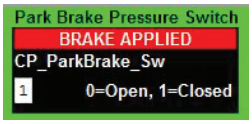
The ***error code*** can be caused if the park brake pressure switch is stuck in the closed position. Use the pressure switch diagnostics steps to check switch operation.



Park Brake Pressure Switch



Park Brake Switch



Park Brake Pressure Switch

The 12VDC for operation of the park brake pressure switch is routed from the switched power circuit and fuse B8 (10A) to the pressure switch terminal A. When the park brake switch is placed in the applied position the park brake solenoid is deenergized, which opens allowing hydraulic pressure to exit the pistons and allows the spring to apply the park brake and close the park brake pressure switch.
When closed the 12VDC is routed through the pressure switch to the controller CM-C8 pin12. The 12VDC at pin 12 signals the controller that the park brake is applied.
When there is no hydraulic pressure applied to release the parking brake (brake applied) the switch is closed.

The park brake pressure switch box on located on the right foot pedal and left foot pedal service tool screens will display BRAKE APPLIED and a 1 when the park brake is set. The box will display BRAKE RELEASED and a 0 when the park brake is released.

Continued

Using an appropriate jack, lift the sweeper drive wheels and block in the raised position.
Place the ignition switch in the ON (RUN) engine off position.
Disconnect the connector CH-C34 from the park brake pressure switch.
Use a multimeter to ***check*** for 12VDC at the connector pin A (orange wire).

The 12VDC is available at the park brake pressure switch terminal A?

NO

Check fuse B8 (10A).
Check for open circuit, broken wire or bad connections between the switched power circuit, fuse B8 & the park brake pressure switch terminal A.

YES

Place a jumper wire between the park brake pressure switch connector CH-C34 pin A (orange wire) and pin B (light green wire). The service tool park brake pressure switch status (BRAKE RELEASED/BRAKE APPLIED) should change when the voltage is applied to connector pin B.

The park brake pressure switch status changes when voltage is applied?

YES

Check with a multimeter set for resistance (ohms lowest setting) between the park brake pressure switch pins A and B.
The multimeter should display a 1 indicating continuity.

The multimeter display indicates switch continuity?

NO

Replace the park brake pressure switch.

YES

Start the engine and push the park brake release button.
Check with a multimeter set for resistance (ohms lowest setting) between the park brake pressure switch pins A and B.
The multimeter should display a 1 indicating continuity.
If the multimeter indicates continuity, ***check*** that drive wheel rotates and the park brake has released.
If the park has released replace the park brake pressure switch.
If the park brake has not released there is low hydraulic pressure at the park brake piston.
Check the hydraulic circuit pressure and application.

END

NO

Remove the C1 CM-C8 50 pin connector from the controller.
Place a jumper wire between the park brake pressure switch connector CHC34 pin B (light green wire) & a known ground.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CMC8 pin C1p12 and a known ground.
The multimeter should display a 1 indicating wire continuity.

The multimeter ***check*** indicates wire continuity?

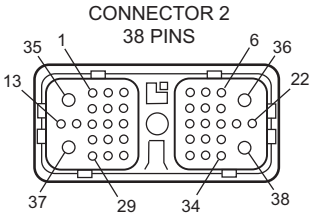
NO

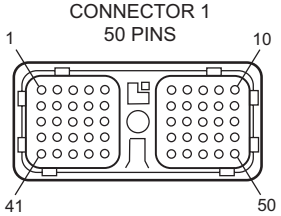
There is an open circuit in the wire from the switch to the controller.
Repair or replace the wiring harness between the switch and the controller.

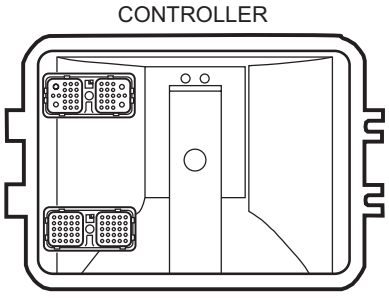
YES

Check the controller inputs and operation.

END

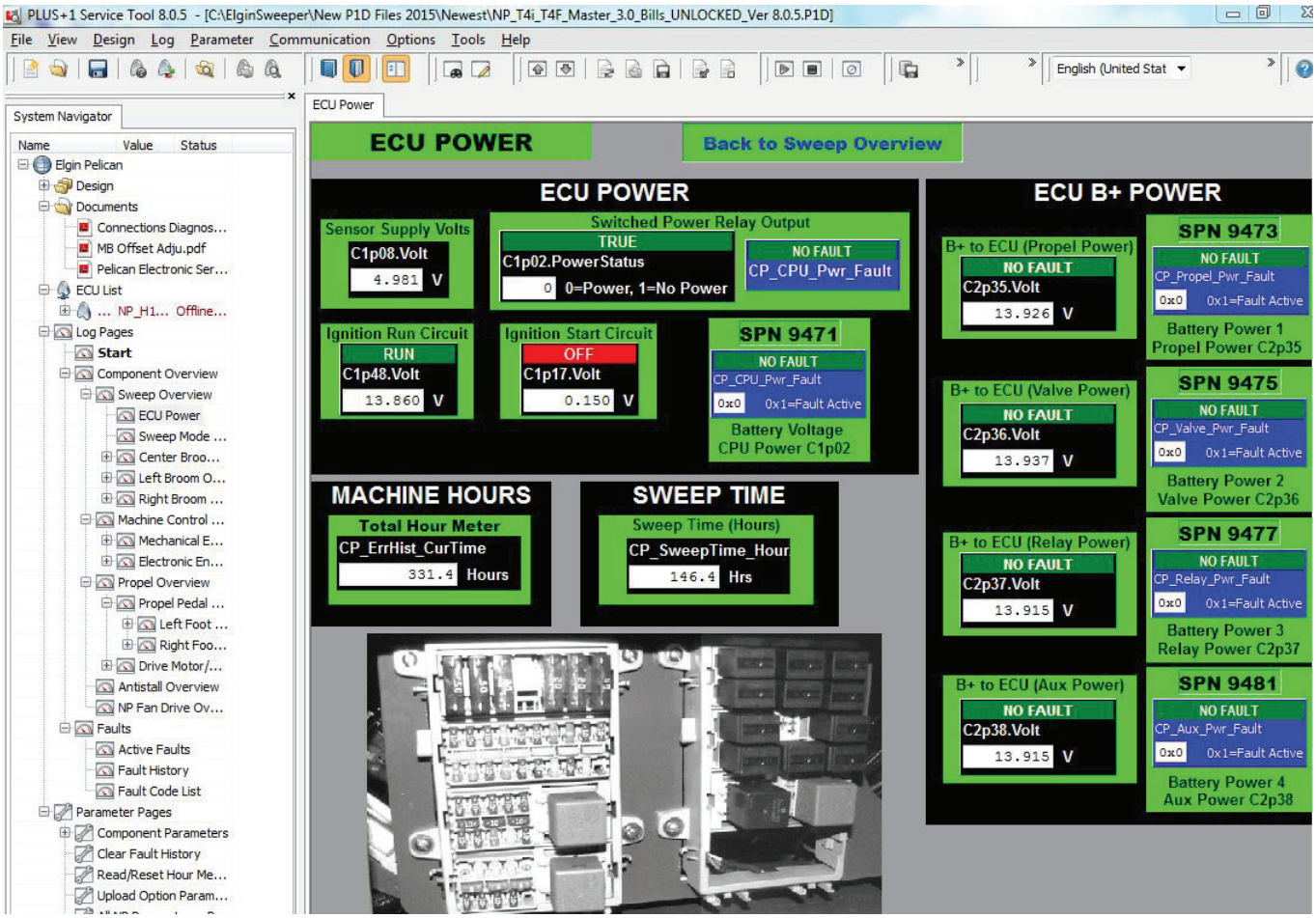






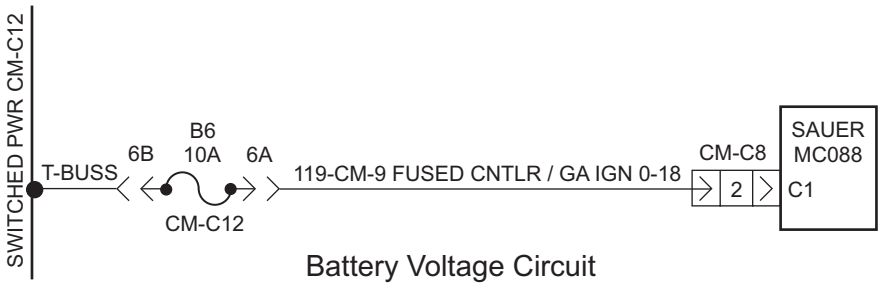
SPN 9471
Battery Voltage - CPU Power

The 9471 error code indicates the controller CM-C8 pin 2 status is in error.



Ecu Power Screen

The service tool ECU Power screen can be used to check the status of the(C1p02.PowerStatus) ECU power.
If the Switched Power Relay Output C1p02.PowerStatus is true (0) the battery voltage is available at the controller CM-C8 pin 2.



Battery Voltage Circuit

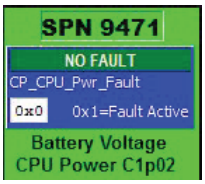
Continued

START

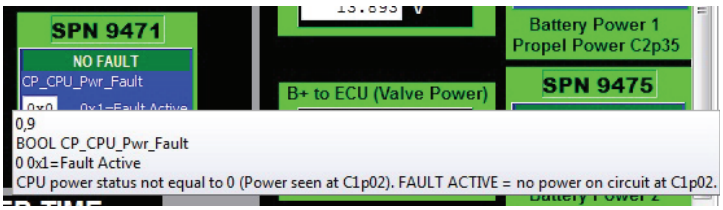
The controller CPU power is routed from the switched power circuit & fuse B6 (10A) to the controller CM-C8 pin C1p02.



Faults Screen

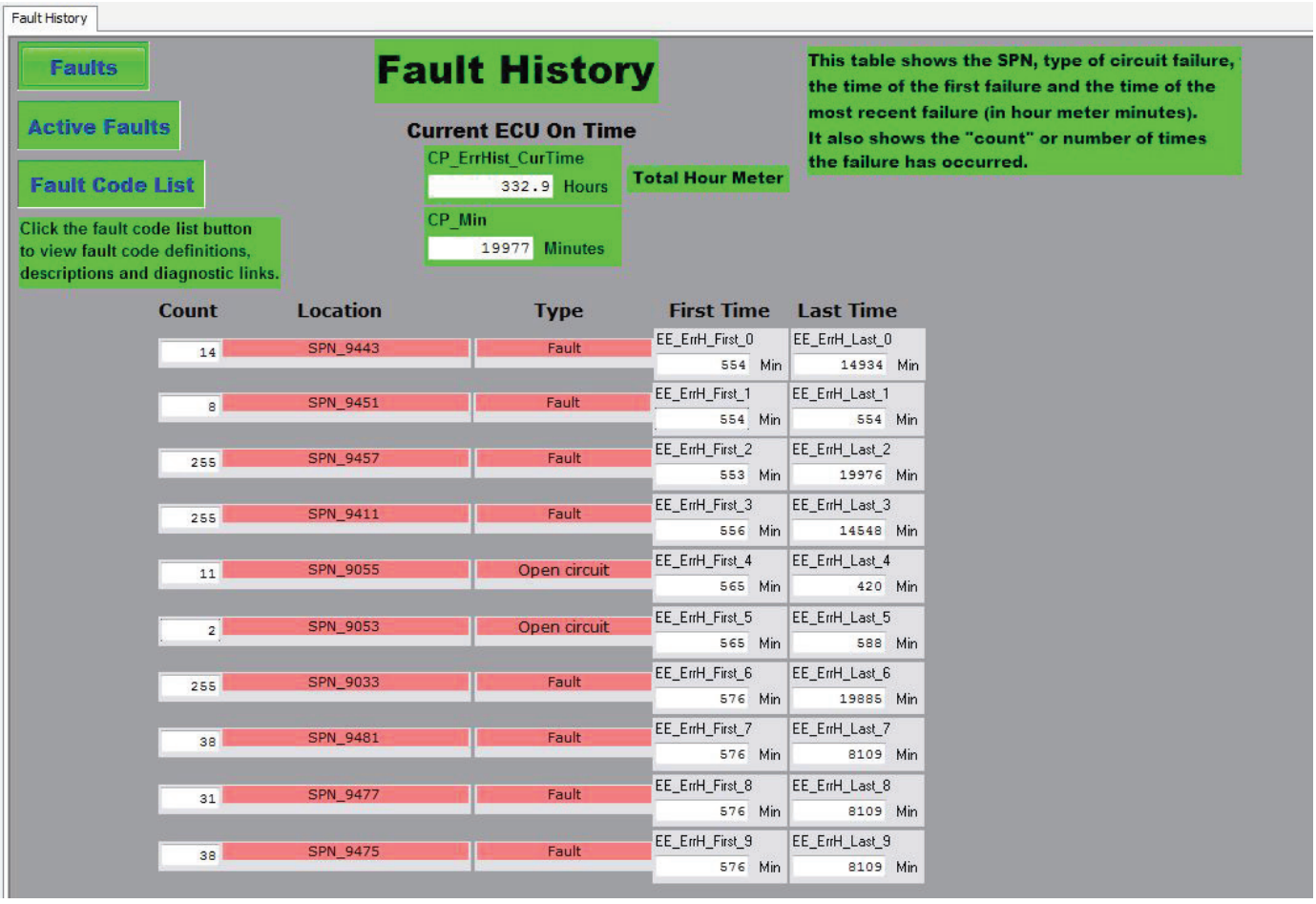


Fault Indicator



Hover SPN 9471 Fault Indicator

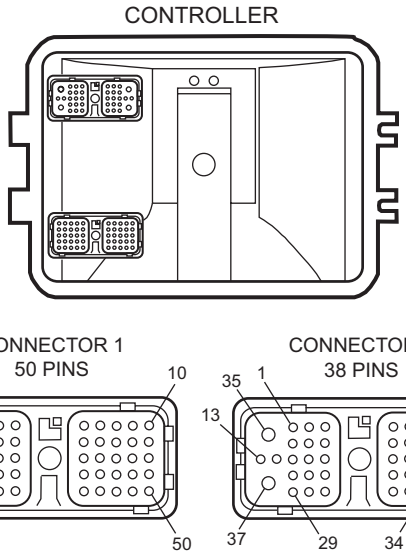
Use the service tool ecu power screen to check the SPN 9471 battery voltage CPU power C1p02 fault indicator. The SPN 9471 fault box will display a fault ID (0x1=FaultActive).
Place the cursor over the SPN 9471 fault indicator and allow to hover.
A dialog box will appear with additional fault information.
The SPN 9471 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.



Fault History Screen

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the fuse B6 connector for secure or broken connection.
Check controller connectors CM-C8 & CM-C18 for secure or broken connector.

Continued



Controller Pin Locator



MC088 Controller

Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin.

NO



Power StatusC1p02 Log Function

Place the ignition switch in the RUN position.
Check with a multimeter equipped withback probe adapters for 12VDC at the controller M-C8 pin 2 (orange wire).
Note:
Check the sevice tool ECU Power screen Switched Power Relay Output C1p02. PowerStatus box. The C1p02.PowerStatus box will display 0=Power or 1=No Power indicator.



Navigator Box

The 12VDC is available at the controller CM-C8 pin 2 (orange wire)?

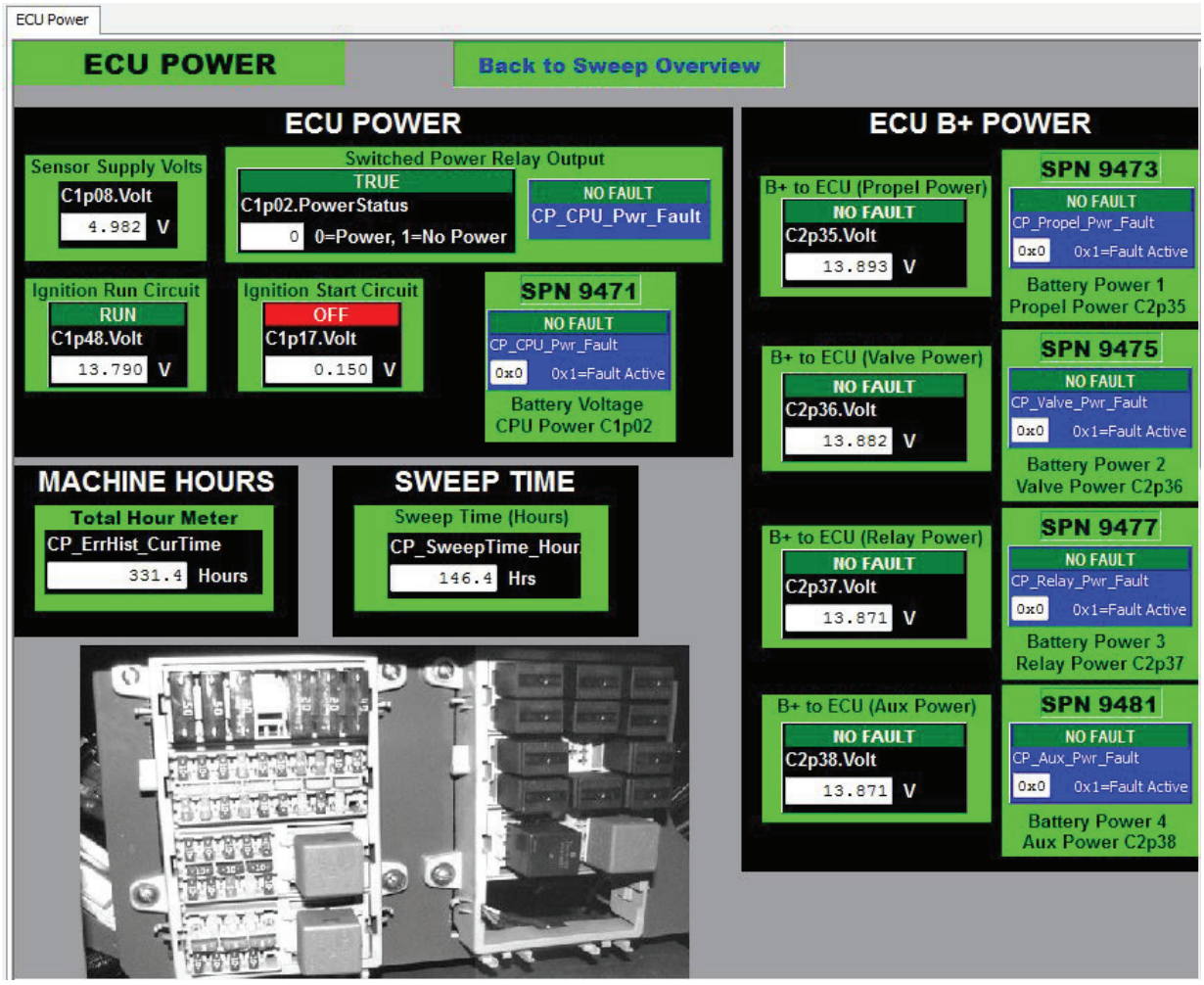
NO → ***Check*** fuse B6 (10A). ***Check*** for 12VDC at the controller CM-C8 pin 2. ***Check*** for an open circuit between fuse B6 & the controller CM-C8 pin 2.

YES → ***Check*** controller inputs & operation

END

SPN 9473
Controller Battery
Power 1 Propel Power

The 9473 error code indicates the controller CM-C8 pin 35 input power is not available.

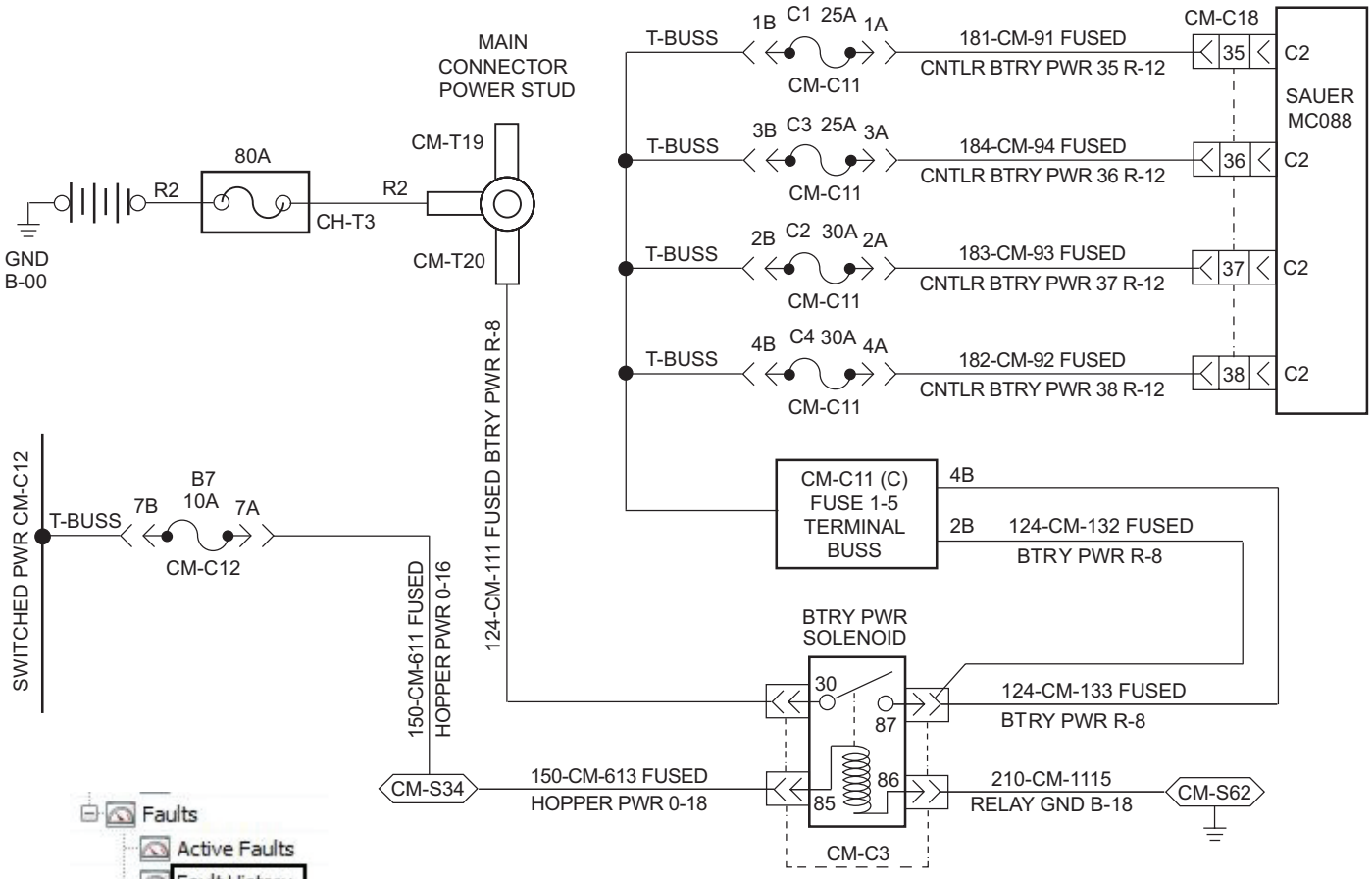


Ecu Power Screen

The 12VDC is routed from the battery power relay to fuse C1. The battery power (12VDC) is routed from the battery positive post through the 80A inline fuse to the battery power relay terminal 30. The relay is grounded at terminal 86 by the relay ground circuit and ground splice CM-S62.

When the ignition switch is placed in the RUN position 12VDC from the switched power circuit is routed through fuse B7 (10A) to the battery power relay terminal 85.
Because of the ground at terminal 86 the relay is activated. When activated the relay routes the 12VDC from relay terminal 87 through terminal bus CM-C11 to fuse C1.
The 12VDC is routed from the fuses to C1 (30A) to the controller CM-C18 pin 35 (red wire).
The 12VDC at the controller is used to power the controller propel functions.

Continued



Controller Battery Power Circuit



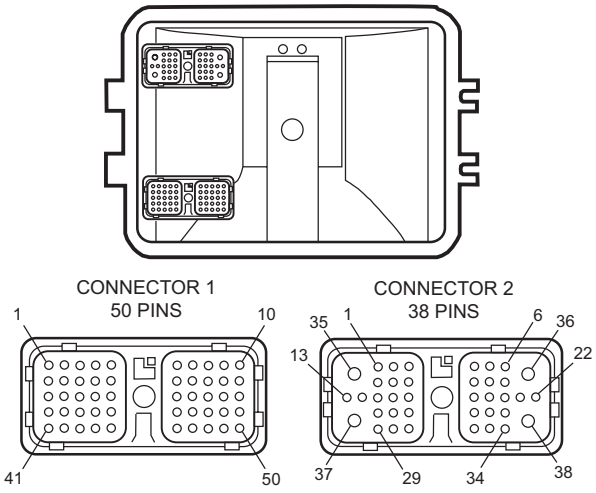
Faults Screen

START

Use the service tool ecu power screen to ***check*** the SPN 9473 battery power 1 propel power C2p35 fault indicator. The SPN 9473 fault box will display a fault ID (0x1=FaultActive). Place the cursor over the SPN 9473 fault indicator and allow to hover. A dialog box will appear with additional fault information.
The SPN 9473 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

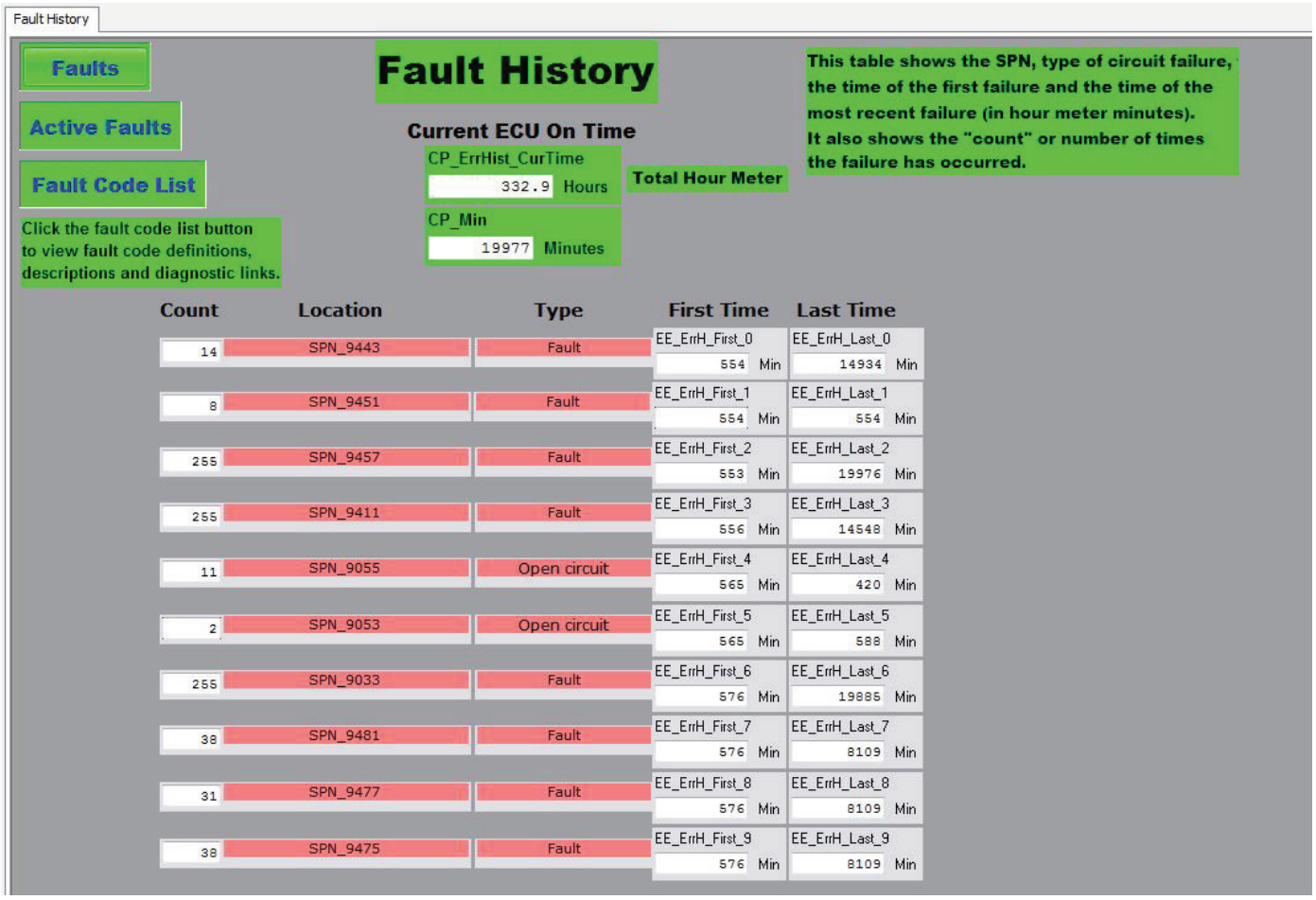


MC088 Controller

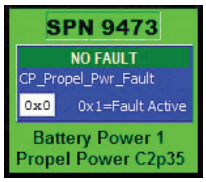


Controller Pin Locator

Continued



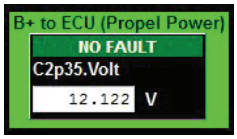
Fault History



SPN 9473
Fault Indicator



Navigator Box



B to ECU Relay Power

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the fuse C1(30A) connector for secure or broken connection.
Check controller connectors CM-C8 & CM-C18 for secure or broken connector.

Loose or broken connection or wire?

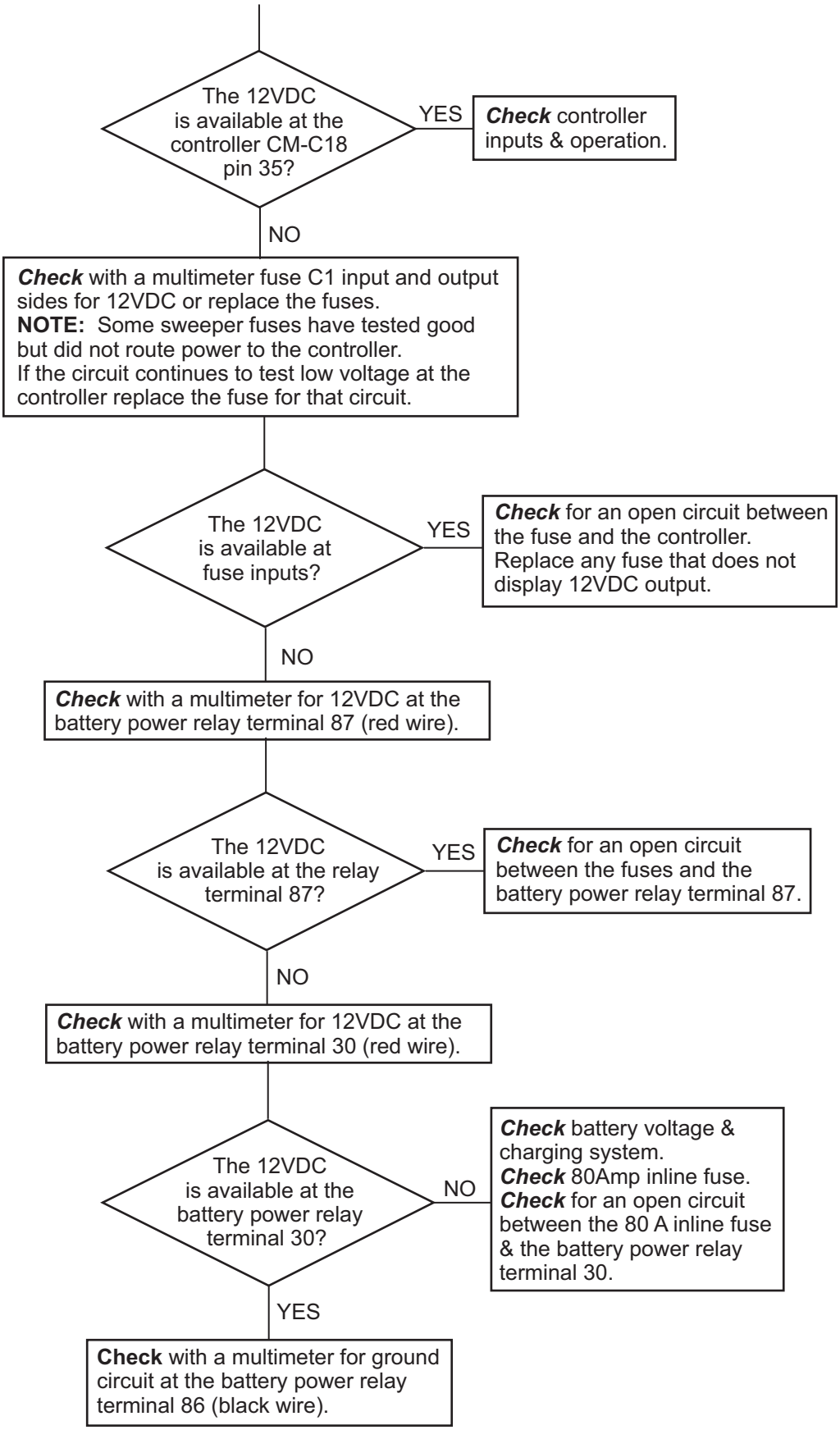
YES → Repair or replace loose or broken terminal, wire or pin.

Note:
See section entitled Back Probe Testing for a description and test procedures.

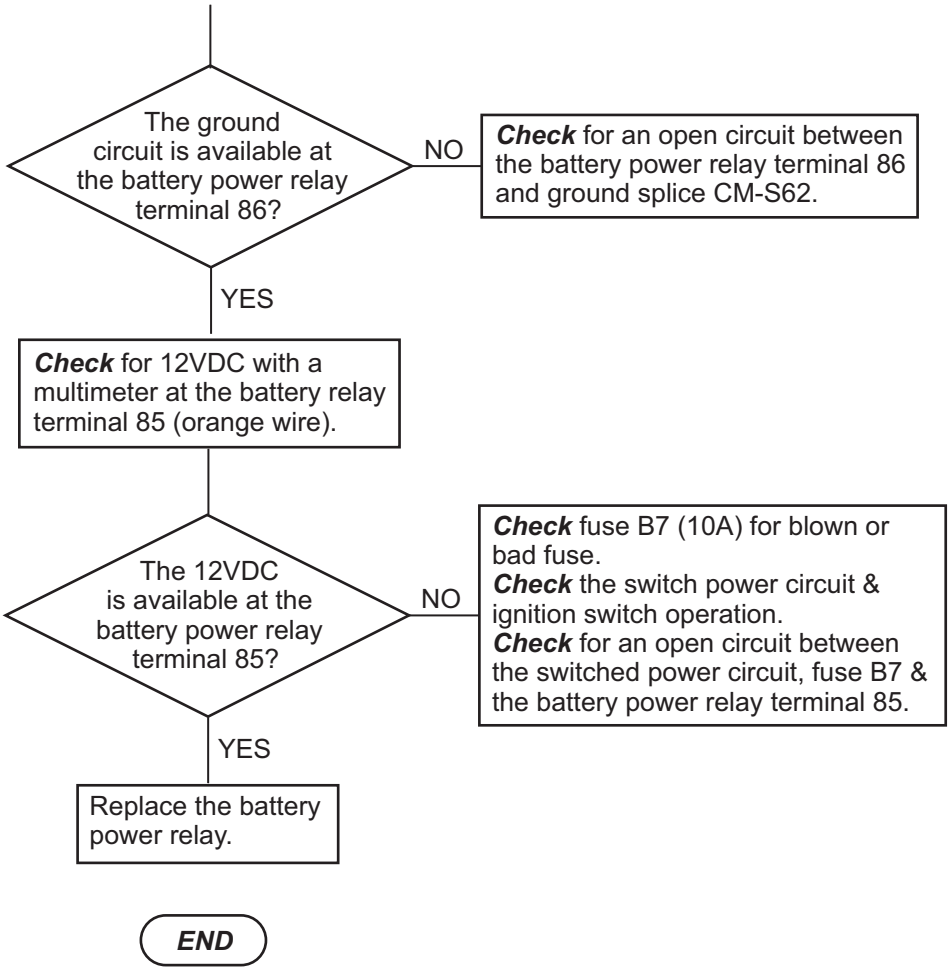
NO

Place the ignition switch in the RUN position.
Check with a multimeter equipped with back probe adapters for 12VDC at the controller CM-C18 pin 35 (red wire).
Note:
Check the service tool B+ to ECU (Propel Power) box.
The box will display the actual voltage at the controller pin C2p35 and indicate a fault condition.

Continued

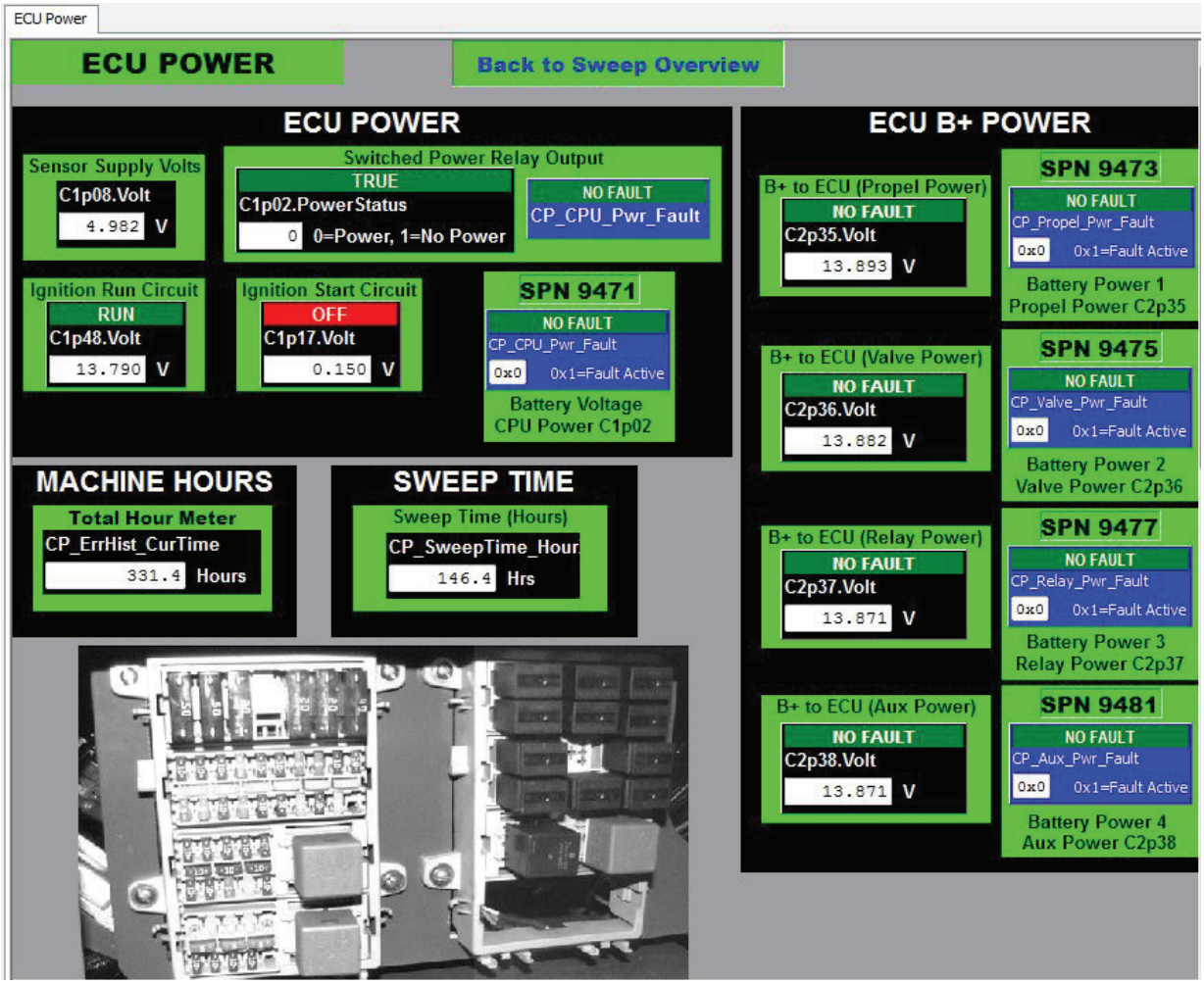

The 12VDC is available at the controller CM-C18 pin 35?
YES
Check controller inputs & operation.
NO
Check with a multimeter fuse C1 input and output sides for 12VDC or replace the fuses.
NOTE: Some sweeper fuses have tested good but did not route power to the controller.
If the circuit continues to test low voltage at the controller replace the fuse for that circuit.
The 12VDC is available at fuse inputs?
YES
Check for an open circuit between the fuse and the controller.
Replace any fuse that does not display 12VDC output.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 87 (red wire).
The 12VDC is available at the relay terminal 87?
YES
Check for an open circuit between the fuses and the battery power relay terminal 87.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 30 (red wire).
The 12VDC is available at the battery power relay terminal 30?
NO
Check battery voltage & charging system.
Check 80Amp inline fuse.
Check for an open circuit between the 80 A inline fuse & the battery power relay terminal 30.
YES
Check with a multimeter for ground circuit at the battery power relay terminal 86 (black wire).

Continued


The ground circuit is available at the battery power relay terminal 86?
NO
Check for an open circuit between the battery power relay terminal 86 and ground splice CM-S62.
YES
Check for 12VDC with a multimeter at the battery relay terminal 85 (orange wire).
The 12VDC is available at the battery power relay terminal 85?
NO
Check fuse B7 (10A) for blown or bad fuse.
Check the switch power circuit & ignition switch operation.
Check for an open circuit between the switched power circuit, fuse B7 & the battery power relay terminal 85.
YES
Replace the battery power relay.
END

SPN 9475
Controller Battery
Power 2 Valve Power

The 9475 error code indicates the controller CM-C8 pin 36 input power is not available.

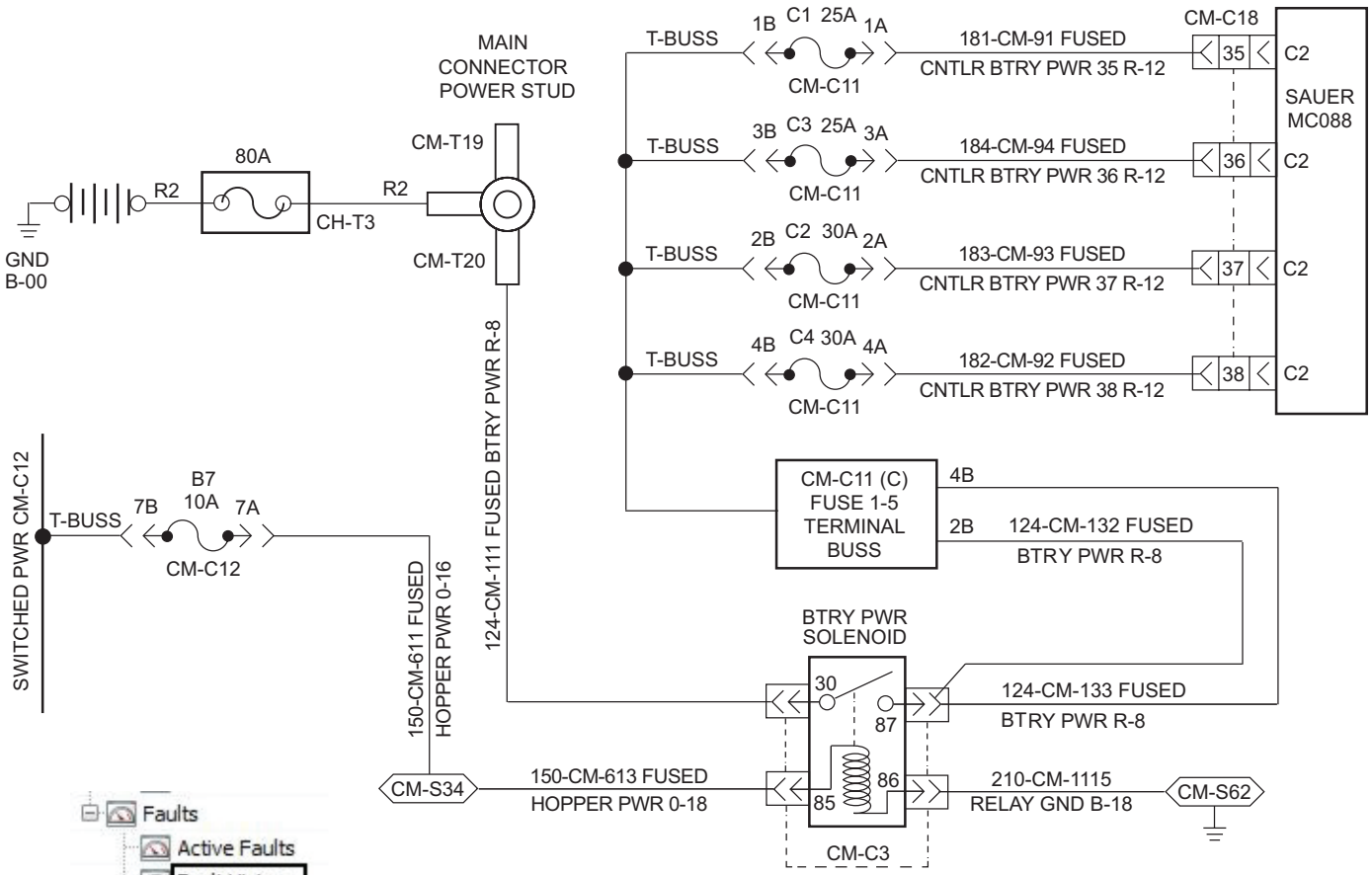


ECU Power Screen

The 12VDC is routed from the battery power relay to fuse C3. The battery power (12VDC) is routed from the battery positive post through the 80A inline fuse to the battery power relay terminal 30. The relay is grounded at terminal 86 by the relay ground circuit and ground splice CM-S62.

When the ignition switch is placed in the RUN position 12VDC from the switched power circuit is routed through fuse B7 (10A) to the battery power relay terminal 85.
Because of the ground at terminal 86 the relay is activated. When activated the relay routes the 12VDC from relay terminal 87 through terminal bus CM-C11 to fuse C3.
The 12VDC is routed from the fuses to C3 (30A) to the controller CM-C18 pin 36 (red wire).
The 12VDC at the controller is used to power the controller valve functions.

Continued



Controller Battery Power Circuit



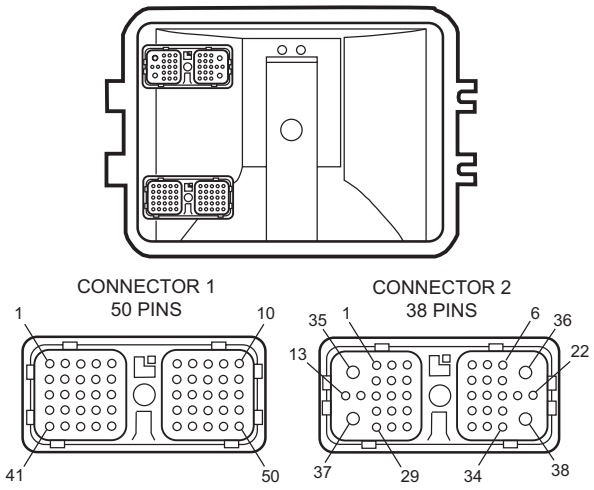
Faults Screen

START

Use the service tool ECU power screen to ***check*** the SPN 9475 battery power 2 valve power C2p36 fault indicator. The SPN 9475 fault box will display a fault ID (0x1=FaultActive). Place the cursor over the SPN 9475 fault indicator and allow to hover. A dialog box will appear with additional fault information.
The SPN 9475 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

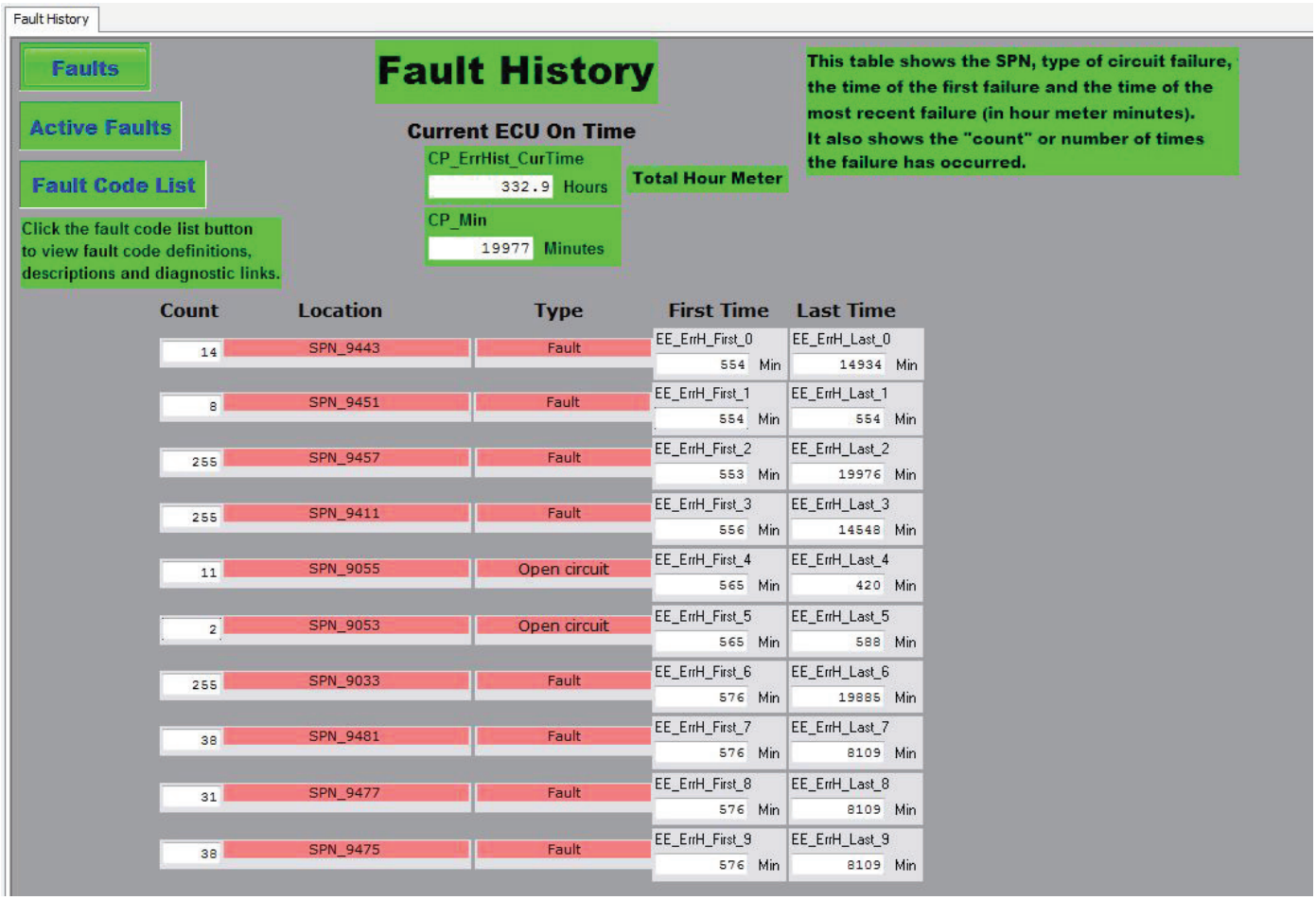


MC088 Controller



Controller Pin Locator

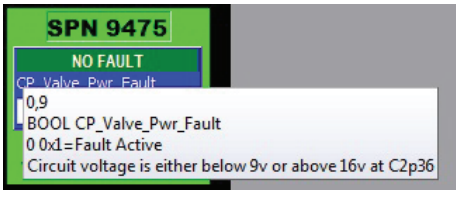
Continued



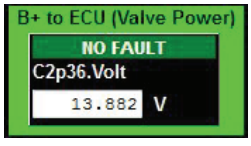
Fault History Fault



Navigator Box

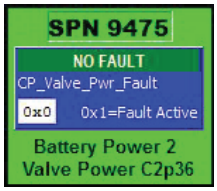


Hover SPN 9475 Fault Indicator



B to ECU Relay Power

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the fuse C3(30A) connector for secure or broken connection.
Check controller connectors CM-C8 & CM-C18 for secure or broken connector.



SPN 9477
Fault Indicator

Loose or broken connection or wire?

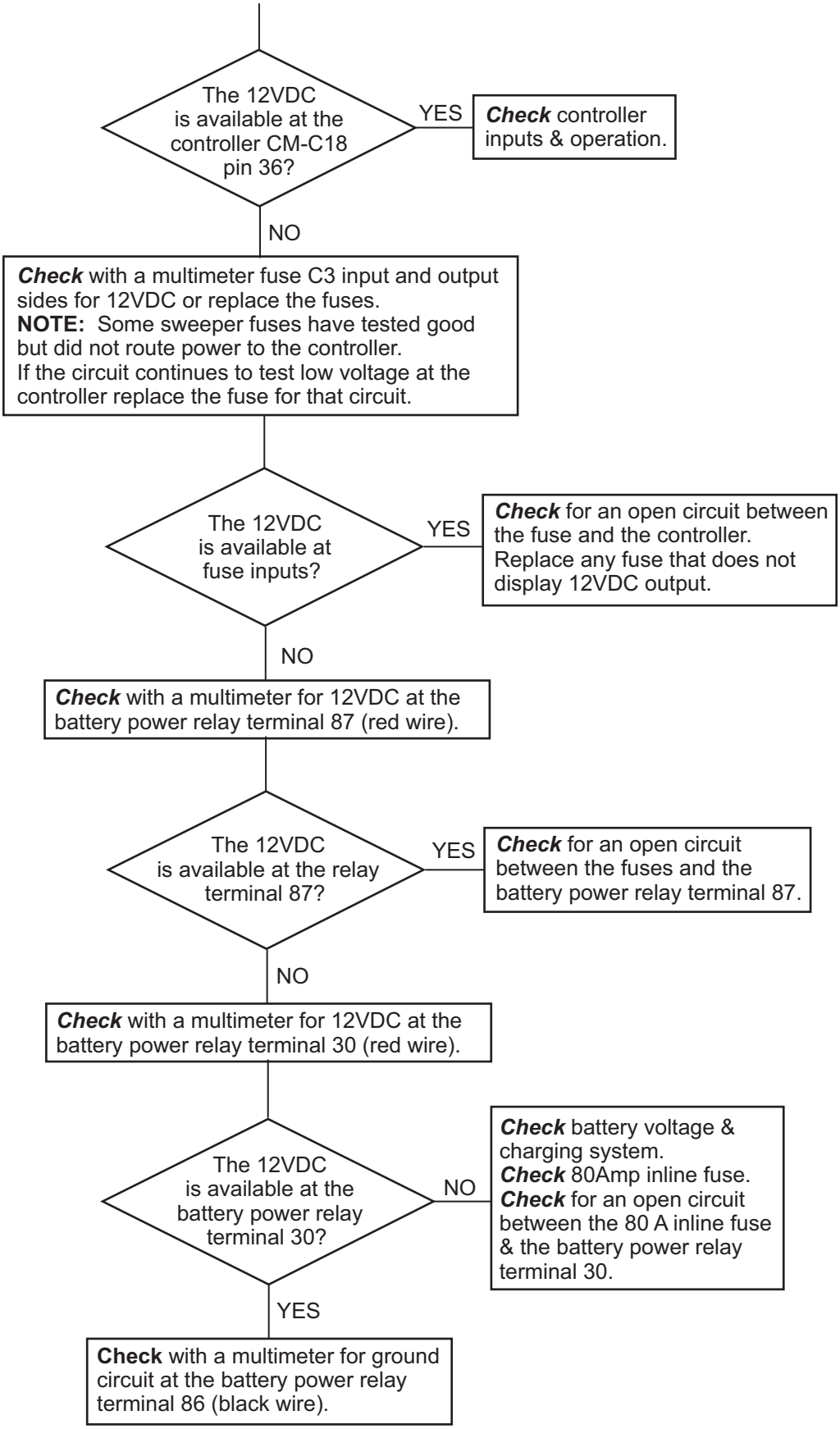
YES — Repair or replace loose or broken terminal, wire or pin.

Note:
See section entitled Back Probe Testing for a description and test procedures.

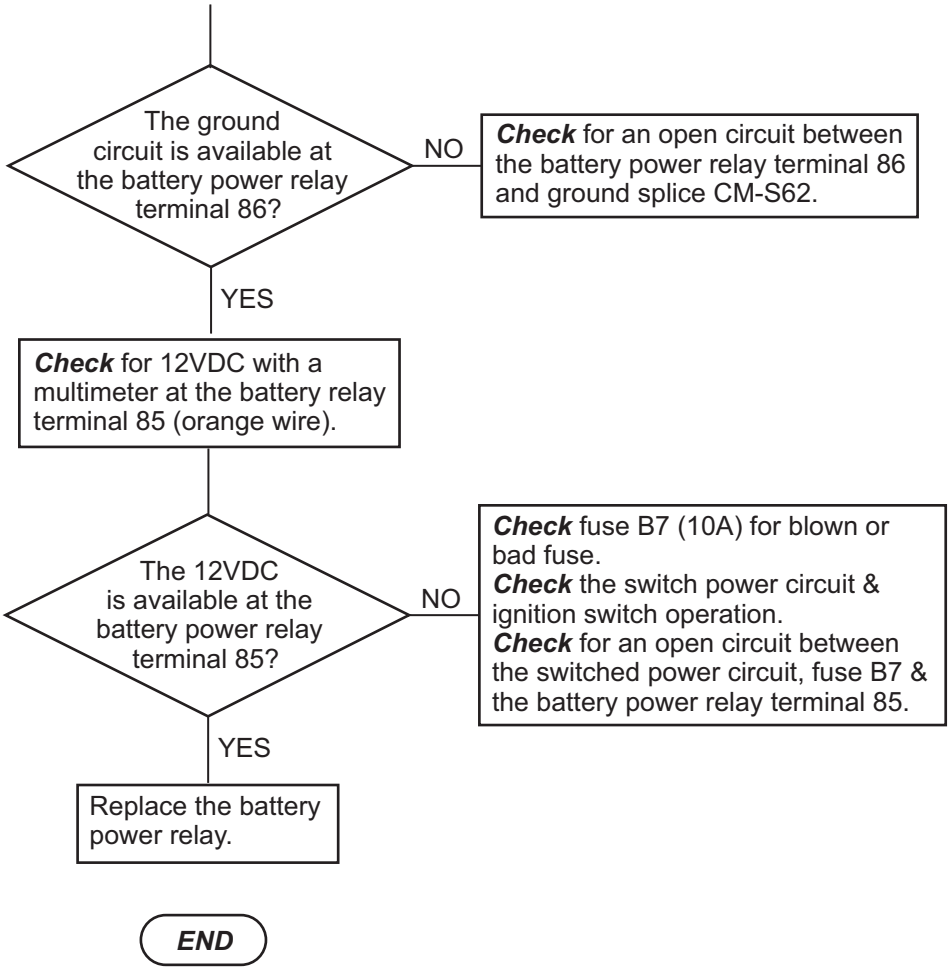
NO

Place the ignition switch in the RUN position.
Check with a multimeter equipped with back probe adapters for 12VDC at the controller CM-C18 pin 35 (red wire).
Note:
Check the service tool B+ to ECU (Valve Power) box.
The box will display the actual voltage at the controller pin C2p36 and indicate a fault condition.

Continued

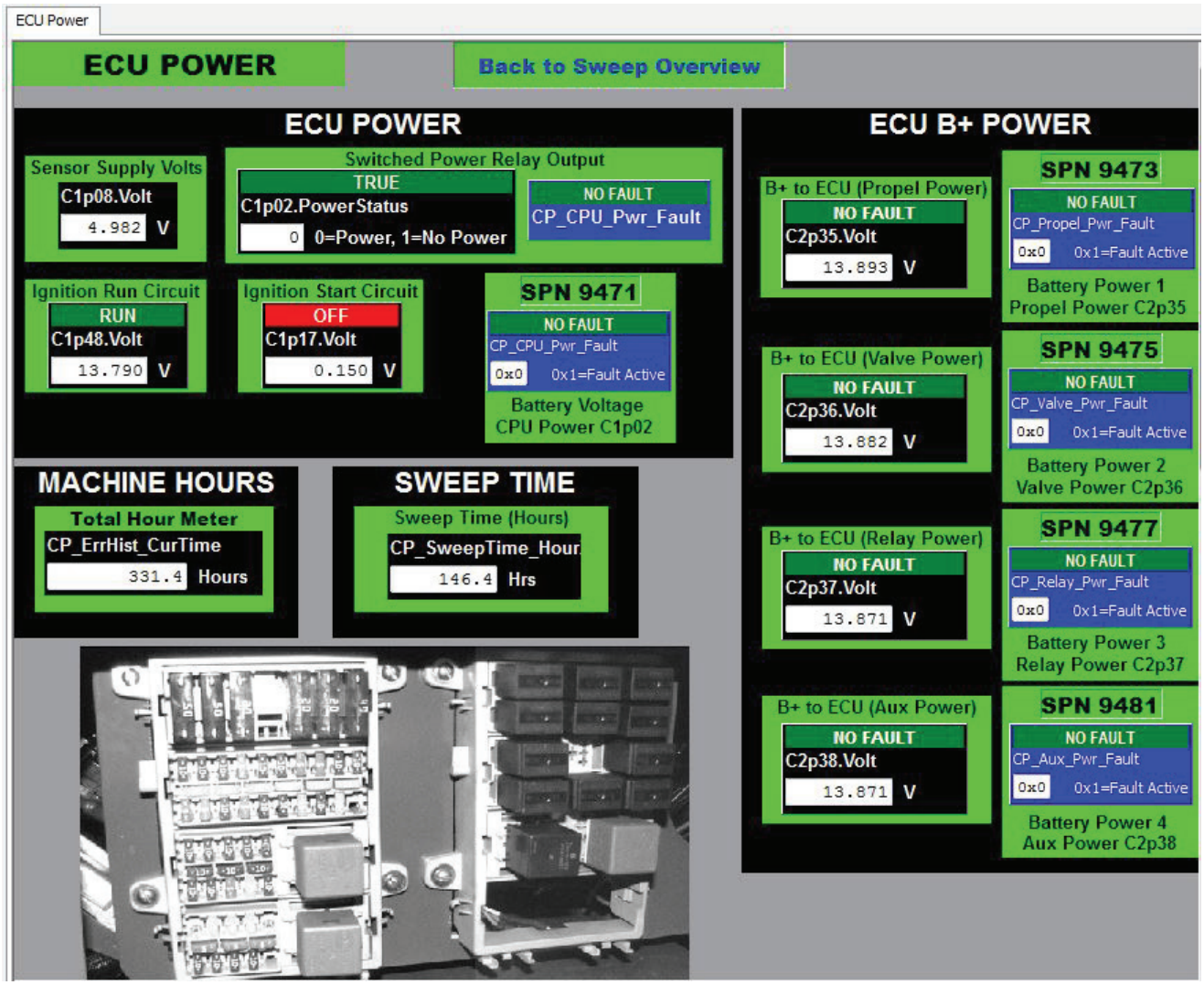

The 12VDC is available at the controller CM-C18 pin 36?
YES
Check controller inputs & operation.
NO
Check with a multimeter fuse C3 input and output sides for 12VDC or replace the fuses.
NOTE: Some sweeper fuses have tested good but did not route power to the controller.
If the circuit continues to test low voltage at the controller replace the fuse for that circuit.
The 12VDC is available at fuse inputs?
YES
Check for an open circuit between the fuse and the controller.
Replace any fuse that does not display 12VDC output.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 87 (red wire).
The 12VDC is available at the relay terminal 87?
YES
Check for an open circuit between the fuses and the battery power relay terminal 87.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 30 (red wire).
The 12VDC is available at the battery power relay terminal 30?
NO
Check battery voltage & charging system.
Check 80Amp inline fuse.
Check for an open circuit between the 80 A inline fuse & the battery power relay terminal 30.
YES
Check with a multimeter for ground circuit at the battery power relay terminal 86 (black wire).

Continued


The ground circuit is available at the battery power relay terminal 86?
NO
Check for an open circuit between the battery power relay terminal 86 and ground splice CM-S62.
YES
Check for 12VDC with a multimeter at the battery relay terminal 85 (orange wire).
The 12VDC is available at the battery power relay terminal 85?
NO
Check fuse B7 (10A) for blown or bad fuse.
Check the switch power circuit & ignition switch operation.
Check for an open circuit between the switched power circuit, fuse B7 & the battery power relay terminal 85.
YES
Replace the battery power relay.
END

SPN 9477
Controller Battery
Power 3 Relay Power

The 9477 error code indicates the controller CM-C8 pin 37 input power is not available.

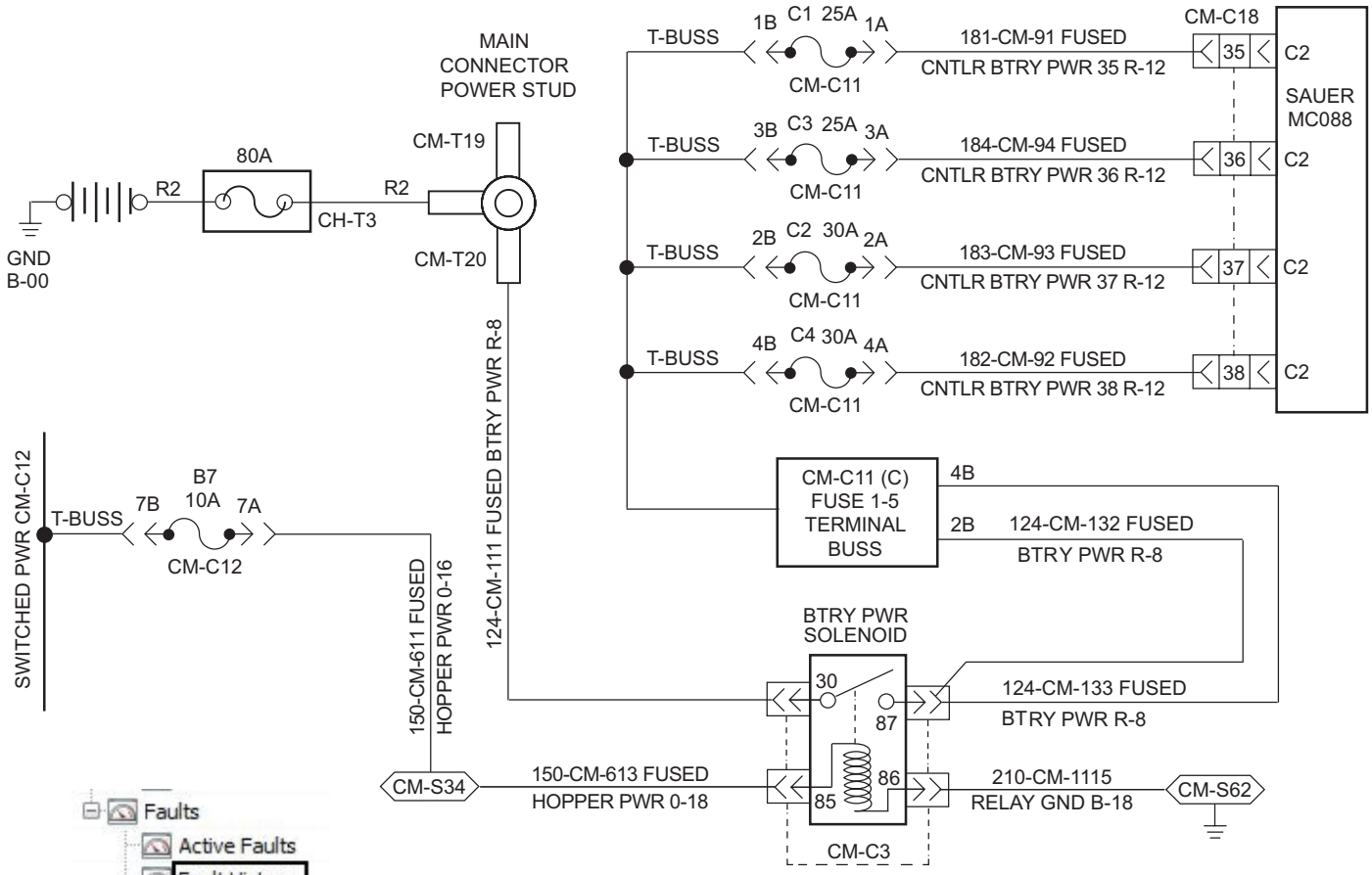


Ecu Power Screen

The 12VDC is routed from the battery power relay to fuse C2. The battery power (12VDC) is routed from the battery positive post through the 80A inline fuse to the battery power relay terminal 30. The relay is grounded at terminal 86 by the relay ground circuit and ground splice CM-S62.

When the ignition switch is placed in the RUN position 12VDC from the switched power circuit is routed through fuse B7 (10A) to the battery power relay terminal 85.
Because of the ground at terminal 86 the relay is activated. When activated the relay routes the 12VDC from relay terminal 87 through terminal bus CM-C11 to fuse C2.
The 12VDC is routed from the fuses to C2 (30A) to the controller CM-C18 pin 36 (red wire).
The 12VDC at the controller is used to power the controller relay functions.

Continued



Controller Battery Power Circuit



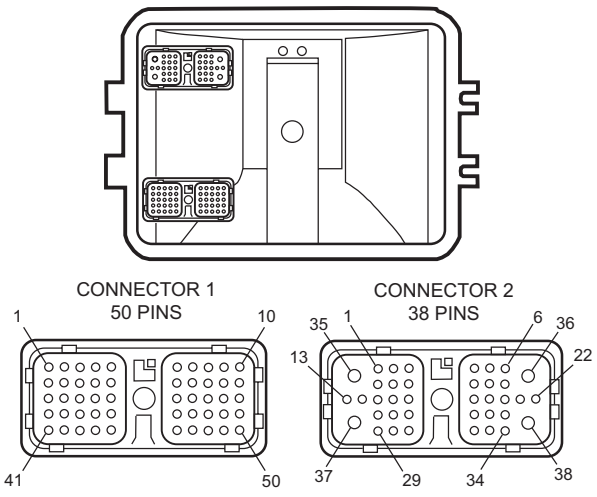
Faults Screen

START

Use the service tool ECU power screen to ***check*** the SPN 9477 battery power 3 relay power C2p37 fault indicator. The SPN 9477 fault box will display a fault ID (0x1=FaultActive). Place the cursor over the SPN 9477 fault indicator and allow to hover. A dialog box will appear with additional fault information.
The SPN 9477 fault can be verified using the service tool fault history screen. The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time & last time the fault occurred.

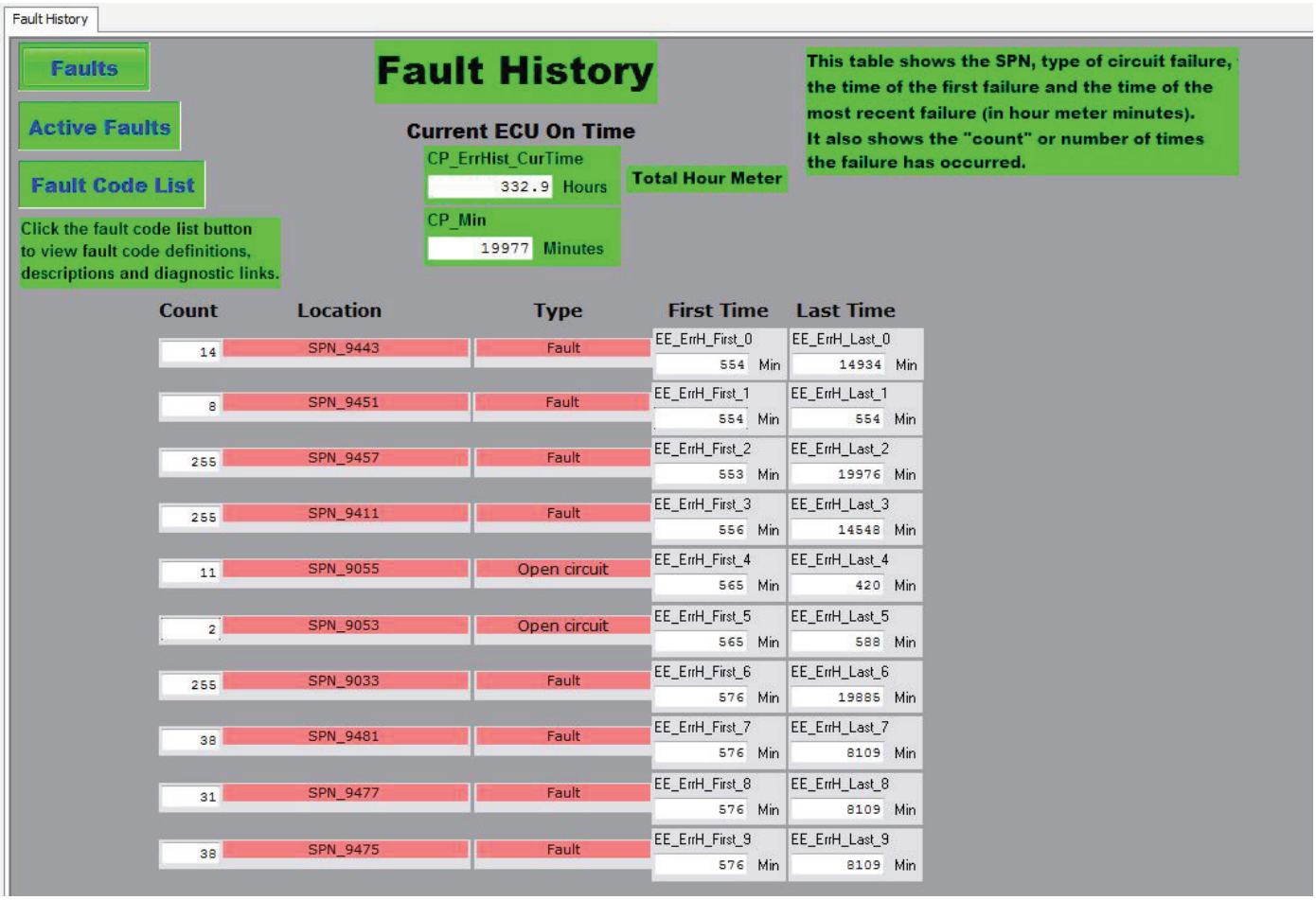


MC088 Controller

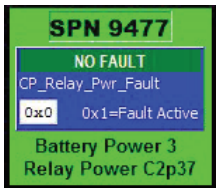


Controller Pin Locator

Continued



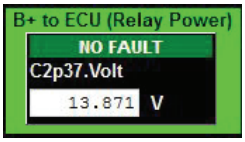
Fault History



SPN 9477
Fault Indicator



Navigator Box



B to ECU Relay Power

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the fuse C2(30A) connector for secure or broken connection.
Check controller connectors CM-C8 & CM-C18 for secure or broken connector.

Loose or broken connection or wire?

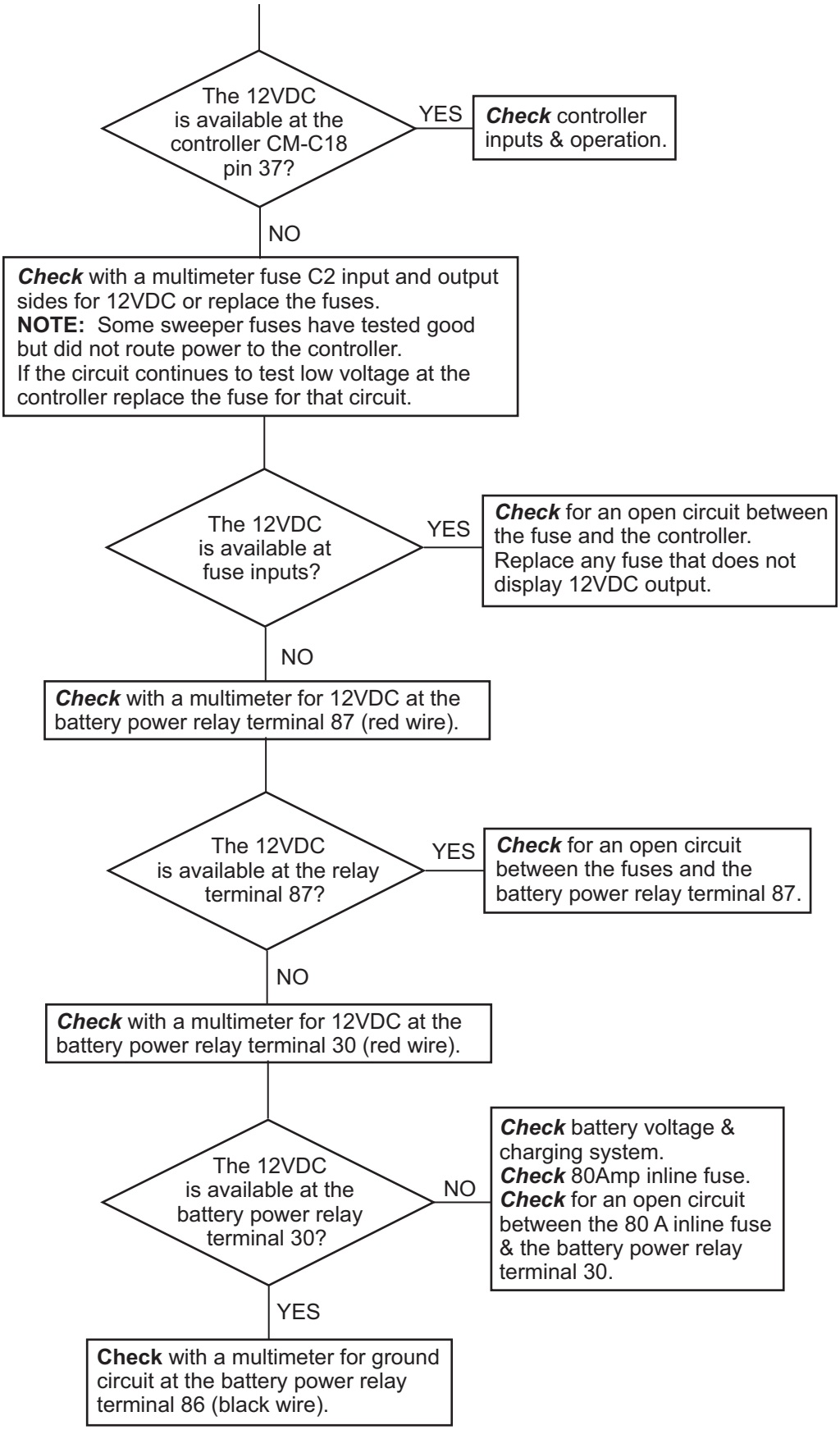
YES → Repair or replace loose or broken terminal, wire or pin.

Note:
See section entitled Back Probe Testing for a description and test procedures.

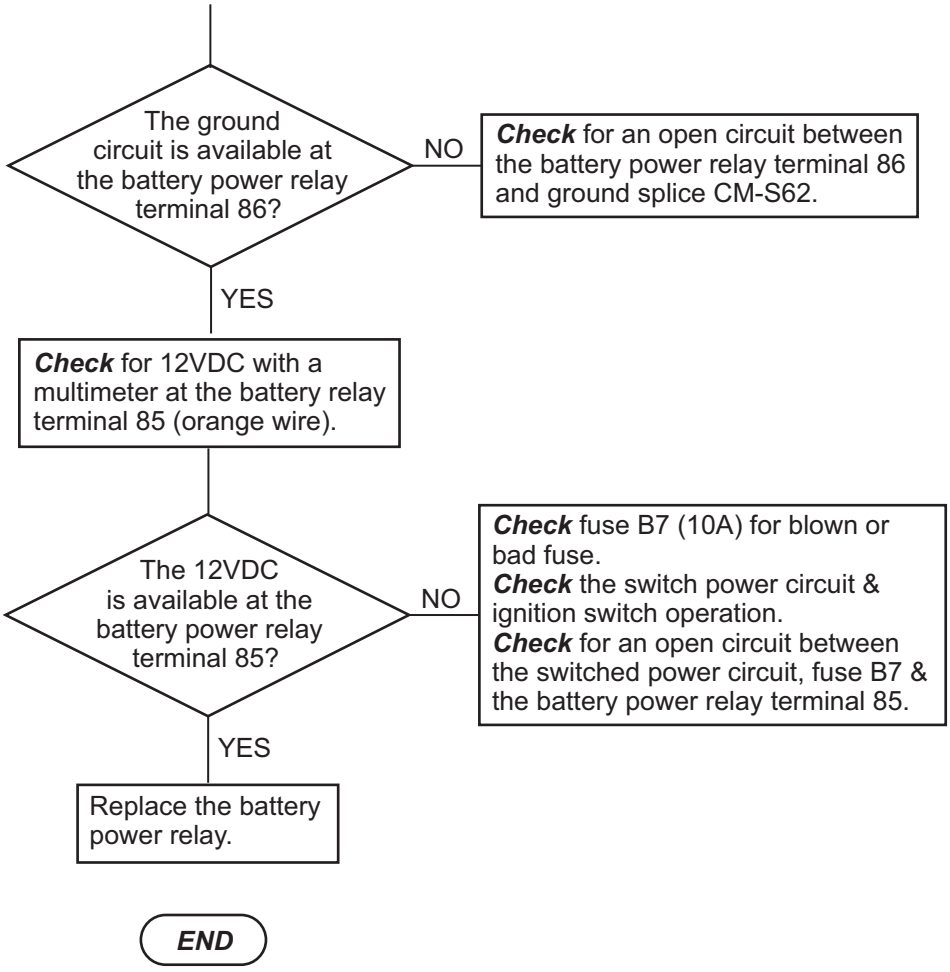
NO

Place the ignition switch in the RUN position.
Check with a multimeter equipped with back probe adapters for 12VDC at the controller CM-C18 pin 37 (red wire).
Note:
Check the service tool B+ to ECU (Relay Power) box. The box will display the actual voltage at the controller pin C2p37 and indicate a fault condition.

Continued

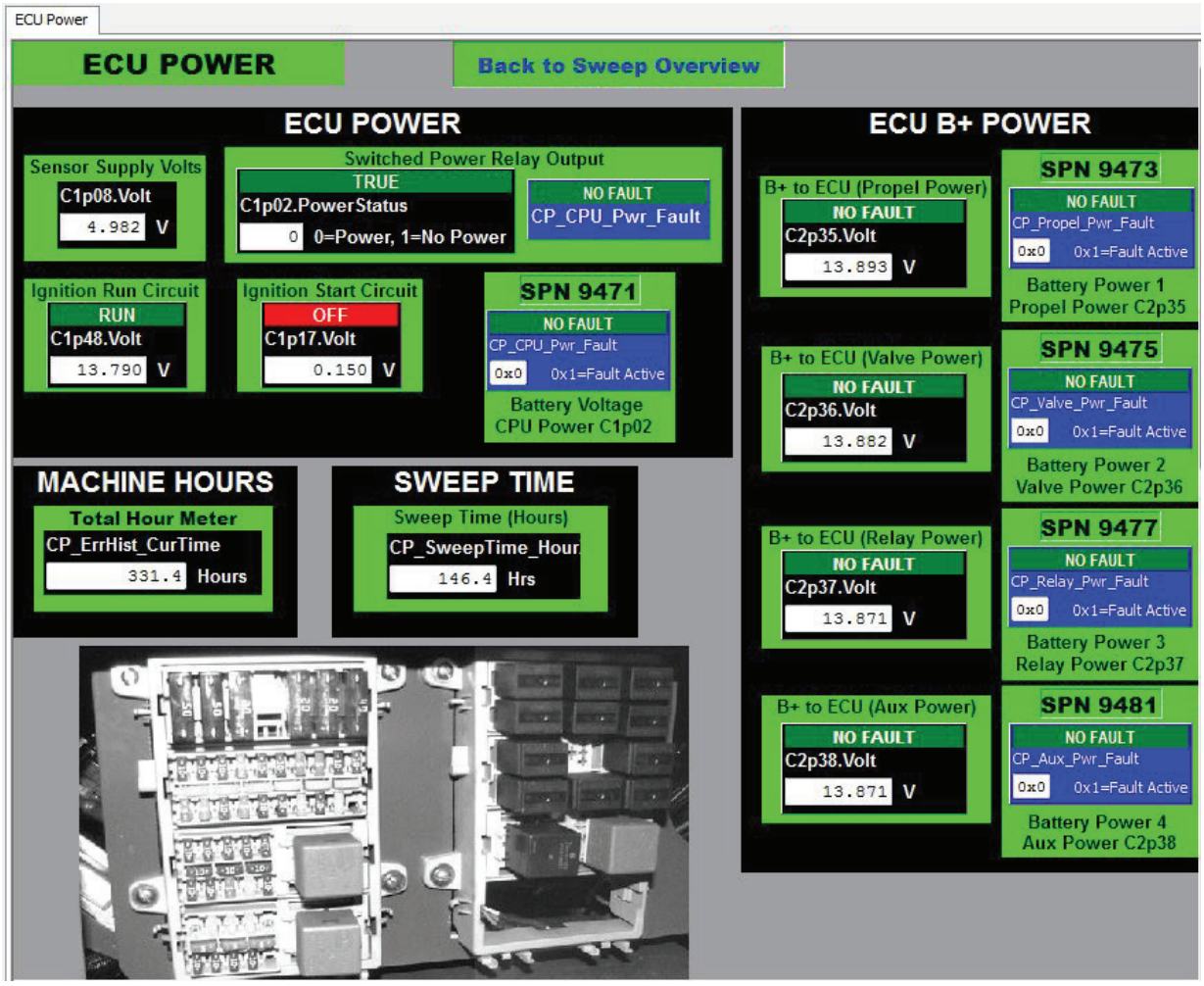

The 12VDC is available at the controller CM-C18 pin 37?
YES
Check controller inputs & operation.
NO
Check with a multimeter fuse C2 input and output sides for 12VDC or replace the fuses.
NOTE: Some sweeper fuses have tested good but did not route power to the controller.
If the circuit continues to test low voltage at the controller replace the fuse for that circuit.
The 12VDC is available at fuse inputs?
YES
Check for an open circuit between the fuse and the controller.
Replace any fuse that does not display 12VDC output.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 87 (red wire).
The 12VDC is available at the relay terminal 87?
YES
Check for an open circuit between the fuses and the battery power relay terminal 87.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 30 (red wire).
The 12VDC is available at the battery power relay terminal 30?
NO
Check battery voltage & charging system.
Check 80Amp inline fuse.
Check for an open circuit between the 80 A inline fuse & the battery power relay terminal 30.
YES
Check with a multimeter for ground circuit at the battery power relay terminal 86 (black wire).

Continued


The ground circuit is available at the battery power relay terminal 86?
NO
Check for an open circuit between the battery power relay terminal 86 and ground splice CM-S62.
YES
Check for 12VDC with a multimeter at the battery relay terminal 85 (orange wire).
The 12VDC is available at the battery power relay terminal 85?
NO
Check fuse B7 (10A) for blown or bad fuse.
Check the switch power circuit & ignition switch operation.
Check for an open circuit between the switched power circuit, fuse B7 & the battery power relay terminal 85.
YES
Replace the battery power relay.
END

SPN 9481
Controller Battery
Power 4 Aux Power

The 9481 error code indicates the controller CM-C8 pin 38 input power is not available.

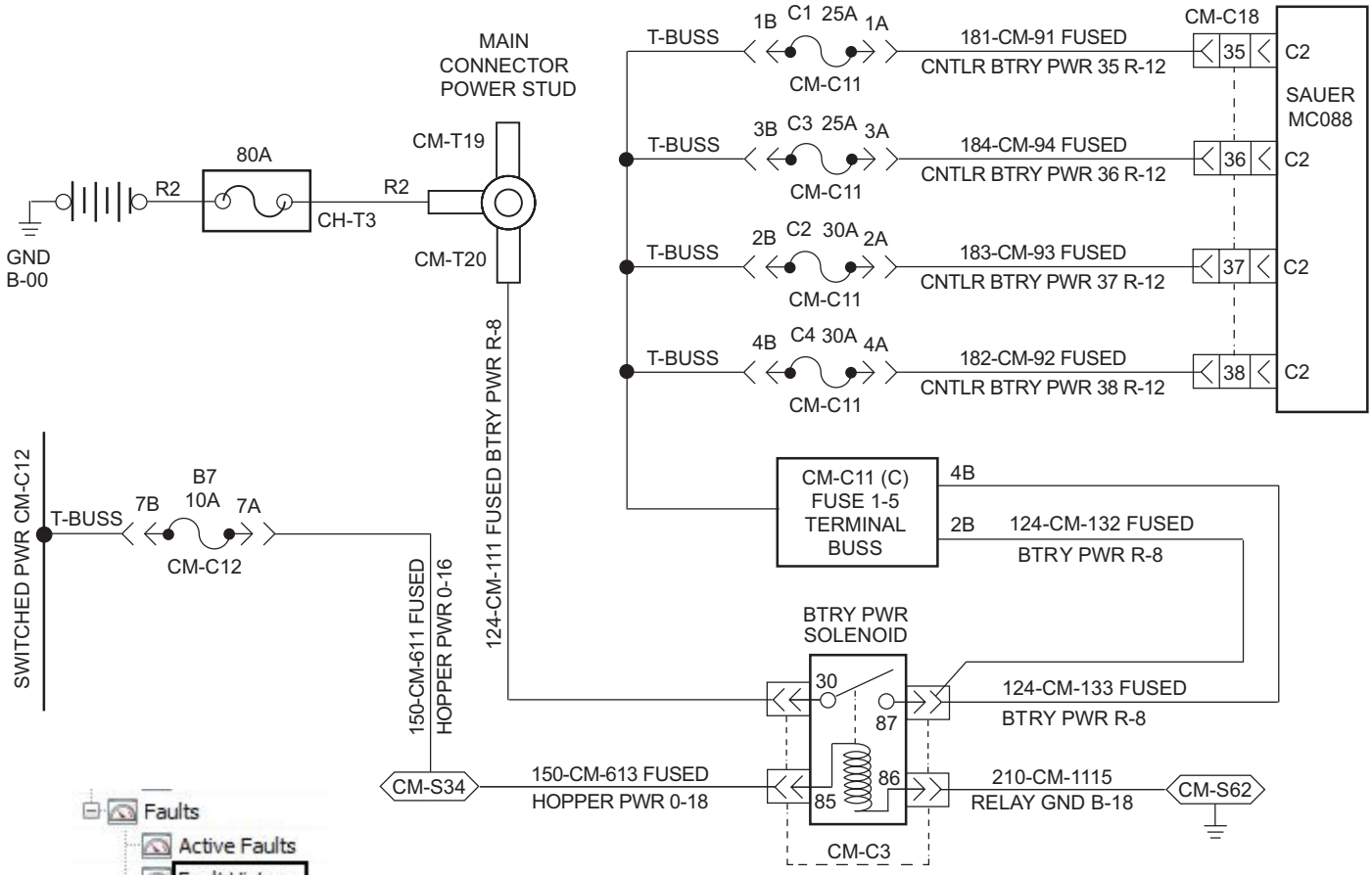


ECU Power Screen

The 12VDC is routed from the battery power relay to fuse C4. The battery power (12VDC) is routed from the battery positive post through the 80A inline fuse to the battery power relay terminal 30. The relay is grounded at terminal 86 by the relay ground circuit and ground splice CM-S62.

When the ignition switch is placed in the RUN position 12VDC from the switched power circuit is routed through fuse B7 (10A) to the battery power relay terminal 85.
Because of the ground at terminal 86 the relay is activated. When activated the relay routes the 12VDC from relay terminal 87 through terminal bus CM-C11 to fuse C4.
The 12VDC is routed from the fuses to C4 (30A) to the controller CM-C18 pin 38 (red wire).
The 12VDC at the controller is used to power the controller auxiliary functions.

Continued



Controller Battery Power Circuit



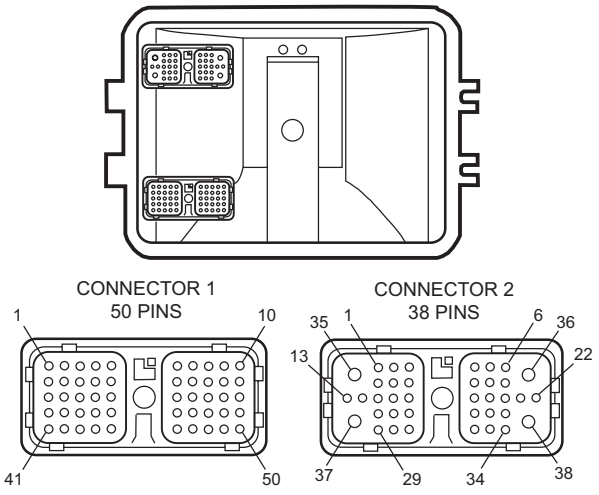
Faults Screen

START

Use the service tool ecu power screen to check the SPN 9481 battery power 4 qux power C2p38 fault indicator. The SPN 9481 fault box will display a fault ID (0x1=FaultActive). Place the cursor over the SPN 9481 fault indicator and allow to hover. A dialog box will appear with additional fault information.
The SPN 9481 fault can be verified using the service tool fault history screen.
The fault history screen will display the number of times the fault has occurred, the location, the type of fault, the first time and last time the fault occurred.

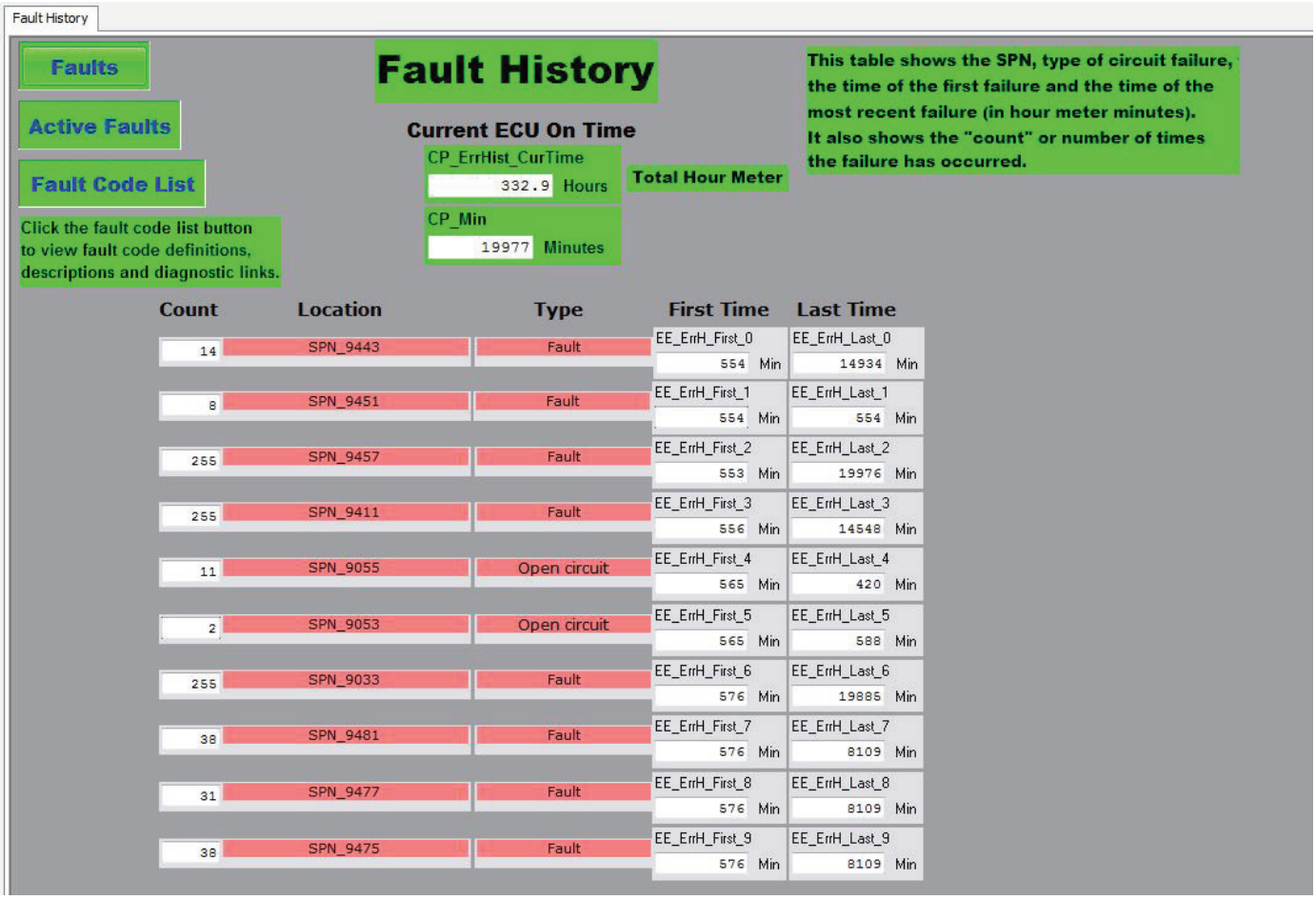


MC088 Controller



Controller Pin Locator

Continued

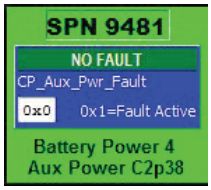


Fault History Screen

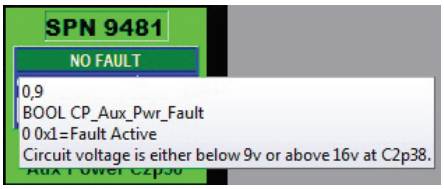


Navigator Box

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the fuse C4(30A) connector for secure or broken connection.
Check controller connectors CM-C8 & CM-C18 for secure or broken connector.



SPN 9481
Fault Indicator



Hover SPN 9481 Fault Indicator

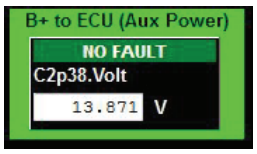
Loose or broken connection or wire?

YES — Repair or replace loose or broken terminal, wire or pin.

Note:
See section entitled Back Probe Testing for a description and test procedures.

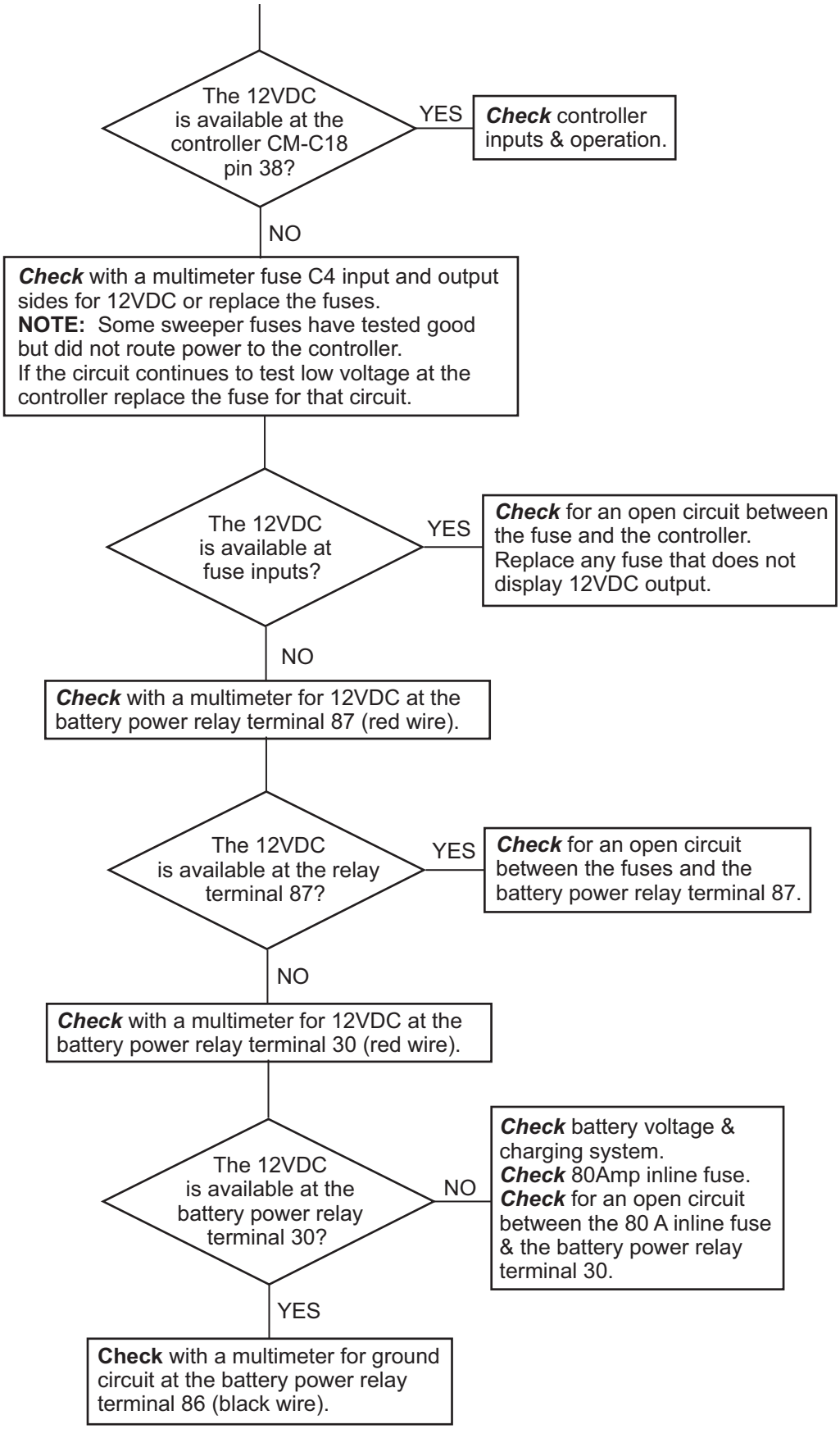
NO

Place the ignition switch in the RUN position.
Check with a multimeter equipped with back probe adapters for 12VDC at the controller CM-C18 pin 38 (red wire).
Note:
Check the service tool B+ to ECU (Aux Power) box.
The box will display the actual voltage at the controller pin C2p38 and indicate a fault condition.

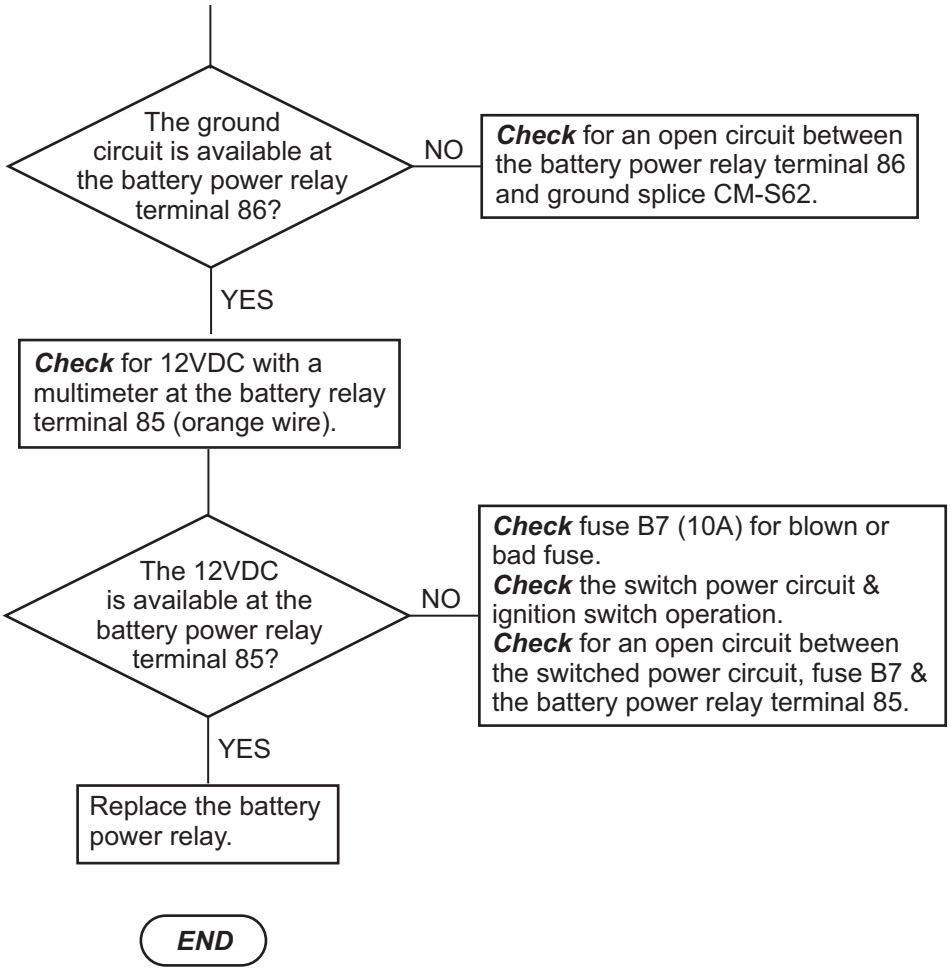


B to ECU Relay Power

Continued

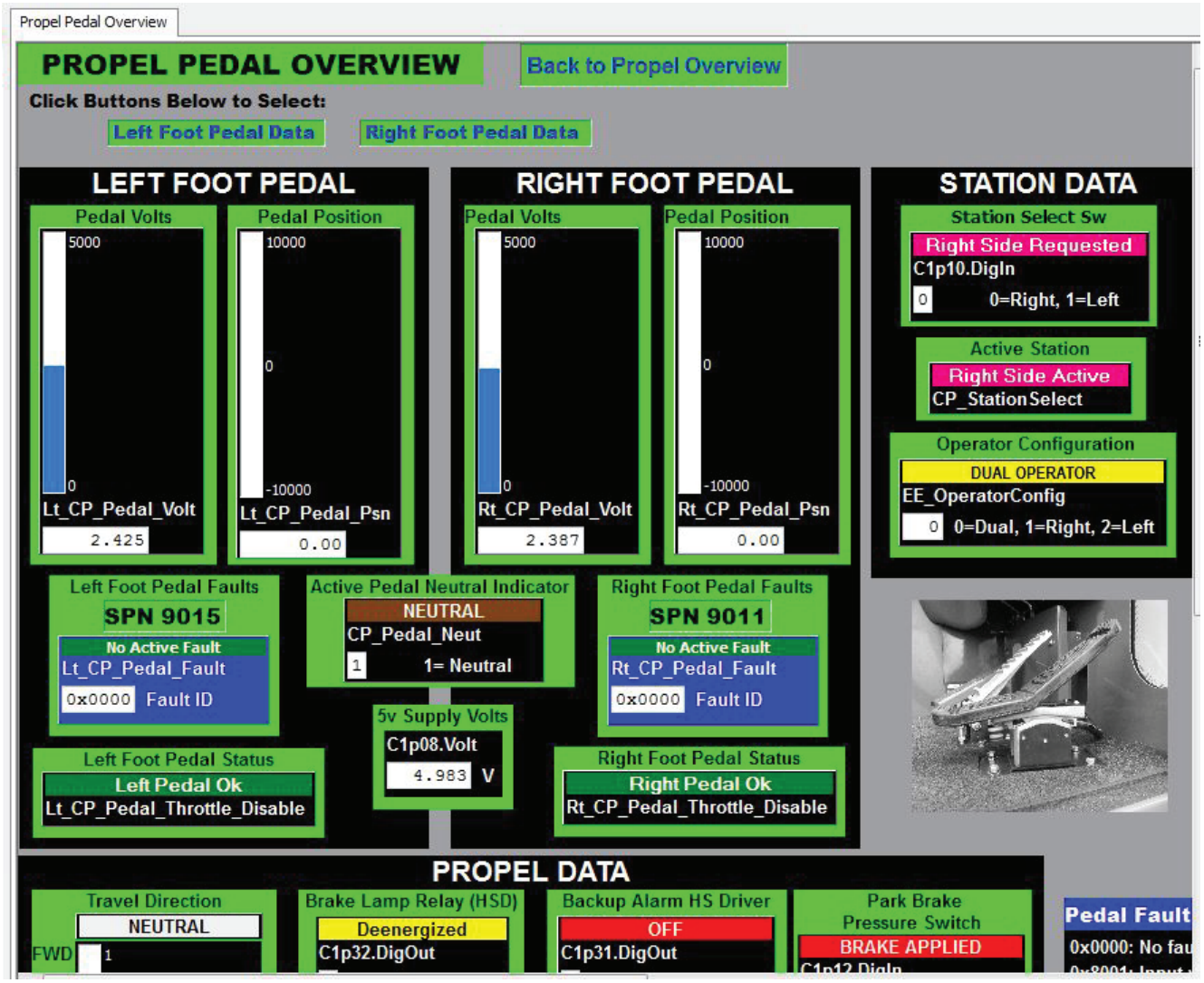

The 12VDC is available at the controller CM-C18 pin 38?
YES
Check controller inputs & operation.
NO
Check with a multimeter fuse C4 input and output sides for 12VDC or replace the fuses.
NOTE: Some sweeper fuses have tested good but did not route power to the controller.
If the circuit continues to test low voltage at the controller replace the fuse for that circuit.
The 12VDC is available at fuse inputs?
YES
Check for an open circuit between the fuse and the controller.
Replace any fuse that does not display 12VDC output.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 87 (red wire).
The 12VDC is available at the relay terminal 87?
YES
Check for an open circuit between the fuses and the battery power relay terminal 87.
NO
Check with a multimeter for 12VDC at the battery power relay terminal 30 (red wire).
The 12VDC is available at the battery power relay terminal 30?
NO
Check battery voltage & charging system.
Check 80Amp inline fuse.
Check for an open circuit between the 80 A inline fuse & the battery power relay terminal 30.
YES
Check with a multimeter for ground circuit at the battery power relay terminal 86 (black wire).

Continued


The ground circuit is available at the battery power relay terminal 86?
NO
Check for an open circuit between the battery power relay terminal 86 and ground splice CM-S62.
YES
Check for 12VDC with a multimeter at the battery relay terminal 85 (orange wire).
The 12VDC is available at the battery power relay terminal 85?
NO
Check fuse B7 (10A) for blown or bad fuse.
Check the switch power circuit & ignition switch operation.
Check for an open circuit between the switched power circuit, fuse B7 & the battery power relay terminal 85.
YES
Replace the battery power relay.
END

Back-Up Alarm

Check the backup alarm circuit as follows.

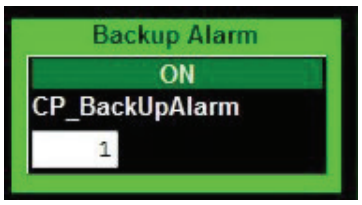


Propel Drive Overview Screen



Backup Alarm HS Driver

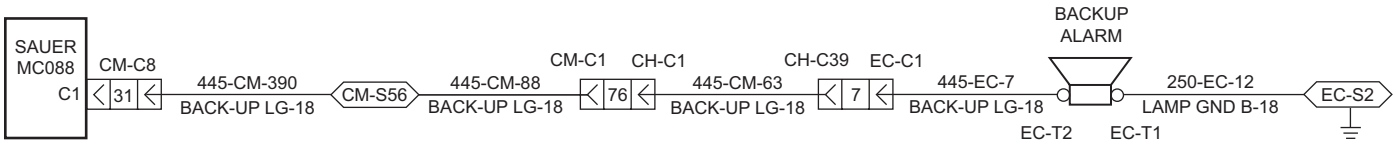
The service tool propel pedal overview screen can be used to ***check*** the backup alarm status. The backup alarm HS driver (C1p31.DigOut) will display a 0 OFF when the backup alarm has not been activated.
The driver will display a 1 ON when the alarm has been activated. A 1 indicates voltage has been routed from the controller pin C1p31 to one side of the alarm.



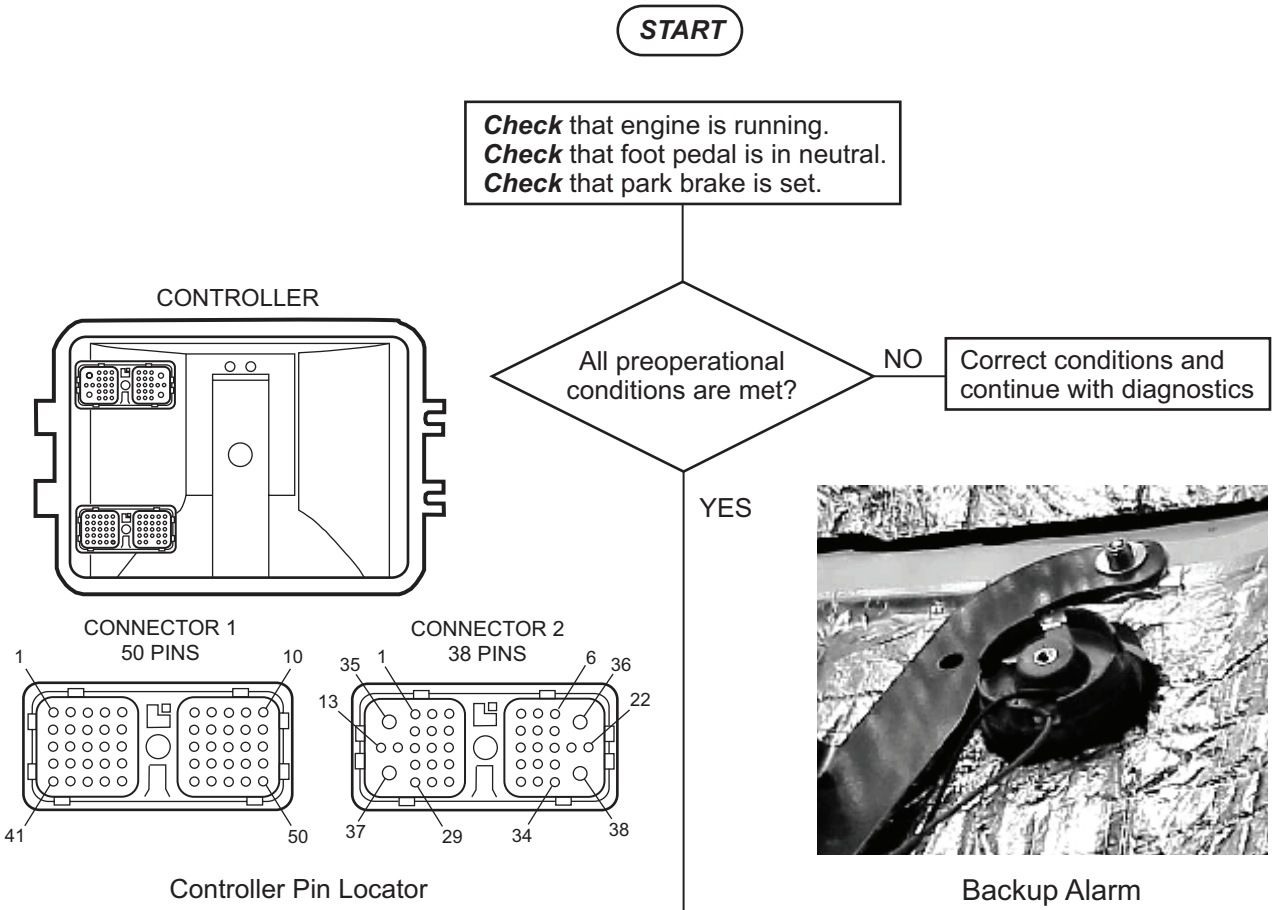
Backup Alarm

The service tool, propel pedal overview screen, back alarm (CP-BackUpAlarm) box will display a 0 OFF when the alarm has not been activated and a 1 ON when the alarm is activated.

Continued



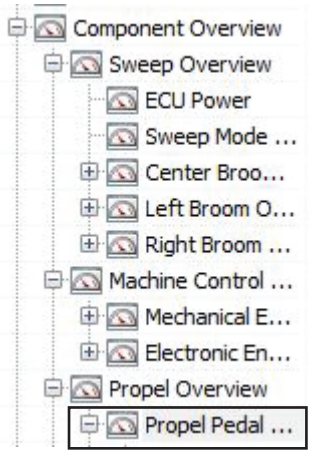
Back-up Alarm Circuit



Controller Pin Locator

Backup Alarm

Continued



Navigation Box

Check backup alarm for secure or broken connections.
Check Controller CM-C8 for secure or broken connections.
Check harness connectors for secure or broken connectors.

Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin

NO

Lift sweeper drive wheels off the ground and support with jack stands or suitable blocking.
Start the engine and place the foot pedal in reverse.
Check with a multimeter for 12VDC at the backup alarm connector EC-T2 (light green wire).

The 12VDC available at the backup alarm connector EC-T2?

NO → ***Check*** the Backup Alarm HS driver (C1p31.DigOut) box, activated log function, if voltage is available from pin C1p31.

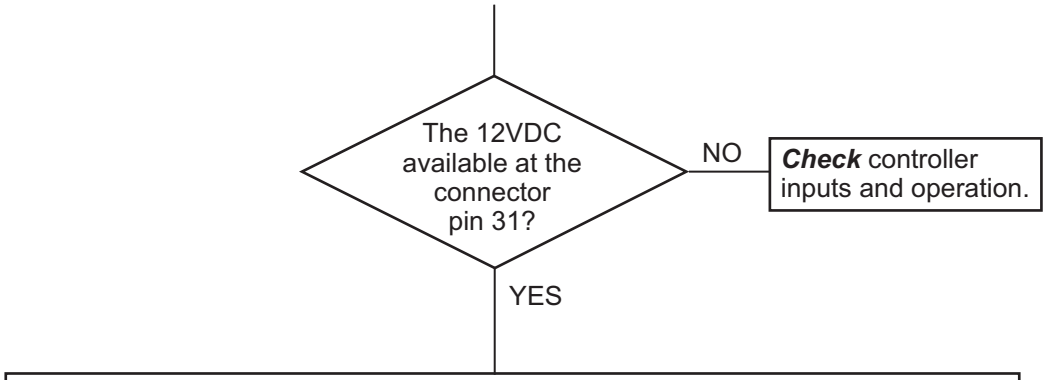
YES → ***Check*** with a multimeter for a ground circuit at the backup alarm connector EC-T1 (black wire). A bad ground connection can cause backup alarm failure and generation of fault codes.

Ground circuit available at the backup alarm connector EC-T1?

NO → ***Check*** ground splice EC-S2 and the backup alarm for open circuits.

YES → Replace backup alarm.

Continued

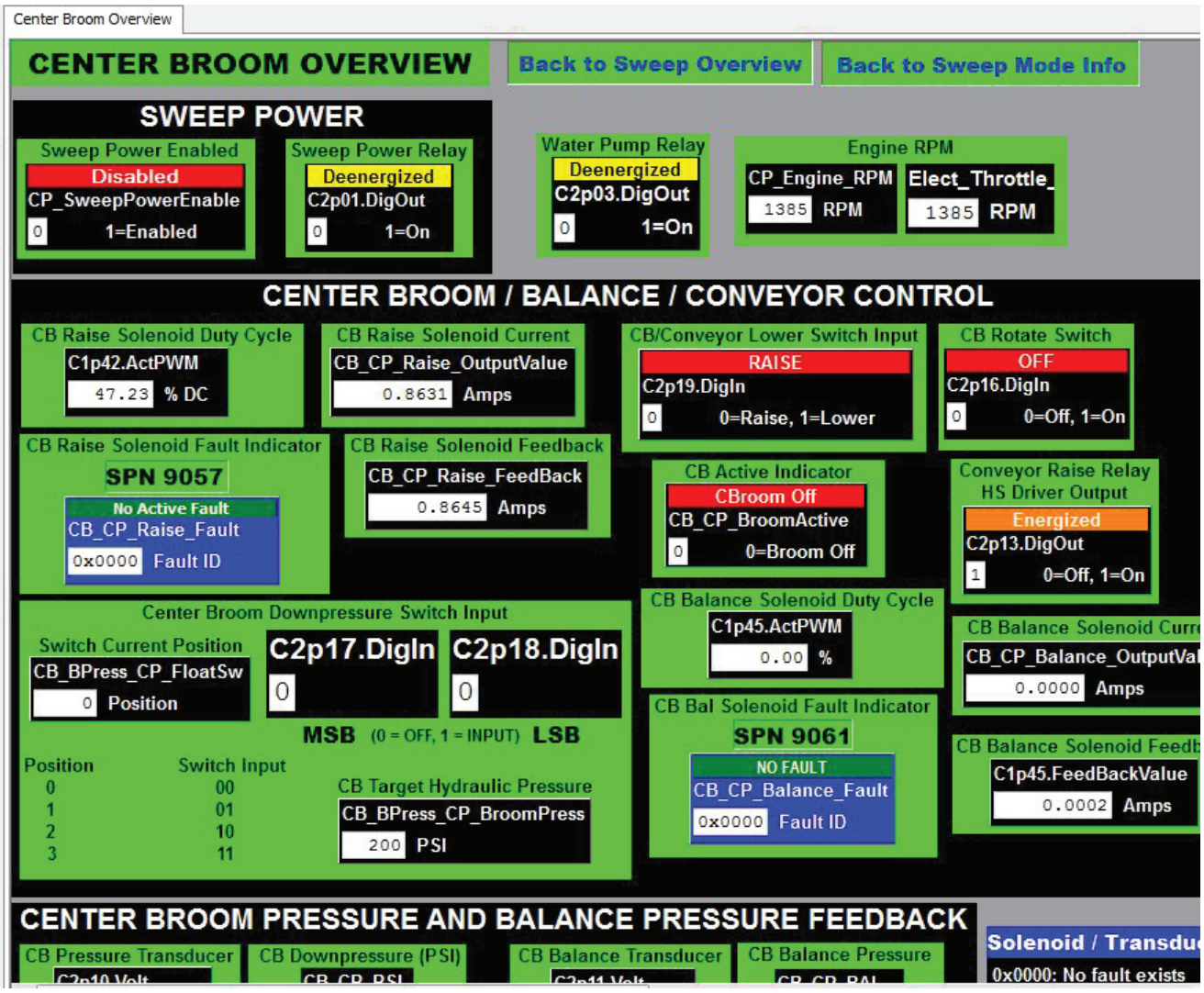


Remove connector CM-C8 from the controller.
Disconnect the wire from the backup alarm connector EC-T2 (light green wire).
Place a jumper wire beween the alarm connector EC-T2 and a known ground.
Check with a multimeter set for resistance (ohms lowest setting) between controller connector CM-C8 pin C1p31 (light green wire) and a known ground.
The multimeter should display a 0 indicating ground continuity.
If the multimeter does not display a 0 there is a open circuit between the controller pin C1p31 and the backup alarm terminal EC-T2.
Repair or replace the wiring harness.
Remove the jumper wire from the backup alarm connector.
Check with a multimeter set for resistance (ohms lowest setting) between the controller connector CM-C8 pin C1p31 (light green wire) and a known good ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short or short to ground between controller pin C1p31 and the backup alarm connector EC-T2.
Repair or replace the wiring harness.

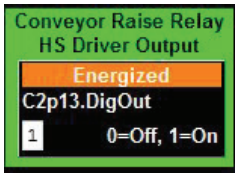
END

Conveyor
Raise Relay

There is a possible short circuit, overcurrent or open circuit in the conveyor raise relay or relay circuit.



Center Broom Overview Screen



Conveyor
Raise HS Driver

The service tool center broom overview screen can be used to monitor the status of the conveyor raise relay. The conveyor raise HS driver box will display Energized (1) when the voltage is routed from the controller CM-C18 (C2p13.Dig.Out) pin C2p13 to the relay terminal 1.
The box will display Deenergized (0)when voltage has not be routed to the relay.

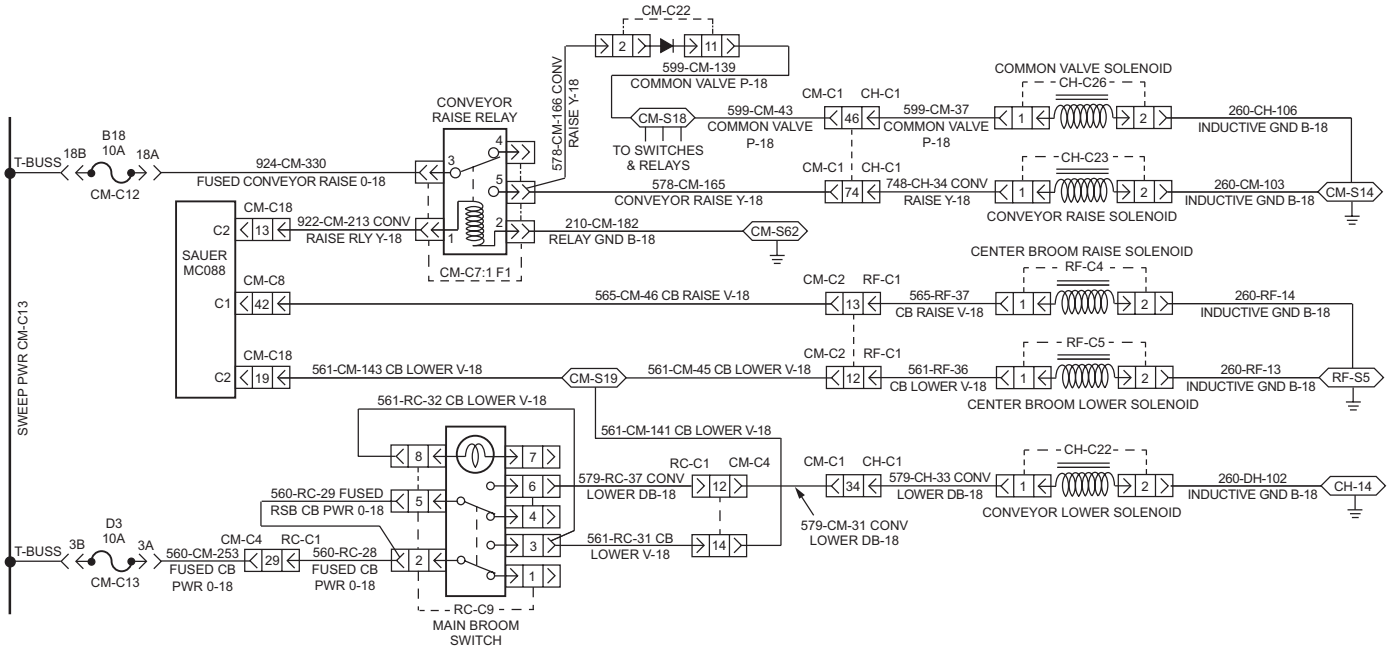
Continued

The conveyor raise relay is controlled by the center broom lower / raise switch and the controller.
When the center broom switch is placed in the LOWER position the 12VDC is routed from the switch terminal 3 to one side of the center broom lower solenoid.
The voltage is also routed from the switch terminal 3 and splice CM-S19 to the controller CM-C18 pin C2p19.
The input at the controller pin C2p19 notifies the controller that the center broom is in the lower position.
At the same time the 12VDC is routed from the switch terminal 6 to one side of the conveyor lower solenoid.
The voltage routed to the conveyor and center broom lower solenoids causes the solenoids to shift position and route hydraulic oil to the conveyor and center broom cylinder lowering the conveyor and center broom.

When the center broom lower / raise switch is placed in the RAISE position the voltage is no longer routed to the controller CM-C18 pin C2p19. The removal of the 12VDC at controller pin C1p19 causes the controller to route the 12VDC from the controller CM-C8 pin C1p42 to the center broom raise solenoid raising the center broom.
At the same time 12VDC is routed from the controller CM-C18 pin C2p13 to the conveyor raise relay coil at terminal 1 activating the relay.

NOTE: The center broom solenoid is a PWM proportional solenoid that is duty cycle operated anytime the center broom is down and is used to hold the broom in the desired position while sweeping. When the center broom up command is generated the raise solenoid is duty cycled at a higher percentage for 5 - 8 seconds to raise the broom. The check valve in the deenergized center broom up solenoid then holds the broom in the up position.

The 12VDC is routed from the switched power circuit and fuse B18 (10A) to the conveyor raise relay terminal 3.
The relay coil is grounded at terminal 2 by the relay ground circuit. With the relay coil activated by voltage from the controller pin 13 and ground at terminal 2 the coil magnetic field causes the relay to shift position. When activated the voltage at terminal 3 is routed from terminal 5 to one side of the conveyor raise solenoid. The raise solenoid shifts position routing hydraulic oil to the conveyor lift cylinders raising the conveyor.
A the same the 12VDC is routed from the relay terminal 5 to one side of the common valve solenoid coil.
The common valve the shifts position causing hydraulic oil to flow to the conveyor raise circuit.



Conveyor Raise Relay Circuit

Continued

START

Use the service tool screens in conjunction with the diagnostic steps to locate & repair circuit problems.

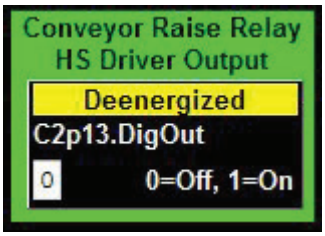
Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the conveyor raise relay for secure or loose mounting.
Check the relay connector for secure or broken connection.
Check controller connectors CM-C8 & CM-C18 for secure or broken connector.

Loose or broken connection or wire?

YES → Repair or replace loose or broken terminal, wire or pin.

NO

Check with a multimeter for a ground circuit at the conveyor raise relay terminal 2 (black wire).
Note: A Bad ground connection can cause error codes and relay failure.



Conveyor Raise Relay
HS Driver Output

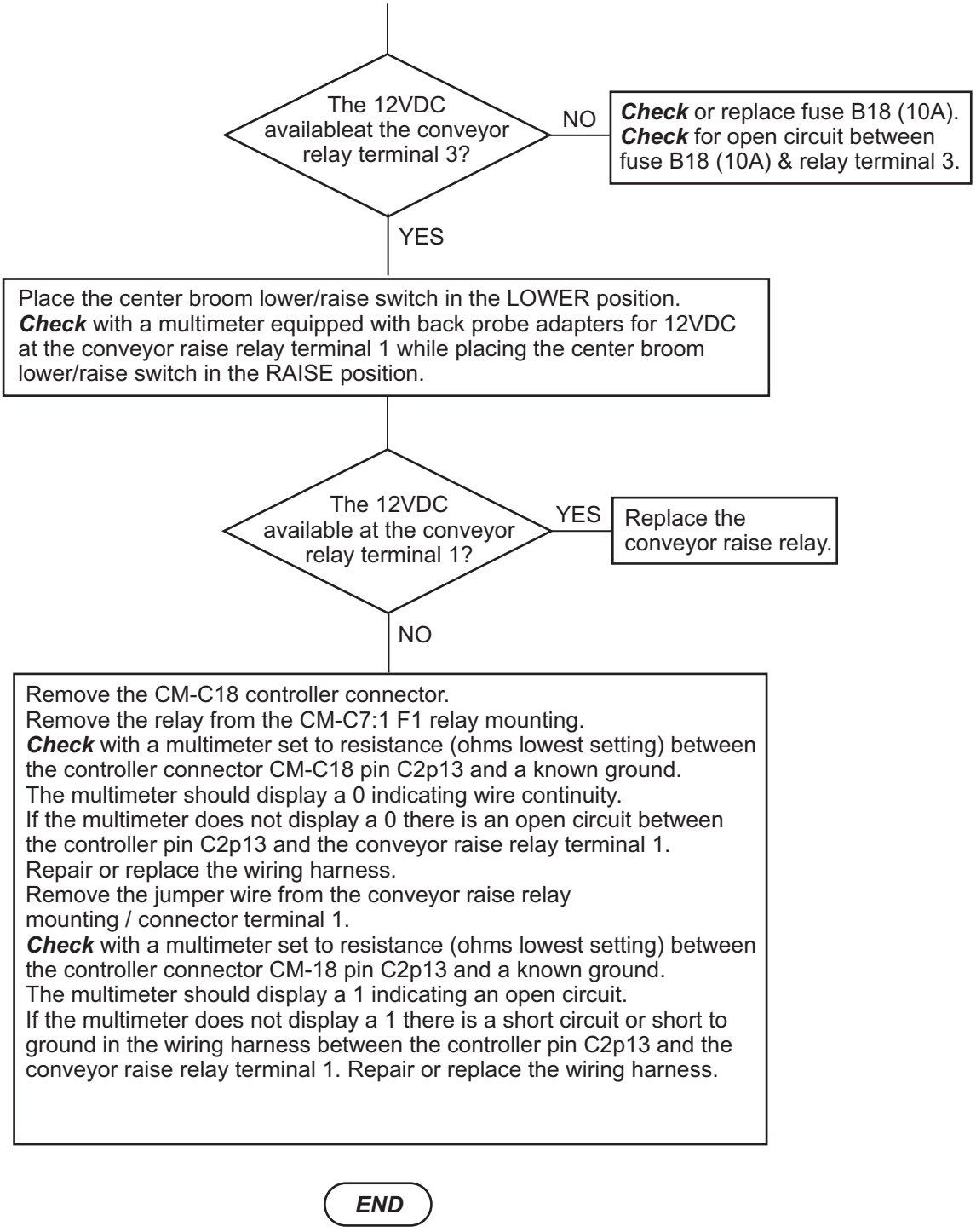
Ground circuit available at the conveyor raise relay terminal 2?

NO → ***Check*** for open circuit in the relay ground circuit between ground splice CM-S62 and the relay terminal 2.

YES

Check with a multimeter for 12VDC at the conveyor raise relay terminal 3.

Continued


The 12VDC availableat the conveyor relay terminal 3?
NO
Check or replace fuse B18 (10A). Check for open circuit between fuse B18 (10A) & relay terminal 3.
YES
Place the center broom lower/raise switch in the LOWER position. Check with a multimeter equipped with back probe adapters for 12VDC at the conveyor raise relay terminal 1 while placing the center broom lower/raise switch in the RAISE position.
The 12VDC available at the conveyor relay terminal 1?
YES
Replace the conveyor raise relay.
NO
Remove the CM-C18 controller connector.
Remove the relay from the CM-C7:1 F1 relay mounting.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CM-C18 pin C2p13 and a known ground.
The multimeter should display a 0 indicating wire continuity.
If the multimeter does not display a 0 there is an open circuit between the controller pin C2p13 and the conveyor raise relay terminal 1.
Repair or replace the wiring harness.
Remove the jumper wire from the conveyor raise relay mounting / connector terminal 1.
Check with a multimeter set to resistance (ohms lowest setting) between the controller connector CM-18 pin C2p13 and a known ground.
The multimeter should display a 1 indicating an open circuit.
If the multimeter does not display a 1 there is a short circuit or short to ground in the wiring harness between the controller pin C2p13 and the conveyor raise relay terminal 1. Repair or replace the wiring harness.
END

Engine Oil
Pressure Sender
T4i Only

The engine oil pressure sender output values are outside of defined range on the instrument panel.

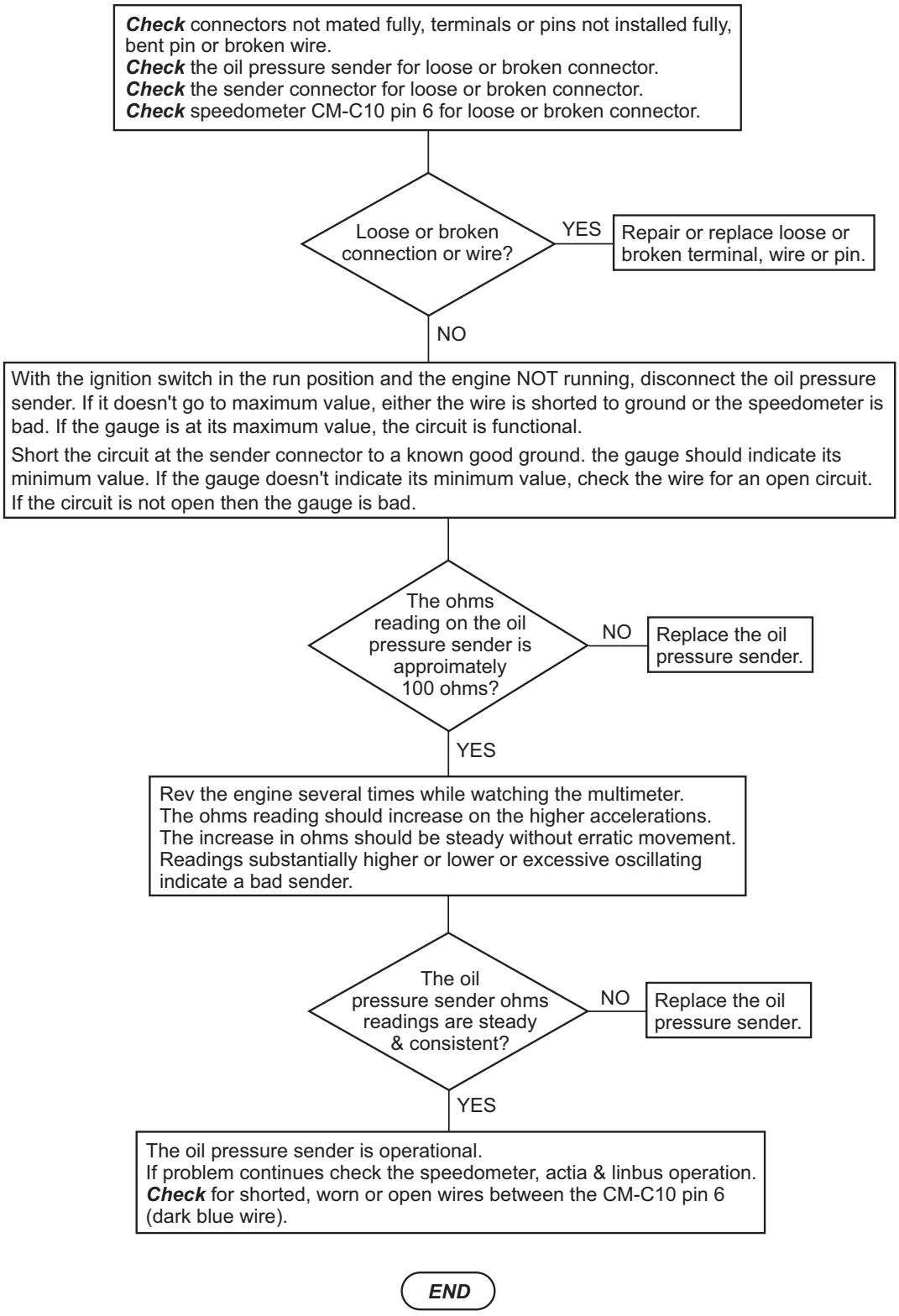


Oil Pressure Sender

START

The oil pressure sender is mounted on the engine in an oil pressure port.
The sender is a type of variable resistor that acts as a variable path to ground.
When the engine is off the sender is shorted to ground and should read zero.
When the engine is running the sender offers resistance to ground providing a mid-range reading on the gauge.
If the sender wire was removed from the sender the gauge would read off the scale to the high side.

Continued

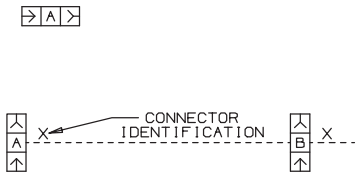

Check connectors not mated fully, terminals or pins not installed fully, bent pin or broken wire.
Check the oil pressure sender for loose or broken connector.
Check the sender connector for loose or broken connector.
Check speedometer CM-C10 pin 6 for loose or broken connector.
Loose or broken connection or wire?
YES
Repair or replace loose or broken terminal, wire or pin.
NO
With the ignition switch in the run position and the engine NOT running, disconnect the oil pressure sender. If it doesn't go to maximum value, either the wire is shorted to ground or the speedometer is bad. If the gauge is at its maximum value, the circuit is functional.
Short the circuit at the sender connector to a known good ground. the gauge should indicate its minimum value. If the gauge doesn't indicate its minimum value, check the wire for an open circuit. If the circuit is not open then the gauge is bad.
The ohms reading on the oil pressure sender is approimately 100 ohms?
NO
Replace the oil pressure sender.
YES
Rev the engine several times while watching the multimeter.
The ohms reading should increase on the higher accelerations.
The increase in ohms should be steady without erratic movement.
Readings substantially higher or lower or excessive oscillating indicate a bad sender.
The oil pressure sender ohms readings are steady & consistent?
NO
Replace the oil pressure sender.
YES
The oil pressure sender is operational.
If problem continues check the speedometer, actia & linbus operation.
Check for shorted, worn or open wires between the CM-C10 pin 6 (dark blue wire).
END

SCHEMATIC DIAGRAM LEGEND

CABLE COLOR ABBREVIATIONS

B = BLACK	LB = LIGHT BLUE
R = RED	DB = DARK BLUE
O = ORANGE	LG = LIGHT GREEN
Y = YELLOW	DG = DARK GREEN
W = WHITE	G = GRAY (SLATE)
P = PINK	BR = BROWN
V = VIOLET (PURPLE)	T = TAN

TERMINALS AND CONNECTORS



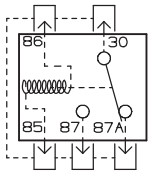
CABLE IDENTIFICATION

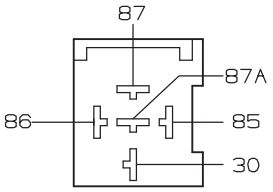
(363-IP-4 TACH) BR-18

HARNESS IDENTIFICATION CODES	
CODE	CABLE OR HARNESS
BC	BATTERY CABLE
CH	CHASSIS HARNESS
CM	CAB MAIN HARNESS
CR	CAB ROOF HARNESS
EC	ENGINE COVER
EN	ENGINE HARNESS
LC	LEFT CONSOLE HARNESS
RC	RIGHT CONSOLE HARNESS
RF	RIGHT FRAME HARNESS
EL	ROOF LIGHTING HARNESS

RELAY SYMBOLS AND SOCKETS

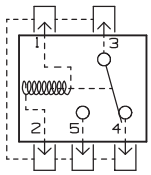
MINI RELAY

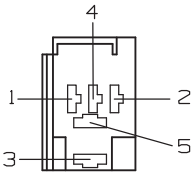




TOP VIEW OF SOCKET

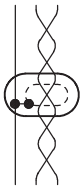
MICRO RELAY



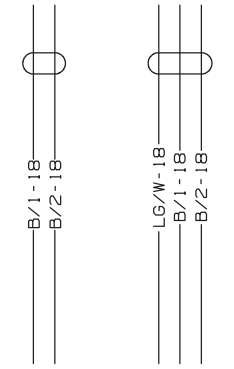


TOP VIEW OF SOCKET

TWISTED PAIR (WIRES TWISTED TOGETHER, ONE TWIST PER INCH)



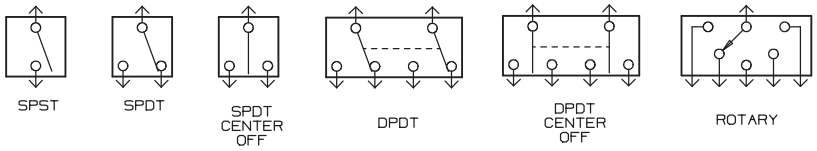
SHIELDED PAIR BELDEN 8790



TWO CONDUCTOR CABLE ALPHA 65802

THREE CONDUCTOR CABLE ALPHA 65803

SWITCH SYMBOLS (SHOWN WITH MAINTAINED CONTACTS)

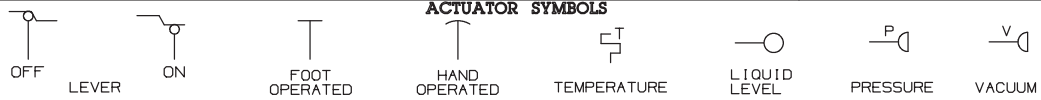


CONTACT ARRANGEMENT

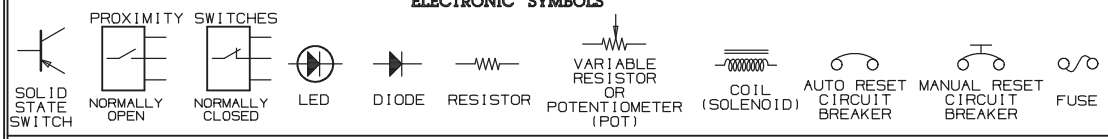
▷ MOMENTARY

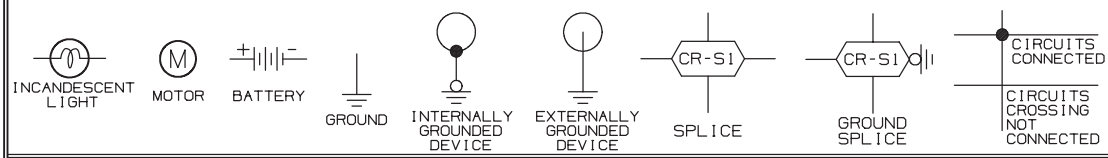
○ MAINTAINED

ACTUATOR SYMBOLS



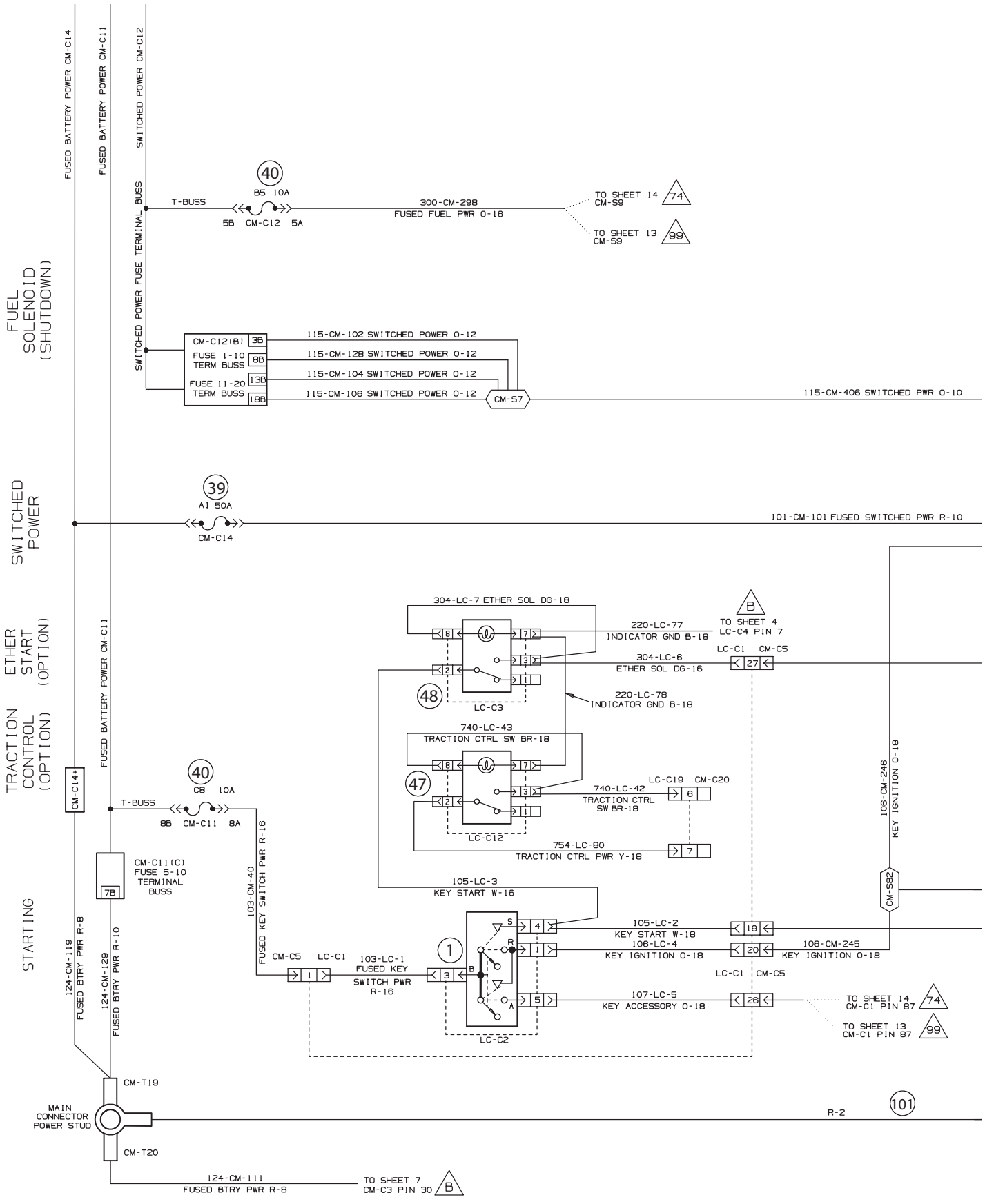
ELECTRONIC SYMBOLS



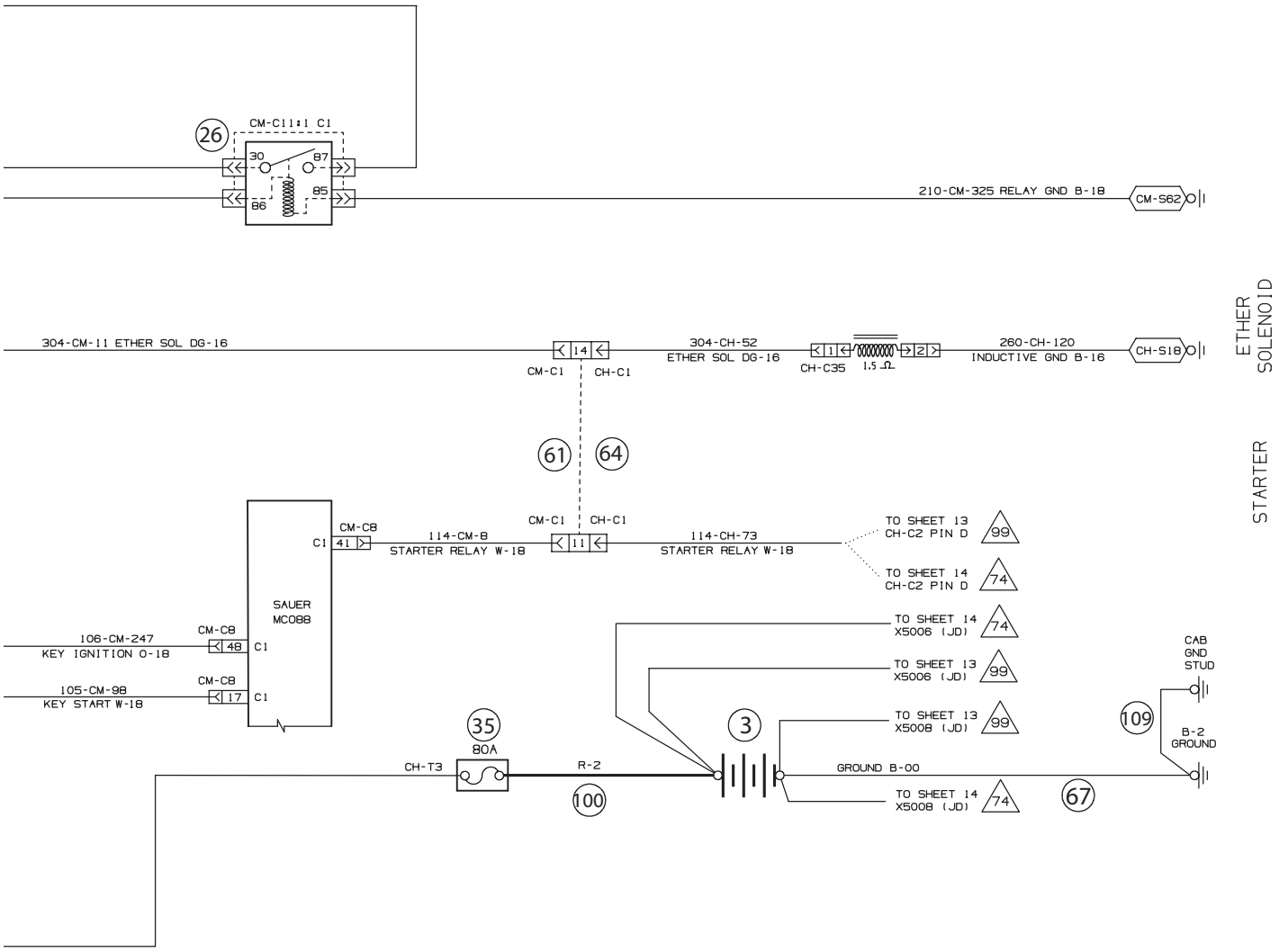


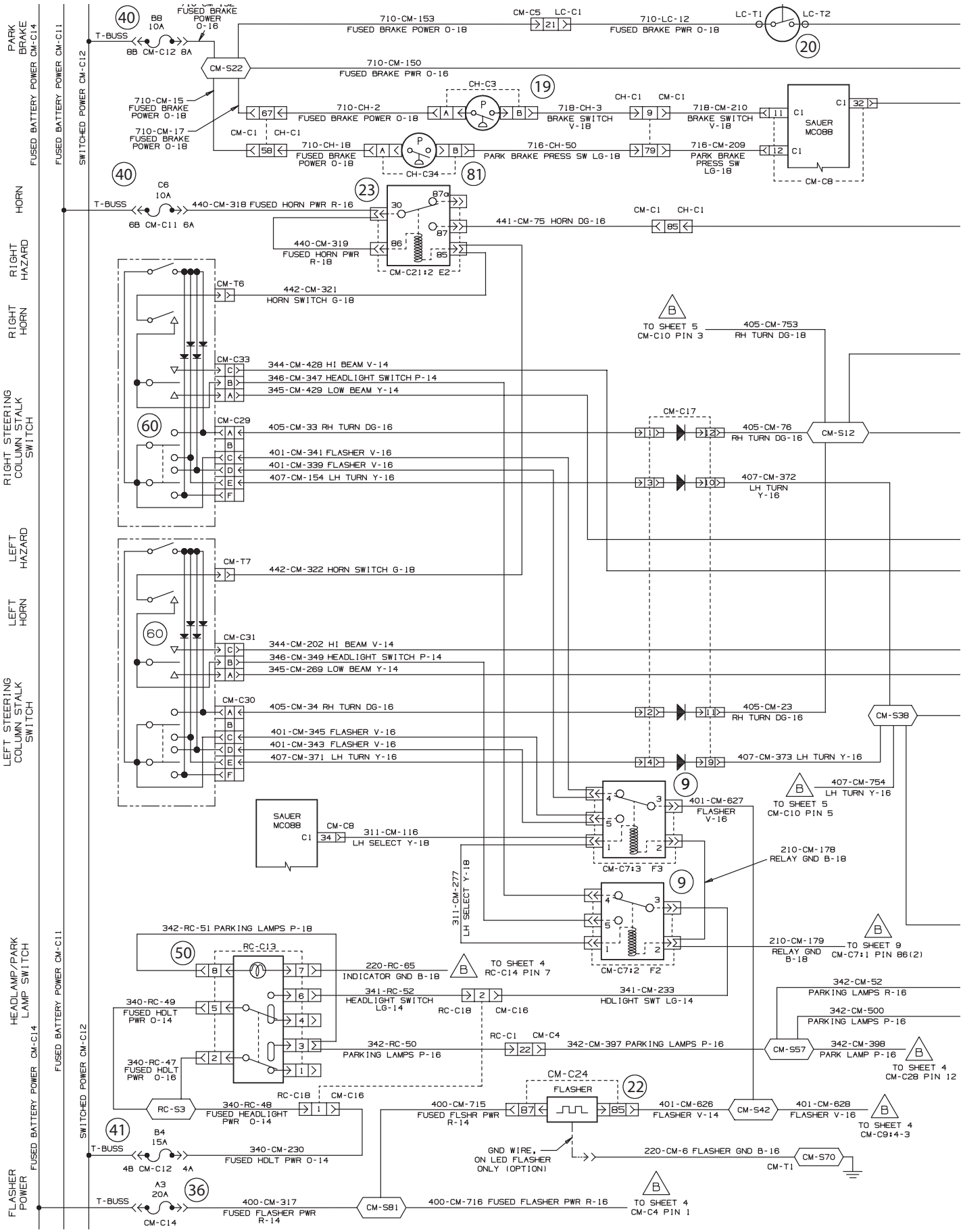
SCHEMATIC IS SHOWN WITH KEY SWITCH TURNED TO THE "OFF" POSITION AND PARK BRAKE SET TO THE "ON" POSITION

SHEET 1 OF 17

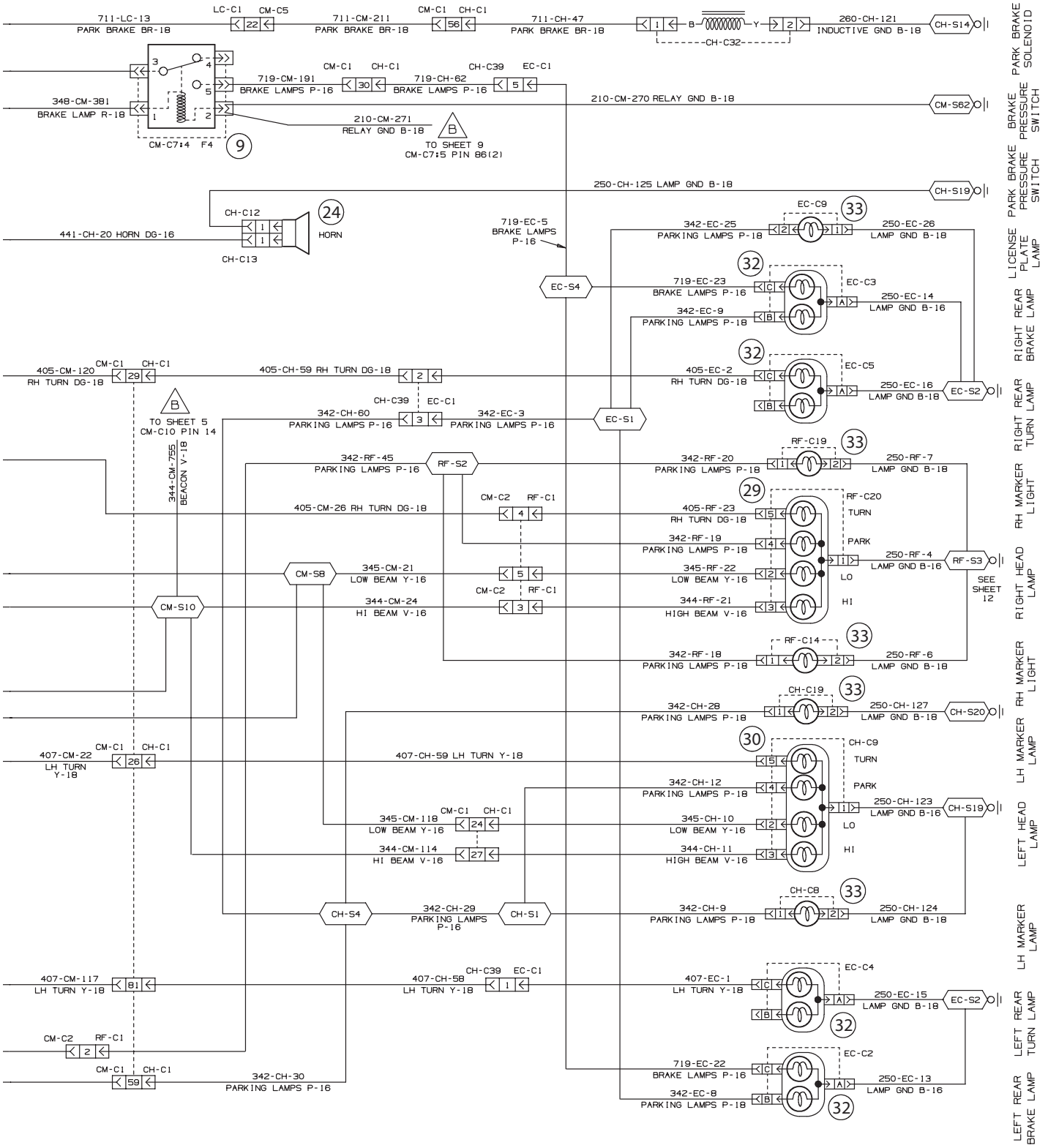

FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWITCHED POWER FUSE TERMINAL BUSS
FUEL SOLENOID (SHUTDOWN)
SWITCHED POWER
ETHER START (OPTION)
TRACTION CONTROL (OPTION)
STARTING
40
B5 10A
T-BUSS
5B CM-C12 5A
300-CM-298
FUSED FUEL PWR O-16
TO SHEET 14
CM-S9
74
TO SHEET 13
CM-S9
99
CM-C12(B)
FUSE 1-10
TERM BUSS
FUSE 11-20
TERM BUSS
3B
8B
13B
18B
115-CM-102 SWITCHED POWER O-12
115-CM-128 SWITCHED POWER O-12
115-CM-104 SWITCHED POWER O-12
115-CM-106 SWITCHED POWER O-12
CM-S7
115-CM-406 SWITCHED PWR O-10
39
A1 50A
CM-C14
101-CM-101 FUSED SWITCHED PWR R-10
304-LC-7 ETHER SOL DG-18
220-LC-77
INDICATOR GND B-18
TO SHEET 4
LC-C4 PIN 7
304-LC-6
ETHER SOL DG-16
LC-C1 CM-C5
27
48
LC-C3
220-LC-78
INDICATOR GND B-18
740-LC-43
TRACTION CTRL SW BR-18
47
740-LC-42
TRACTION CTRL
SW BR-18
LC-C19 CM-C20
6
LC-C12
754-LC-80
TRACTION CTRL PWR Y-18
7
106-CM-246
KEY IGNITION O-18
CM-S82
CM-C14+
40
C8 10A
T-BUSS
8B CM-C11 8A
CM-C11(C)
FUSE 5-10
TERMINAL
BUSS
7B
103-CM-40
FUSED KEY SWITCH PWR R-16
105-LC-3
KEY START W-16
CM-C5 LC-C1
103-LC-1
FUSED KEY
SWITCH PWR
R-16
1
105-LC-2
KEY START W-18
106-LC-4
KEY IGNITION O-18
106-CM-245
KEY IGNITION O-18
LC-C1 CM-C5
107-LC-5
KEY ACCESSORY O-18
TO SHEET 14
CM-C1 PIN 87
TO SHEET 13
CM-C1 PIN 87
LC-C2
124-CM-119
FUSED BTRY PWR R-8
124-CM-129
FUSED BTRY PWR R-10
CM-T19
MAIN
CONNECTOR
POWER STUB
CM-T20
R-2
101
124-CM-111
FUSED BTRY PWR R-8
TO SHEET 7
CM-C3 PIN 30

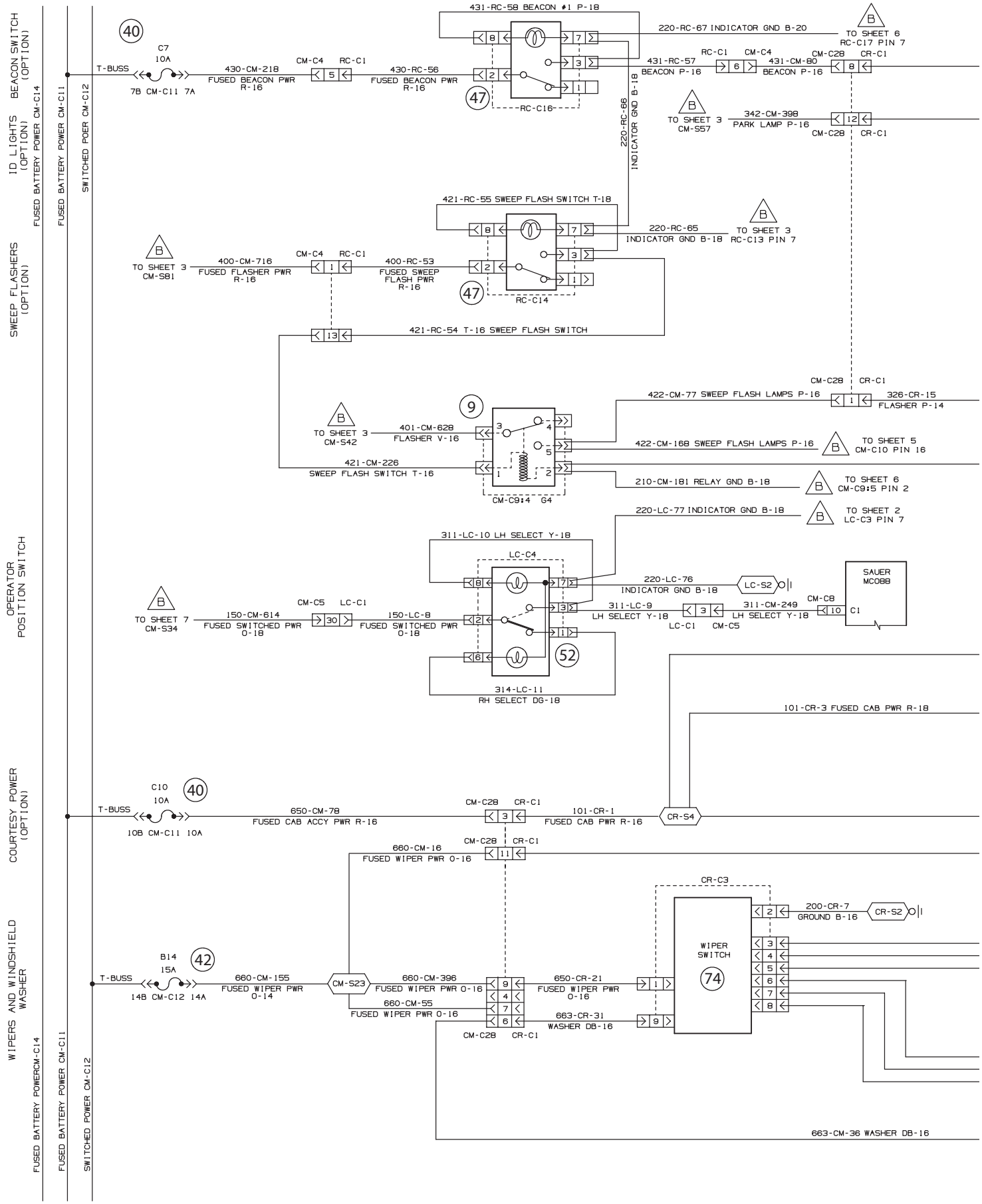
SHEET 2 OF 17


26
CM-C11#1 C1
30
87
85
86
210-CM-325 RELAY GND B-18
CM-S62
304-CM-11 ETHER SOL DG-16
14
CM-C1
CH-C1
304-CH-52
ETHER SOL DG-16
CH-C35
1.5 Ω
1
2
260-CH-120
INDUCTIVE GND B-16
CH-S18
ETHER SOLENOID
61
64
STARTER
CM-C8
C1
41
114-CM-8
STARTER RELAY W-18
CM-C1
CH-C1
11
114-CH-73
STARTER RELAY W-18
TO SHEET 13
CH-C2 PIN D
99
TO SHEET 14
CH-C2 PIN D
74
SAUER
MC088
106-CM-247
KEY IGNITION O-18
CM-C8
48
C1
105-CM-98
KEY START W-18
CM-C8
17
C1
TO SHEET 14
X5006 (JD)
74
TO SHEET 13
X5006 (JD)
99
TO SHEET 13
X5008 (JD)
99
CAB
GND
STUD
109
B-2
GROUND
35
80A
3
CH-T3
R-2
100
GROUND B-00
TO SHEET 14
X5008 (JD)
74
67

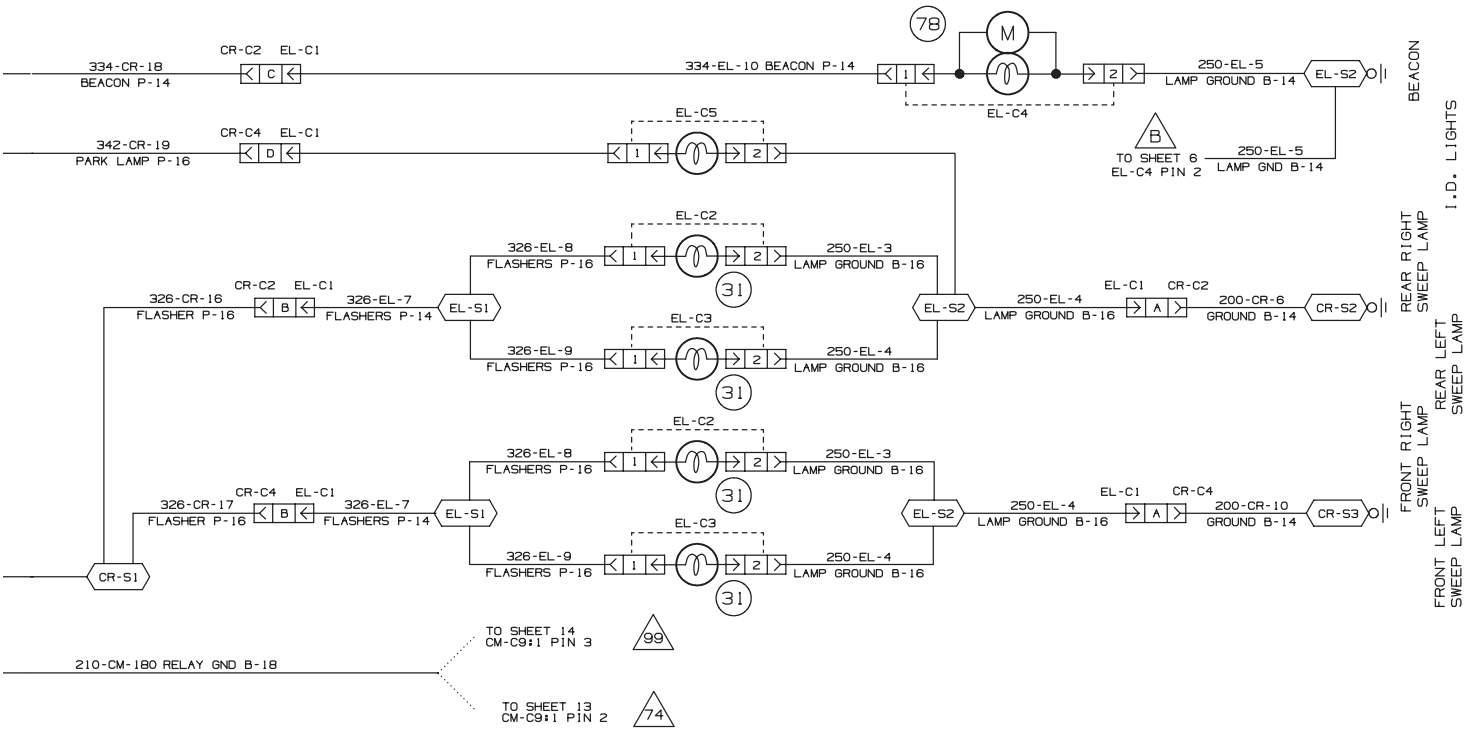

PARK BRAKE
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
HORN
RIGHT HAZARD
RIGHT HORN
RIGHT STEERING COLUMN STALK SWITCH
LEFT HAZARD
LEFT HORN
LEFT STEERING COLUMN STALK SWITCH
HEADLAMP/PARK LAMP SWITCH
FLASHER POWER
T-BUSS
8B 10A
710-CM-153 FUSED BRAKE POWER O-18
CM-C5 LC-C1
710-LC-12 FUSED BRAKE PWR O-18
LC-T1 LC-T2
CM-S22
710-CM-150 FUSED BRAKE PWR O-16
710-CM-15 FUSED BRAKE POWER O-18
710-CM-17 FUSED BRAKE POWER O-18
710-CH-2 FUSED BRAKE POWER O-18
718-CH-3 BRAKE SWITCH V-18
718-CM-210 BRAKE SWITCH V-18
SAUER MC088
710-CH-18 FUSED BRAKE POWER O-18
716-CH-50 PARK BRAKE PRESS SW LG-18
716-CM-209 PARK BRAKE PRESS SW LG-18
CM-C8
C6 10A
6B CM-C11 6A
440-CM-318 FUSED HORN PWR R-16
441-CM-75 HORN DG-16
440-CM-319 FUSED HORN PWR R-18
CM-C21:2 E2
CM-T6
442-CM-321 HORN SWITCH G-18
TO SHEET 5 CM-C10 PIN 3
405-CM-753 RH TURN DG-18
CM-C33
344-CM-428 HI BEAM V-14
346-CM-347 HEADLIGHT SWITCH P-14
345-CM-429 LOW BEAM Y-14
CM-C29
405-CM-33 RH TURN DG-16
401-CM-341 FLASHER V-16
401-CM-339 FLASHER V-16
407-CM-154 LH TURN Y-16
CM-C17
405-CM-76 RH TURN DG-16
CM-S12
407-CM-372 LH TURN Y-16
CM-T7
442-CM-322 HORN SWITCH G-18
CM-C31
344-CM-202 HI BEAM V-14
346-CM-349 HEADLIGHT SWITCH P-14
345-CM-269 LOW BEAM Y-14
CM-C30
405-CM-34 RH TURN DG-16
401-CM-345 FLASHER V-16
401-CM-343 FLASHER V-16
407-CM-371 LH TURN Y-16
405-CM-23 RH TURN DG-16
CM-S38
407-CM-373 LH TURN Y-16
407-CM-754 LH TURN Y-16
TO SHEET 5 CM-C10 PIN 5
401-CM-627 FLASHER V-16
CM-C7:3 F3
SAUER MC088
311-CM-116 LH SELECT Y-18
210-CM-178 RELAY GND B-18
311-CM-277 LH SELECT Y-18
342-RC-51 PARKING LAMPS P-18
RC-C13
220-RC-65 INDICATOR GND B-18
TO SHEET 4 RC-C14 PIN 7
210-CM-179 RELAY GND B-18
TO SHEET 9 CM-C7:1 PIN 86(2)
CM-C7:2 F2
340-RC-49 FUSED HDLT PWR O-14
341-RC-52 HEADLIGHT SWITCH LG-14
RC-C18
CM-C16
341-CM-233 HDLIGHT SWT LG-14
342-CM-52 PARKING LAMPS R-16
342-CM-500 PARKING LAMPS P-16
RC-C1 CM-C4
342-RC-50 PARKING LAMPS P-16
342-CM-397 PARKING LAMPS P-16
CM-S57
342-CM-398 PARK LAMP P-16
TO SHEET 4 CM-C28 PIN 12
340-RC-47 FUSED HDLT PWR O-16
RC-S3
340-RC-48 FUSED HEADLIGHT PWR O-14
CM-C24 FLASHER
400-CM-715 FUSED FLSHR PWR R-14
401-CM-626 FLASHER V-14
CM-S42
401-CM-628 FLASHER V-16
TO SHEET 4 CM-C9:4-3
B4 15A
4B CM-C12 4A
340-CM-230 FUSED HDLT PWR O-14
GND WIRE, ON LED FLASHER ONLY (OPTION)
220-CM-6 FLASHER GND B-16
CM-S70
CM-T1
A3 20A
CM-C14
400-CM-317 FUSED FLASHER PWR R-14
CM-S81
400-CM-716 FUSED FLASHER PWR R-16
TO SHEET 4 CM-C4 PIN 1

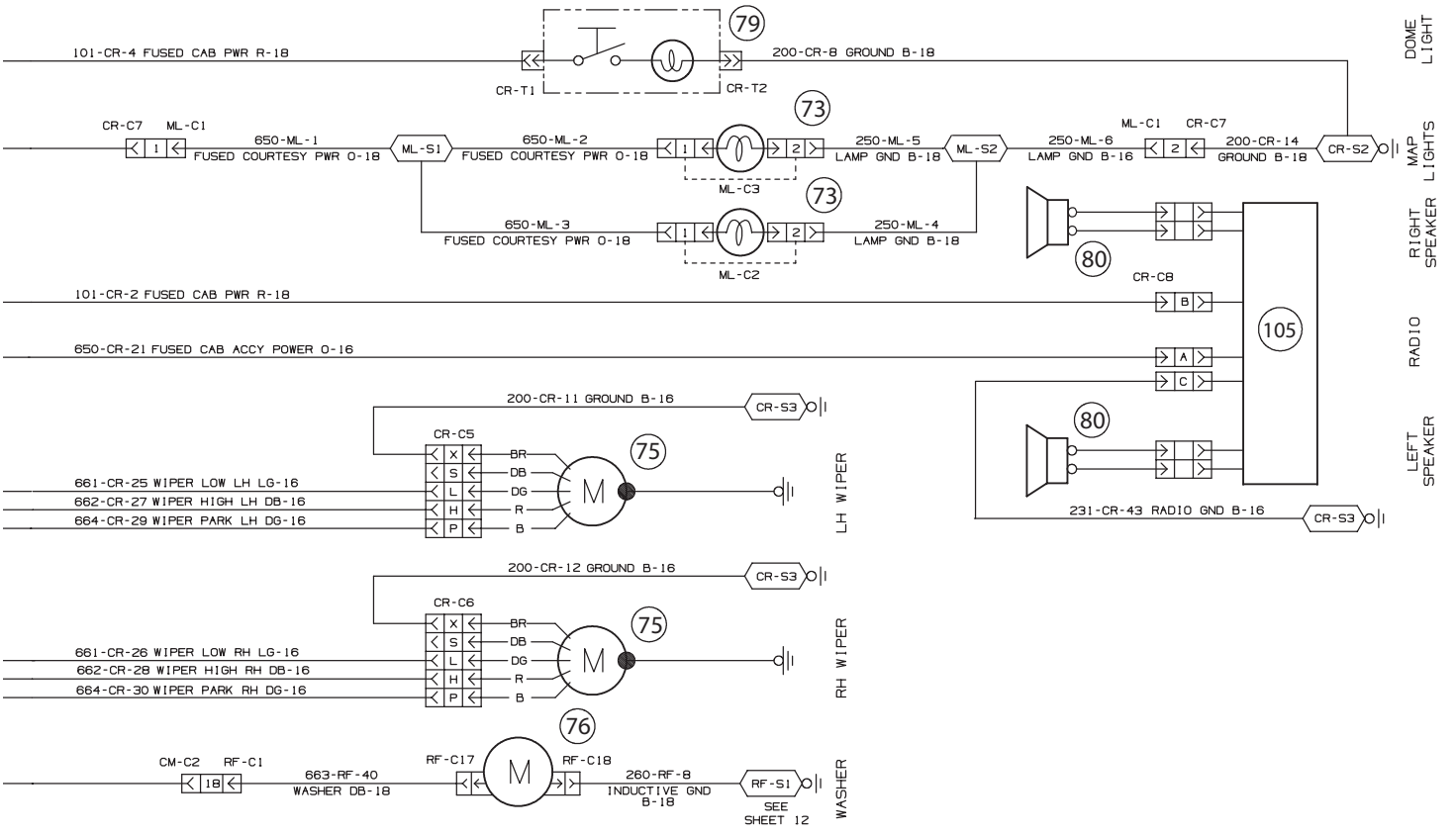
SHEET 3 OF 17

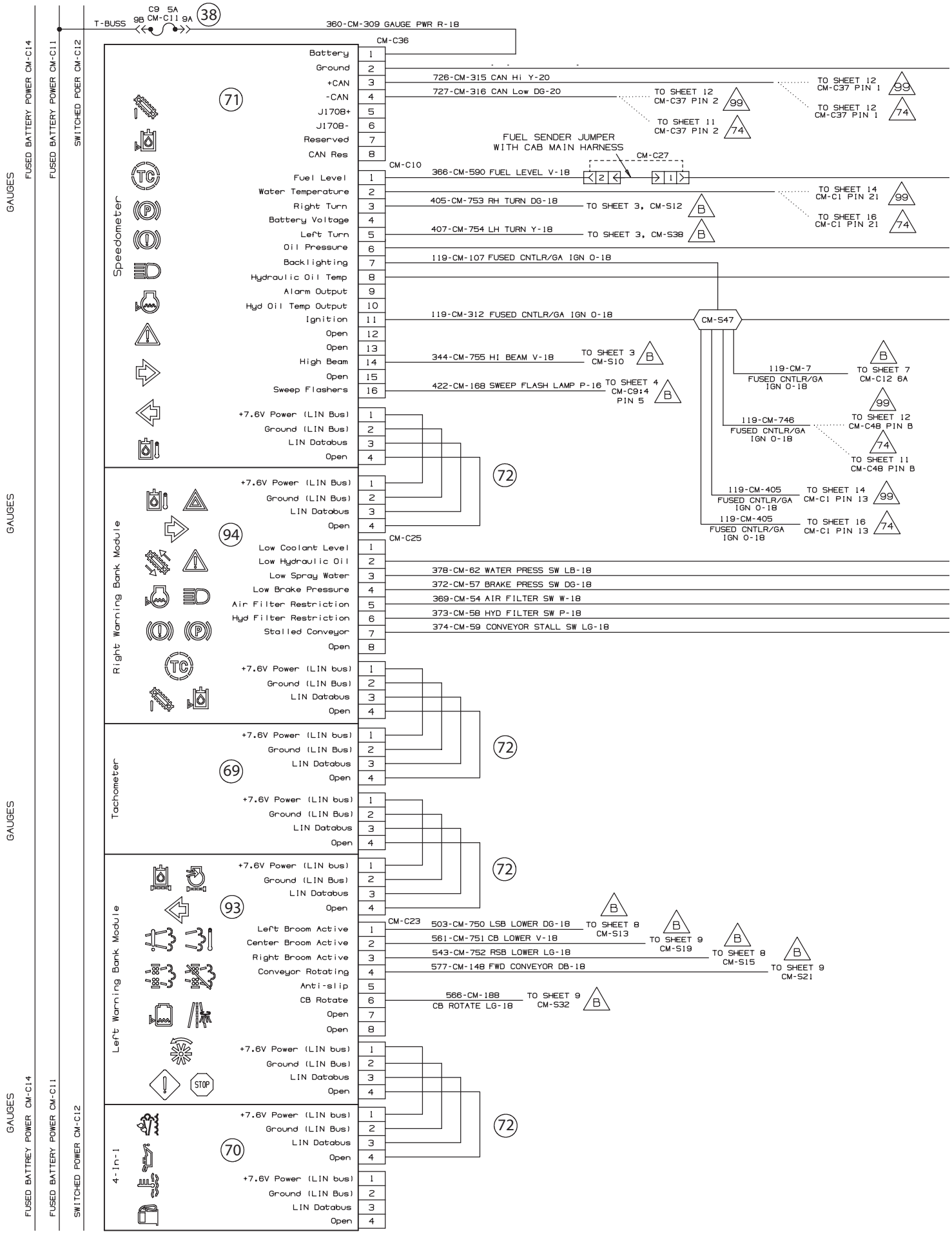

711-LC-13
PARK BRAKE BR-18
LC-C1
CM-C5
22
711-CM-211
PARK BRAKE BR-18
CM-C1
CH-C1
56
711-CH-47
PARK BRAKE BR-18
1
B
Y
2
260-CH-121
INDUCTIVE GND B-18
CH-S14
PARK BRAKE SOLENOID
CH-C32
348-CM-381
BRAKE LAMP R-18
719-CM-191
BRAKE LAMPS P-16
30
719-CH-62
BRAKE LAMPS P-16
CH-C39
EC-C1
5
210-CM-270 RELAY GND B-18
CM-S62
BRAKE PRESSURE SWITCH
210-CM-271
RELAY GND B-18
TO SHEET 9
CM-C7:5 PIN 86(2)
CM-C7:4 F4
9
250-CH-125 LAMP GND B-18
CH-S19
PARK BRAKE PRESSURE SWITCH
CH-C12
24
441-CH-20 HORN DG-16
HORN
CH-C13
719-EC-5
BRAKE LAMPS
P-16
EC-C9
33
342-EC-25
PARKING LAMPS P-18
250-EC-26
LAMP GND B-18
LICENSE PLATE LAMP
32
EC-S4
719-EC-23
BRAKE LAMPS P-16
EC-C3
250-EC-14
LAMP GND B-16
342-EC-9
PARKING LAMPS P-18
RIGHT REAR BRAKE LAMP
405-CM-120
RH TURN DG-18
405-CH-59 RH TURN DG-18
405-EC-2
RH TURN DG-18
EC-C5
250-EC-16
LAMP GND B-18
EC-S2
RIGHT REAR TURN LAMP
TO SHEET 5
CM-C10 PIN 14
342-CH-60
PARKING LAMPS P-16
342-EC-3
PARKING LAMPS P-16
EC-S1
344-CM-755
BEACON V-18
342-RF-45
PARKING LAMPS P-16
RF-S2
RF-C19
342-RF-20
PARKING LAMPS P-18
250-RF-7
LAMP GND B-18
RH MARKER LIGHT
29
405-CM-26 RH TURN DG-18
CM-C2
RF-C1
4
RF-C20
TURN
405-RF-23
RH TURN DG-18
PARK
342-RF-19
PARKING LAMPS P-18
250-RF-4
LAMP GND B-16
RF-S3
SEE SHEET 12
CM-S8
345-CM-21
LOW BEAM Y-16
5
345-RF-22
LOW BEAM Y-16
LO
RIGHT HEAD LAMP
CM-S10
344-CM-24
HI BEAM V-16
344-RF-21
HIGH BEAM V-16
HI
RF-C14
342-RF-18
PARKING LAMPS P-18
250-RF-6
LAMP GND B-18
RH MARKER LIGHT
CH-C19
342-CH-28
PARKING LAMPS P-18
250-CH-127
LAMP GND B-18
CH-S20
30
407-CM-22
LH TURN
Y-18
407-CH-59 LH TURN Y-18
CH-C9
TURN
342-CH-12
PARKING LAMPS P-18
PARK
250-CH-123
LAMP GND B-16
CH-S19
LH MARKER LAMP
345-CM-118
LOW BEAM Y-16
24
345-CH-10
LOW BEAM Y-16
LO
LEFT HEAD LAMP
344-CM-114
HI BEAM V-16
27
344-CH-11
HIGH BEAM V-16
HI
CH-C8
342-CH-9
PARKING LAMPS P-18
250-CH-124
LAMP GND B-18
LH MARKER LAMP
CH-S4
342-CH-29
PARKING LAMPS
P-16
CH-S1
407-CM-117
LH TURN Y-18
81
407-CH-58
LH TURN Y-18
CH-C39
EC-C1
1
407-EC-1
LH TURN Y-18
EC-C4
250-EC-15
LAMP GND B-18
EC-S2
LEFT REAR TURN LAMP
CM-C2
RF-C1
2
719-EC-22
BRAKE LAMPS P-16
EC-C2
250-EC-13
LAMP GND B-16
342-EC-8
PARKING LAMPS P-18
CM-C1
CH-C1
59
342-CH-30
PARKING LAMPS P-16
LEFT REAR BRAKE LAMP


ID LIGHTS (OPTION) BEACON SWITCH
SWEEP FLASHERS (OPTION)
OPERATOR POSITION SWITCH
COURTESY POWER (OPTION)
WIPERS AND WINDSHIELD WASHER
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POER CM-C12
SWITCHED POWER CM-C12
40
C7
10A
T-BUSS
7B CM-C11 7A
430-CM-218
FUSED BEACON PWR
R-16
CM-C4
RC-C1
5
430-RC-56
FUSED BEACON PWR
R-16
431-RC-58 BEACON #1 P-18
8
7
3
2
1
47
RC-C16
220-RC-67 INDICATOR GND B-20
TO SHEET 6
RC-C17 PIN 7
431-RC-57
BEACON P-16
6
431-CM-80
BEACON P-16
CM-C28
CR-C1
8
220-RC-66
INDICATOR GND B-18
TO SHEET 3
CM-S57
342-CM-398
PARK LAMP P-16
12
421-RC-55 SWEEP FLASH SWITCH T-18
220-RC-65
INDICATOR GND B-18
TO SHEET 3
RC-C13 PIN 7
TO SHEET 3
CM-S81
400-CM-716
FUSED FLASHER PWR
R-16
400-RC-53
FUSED SWEEP
FLASH PWR
R-16
RC-C14
13
421-RC-54 T-16 SWEEP FLASH SWITCH
422-CM-77 SWEEP FLASH LAMPS P-16
326-CR-15
FLASHER P-14
9
TO SHEET 3
CM-S42
401-CM-628
FLASHER V-16
3
4
5
422-CM-168 SWEEP FLASH LAMPS P-16
TO SHEET 5
CM-C10 PIN 16
421-CM-226
SWEEP FLASH SWITCH T-16
1
2
210-CM-181 RELAY GND B-18
TO SHEET 6
CM-C9:5 PIN 2
CM-C9:4 G4
220-LC-77 INDICATOR GND B-18
TO SHEET 2
LC-C3 PIN 7
311-LC-10 LH SELECT Y-18
LC-C4
220-LC-76
INDICATOR GND B-18
LC-S2
SAUER
MC088
CM-C8
C1
TO SHEET 7
CM-S34
150-CM-614
FUSED SWITCHED PWR
O-18
CM-C5
LC-C1
30
150-LC-8
FUSED SWITCHED PWR
O-18
311-LC-9
LH SELECT Y-18
311-CM-249
LH SELECT Y-18
LC-C1
CM-C5
52
314-LC-11
RH SELECT DG-18
101-CR-3 FUSED CAB PWR R-18
C10
10A
40
T-BUSS
10B CM-C11 10A
650-CM-78
FUSED CAB ACCY PWR R-16
CM-C28
CR-C1
101-CR-1
FUSED CAB PWR R-16
CR-S4
660-CM-16
FUSED WIPER PWR O-16
11
CR-C3
200-CR-7
GROUND B-16
CR-S2
WIPER
SWITCH
74
B14
15A
42
T-BUSS
14B CM-C12 14A
660-CM-155
FUSED WIPER PWR
O-14
CM-S23
660-CM-396
FUSED WIPER PWR O-16
660-CM-55
FUSED WIPER PWR O-16
650-CR-21
FUSED WIPER PWR
O-16
663-CR-31
WASHER DB-16
9
4
7
6
1
9
CM-C28
CR-C1
663-CM-36 WASHER DB-16

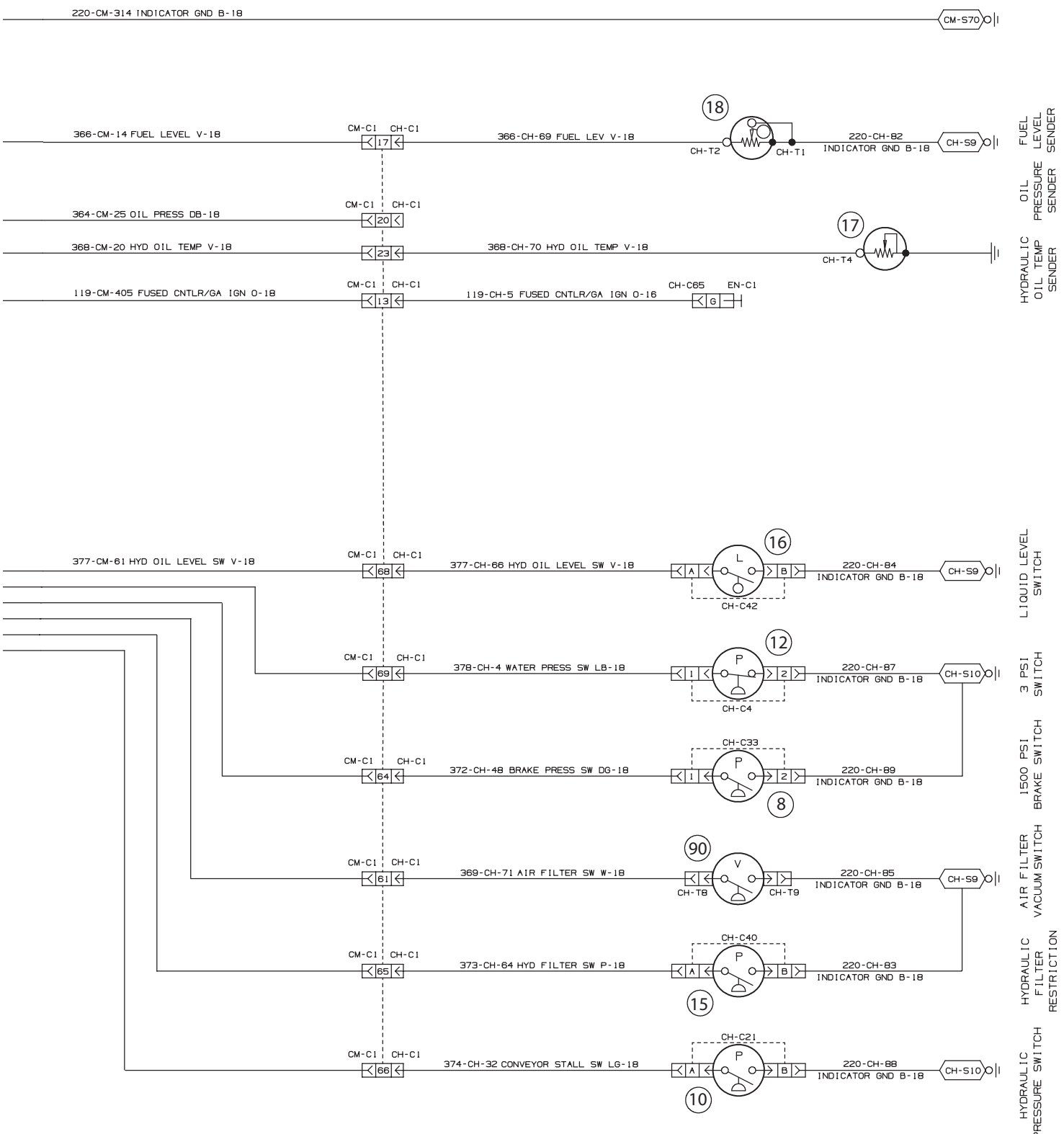
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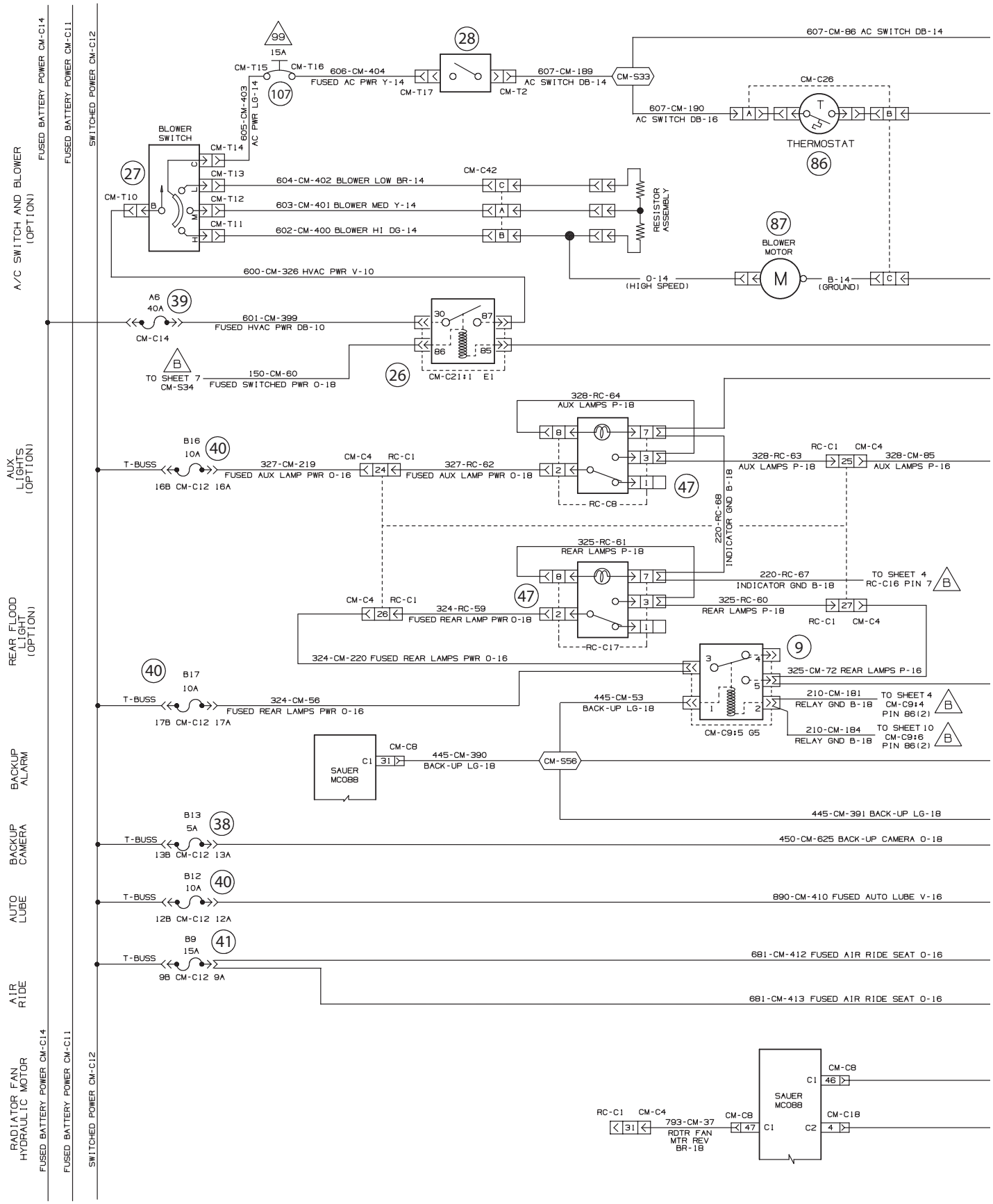

78
M
EL-C4
334-CR-18
BEACON P-14
CR-C2 EL-C1
334-EL-10 BEACON P-14
250-EL-5
LAMP GROUND B-14
EL-S2
BEACON
I.D. LIGHTS
342-CR-19
PARK LAMP P-16
CR-C4 EL-C1
EL-C5
B
TO SHEET 6
EL-C4 PIN 2
250-EL-5
LAMP GND B-14
EL-C2
326-EL-8
FLASHERS P-16
250-EL-3
LAMP GROUND B-16
31
326-CR-16
FLASHER P-16
CR-C2 EL-C1
326-EL-7
FLASHERS P-14
EL-S1
EL-S2
250-EL-4
LAMP GROUND B-16
EL-C1 CR-C2
200-CR-6
GROUND B-14
CR-S2
REAR RIGHT
SWEEP LAMP
EL-C3
326-EL-9
FLASHERS P-16
250-EL-4
LAMP GROUND B-16
REAR LEFT
SWEEP LAMP
EL-C2
326-EL-8
FLASHERS P-16
250-EL-3
LAMP GROUND B-16
326-CR-17
FLASHER P-16
CR-C4 EL-C1
326-EL-7
FLASHERS P-14
EL-S1
EL-S2
250-EL-4
LAMP GROUND B-16
EL-C1 CR-C4
200-CR-10
GROUND B-14
CR-S3
FRONT RIGHT
SWEEP LAMP
EL-C3
326-EL-9
FLASHERS P-16
250-EL-4
LAMP GROUND B-16
FRONT LEFT
SWEEP LAMP
CR-S1
TO SHEET 14
CM-C9:1 PIN 3
99
210-CM-180 RELAY GND B-18
TO SHEET 13
CM-C9:1 PIN 2
74


79
101-CR-4 FUSED CAB PWR R-18
200-CR-8 GROUND B-18
CR-T1
CR-T2
DOME
LIGHT
73
CR-C7 ML-C1
650-ML-1
FUSED COURTESY PWR O-18
ML-S1
650-ML-2
FUSED COURTESY PWR O-18
250-ML-5
LAMP GND B-18
ML-S2
250-ML-6
LAMP GND B-16
ML-C1 CR-C7
200-CR-14
GROUND B-18
CR-S2
MAP
LIGHTS
ML-C3
650-ML-3
FUSED COURTESY PWR O-18
250-ML-4
LAMP GND B-18
ML-C2
80
RIGHT
SPEAKER
CR-C8
101-CR-2 FUSED CAB PWR R-18
105
650-CR-21 FUSED CAB ACCY POWER O-16
RADIO
200-CR-11 GROUND B-16
CR-S3
CR-C5
75
661-CR-25 WIPER LOW LH LG-16
662-CR-27 WIPER HIGH LH DB-16
664-CR-29 WIPER PARK LH DG-16
LH WIPER
LEFT
SPEAKER
231-CR-43 RADIO GND B-16
200-CR-12 GROUND B-16
CR-C6
661-CR-26 WIPER LOW RH LG-16
662-CR-28 WIPER HIGH RH DB-16
664-CR-30 WIPER PARK RH DG-16
RH WIPER
76
CM-C2 RF-C1
663-RF-40
WASHER DB-18
RF-C17
RF-C18
260-RF-8
INDUCTIVE GND
B-18
RF-S1
SEE
SHEET 12
WASHER

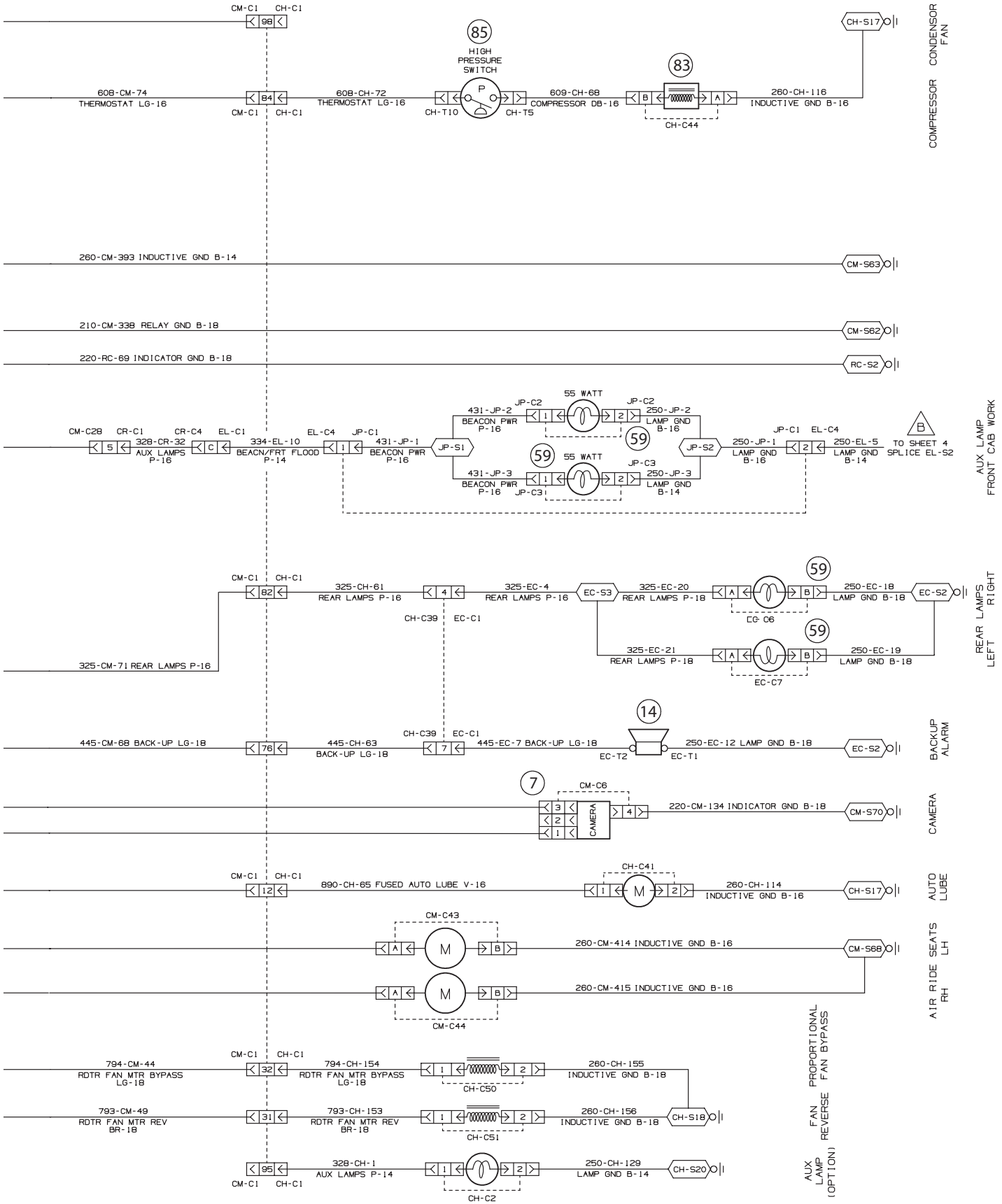

GAUGES
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POER CM-C12
T-BUSS
C9 5A
CM-C11
9B
9A
38
360-CM-309 GAUGE PWR R-18
CM-C36
Speedometer
71
Battery
Ground
+CAN
-CAN
J1708+
J1708-
Reserved
CAN Res
Fuel Level
Water Temperature
Right Turn
Battery Voltage
Left Turn
Oil Pressure
Backlighting
Hydraulic Oil Temp
Alarm Output
Hyd Oil Temp Output
Ignition
Open
Open
High Beam
Open
Sweep Flashers
+7.6V Power (LIN Bus)
Ground (LIN Bus)
LIN Databus
Open
726-CM-315 CAN Hi Y-20
727-CM-316 CAN Low DG-20
TO SHEET 12 CM-C37 PIN 2
TO SHEET 11 CM-C37 PIN 2
TO SHEET 12 CM-C37 PIN 1
TO SHEET 12 CM-C37 PIN 1
FUEL SENDER JUMPER WITH CAB MAIN HARNESS
CM-C10
CM-C27
366-CM-590 FUEL LEVEL V-18
405-CM-753 RH TURN DG-18
TO SHEET 3, CM-S12
407-CM-754 LH TURN Y-18
TO SHEET 3, CM-S38
TO SHEET 14 CM-C1 PIN 21
TO SHEET 16 CM-C1 PIN 21
119-CM-107 FUSED CNTLR/GA IGN O-18
119-CM-312 FUSED CNTLR/GA IGN O-18
CM-S47
344-CM-755 HI BEAM V-18
TO SHEET 3 CM-S10
422-CM-168 SWEEP FLASH LAMP P-16
TO SHEET 4 CM-C9:4 PIN 5
119-CM-7 FUSED CNTLR/GA IGN O-18
TO SHEET 7 CM-C12 6A
119-CM-746 FUSED CNTLR/GA IGN O-18
TO SHEET 12 CM-C48 PIN B
TO SHEET 11 CM-C48 PIN B
119-CM-405 FUSED CNTLR/GA IGN O-18
TO SHEET 14 CM-C1 PIN 13
119-CM-405 FUSED CNTLR/GA IGN O-18
TO SHEET 16 CM-C1 PIN 13
72
Right Warning Bank Module
94
CM-C25
Low Coolant Level
Low Hydraulic Oil
Low Spray Water
Low Brake Pressure
Air Filter Restriction
Hyd Filter Restriction
Stalled Conveyor
Open
378-CM-62 WATER PRESS SW LB-18
372-CM-57 BRAKE PRESS SW DG-18
369-CM-54 AIR FILTER SW W-18
373-CM-58 HYD FILTER SW P-18
374-CM-59 CONVEYOR STALL SW LG-18
Tachometer
69
Left Warning Bank Module
93
CM-C23
Left Broom Active
Center Broom Active
Right Broom Active
Conveyor Rotating
Anti-slip
CB Rotate
Open
Open
503-CM-750 LSB LOWER DG-18
TO SHEET 8 CM-S13
561-CM-751 CB LOWER V-18
TO SHEET 9 CM-S19
543-CM-752 RSB LOWER LG-18
TO SHEET 8 CM-S15
577-CM-148 FWD CONVEYOR DB-18
TO SHEET 9 CM-S21
566-CM-188 CB ROTATE LG-18
TO SHEET 9 CM-S32
STOP
4-in-1
70

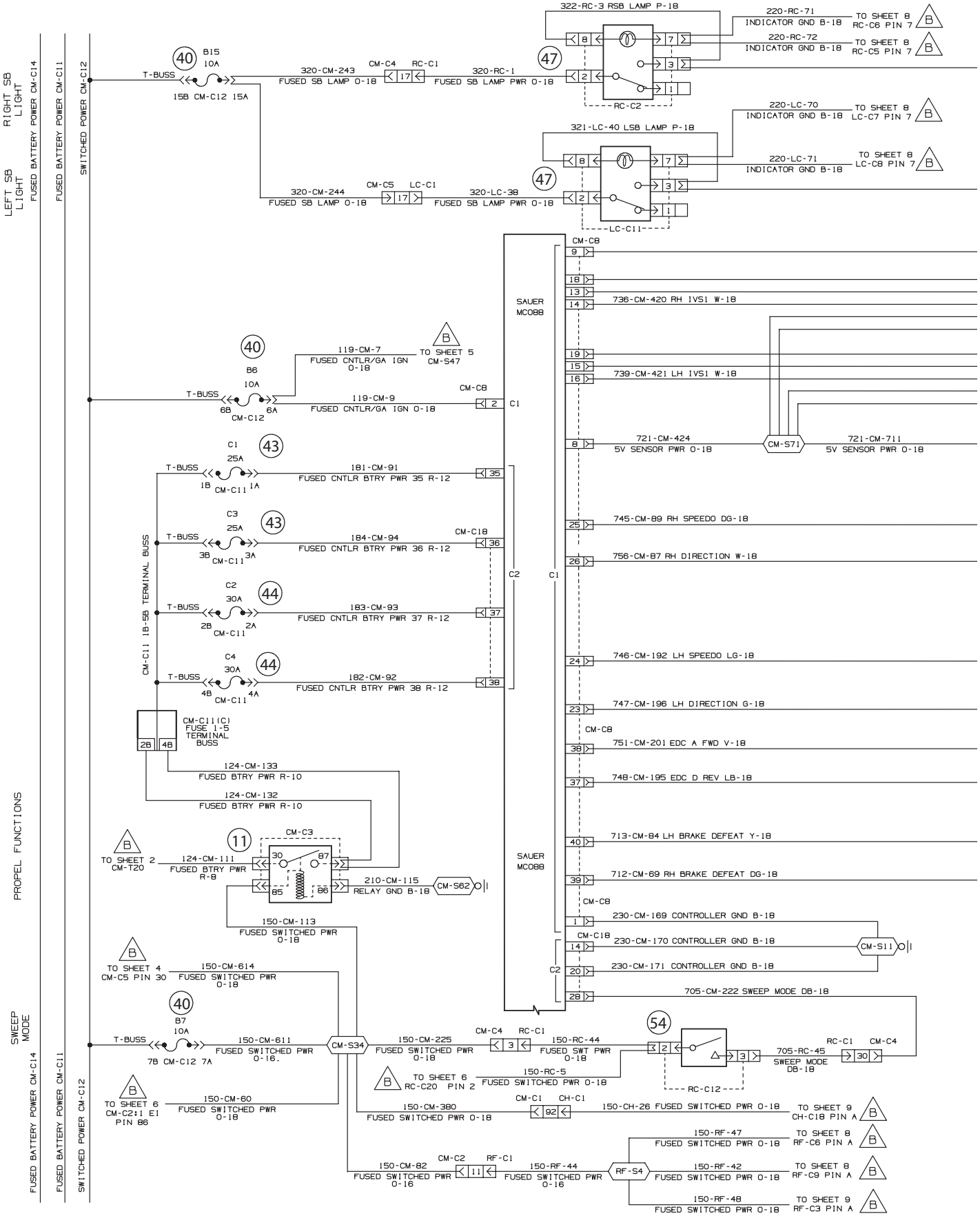
SHEET 5 OF 17


220-CM-314 INDICATOR GND B-18
CM-S70
18
366-CM-14 FUEL LEVEL V-18
CM-C1
CH-C1
17
366-CH-69 FUEL LEV V-18
CH-T2
CH-T1
220-CH-82
INDICATOR GND B-18
CH-S9
FUEL LEVEL SENDER
364-CM-25 OIL PRESS DB-18
20
OIL PRESSURE SENDER
17
368-CM-20 HYD OIL TEMP V-18
23
368-CH-70 HYD OIL TEMP V-18
CH-T4
HYDRAULIC OIL TEMP SENDER
119-CM-405 FUSED CNTLR/GA IGN 0-18
13
119-CH-5 FUSED CNTLR/GA IGN 0-16
CH-C65
EN-C1
G
16
377-CM-61 HYD OIL LEVEL SW V-18
68
377-CH-66 HYD OIL LEVEL SW V-18
L
A
B
220-CH-84
INDICATOR GND B-18
CH-C42
LIQUID LEVEL SWITCH
12
378-CH-4 WATER PRESS SW LB-18
69
P
1
2
220-CH-87
INDICATOR GND B-18
CH-C4
CH-S10
3 PSI SWITCH
CH-C33
372-CH-48 BRAKE PRESS SW DG-18
64
220-CH-89
INDICATOR GND B-18
8
1500 PSI BRAKE SWITCH
90
369-CH-71 AIR FILTER SW W-18
61
V
CH-T8
CH-T9
220-CH-85
INDICATOR GND B-18
AIR FILTER VACUUM SWITCH
CH-C40
373-CH-64 HYD FILTER SW P-18
65
220-CH-83
INDICATOR GND B-18
15
HYDRAULIC FILTER RESTRICTION
CH-C21
374-CH-32 CONVEYOR STALL SW LG-18
66
220-CH-88
INDICATOR GND B-18
10
HYDRAULIC PRESSURE SWITCH

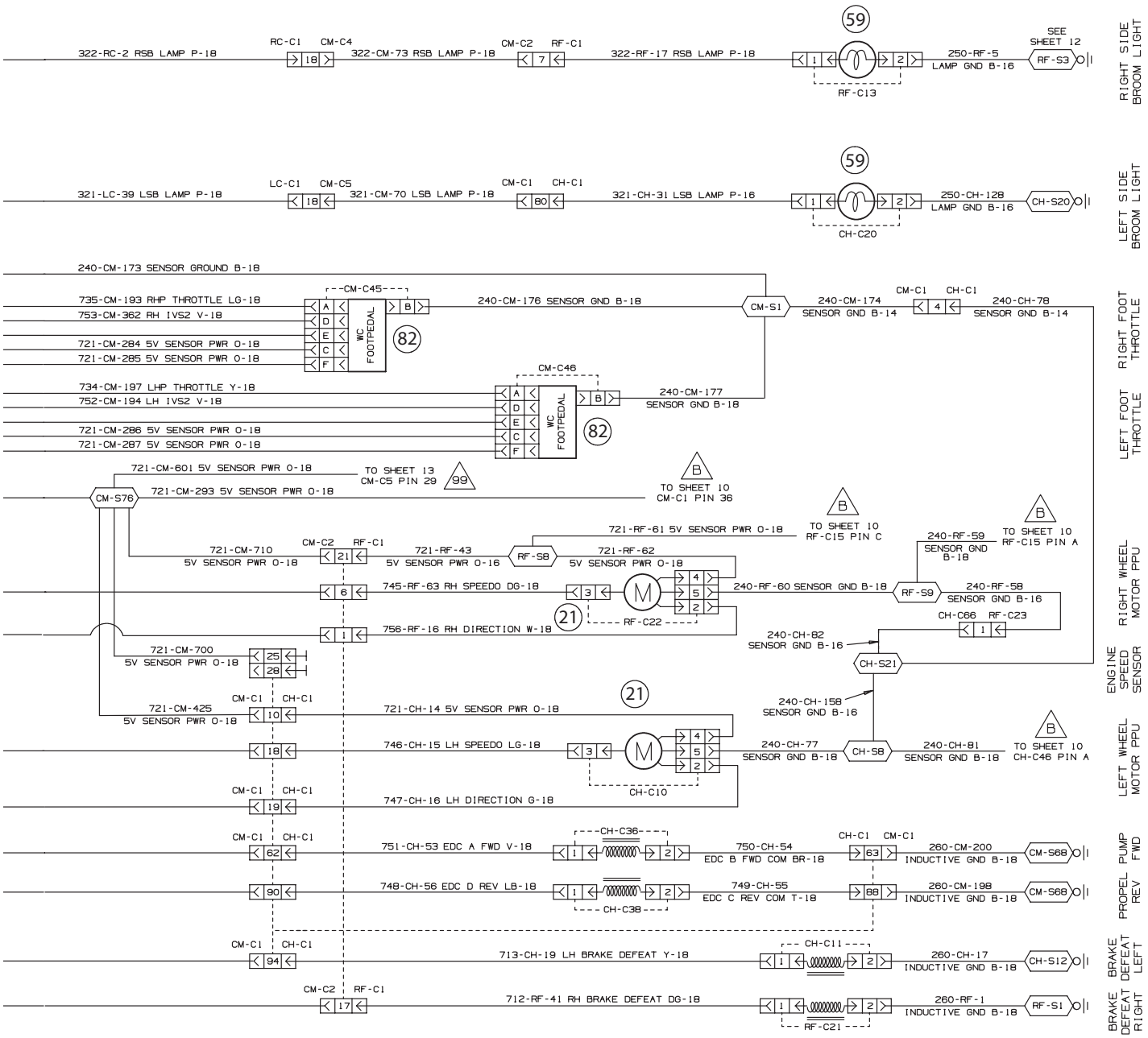

A/C SWITCH AND BLOWER (OPTION)
AUX LIGHTS (OPTION)
REAR FLOOD LIGHT (OPTION)
BACKUP ALARM
BACKUP CAMERA
AUTO LUBE
AIR RIDE
RADIATOR FAN HYDRAULIC MOTOR
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
99
15A
CM-T15
CM-T16
606-CM-404
FUSED AC PWR Y-14
CM-T17
28
CM-T2
607-CM-189
AC SWITCH DB-14
CM-S33
607-CM-86 AC SWITCH DB-14
CM-C26
607-CM-190
AC SWITCH DB-16
THERMOSTAT
86
107
605-CM-403
AC PWR LG-14
BLOWER SWITCH
CM-T14
CM-T13
CM-T12
CM-T11
CM-T10
27
604-CM-402 BLOWER LOW BR-14
603-CM-401 BLOWER MED Y-14
602-CM-400 BLOWER HI DG-14
CM-C42
RESISTOR ASSEMBLY
87
BLOWER MOTOR
O-14
(HIGH SPEED)
B-14
(GROUND)
600-CM-326 HVAC PWR V-10
A6
40A
39
CM-C14
601-CM-399
FUSED HVAC PWR DB-10
30
87
86
85
CM-C21:1 E1
26
TO SHEET 7
CM-S34
150-CM-60
FUSED SWITCHED PWR O-18
328-RC-64
AUX LAMPS P-18
B16
10A
40
T-BUSS
16B CM-C12 16A
327-CM-219
FUSED AUX LAMP PWR O-16
CM-C4
RC-C1
24
327-RC-62
FUSED AUX LAMP PWR O-18
RC-C8
47
328-RC-63
AUX LAMPS P-18
25
328-CM-85
AUX LAMPS P-16
220-RC-68
INDICATOR GND B-18
325-RC-61
REAR LAMPS P-18
220-RC-67
INDICATOR GND B-18
TO SHEET 4
RC-C16 PIN 7
26
324-RC-59
FUSED REAR LAMP PWR O-18
RC-C17
325-RC-60
REAR LAMPS P-18
27
324-CM-220 FUSED REAR LAMPS PWR O-16
9
325-CM-72 REAR LAMPS P-16
B17
10A
17B CM-C12 17A
324-CM-56
FUSED REAR LAMPS PWR O-16
445-CM-53
BACK-UP LG-18
210-CM-181
RELAY GND B-18
TO SHEET 4
CM-C9:4
PIN 86(2)
CM-C9:5 G5
210-CM-184
RELAY GND B-18
TO SHEET 10
CM-C9:6
PIN 86(2)
SAUER MC088
CM-C8
C1
31
445-CM-390
BACK-UP LG-18
CM-S56
445-CM-391 BACK-UP LG-18
B13
5A
38
13B CM-C12 13A
450-CM-625 BACK-UP CAMERA O-18
B12
10A
12B CM-C12 12A
890-CM-410 FUSED AUTO LUBE V-16
B9
15A
41
9B CM-C12 9A
681-CM-412 FUSED AIR RIDE SEAT O-16
681-CM-413 FUSED AIR RIDE SEAT O-16
RC-C1
CM-C4
31
793-CM-37
RDTR FAN MTR REV BR-18
CM-C8
47
C1
C2
CM-C18
4
46

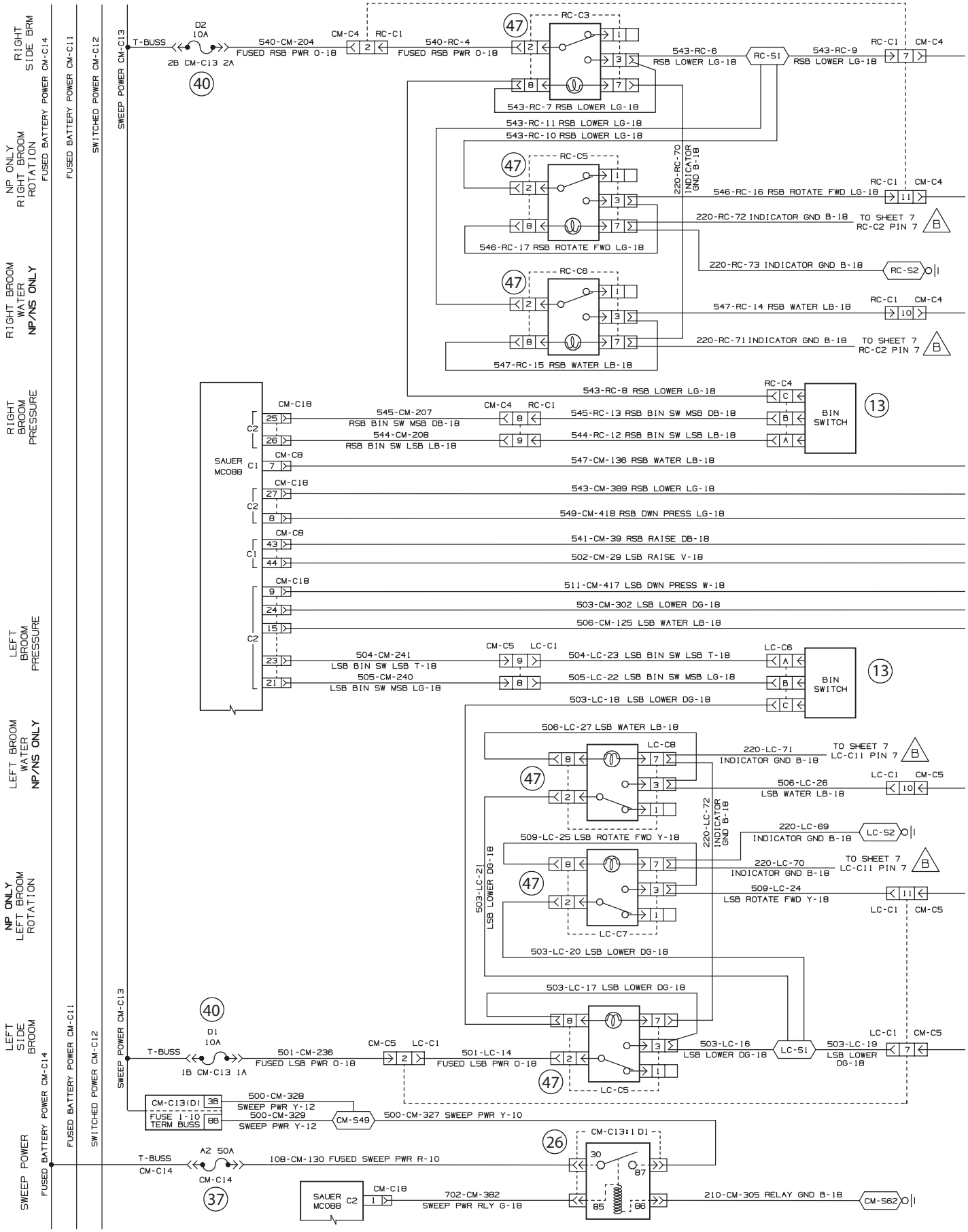
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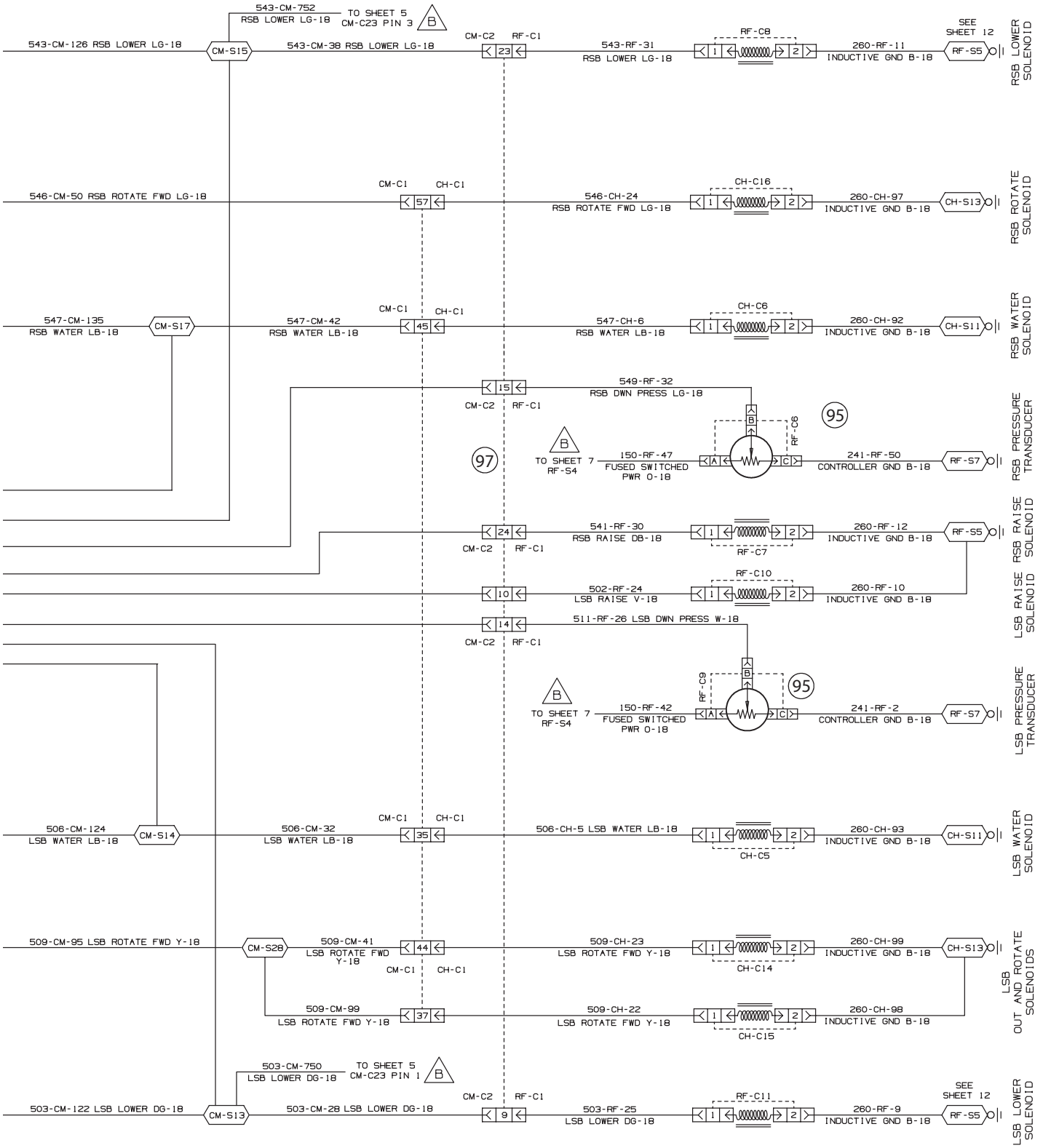

CM-C1 CH-C1
98
85
HIGH PRESSURE SWITCH
P
CH-S17
CONDENSOR FAN
608-CM-74
THERMOSTAT LG-16
84
608-CH-72
THERMOSTAT LG-16
CH-T10
CH-T5
609-CH-68
COMPRESSOR DB-16
83
B
A
260-CH-116
INDUCTIVE GND B-16
CH-C44
COMPRESSOR
260-CM-393 INDUCTIVE GND B-14
CM-S63
210-CM-338 RELAY GND B-18
CM-S62
220-RC-69 INDICATOR GND B-18
RC-S2
55 WATT
JP-C2
431-JP-2
BEACON PWR P-16
250-JP-2
LAMP GND B-16
59
JP-C3
431-JP-3
250-JP-3
LAMP GND B-14
CM-C28
CR-C1
CR-C4
EL-C1
328-CR-32
AUX LAMPS P-16
334-EL-10
BEACN/FRT FLOOD P-14
EL-C4
JP-C1
431-JP-1
BEACON PWR P-16
JP-S1
JP-S2
250-JP-1
LAMP GND B-16
250-EL-5
LAMP GND B-14
TO SHEET 4
SPLICE EL-S2
AUX LAMP FRONT CAB WORK
325-CH-61
REAR LAMPS P-16
325-EC-4
EC-S3
325-EC-20
250-EC-18
LAMP GND B-18
EC-S2
CG-C6
CH-C39
EC-C1
325-EC-21
250-EC-19
EC-C7
325-CM-71 REAR LAMPS P-16
REAR LAMPS LEFT RIGHT
445-CM-68 BACK-UP LG-18
76
445-CH-63
BACK-UP LG-18
7
445-EC-7 BACK-UP LG-18
14
EC-T2
EC-T1
250-EC-12 LAMP GND B-18
BACKUP ALARM
CM-C6
CAMERA
220-CM-134 INDICATOR GND B-18
CM-S70
CAMERA
CH-C41
890-CH-65 FUSED AUTO LUBE V-16
12
260-CH-114
INDUCTIVE GND B-16
AUTO LUBE
CM-C43
260-CM-414 INDUCTIVE GND B-16
CM-S68
260-CM-415 INDUCTIVE GND B-16
CM-C44
AIR RIDE SEATS LH RH
794-CM-44
RDTR FAN MTR BYPASS LG-18
32
794-CH-154
RDTR FAN MTR BYPASS LG-18
CH-C50
260-CH-155
INDUCTIVE GND B-18
PROPORTIONAL FAN BYPASS
793-CM-49
RDTR FAN MTR REV BR-18
31
793-CH-153
RDTR FAN MTR REV BR-18
CH-C51
260-CH-156
INDUCTIVE GND B-18
CH-S18
FAN REVERSE
95
328-CH-1
AUX LAMPS P-14
250-CH-129
LAMP GND B-14
CH-S20
CH-C2
AUX LAMP (OPTION)

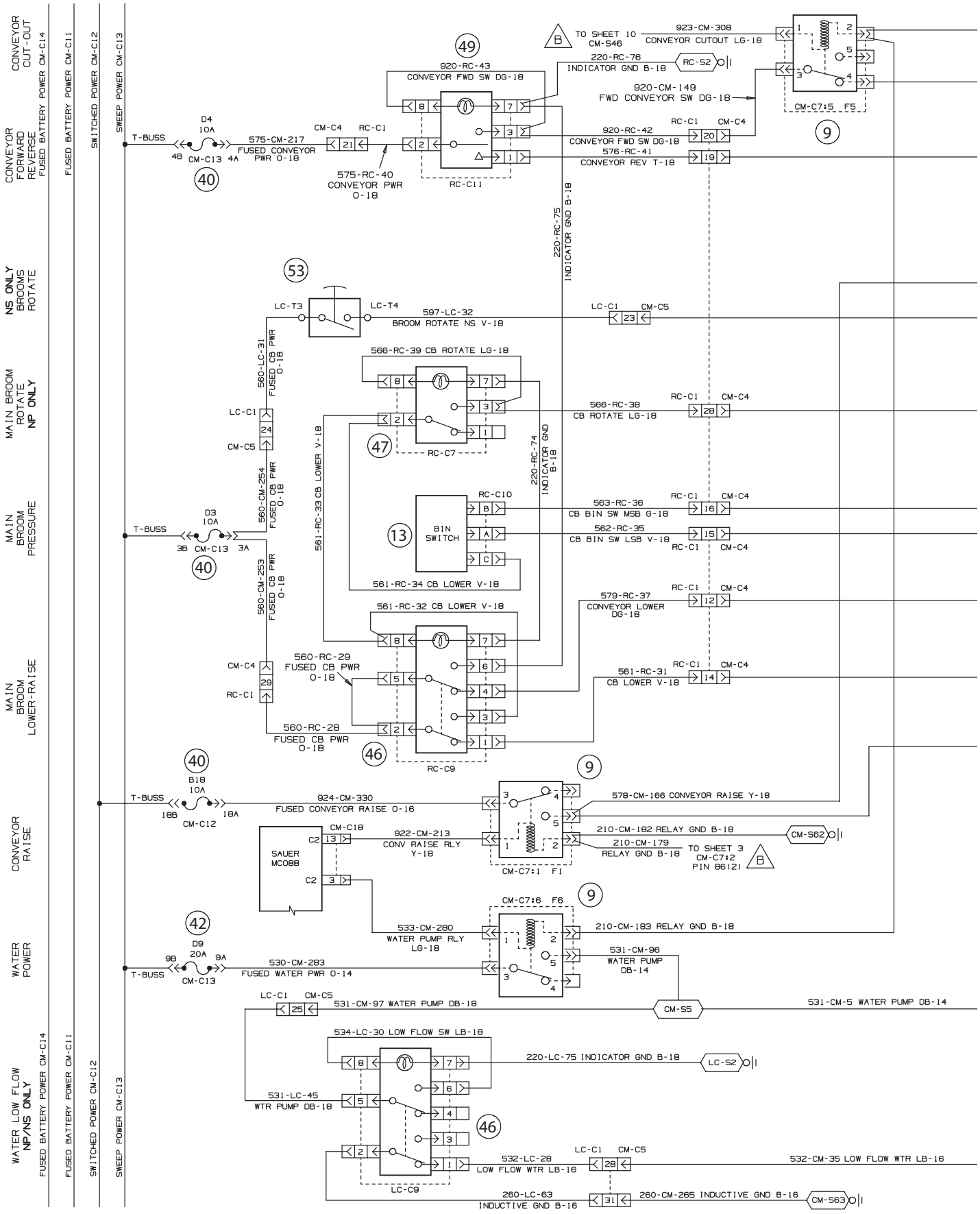

RIGHT SB LIGHT
LEFT SB LIGHT
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
PROPEL FUNCTIONS
SWEEP MODE
322-RC-3 RSB LAMP P-18
321-LC-40 LSB LAMP P-18
T-BUSS
B15 10A
15B CM-C12 15A
320-CM-243 FUSED SB LAMP O-18
320-RC-1 FUSED SB LAMP PWR O-18
320-CM-244 FUSED SB LAMP O-18
320-LC-38 FUSED SB LAMP PWR O-18
220-RC-71 INDICATOR GND B-18
220-RC-72 INDICATOR GND B-18
220-LC-70 INDICATOR GND B-18
220-LC-71 INDICATOR GND B-18
TO SHEET 8 RC-C6 PIN 7
TO SHEET 8 RC-C5 PIN 7
TO SHEET 8 LC-C7 PIN 7
TO SHEET 8 LC-C8 PIN 7
RC-C2
LC-C11
CM-C8
SAUER MC088
736-CM-420 RH IVS1 W-18
739-CM-421 LH IVS1 W-18
721-CM-424 5V SENSOR PWR O-18
721-CM-711 5V SENSOR PWR O-18
CM-S71
119-CM-7 FUSED CNTLR/GA IGN O-18
TO SHEET 5 CM-S47
B6 10A
6B CM-C12 6A
119-CM-9 FUSED CNTLR/GA IGN O-18
C1 25A
1B CM-C11 1A
181-CM-91 FUSED CNTLR BTRY PWR 35 R-12
C3 25A
3B CM-C11 3A
184-CM-94 FUSED CNTLR BTRY PWR 36 R-12
C2 30A
2B CM-C11 2A
183-CM-93 FUSED CNTLR BTRY PWR 37 R-12
C4 30A
4B CM-C11 4A
182-CM-92 FUSED CNTLR BTRY PWR 38 R-12
CM-C11 1B-5B TERMINAL BUSS
CM-C11(C) FUSE 1-5 TERMINAL BUSS
745-CM-89 RH SPEEDO DG-18
756-CM-87 RH DIRECTION W-18
746-CM-192 LH SPEEDO LG-18
747-CM-196 LH DIRECTION G-18
751-CM-201 EDC A FWD V-18
748-CM-195 EDC D REV LB-18
713-CM-84 LH BRAKE DEFEAT Y-18
712-CM-69 RH BRAKE DEFEAT DG-18
230-CM-169 CONTROLLER GND B-18
230-CM-170 CONTROLLER GND B-18
230-CM-171 CONTROLLER GND B-18
705-CM-222 SWEEP MODE DB-18
CM-S11
124-CM-133 FUSED BTRY PWR R-10
124-CM-132 FUSED BTRY PWR R-10
TO SHEET 2 CM-T20
124-CM-111 FUSED BTRY PWR R-8
CM-C3
210-CM-115 RELAY GND B-18
CM-S62
150-CM-113 FUSED SWITCHED PWR O-18
TO SHEET 4 CM-C5 PIN 30
150-CM-614 FUSED SWITCHED PWR O-18
B7 10A
7B CM-C12 7A
150-CM-611 FUSED SWITCHED PWR O-16.
CM-S34
150-CM-225 FUSED SWITCHED PWR O-18
150-RC-44 FUSED SWT PWR O-18
705-RC-45 SWEEP MODE DB-18
TO SHEET 6 RC-C20 PIN 2
150-RC-5 FUSED SWITCHED PWR O-18
RC-C12
TO SHEET 6 CM-C2:1 E1 PIN 86
150-CM-60 FUSED SWITCHED PWR O-18
150-CM-380 FUSED SWITCHED PWR O-18
150-CH-26 FUSED SWITCHED PWR O-18
TO SHEET 9 CH-C18 PIN A
150-RF-47 FUSED SWITCHED PWR O-18
TO SHEET 8 RF-C6 PIN A
150-CM-82 FUSED SWITCHED PWR O-16
150-RF-44 FUSED SWITCHED PWR O-16
RF-S4
150-RF-42 FUSED SWITCHED PWR O-18
TO SHEET 8 RF-C9 PIN A
150-RF-48 FUSED SWITCHED PWR O-18
TO SHEET 9 RF-C3 PIN A

SHEET 7 OF 17

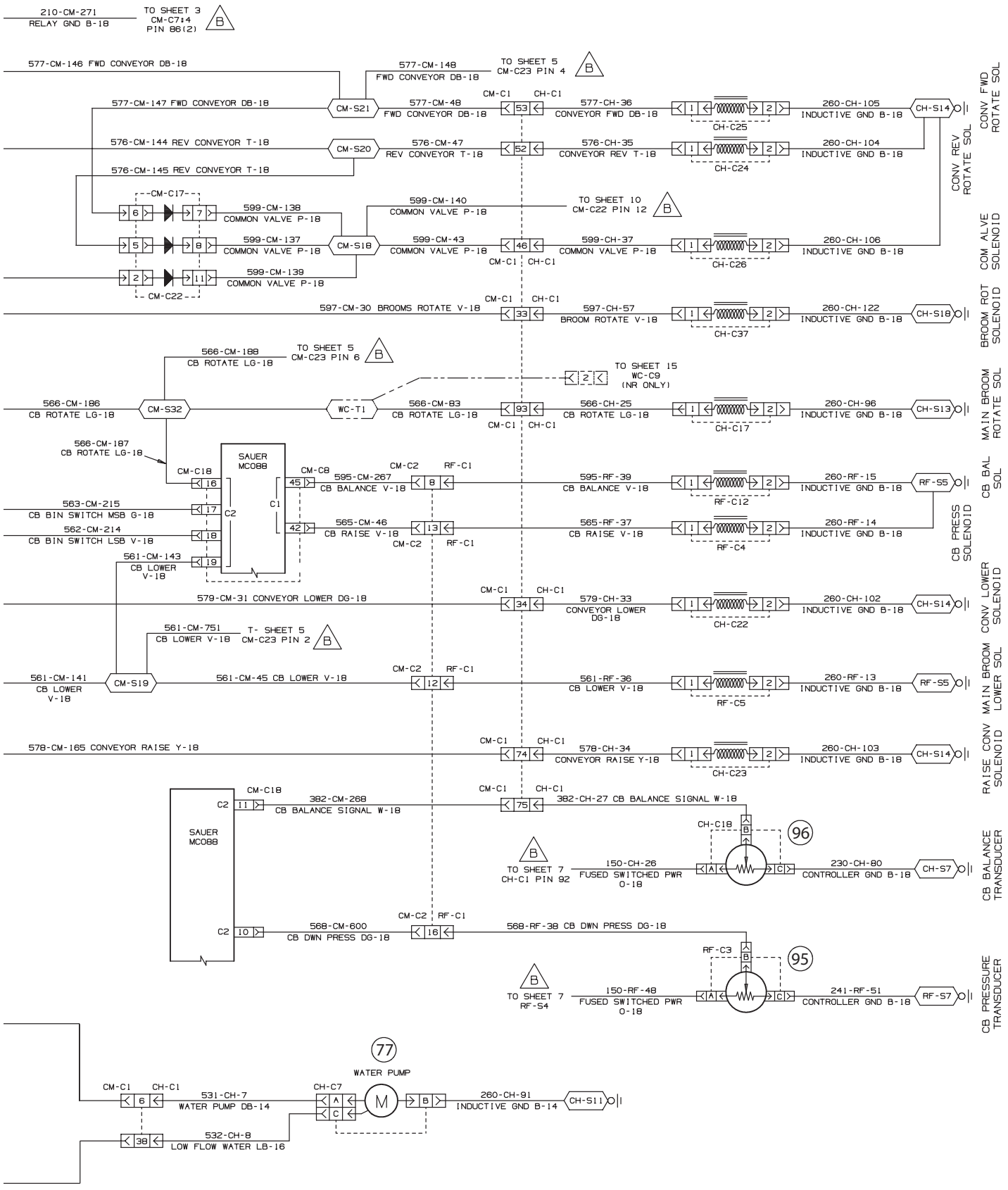

322-RC-2 RSB LAMP P-18
RC-C1
CM-C4
322-CM-73 RSB LAMP P-18
CM-C2
RF-C1
322-RF-17 RSB LAMP P-18
59
RF-C13
250-RF-5
LAMP GND B-16
SEE SHEET 12
RF-S3
RIGHT SIDE BROOM LIGHT
321-LC-39 LSB LAMP P-18
LC-C1
CM-C5
321-CM-70 LSB LAMP P-18
CM-C1
CH-C1
321-CH-31 LSB LAMP P-16
59
CH-C20
250-CH-128
LAMP GND B-16
CH-S20
LEFT SIDE BROOM LIGHT
240-CM-173 SENSOR GROUND B-18
735-CM-193 RHP THROTTLE LG-18
753-CM-362 RH IVS2 V-18
721-CM-284 5V SENSOR PWR O-18
721-CM-285 5V SENSOR PWR O-18
CM-C45
WC FOOTPEDAL
82
240-CM-176 SENSOR GND B-18
CM-S1
240-CM-174
SENSOR GND B-14
CM-C1
CH-C1
240-CH-78
SENSOR GND B-14
RIGHT FOOT THROTTLE
734-CM-197 LHP THROTTLE Y-18
752-CM-194 LH IVS2 V-18
721-CM-286 5V SENSOR PWR O-18
721-CM-287 5V SENSOR PWR O-18
CM-C46
WC FOOTPEDAL
82
240-CM-177
SENSOR GND B-18
LEFT FOOT THROTTLE
721-CM-601 5V SENSOR PWR O-18
TO SHEET 13
CM-C5 PIN 29
99
721-CM-293 5V SENSOR PWR O-18
CM-S76
B
TO SHEET 10
CM-C1 PIN 36
721-RF-61 5V SENSOR PWR O-18
B
TO SHEET 10
RF-C15 PIN C
B
TO SHEET 10
RF-C15 PIN A
721-CM-710
5V SENSOR PWR O-18
CM-C2
RF-C1
721-RF-43
5V SENSOR PWR O-18
RF-S8
721-RF-62
5V SENSOR PWR O-18
240-RF-59
SENSOR GND B-18
745-RF-63 RH SPEEDO DG-18
240-RF-60 SENSOR GND B-18
RF-S9
240-RF-58
SENSOR GND B-16
21
RF-C22
CH-C66
RF-C23
RIGHT WHEEL MOTOR PPU
756-RF-16 RH DIRECTION W-18
240-CH-82
SENSOR GND B-16
721-CM-700
5V SENSOR PWR O-18
CH-S21
ENGINE SPEED SENSOR
21
CM-C1
CH-C1
721-CM-425
5V SENSOR PWR O-18
721-CH-14 5V SENSOR PWR O-18
240-CH-158
SENSOR GND B-16
746-CH-15 LH SPEEDO LG-18
240-CH-77
SENSOR GND B-18
CH-S8
240-CH-81
SENSOR GND B-18
B
TO SHEET 10
CH-C46 PIN A
CH-C10
LEFT WHEEL MOTOR PPU
747-CH-16 LH DIRECTION G-18
CH-C36
751-CH-53 EDC A FWD V-18
750-CH-54
EDC B FWD COM BR-18
260-CM-200
INDUCTIVE GND B-18
CM-S68
PROPEL PUMP FWD
748-CH-56 EDC D REV LB-18
749-CH-55
EDC C REV COM T-18
260-CM-198
INDUCTIVE GND B-18
CM-S68
PROPEL REV
CH-C38
CH-C11
713-CH-19 LH BRAKE DEFEAT Y-18
260-CH-17
INDUCTIVE GND B-18
CH-S12
BRAKE DEFEAT LEFT
712-RF-41 RH BRAKE DEFEAT DG-18
260-RF-1
INDUCTIVE GND B-18
RF-S1
RF-C21
BRAKE DEFEAT RIGHT

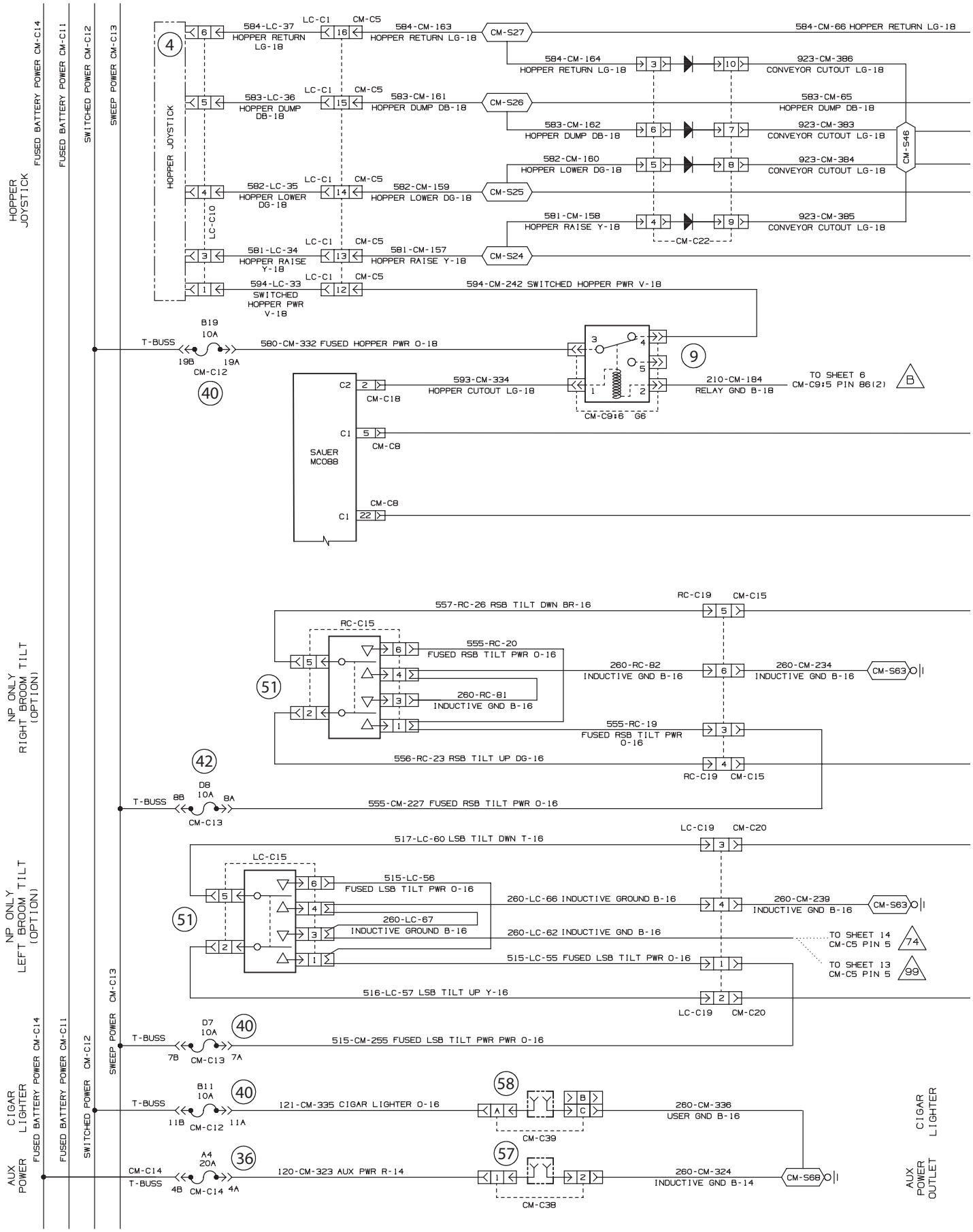

RIGHT SIDE BRM
NP ONLY RIGHT BROOM ROTATION
RIGHT BROOM WATER NP/NS ONLY
RIGHT BROOM PRESSURE
LEFT BROOM PRESSURE
LEFT BROOM WATER NP/NS ONLY
NP ONLY LEFT BROOM ROTATION
LEFT SIDE BROOM
SWEEP POWER
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWEEP POWER CM-C13
T-BUSS
D2 10A
2B CM-C13 2A
40
540-CM-204 FUSED RSB PWR O-18
CM-C4
RC-C1
540-RC-4 FUSED RSB PWR O-18
RC-C3
47
543-RC-6 RSB LOWER LG-18
RC-S1
543-RC-9 RSB LOWER LG-18
543-RC-7 RSB LOWER LG-18
543-RC-11 RSB LOWER LG-18
543-RC-10 RSB LOWER LG-18
RC-C5
220-RC-70 INDICATOR GND B-18
546-RC-16 RSB ROTATE FWD LG-18
220-RC-72 INDICATOR GND B-18
TO SHEET 7 RC-C2 PIN 7
546-RC-17 RSB ROTATE FWD LG-18
220-RC-73 INDICATOR GND B-18
RC-S2
RC-C6
547-RC-14 RSB WATER LB-18
220-RC-71 INDICATOR GND B-18
547-RC-15 RSB WATER LB-18
543-RC-8 RSB LOWER LG-18
BIN SWITCH
13
CM-C18
545-CM-207 RSB BIN SW MSB DB-18
545-RC-13 RSB BIN SW MSB DB-18
544-CM-208 RSB BIN SW LSB LB-18
544-RC-12 RSB BIN SW LSB LB-18
SAUER MC088
CM-C8
547-CM-136 RSB WATER LB-18
543-CM-389 RSB LOWER LG-18
549-CM-418 RSB DWN PRESS LG-18
541-CM-39 RSB RAISE DB-18
502-CM-29 LSB RAISE V-18
511-CM-417 LSB DWN PRESS W-18
503-CM-302 LSB LOWER DG-18
506-CM-125 LSB WATER LB-18
504-CM-241 LSB BIN SW LSB T-18
505-CM-240 LSB BIN SW MSB LG-18
CM-C5
LC-C1
504-LC-23 LSB BIN SW LSB T-18
505-LC-22 LSB BIN SW MSB LG-18
LC-C6
503-LC-18 LSB LOWER DG-18
506-LC-27 LSB WATER LB-18
LC-C8
220-LC-71 INDICATOR GND B-18
TO SHEET 7 LC-C11 PIN 7
506-LC-26 LSB WATER LB-18
220-LC-72 INDICATOR GND B-18
509-LC-25 LSB ROTATE FWD Y-18
220-LC-69 INDICATOR GND B-18
LC-S2
220-LC-70 INDICATOR GND B-18
509-LC-24 LSB ROTATE FWD Y-18
503-LC-21 LSB LOWER DG-18
LC-C7
503-LC-20 LSB LOWER DG-18
503-LC-17 LSB LOWER DG-18
D1 10A
1B CM-C13 1A
501-CM-236 FUSED LSB PWR O-18
501-LC-14 FUSED LSB PWR O-18
503-LC-16 LSB LOWER DG-18
LC-S1
503-LC-19 LSB LOWER DG-18
LC-C5
CM-C13(D) 3B
FUSE 1-10 TERM BUSS 8B
500-CM-328 SWEEP PWR Y-12
500-CM-329 SWEEP PWR Y-12
CM-S49
500-CM-327 SWEEP PWR Y-10
A2 50A
CM-C14
108-CM-130 FUSED SWEEP PWR R-10
26
CM-C13:1 D1
30
87
85
86
37
702-CM-382 SWEEP PWR RLY G-18
210-CM-305 RELAY GND B-18
CM-S62


543-CM-752
RSB LOWER LG-18
TO SHEET 5
CM-C23 PIN 3
543-CM-126 RSB LOWER LG-18
CM-S15
543-CM-38 RSB LOWER LG-18
CM-C2
RF-C1
23
543-RF-31
RSB LOWER LG-18
RF-C8
260-RF-11
INDUCTIVE GND B-18
SEE
SHEET 12
RF-S5
RSB LOWER
SOLENOID
546-CM-50 RSB ROTATE FWD LG-18
CM-C1
CH-C1
57
546-CH-24
RSB ROTATE FWD LG-18
CH-C16
260-CH-97
INDUCTIVE GND B-18
CH-S13
RSB ROTATE
SOLENOID
547-CM-135
RSB WATER LB-18
CM-S17
547-CM-42
RSB WATER LB-18
CM-C1
CH-C1
45
547-CH-6
RSB WATER LB-18
CH-C6
260-CH-92
INDUCTIVE GND B-18
CH-S11
RSB WATER
SOLENOID
549-RF-32
RSB DWN PRESS LG-18
15
CM-C2
RF-C1
97
TO SHEET 7
RF-S4
150-RF-47
FUSED SWITCHED
PWR 0-18
RF-C6
95
241-RF-50
CONTROLLER GND B-18
RF-S7
RSB PRESSURE
TRANSDUCER
541-RF-30
RSB RAISE DB-18
24
RF-C7
260-RF-12
INDUCTIVE GND B-18
RF-S5
RSB RAISE
SOLENOID
502-RF-24
LSB RAISE V-18
10
RF-C10
260-RF-10
INDUCTIVE GND B-18
LSB RAISE
SOLENOID
511-RF-26 LSB DWN PRESS W-18
14
RF-C9
TO SHEET 7
RF-S4
150-RF-42
FUSED SWITCHED
PWR 0-18
95
241-RF-2
CONTROLLER GND B-18
RF-S7
LSB PRESSURE
TRANSDUCER
506-CM-124
LSB WATER LB-18
CM-S14
506-CM-32
LSB WATER LB-18
CM-C1
CH-C1
35
506-CH-5 LSB WATER LB-18
CH-C5
260-CH-93
INDUCTIVE GND B-18
CH-S11
LSB WATER
SOLENOID
509-CM-95 LSB ROTATE FWD Y-18
CM-S28
509-CM-41
LSB ROTATE FWD
Y-18
44
509-CH-23
LSB ROTATE FWD Y-18
CH-C14
260-CH-99
INDUCTIVE GND B-18
CH-S13
509-CM-99
LSB ROTATE FWD Y-18
37
509-CH-22
LSB ROTATE FWD Y-18
CH-C15
260-CH-98
INDUCTIVE GND B-18
LSB
OUT AND ROTATE
SOLENOIDS
503-CM-750
LSB LOWER DG-18
TO SHEET 5
CM-C23 PIN 1
503-CM-122 LSB LOWER DG-18
CM-S13
503-CM-28 LSB LOWER DG-18
9
503-RF-25
LSB LOWER DG-18
RF-C11
260-RF-9
INDUCTIVE GND B-18
SEE
SHEET 12
RF-S5
LSB LOWER
SOLENOID

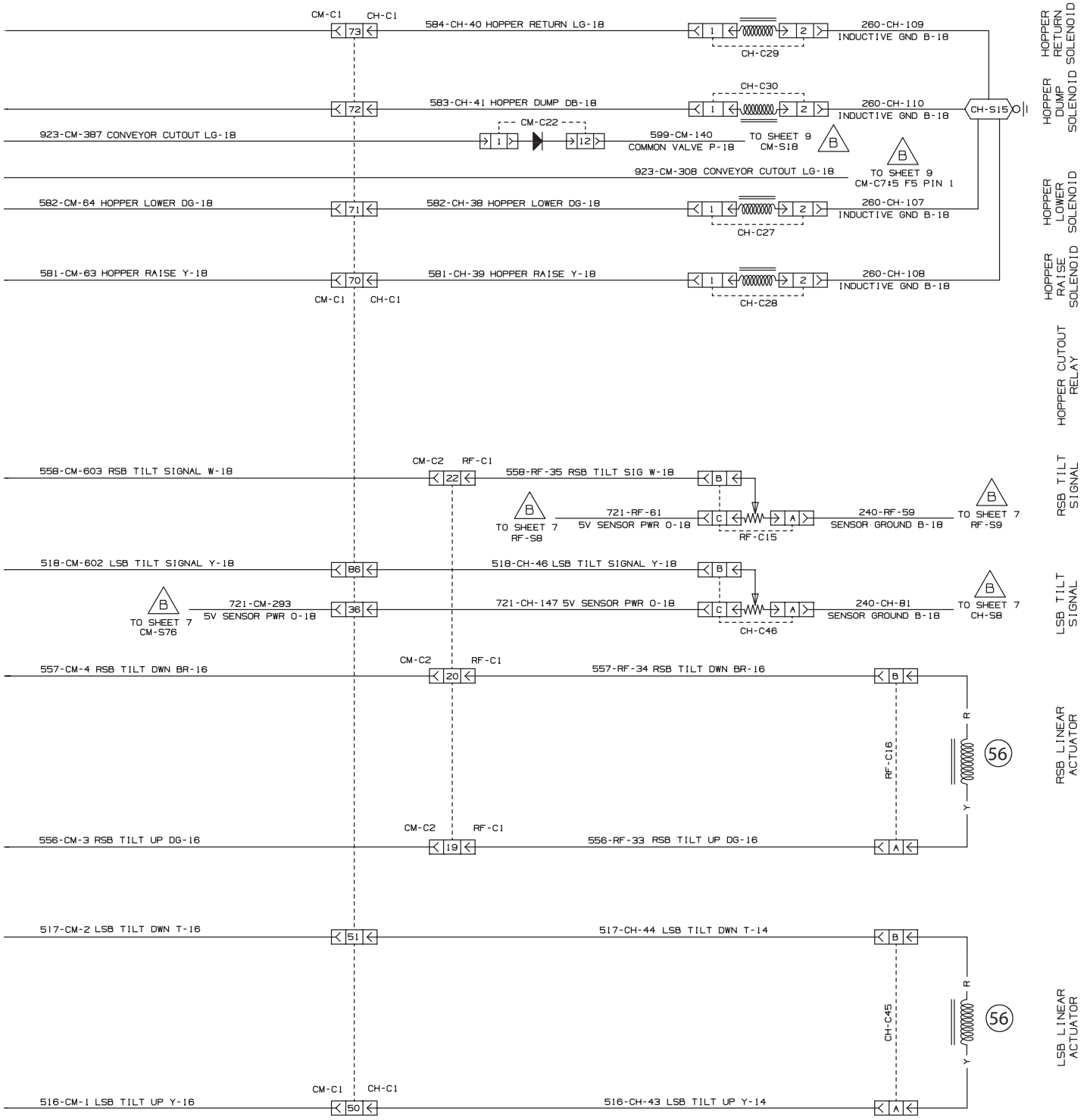

CONVEYOR CUT-OUT
CONVEYOR FORWARD REVERSE
NS ONLY BROOMS ROTATE
MAIN BROOM ROTATE NP ONLY
MAIN BROOM PRESSURE
MAIN BROOM LOWER-RAISE
CONVEYOR RAISE
WATER POWER
WATER LOW FLOW NP/NS ONLY
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWEEP POWER CM-C13
TO SHEET 10 CM-S46
923-CM-308 CONVEYOR CUTOUT LG-18
220-RC-76 INDICATOR GND B-18
RC-S2
920-CM-149 FWD CONVEYOR SW DG-18
CM-C7:5 F5
920-RC-43 CONVEYOR FWD SW DG-18
920-RC-42 CONVEYOR FWD SW DG-18
576-RC-41 CONVEYOR REV T-18
575-CM-217 FUSED CONVEYOR PWR O-18
575-RC-40 CONVEYOR PWR O-18
D4 10A
CM-C13
RC-C11
220-RC-75 INDICATOR GND B-18
597-LC-32 BROOM ROTATE NS V-18
560-LC-31 FUSED CB PWR O-18
566-RC-39 CB ROTATE LG-18
566-RC-38 CB ROTATE LG-18
RC-C7
561-RC-33 CB LOWER V-18
220-RC-74 INDICATOR GND B-18
560-CM-254 FUSED CB PWR O-18
D3 10A
RC-C10
BIN SWITCH
563-RC-36 CB BIN SW MSB G-18
562-RC-35 CB BIN SW LSB V-18
561-RC-34 CB LOWER V-18
560-CM-253 FUSED CB PWR O-18
561-RC-32 CB LOWER V-18
579-RC-37 CONVEYOR LOWER DG-18
560-RC-29 FUSED CB PWR O-18
561-RC-31 CB LOWER V-18
560-RC-28 FUSED CB PWR O-18
RC-C9
B18 10A
924-CM-330 FUSED CONVEYOR RAISE O-16
578-CM-166 CONVEYOR RAISE Y-18
922-CM-213 CONV RAISE RLY Y-18
210-CM-182 RELAY GND B-18
210-CM-179 RELAY GND B-18
TO SHEET 3 CM-C7:2 PIN 86(2)
CM-S62
CM-C7:1 F1
SAUER MC088
CM-C18
CM-C7:6 F6
533-CM-280 WATER PUMP RLY LG-18
210-CM-183 RELAY GND B-18
D9 20A
530-CM-283 FUSED WATER PWR O-14
531-CM-96 WATER PUMP DB-14
531-CM-97 WATER PUMP DB-18
CM-S5
531-CM-5 WATER PUMP DB-14
534-LC-30 LOW FLOW SW LB-18
220-LC-75 INDICATOR GND B-18
LC-S2
531-LC-45 WTR PUMP DB-18
532-LC-28 LOW FLOW WTR LB-16
532-CM-35 LOW FLOW WTR LB-16
260-LC-63 INDUCTIVE GND B-16
260-CM-265 INDUCTIVE GND B-16
CM-S63

SHEET 9 OF 17


210-CM-271
RELAY GND B-18
TO SHEET 3
CM-C7:4
PIN 86(2)
577-CM-146 FWD CONVEYOR DB-18
577-CM-148
FWD CONVEYOR DB-18
TO SHEET 5
CM-C23 PIN 4
577-CM-147 FWD CONVEYOR DB-18
CM-S21
577-CM-48
FWD CONVEYOR DB-18
577-CH-36
CONVEYOR FWD DB-18
260-CH-105
INDUCTIVE GND B-18
CH-S14
CONV FWD ROTATE SOL
CH-C25
576-CM-144 REV CONVEYOR T-18
CM-S20
576-CM-47
REV CONVEYOR T-18
576-CH-35
CONVEYOR REV T-18
260-CH-104
INDUCTIVE GND B-18
CONV REV ROTATE SOL
CH-C24
576-CM-145 REV CONVEYOR T-18
CM-C17
599-CM-138
COMMON VALVE P-18
599-CM-140
COMMON VALVE P-18
TO SHEET 10
CM-C22 PIN 12
599-CM-137
COMMON VALVE P-18
CM-S18
599-CM-43
COMMON VALVE P-18
599-CH-37
COMMON VALVE P-18
260-CH-106
INDUCTIVE GND B-18
COM ALVE SOLENOID
CH-C26
599-CM-139
COMMON VALVE P-18
CM-C22
597-CM-30 BROOMS ROTATE V-18
597-CH-57
BROOM ROTATE V-18
260-CH-122
INDUCTIVE GND B-18
CH-S18
BROOM ROT SOLENOID
CH-C37
566-CM-188
CB ROTATE LG-18
TO SHEET 5
CM-C23 PIN 6
TO SHEET 15
WC-C9
(NR ONLY)
566-CM-186
CB ROTATE LG-18
CM-S32
WC-T1
566-CM-83
CB ROTATE LG-18
566-CH-25
CB ROTATE LG-18
260-CH-96
INDUCTIVE GND B-18
CH-S13
MAIN BROOM ROTATE SOL
CH-C17
566-CM-187
CB ROTATE LG-18
SAUER
MC088
595-CM-267
CB BALANCE V-18
595-RF-39
CB BALANCE V-18
260-RF-15
INDUCTIVE GND B-18
RF-S5
CB BAL SOL
RF-C12
563-CM-215
CB BIN SWITCH MSB G-18
562-CM-214
CB BIN SWITCH LSB V-18
565-CM-46
CB RAISE V-18
565-RF-37
CB RAISE V-18
260-RF-14
INDUCTIVE GND B-18
CB PRESS SOLENOID
RF-C4
561-CM-143
CB LOWER V-18
579-CM-31 CONVEYOR LOWER DG-18
579-CH-33
CONVEYOR LOWER DG-18
260-CH-102
INDUCTIVE GND B-18
CH-S14
CONV LOWER SOLENOID
CH-C22
561-CM-751
CB LOWER V-18
T- SHEET 5
CM-C23 PIN 2
561-CM-141
CB LOWER V-18
CM-S19
561-CM-45 CB LOWER V-18
561-RF-36
CB LOWER V-18
260-RF-13
INDUCTIVE GND B-18
RF-S5
MAIN BROOM LOWER SOL
RF-C5
578-CM-165 CONVEYOR RAISE Y-18
578-CH-34
CONVEYOR RAISE Y-18
260-CH-103
INDUCTIVE GND B-18
CH-S14
RAISE CONV SOLENOID
CH-C23
382-CM-268
CB BALANCE SIGNAL W-18
382-CH-27 CB BALANCE SIGNAL W-18
SAUER
MC088
CH-C18
96
TO SHEET 7
CH-C1 PIN 92
150-CH-26
FUSED SWITCHED PWR
O-18
230-CH-80
CONTROLLER GND B-18
CH-S7
CB BALANCE TRANSDUCER
568-CM-600
CB DWN PRESS DG-18
568-RF-38 CB DWN PRESS DG-18
RF-C3
95
TO SHEET 7
RF-S4
150-RF-48
FUSED SWITCHED PWR
O-18
241-RF-51
CONTROLLER GND B-18
RF-S7
CB PRESSURE TRANSDUCER
77
WATER PUMP
531-CH-7
WATER PUMP DB-14
260-CH-91
INDUCTIVE GND B-14
CH-S11
532-CH-8
LOW FLOW WATER LB-16



SHEET 10 OF 17

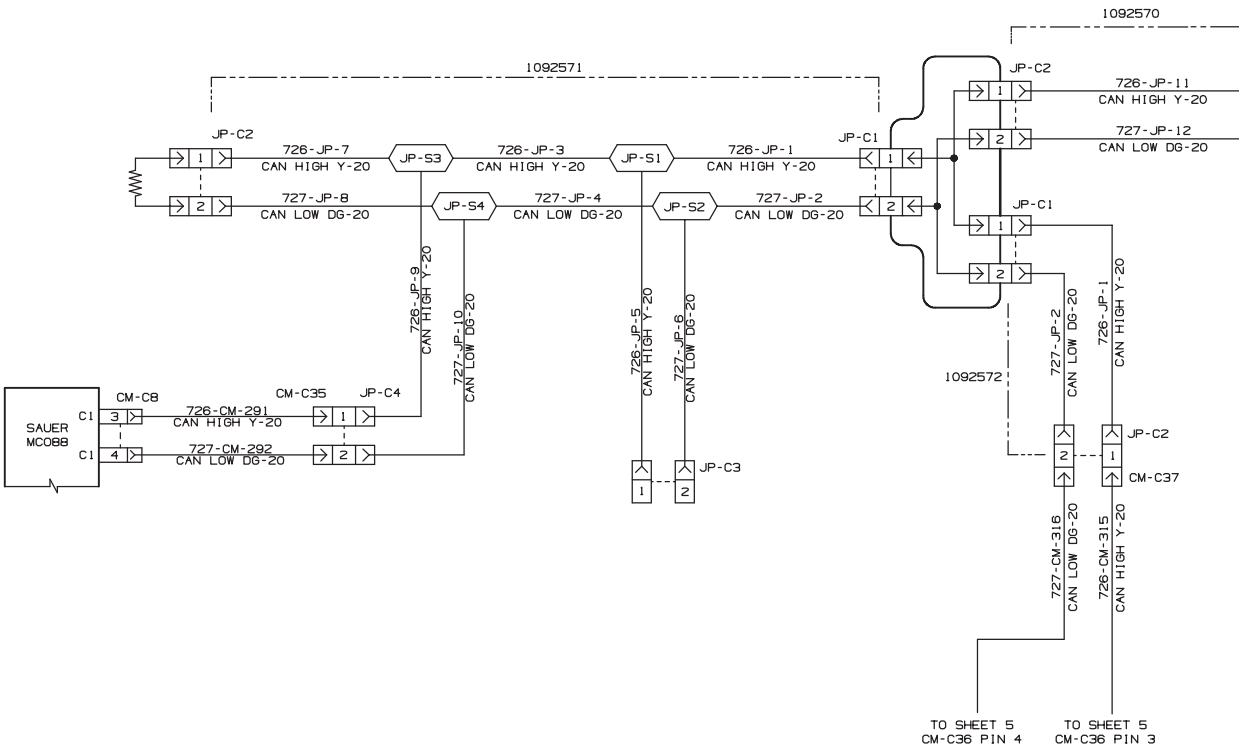

CM-C1
CH-C1
584-CH-40 HOPPER RETURN LG-18
260-CH-109
INDUCTIVE GND B-18
CH-C29
HOPPER RETURN SOLENOID
CH-C30
583-CH-41 HOPPER DUMP DB-18
260-CH-110
INDUCTIVE GND B-18
CH-S15
HOPPER DUMP SOLENOID
CM-C22
923-CM-387 CONVEYOR CUTOUT LG-18
599-CM-140
COMMON VALVE P-18
TO SHEET 9
CM-S18
923-CM-308 CONVEYOR CUTOUT LG-18
TO SHEET 9
CM-C7:5 F5 PIN 1
582-CM-64 HOPPER LOWER DG-18
582-CH-38 HOPPER LOWER DG-18
260-CH-107
INDUCTIVE GND B-18
CH-C27
HOPPER LOWER SOLENOID
581-CM-63 HOPPER RAISE Y-18
581-CH-39 HOPPER RAISE Y-18
260-CH-108
INDUCTIVE GND B-18
CH-C28
HOPPER RAISE SOLENOID
HOPPER CUTOUT RELAY
558-CM-603 RSB TILT SIGNAL W-18
CM-C2
RF-C1
558-RF-35 RSB TILT SIG W-18
721-RF-61
5V SENSOR PWR O-18
240-RF-59
SENSOR GROUND B-18
TO SHEET 7
RF-S8
TO SHEET 7
RF-S9
RF-C15
RSB TILT SIGNAL
518-CM-602 LSB TILT SIGNAL Y-18
518-CH-46 LSB TILT SIGNAL Y-18
721-CM-293
5V SENSOR PWR O-18
721-CH-147 5V SENSOR PWR O-18
240-CH-81
SENSOR GROUND B-18
TO SHEET 7
CM-S76
TO SHEET 7
CH-S8
CH-C46
LSB TILT SIGNAL
557-CM-4 RSB TILT DWN BR-16
557-RF-34 RSB TILT DWN BR-16
RF-C16
56
RSB LINEAR ACTUATOR
556-CM-3 RSB TILT UP DG-16
556-RF-33 RSB TILT UP DG-16
517-CM-2 LSB TILT DWN T-16
517-CH-44 LSB TILT DWN T-14
CH-C45
56
LSB LINEAR ACTUATOR
516-CM-1 LSB TILT UP Y-16
516-CH-43 LSB TILT UP Y-14

FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

SWITCHED POWER CM-C12

SWEEP POWER CM-C13



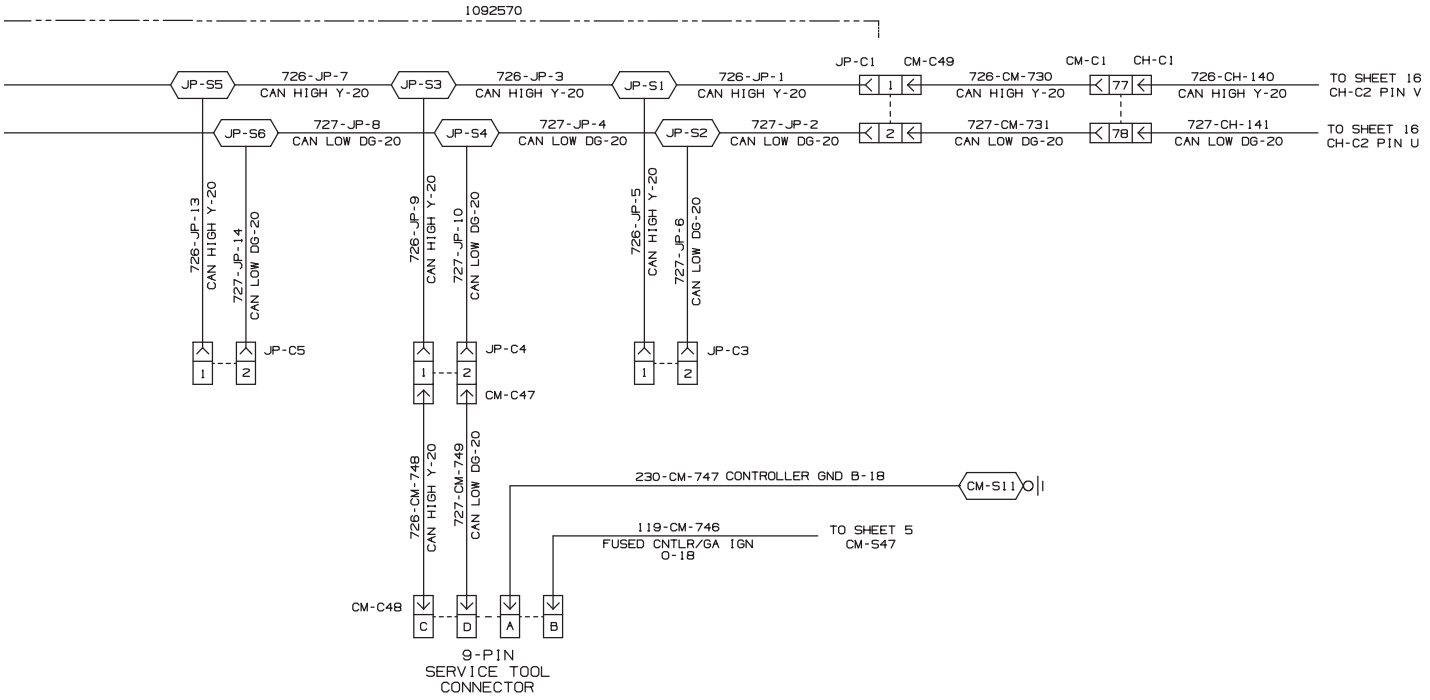
74HP ONLY

FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

SWITCHED POWER CM-C12

SWEEP POWER CM-C13

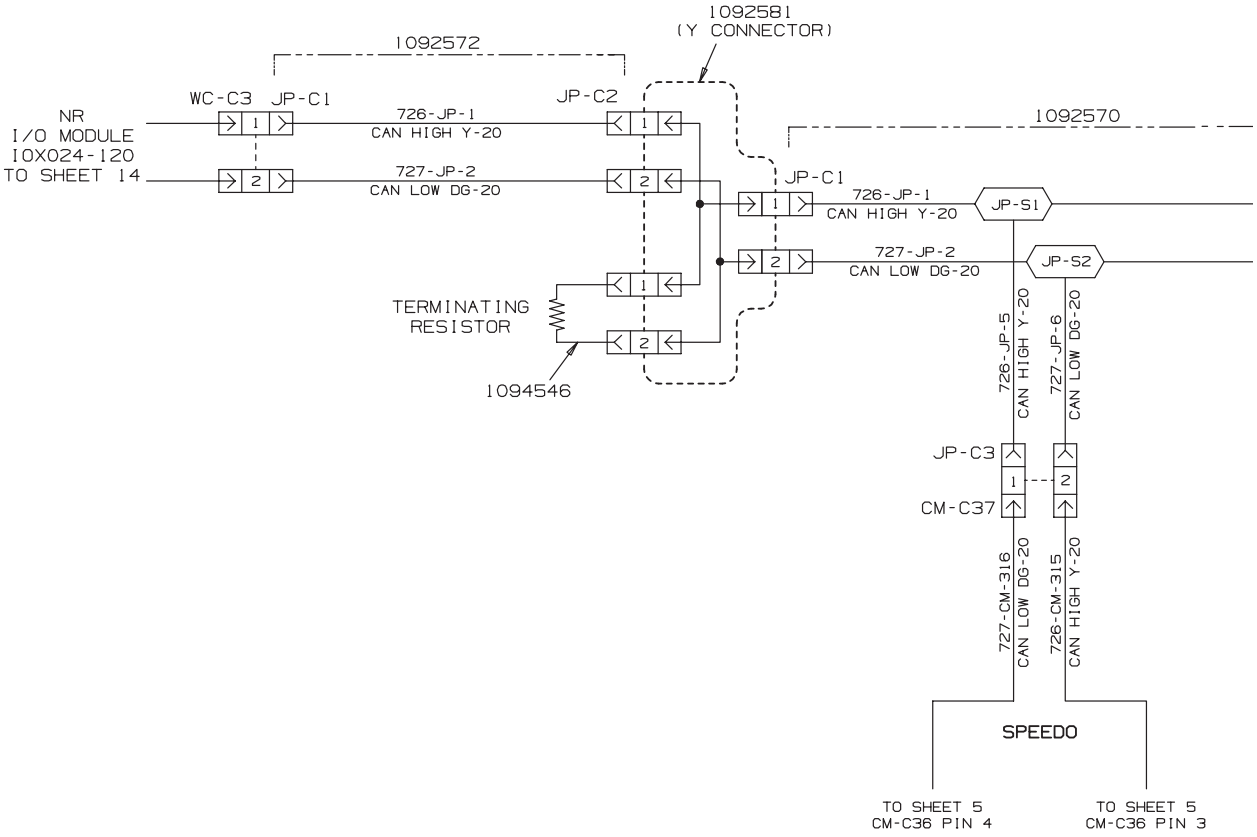

1092570
JP-S5
726-JP-7
CAN HIGH Y-20
JP-S3
726-JP-3
CAN HIGH Y-20
JP-S1
726-JP-1
CAN HIGH Y-20
JP-C1
CM-C49
1
726-CM-730
CAN HIGH Y-20
CM-C1
CH-C1
77
726-CH-140
CAN HIGH Y-20
TO SHEET 16
CH-C2 PIN V
JP-S6
727-JP-8
CAN LOW DG-20
JP-S4
727-JP-4
CAN LOW DG-20
JP-S2
727-JP-2
CAN LOW DG-20
2
727-CM-731
CAN LOW DG-20
78
727-CH-141
CAN LOW DG-20
TO SHEET 16
CH-C2 PIN U
726-JP-13
CAN HIGH Y-20
727-JP-14
CAN LOW DG-20
JP-C5
726-JP-9
CAN HIGH Y-20
727-JP-10
CAN LOW DG-20
JP-C4
CM-C47
726-JP-5
CAN HIGH Y-20
727-JP-6
CAN LOW DG-20
JP-C3
230-CM-747 CONTROLLER GND B-18
CM-S11
726-CM-748
CAN HIGH Y-20
727-CM-749
CAN LOW DG-20
119-CM-746
FUSED CNTLR/GA IGN
0-18
TO SHEET 5
CM-S47
CM-C48
C
D
A
B
9-PIN
SERVICE TOOL
CONNECTOR

FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

SWITCHED POWER CM-C12

SWEEP POWER CM-C13



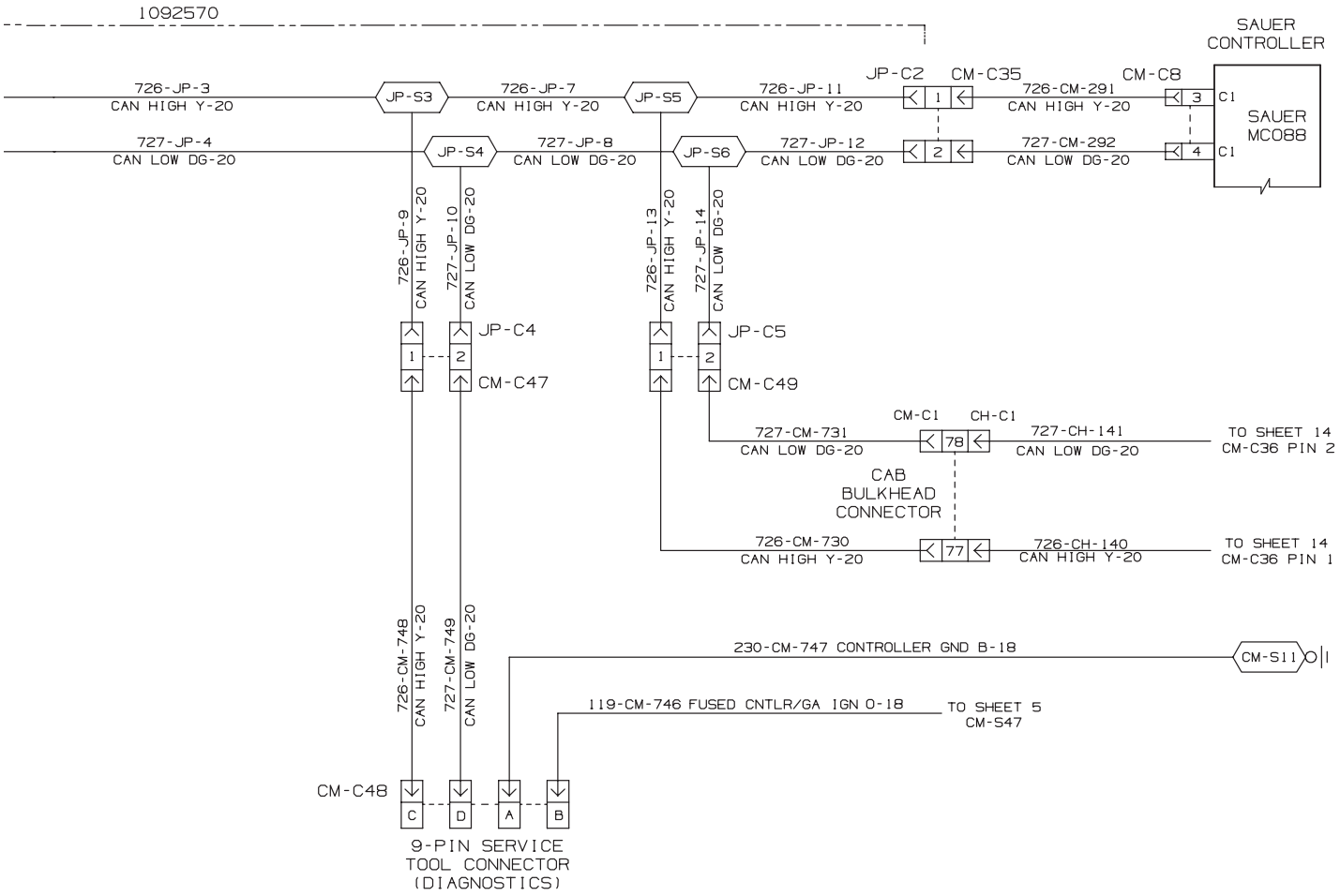
99HP NR ONLY

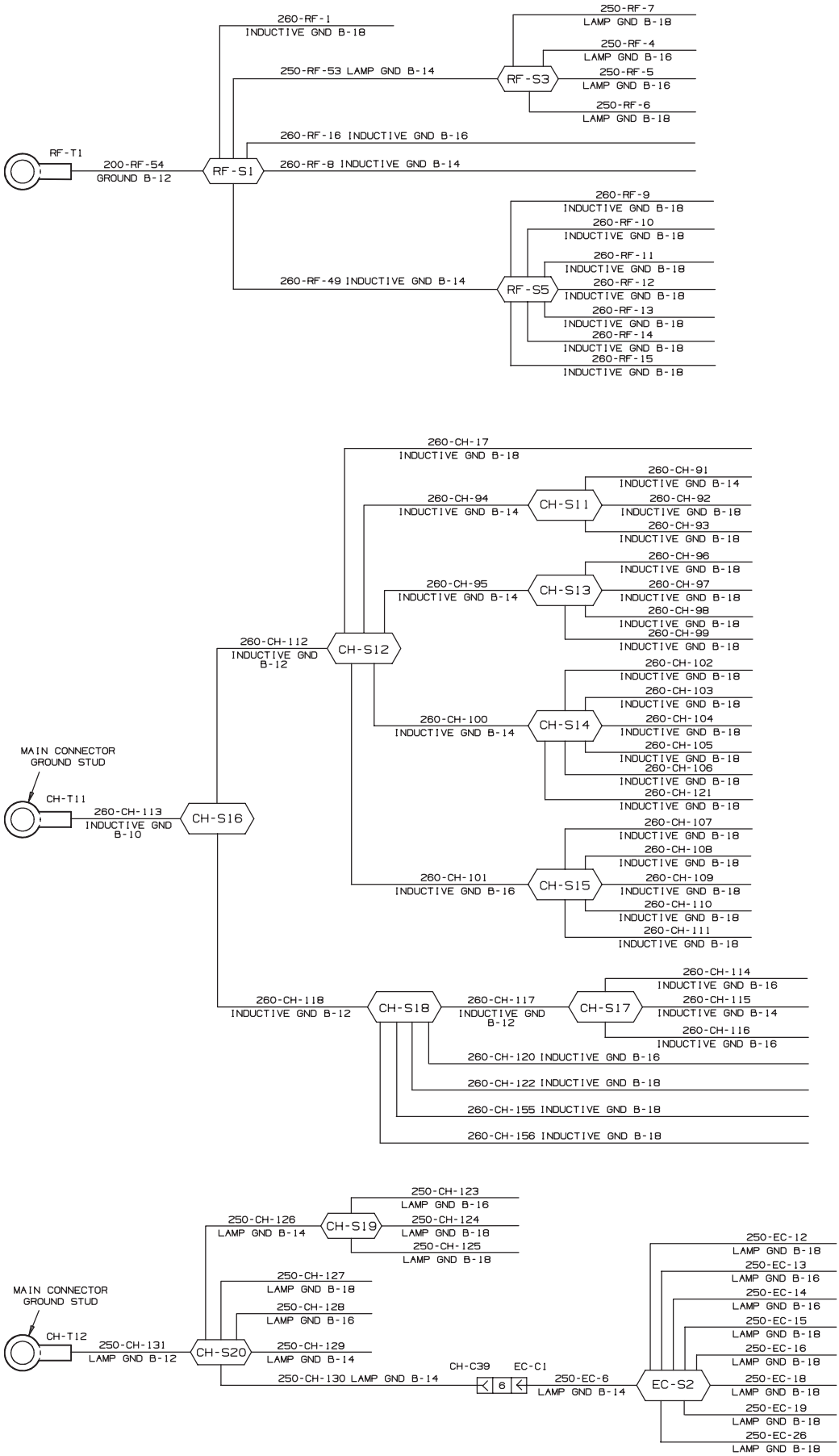
FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

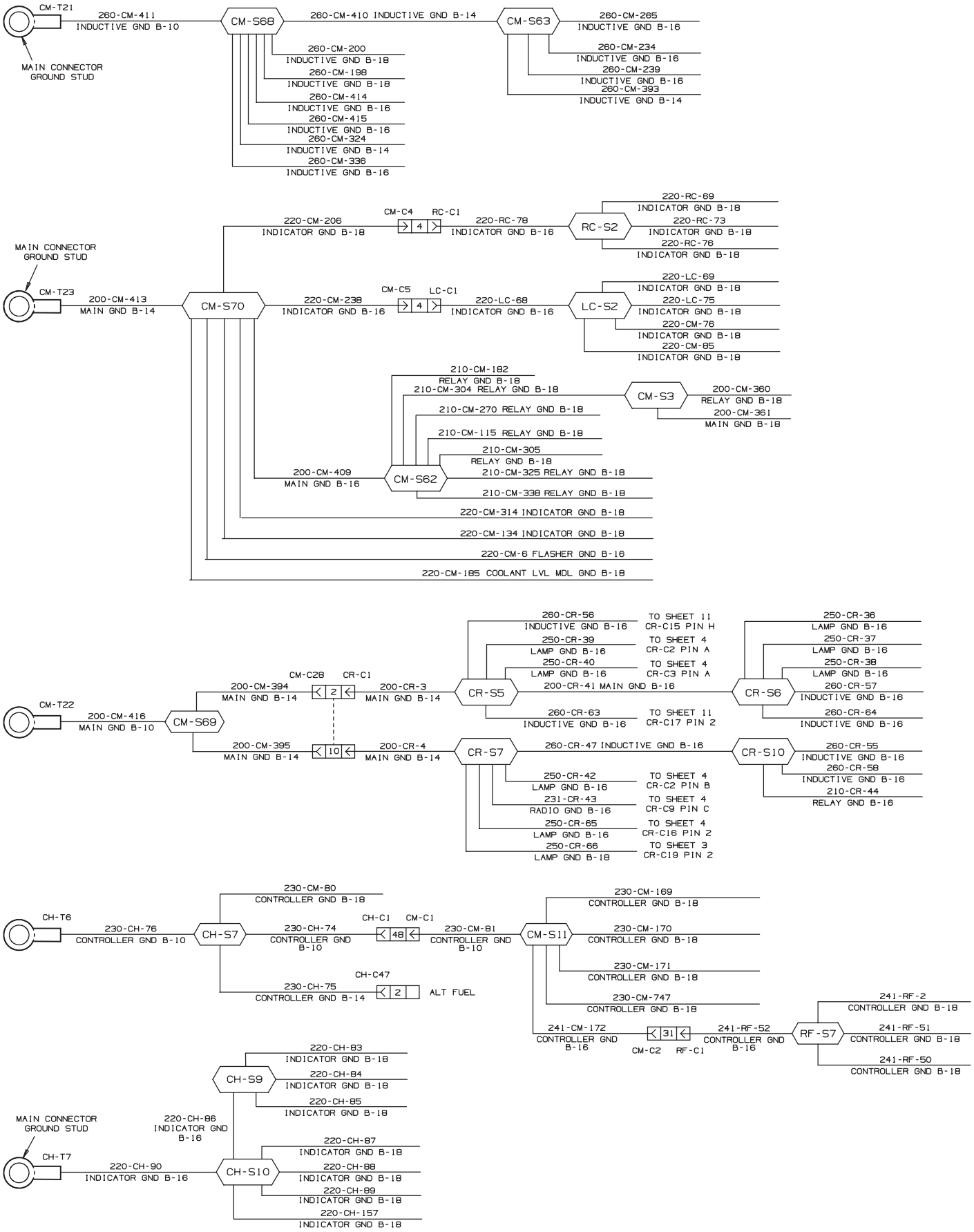
SWITCHED POWER CM-C12

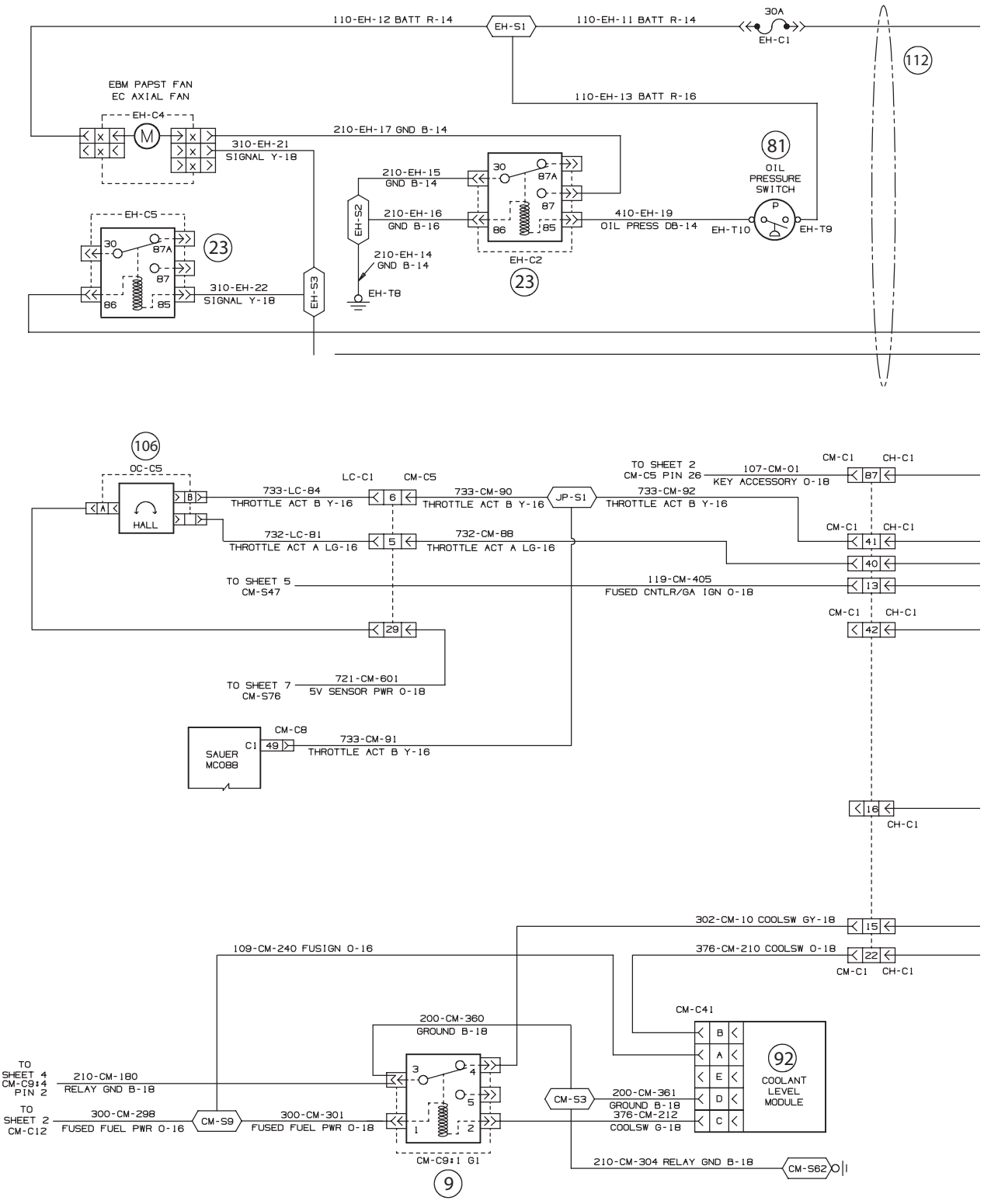
SWEEP POWER CM-C13


1092570
SAUER CONTROLLER
726-JP-3 CAN HIGH Y-20
JP-S3
726-JP-7 CAN HIGH Y-20
JP-S5
726-JP-11 CAN HIGH Y-20
JP-C2
CM-C35
CM-C8
726-CM-291 CAN HIGH Y-20
C1
SAUER MC088
727-JP-4 CAN LOW DG-20
JP-S4
727-JP-8 CAN LOW DG-20
JP-S6
727-JP-12 CAN LOW DG-20
727-CM-292 CAN LOW DG-20
726-JP-9 CAN HIGH Y-20
727-JP-10 CAN LOW DG-20
726-JP-13 CAN HIGH Y-20
727-JP-14 CAN LOW DG-20
JP-C4
CM-C47
JP-C5
CM-C49
CM-C1
CH-C1
727-CM-731 CAN LOW DG-20
727-CH-141 CAN LOW DG-20
TO SHEET 14 CM-C36 PIN 2
CAB BULKHEAD CONNECTOR
726-CM-730 CAN HIGH Y-20
726-CH-140 CAN HIGH Y-20
TO SHEET 14 CM-C36 PIN 1
726-CM-748 CAN HIGH Y-20
727-CM-749 CAN LOW DG-20
230-CM-747 CONTROLLER GND B-18
CM-S11
119-CM-746 FUSED CNTLR/GA IGN 0-18
TO SHEET 5 CM-S47
CM-C48
9-PIN SERVICE TOOL CONNECTOR (DIAGNOSTICS)



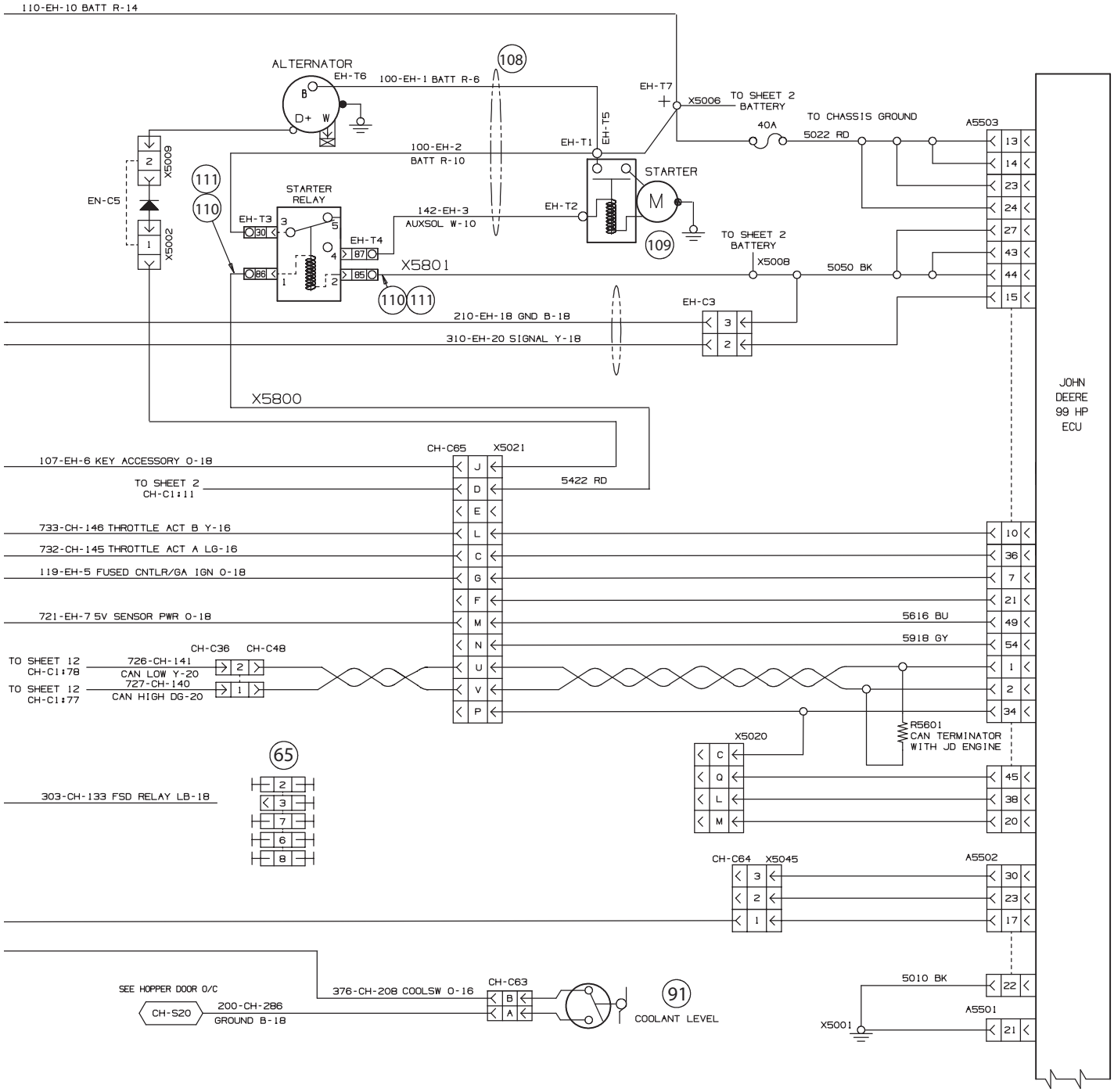
GROUND TREE SPLICES

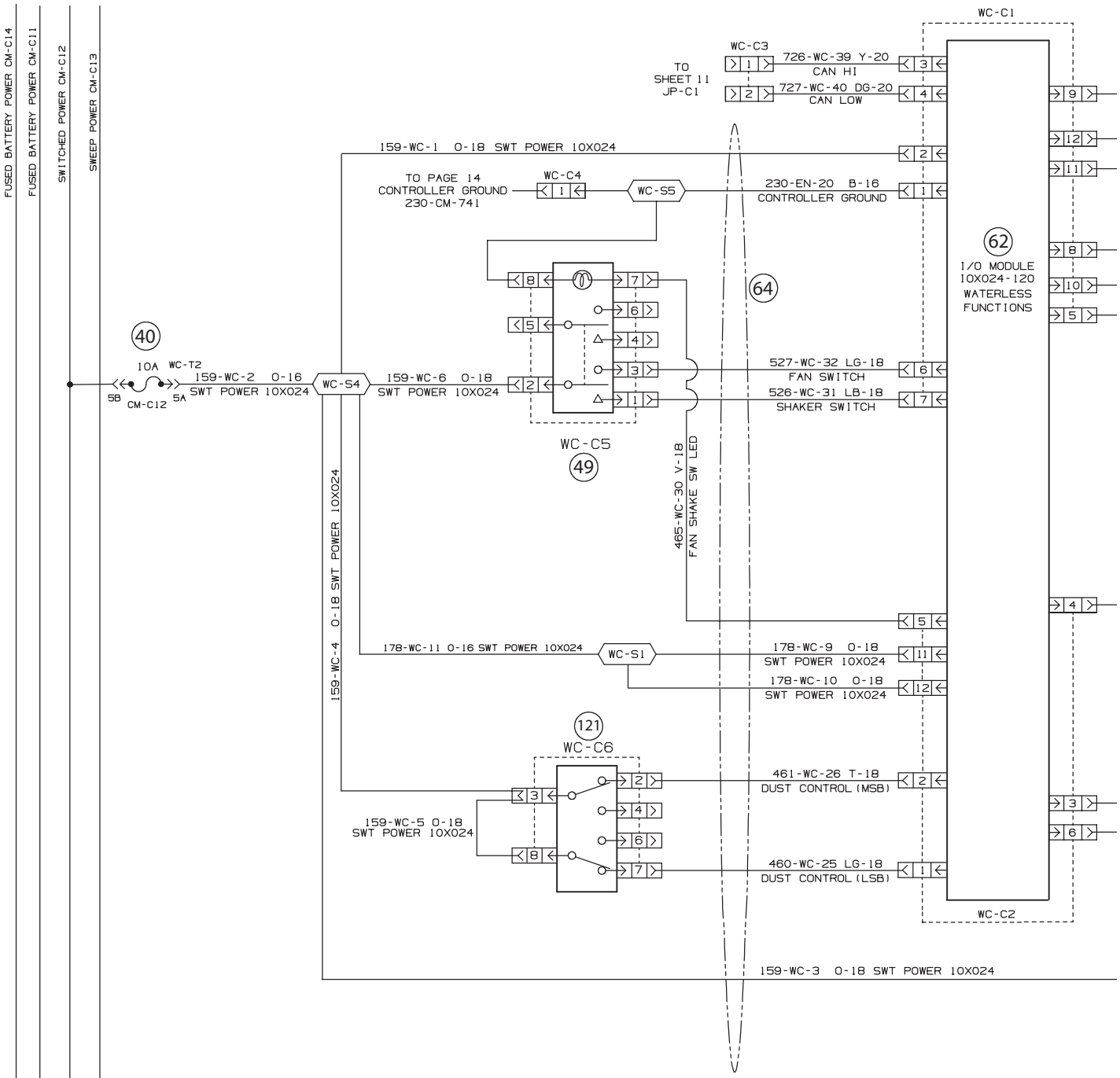

CM-T21
260-CM-411
INDUCTIVE GND B-10
MAIN CONNECTOR GROUND STUD
CM-S68
260-CM-410 INDUCTIVE GND B-14
CM-S63
260-CM-265
INDUCTIVE GND B-16
260-CM-234
INDUCTIVE GND B-16
260-CM-239
INDUCTIVE GND B-16
260-CM-393
INDUCTIVE GND B-14
260-CM-200
INDUCTIVE GND B-18
260-CM-198
INDUCTIVE GND B-18
260-CM-414
INDUCTIVE GND B-16
260-CM-415
INDUCTIVE GND B-16
260-CM-324
INDUCTIVE GND B-14
260-CM-336
INDUCTIVE GND B-16
MAIN CONNECTOR GROUND STUD
CM-T23
200-CM-413
MAIN GND B-14
CM-S70
220-CM-206
INDICATOR GND B-18
CM-C4
RC-C1
4
220-RC-78
INDICATOR GND B-16
RC-S2
220-RC-69
INDICATOR GND B-18
220-RC-73
INDICATOR GND B-18
220-RC-76
INDICATOR GND B-18
220-CM-238
INDICATOR GND B-16
CM-C5
LC-C1
4
220-LC-68
INDICATOR GND B-16
LC-S2
220-LC-69
INDICATOR GND B-18
220-LC-75
INDICATOR GND B-18
220-CM-76
INDICATOR GND B-18
220-CM-85
INDICATOR GND B-18
210-CM-182
RELAY GND B-18
210-CM-304 RELAY GND B-18
CM-S3
200-CM-360
RELAY GND B-18
200-CM-361
MAIN GND B-18
210-CM-270 RELAY GND B-18
210-CM-115 RELAY GND B-18
210-CM-305
RELAY GND B-18
200-CM-409
MAIN GND B-16
CM-S62
210-CM-325 RELAY GND B-18
210-CM-338 RELAY GND B-18
220-CM-314 INDICATOR GND B-18
220-CM-134 INDICATOR GND B-18
220-CM-6 FLASHER GND B-16
220-CM-185 COOLANT LVL MDL GND B-18
CM-T22
200-CM-416
MAIN GND B-10
CM-S69
CM-C28
CR-C1
200-CM-394
MAIN GND B-14
2
200-CR-3
MAIN GND B-14
CR-S5
260-CR-56
INDUCTIVE GND B-16
TO SHEET 11
CR-C15 PIN H
250-CR-39
LAMP GND B-16
TO SHEET 4
CR-C2 PIN A
250-CR-40
LAMP GND B-16
TO SHEET 4
CR-C3 PIN A
200-CR-41 MAIN GND B-16
260-CR-63
INDUCTIVE GND B-16
TO SHEET 11
CR-C17 PIN 2
CR-S6
250-CR-36
LAMP GND B-16
250-CR-37
LAMP GND B-16
250-CR-38
LAMP GND B-16
260-CR-57
INDUCTIVE GND B-16
260-CR-64
INDUCTIVE GND B-16
200-CM-395
MAIN GND B-14
10
200-CR-4
MAIN GND B-14
CR-S7
260-CR-47 INDUCTIVE GND B-16
250-CR-42
LAMP GND B-16
TO SHEET 4
CR-C2 PIN B
231-CR-43
RADIO GND B-16
TO SHEET 4
CR-C9 PIN C
250-CR-65
LAMP GND B-16
TO SHEET 4
CR-C16 PIN 2
250-CR-66
LAMP GND B-18
TO SHEET 3
CR-C19 PIN 2
CR-S10
260-CR-55
INDUCTIVE GND B-16
260-CR-58
INDUCTIVE GND B-16
210-CR-44
RELAY GND B-16
CH-T6
230-CH-76
CONTROLLER GND B-10
CH-S7
230-CM-80
CONTROLLER GND B-18
230-CH-74
CONTROLLER GND B-10
CH-C1
CM-C1
48
230-CM-81
CONTROLLER GND B-10
CM-S11
230-CM-169
CONTROLLER GND B-18
230-CM-170
CONTROLLER GND B-18
230-CM-171
CONTROLLER GND B-18
230-CM-747
CONTROLLER GND B-18
CH-C47
230-CH-75
CONTROLLER GND B-14
2
ALT FUEL
241-CM-172
CONTROLLER GND B-16
CM-C2
31
RF-C1
241-RF-52
CONTROLLER GND B-16
RF-S7
241-RF-2
CONTROLLER GND B-18
241-RF-51
CONTROLLER GND B-18
241-RF-50
CONTROLLER GND B-18
220-CH-83
INDICATOR GND B-18
CH-S9
220-CH-84
INDICATOR GND B-18
220-CH-85
INDICATOR GND B-18
MAIN CONNECTOR GROUND STUD
220-CH-86
INDICATOR GND B-16
CH-T7
220-CH-90
INDICATOR GND B-16
CH-S10
220-CH-87
INDICATOR GND B-18
220-CH-88
INDICATOR GND B-18
220-CH-89
INDICATOR GND B-18
220-CH-157
INDICATOR GND B-18



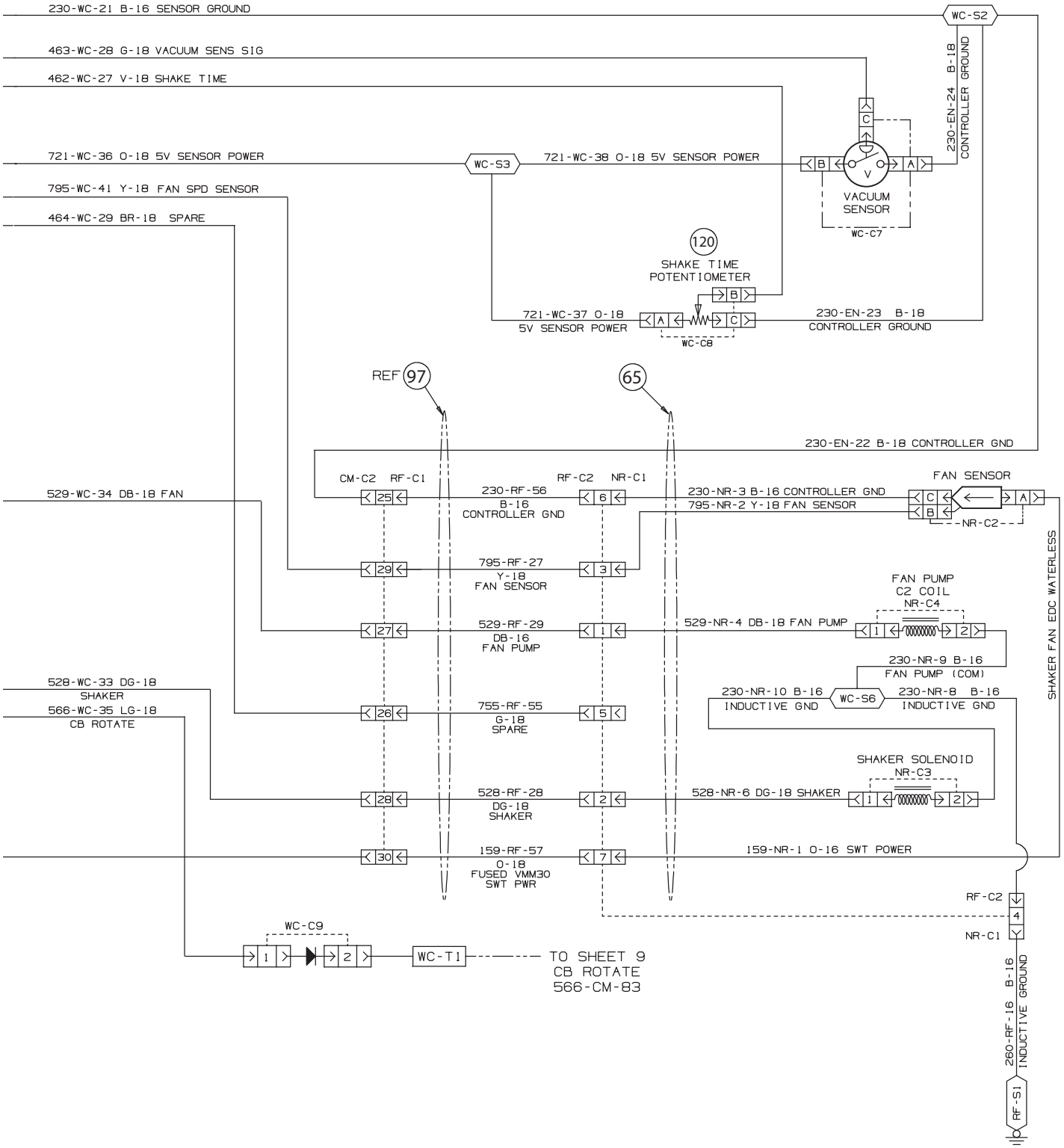
99HP ONLY

FUSED BATTERY POWER CM-C14 | FUSED BATTERY POWER CM-C11 | SWITCHED POWER CM-C12 | SWEEP POWER CM-C13


110-EH-10 BATT R-14
ALTERNATOR
EH-T6
B
D+ W
100-EH-1 BATT R-6
108
EH-T7
X5006
TO SHEET 2
BATTERY
TO CHASSIS GROUND
40A
5022 RD
A5503
EH-T1
EH-T5
100-EH-2
BATT R-10
STARTER
M
EH-T2
142-EH-3
AUXSOL W-10
109
TO SHEET 2
BATTERY
X5008
5050 BK
EN-C5
X5009
X5002
111
110
STARTER
RELAY
EH-T3
EH-T4
X5801
110
111
210-EH-18 GND B-18
310-EH-20 SIGNAL Y-18
EH-C3
X5800
JOHN
DEERE
99 HP
ECU
CH-C65
X5021
107-EH-6 KEY ACCESSORY O-18
TO SHEET 2
CH-C1:11
5422 RD
733-CH-146 THROTTLE ACT B Y-16
732-CH-145 THROTTLE ACT A LG-16
119-EH-5 FUSED CNTLR/GA IGN O-18
721-EH-7 5V SENSOR PWR O-18
5616 BU
5918 GY
CH-C36
CH-C48
TO SHEET 12
CH-C1:78
726-CH-141
CAN LOW Y-20
TO SHEET 12
CH-C1:77
727-CH-140
CAN HIGH DG-20
X5020
R5601
CAN TERMINATOR
WITH JD ENGINE
65
303-CH-133 FSD RELAY LB-18
CH-C64
X5045
A5502
SEE HOPPER DOOR O/C
CH-S20
200-CH-286
GROUND B-18
376-CH-208 COOLSW O-16
CH-C63
91
COOLANT LEVEL
5010 BK
X5001
A5501


FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWEEP POWER CM-C13
WC-C1
WC-C3
TO SHEET 11 JP-C1
726-WC-39 Y-20 CAN HI
727-WC-40 DG-20 CAN LOW
159-WC-1 0-18 SWT POWER 10X024
TO PAGE 14 CONTROLLER GROUND 230-CM-741
WC-C4
WC-S5
230-EN-20 B-16 CONTROLLER GROUND
62
I/O MODULE 10X024-120 WATERLESS FUNCTIONS
64
40
10A WC-T2
159-WC-2 0-16 SWT POWER 10X024
5B
CM-C12
5A
WC-S4
159-WC-6 0-18 SWT POWER 10X024
527-WC-32 LG-18 FAN SWITCH
526-WC-31 LB-18 SHAKER SWITCH
WC-C5
49
465-WC-30 V-18 FAN SHAKE SW LED
159-WC-4 0-18 SWT POWER 10X024
178-WC-11 0-16 SWT POWER 10X024
WC-S1
178-WC-9 0-18 SWT POWER 10X024
178-WC-10 0-18 SWT POWER 10X024
121
WC-C6
461-WC-26 T-18 DUST CONTROL (MSB)
159-WC-5 0-18 SWT POWER 10X024
460-WC-25 LG-18 DUST CONTROL (LSB)
WC-C2
159-WC-3 0-18 SWT POWER 10X024

99HP NR ONLY


230-WC-21 B-16 SENSOR GROUND
463-WC-28 G-18 VACUUM SENS SIG
462-WC-27 V-18 SHAKE TIME
721-WC-36 O-18 5V SENSOR POWER
795-WC-41 Y-18 FAN SPD SENSOR
464-WC-29 BR-18 SPARE
529-WC-34 DB-18 FAN
528-WC-33 DG-18 SHAKER
566-WC-35 LG-18 CB ROTATE
WC-S2
230-EN-24 B-18 CONTROLLER GROUND
WC-S3
721-WC-38 O-18 5V SENSOR POWER
VACUUM SENSOR
WC-C7
120
SHAKE TIME POTENTIOMETER
721-WC-37 O-18 5V SENSOR POWER
230-EN-23 B-18 CONTROLLER GROUND
WC-C8
REF 97
65
230-EN-22 B-18 CONTROLLER GND
CM-C2 RF-C1
RF-C2 NR-C1
230-RF-56 B-16 CONTROLLER GND
230-NR-3 B-16 CONTROLLER GND
795-NR-2 Y-18 FAN SENSOR
FAN SENSOR
NR-C2
795-RF-27 Y-18 FAN SENSOR
FAN PUMP C2 COIL NR-C4
529-RF-29 DB-16 FAN PUMP
529-NR-4 DB-18 FAN PUMP
230-NR-9 B-16 FAN PUMP (COM)
230-NR-10 B-16 INDUCTIVE GND
WC-S6
230-NR-8 B-16 INDUCTIVE GND
755-RF-55 G-18 SPARE
SHAKER SOLENOID NR-C3
528-RF-28 DG-18 SHAKER
528-NR-6 DG-18 SHAKER
159-RF-57 O-18 FUSED VMM30 SWT PWR
159-NR-1 O-16 SWT POWER
SHAKER FAN EDC WATERLESS
RF-C2
NR-C1
WC-C9
WC-T1
TO SHEET 9 CB ROTATE 566-CM-83
260-RF-16 B-16 INDUCTIVE GROUND
RF-S1

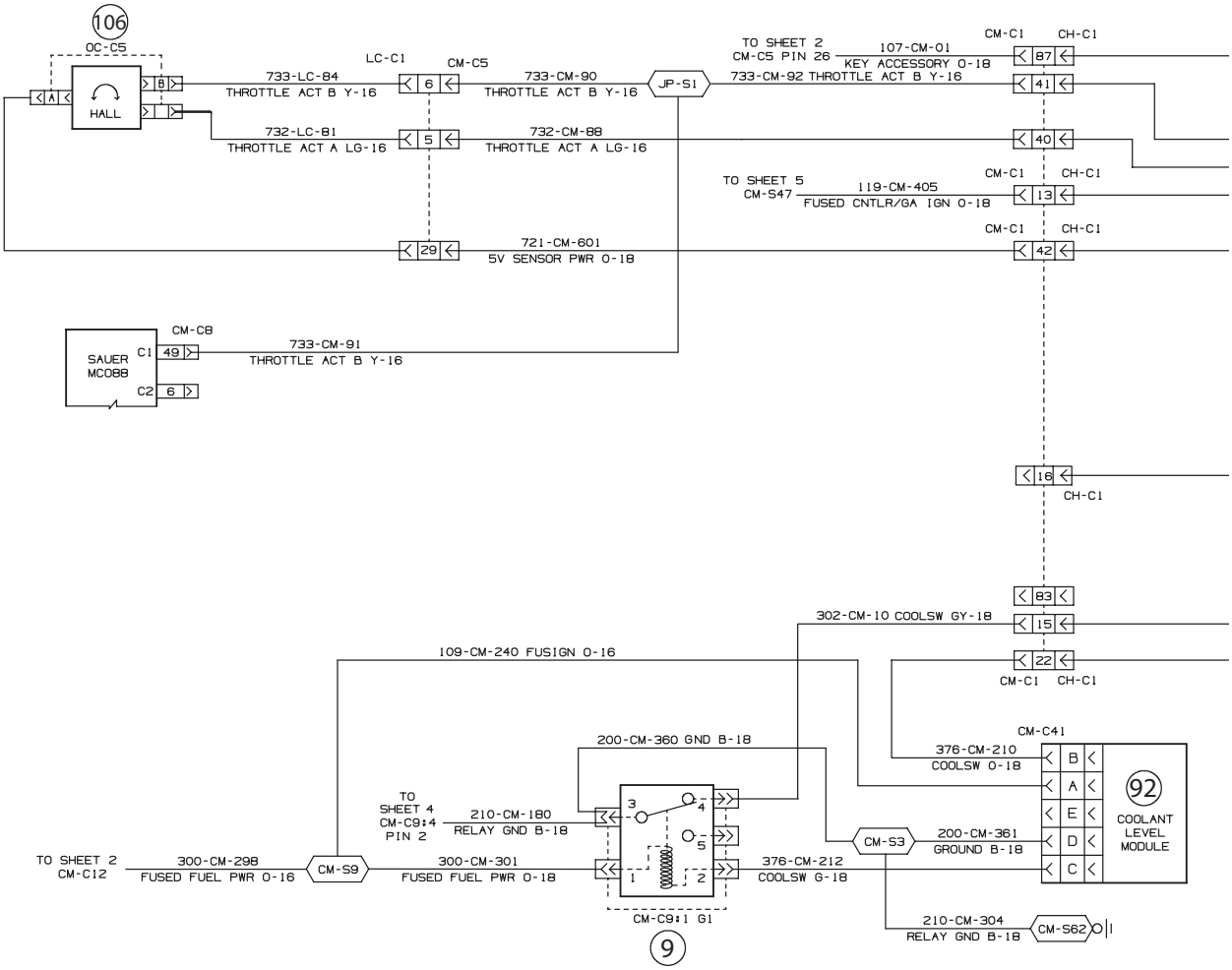
FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

SWITCHED POWER CM-C12

SWEEP POWER CM-C13

74HP ONLY

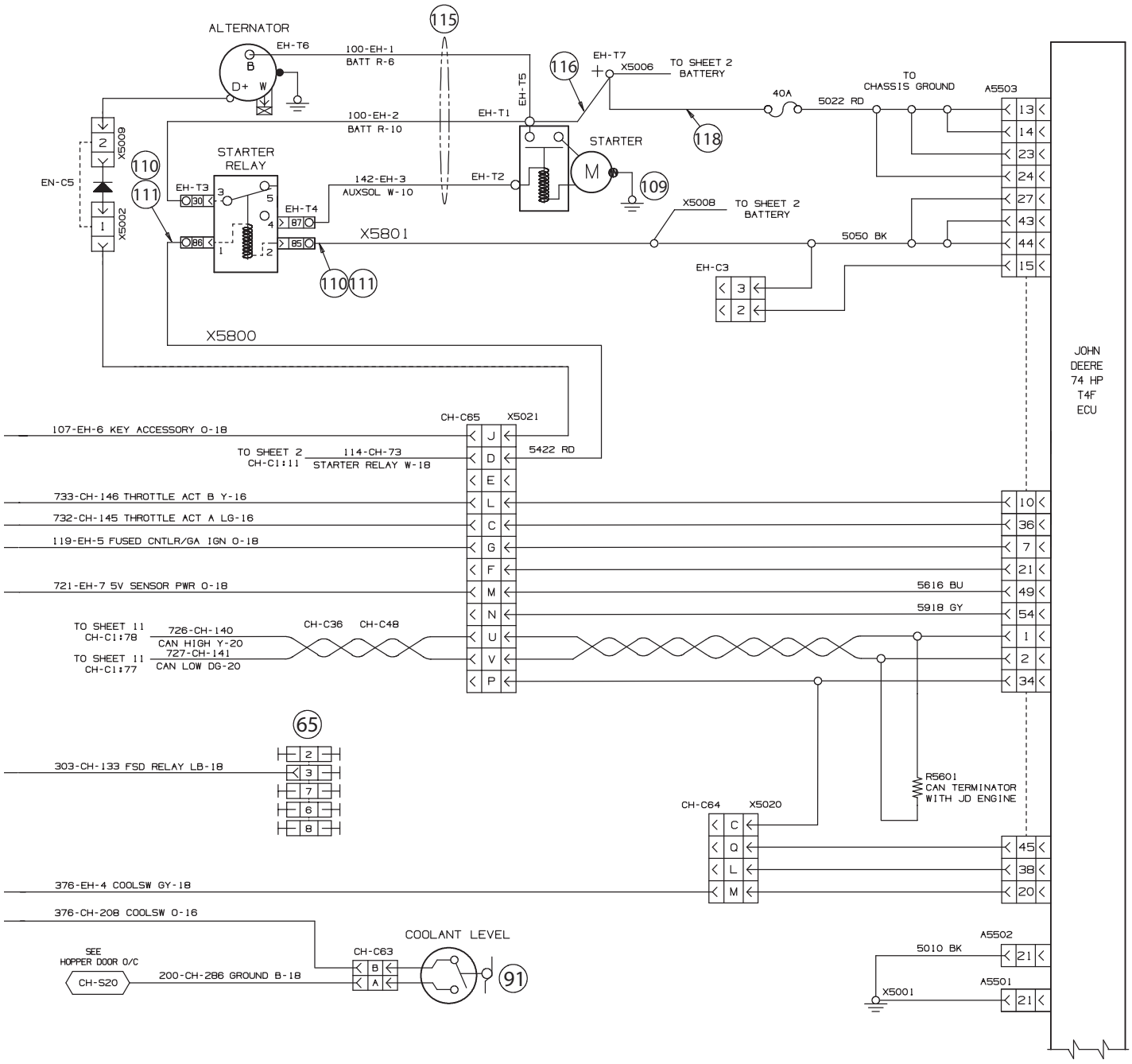


FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

SWITCHED POWER CM-C12

SWEEP POWER CM-C13


ALTERNATOR
EH-T6
100-EH-1
BATT R-6
100-EH-2
BATT R-10
EH-T5
EH-T1
115
116
EH-T7
X5006
TO SHEET 2
BATTERY
40A
5022 RD
TO
CHASSIS GROUND
A5503
STARTER
118
STARTER
RELAY
EN-C5
X5009
X5002
110
111
EH-T3
EH-T4
142-EH-3
AUXSOL W-10
EH-T2
109
X5008
TO SHEET 2
BATTERY
X5801
5050 BK
EH-C3
110
111
X5800
JOHN
DEERE
74 HP
T4F
ECU
CH-C65
X5021
107-EH-6 KEY ACCESSORY O-18
TO SHEET 2
CH-C1:11
114-CH-73
STARTER RELAY W-18
5422 RD
733-CH-146 THROTTLE ACT B Y-16
732-CH-145 THROTTLE ACT A LG-16
119-EH-5 FUSED CNTLR/GA IGN O-18
721-EH-7 5V SENSOR PWR O-18
5616 BU
5918 GY
TO SHEET 11
CH-C1:78
726-CH-140
CAN HIGH Y-20
TO SHEET 11
CH-C1:77
727-CH-141
CAN LOW DG-20
CH-C36
CH-C48
65
303-CH-133 FSD RELAY LB-18
R5601
CAN TERMINATOR
WITH JD ENGINE
CH-C64
X5020
376-EH-4 COOLSW GY-18
376-CH-208 COOLSW O-16
COOLANT LEVEL
SEE
HOPPER DOOR O/C
CH-S20
200-CH-286 GROUND B-18
CH-C63
91
A5502
5010 BK
A5501
X5001

SPLICES BY SHEET

TOTAL	CH-S1	CH-S4	CH-S7	CH-S8	CH-S9	CH-S10	CH-S11	CH-S12	CH-S13	CH-S14	CH-S15	CH-S16
SHT 2			1									
SHT 3	1	1								1		
SHT 4												
SHT 5					3	2						
SHT 6												
SHT 7				1				1				
SHT 8							2		2			
SHT 9			1				1		1	2		
SHT 10												
SHT 11												
SHT 12			1		1	1	1	1	1	1	1	1
SHT 13						1						
SHT 14												
SHT 15												

TOTAL	CM-S12	CM-S13	CM-S14	CM-S15	CM-S17	CM-S18	CM-S19	CM-S20	CM-S21	CM-S22	CM-S23	CM-S24
SHT 2						1						
SHT 3	1									1		
SHT 4											1	
SHT 5												
SHT 6												
SHT 7												
SHT 8		1	1	1	1							
SHT 9						1	1	1	1			
SHT 10				1								1
SHT 11												
SHT 12												
SHT 13												
SHT 14												
SHT 15												

TOTAL	CM-S56	CM-S57	CM-S62	CM-S63	CM-S68	CM-S69	CM-S70	CM-S71	CM-S76	CM-S81	CM-S82	CR-S1
SHT 2			1								1	
SHT 3		1	1				1			1		
SHT 4												1
SHT 5							1					
SHT 6	1		1	1	1		1					
SHT 7			1		2			1	1			
SHT 8			1									
SHT 9			1	1								
SHT 10				2	1							
SHT 11												
SHT 12			1	1	1	1	1					
SHT 13			1				1					
SHT 14			1									
SHT 15												

TOTAL	EL-S2	EH-S1	JP-S1	JP-S2	JP-S3	JP-S4	JP-S5	JP-S6	LC-S1	LC-S2	ML-S1	ML-S2
SHT 2												
SHT 3												
SHT 4	2									1	1	1
SHT 5			1	1								
SHT 6			1	1								
SHT 7												
SHT 8									1	1		
SHT 9										1		
SHT 10												
SHT 11			2	2	2	2	1	1				
SHT 12										1		
SHT 13		1										
SHT 14			1									
SHT 15			1									

TOTAL	EH-S2	EH-S3	WC-S1	WC-S2	WC-S3	WC-S4	WC-S5	CM-S3
SHT 2								
SHT 3								
SHT 4								
SHT 5								
SHT 6								
SHT 7								
SHT 8								
SHT 9								
SHT 10								
SHT 11								
SHT 12								
SHT 13								
SHT 14	1	1						1
SHT 15			1	1	1	1	1	
SHT 16								1

CH-S17	CH-S18	CH-S19	CH-S20	CH-S21	CM-S1	CM-S5	CM-S7	CM-S8	CM-S9	CM-S10	CM-S11	
												SHT 2
		2	1					1		1		SHT 3
												SHT4
												SHT 5
2	1		1									SHT 6
			1	1	1						1	SHT 7
												SHT 8
	1					1						SHT 9
												SHT 10
											1	SHT 11
1	1	1	1								1	SHT 12
									1			SHT 13
			1						1			SHT 14
												SHT-15

CM-S25	CM-S26	CM-S27	CM-S28	CM-S32	CM-S33	CM-S34	CM-S38	CM-S42	CM-S47	CM-S48	CM-S49	
												SHT 2
							1	1				SHT 3
												SHT 4
									1			SHT 5
					1							SHT 6
						1						SHT 7
			1								1	SHT 8
				1								SHT 9
1	1	1								1		SHT 10
												SHT 11
												SHT 12
												SHT 13
												SHT 14
												SHT-15

CR-S2	CR-S3	CR-S4	CR-S5	CR-S6	CR-S7	CR-S10	EC-S1	EC-S2	EC-S3	EC-S4	EL-S1	
												SHT 2
							1	2		1		SHT 3
3	4	1									2	SHT 4
								2	1			SHT 5
								2	1			SHT 6
												SHT 7
												SHT 8
												SHT 9
												SHT 10
												SHT 11
			1	1	1	1		1				SHT 12
												SHT 13
												SHT 14
												SHT-15

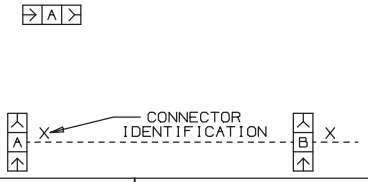
RC-S1	RC-S2	RC-S3	RF-S1	RF-S2	RF-S3	RF-S4	RF-S5	RF-S7	RF-S8	RF-S9		
												SHT 2
		1		1	1							SHT 3
			1									SHT 4
												SHT 5
	1											SHT 6
			1		1	1			1	1		SHT 7
1	1						3	2				SHT 8
	1						2	1				SHT 9
												SHT 10
												SHT 11
	1		1		1		1	1				SHT 12
												SHT 13
												SHT 14
												SHT 15

SCHEMATIC DIAGRAM LEGEND

CABLE COLOR ABBREVIATIONS

B = BLACK	LB = LIGHT BLUE
R = RED	DB = DARK BLUE
O = ORANGE	LG = LIGHT GREEN
Y = YELLOW	DG = DARK GREEN
W = WHITE	G = GRAY (SLATE)
P = PINK	BR = BROWN
V = VIOLET (PURPLE)	T = TAN

TERMINALS AND CONNECTORS



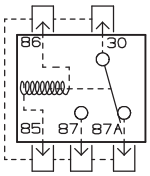
CABLE IDENTIFICATION

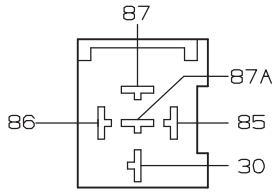
(363-IP-4 TACH) BR-18

HARNESS IDENTIFICATION CODES	
CODE	CABLE OR HARNESS
BC	BATTERY CABLE
CH	CHASSIS HARNESS
CM	CAB MAIN HARNESS
CR	CAB ROOF HARNESS
EC	ENGINE COVER
EN	ENGINE HARNESS
LC	LEFT CONSOLE HARNESS
RC	RIGHT CONSOLE HARNESS
RF	RIGHT FRAME HARNESS
EL	ROOF LIGHTING HARNESS

RELAY SYMBOLS AND SOCKETS

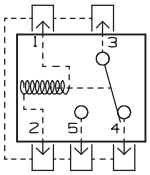
MINI RELAY

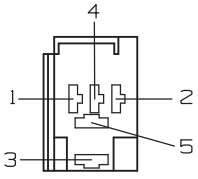




TOP VIEW OF SOCKET

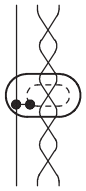
MICRO RELAY



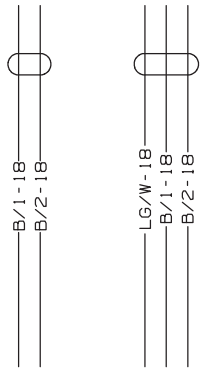


TOP VIEW OF SOCKET

TWISTED PAIR (WIRES TWISTED TOGETHER, ONE TWIST PER INCH)



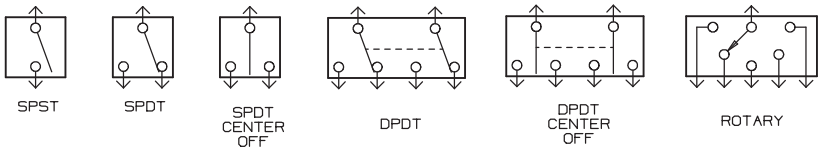
SHIELDED PAIR BELDEN 8790



TWO CONDUCTOR CABLE ALPHA 65802

THREE CONDUCTOR CABLE ALPHA 65803

SWITCH SYMBOLS (SHOWN WITH MAINTAINED CONTACTS)

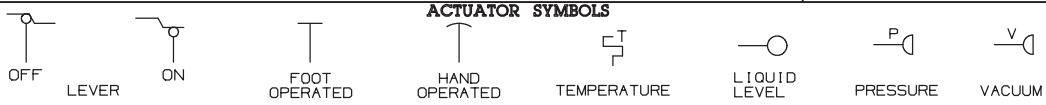


CONTACT ARRANGEMENT

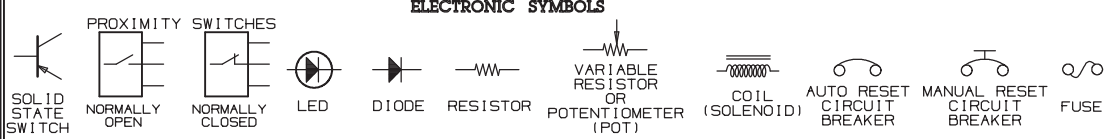
▷ MOMENTARY

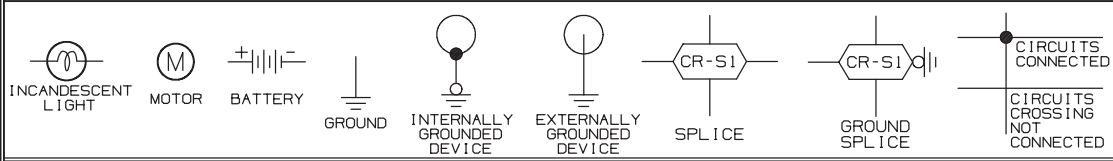
○ MAINTAINED

ACTUATOR SYMBOLS



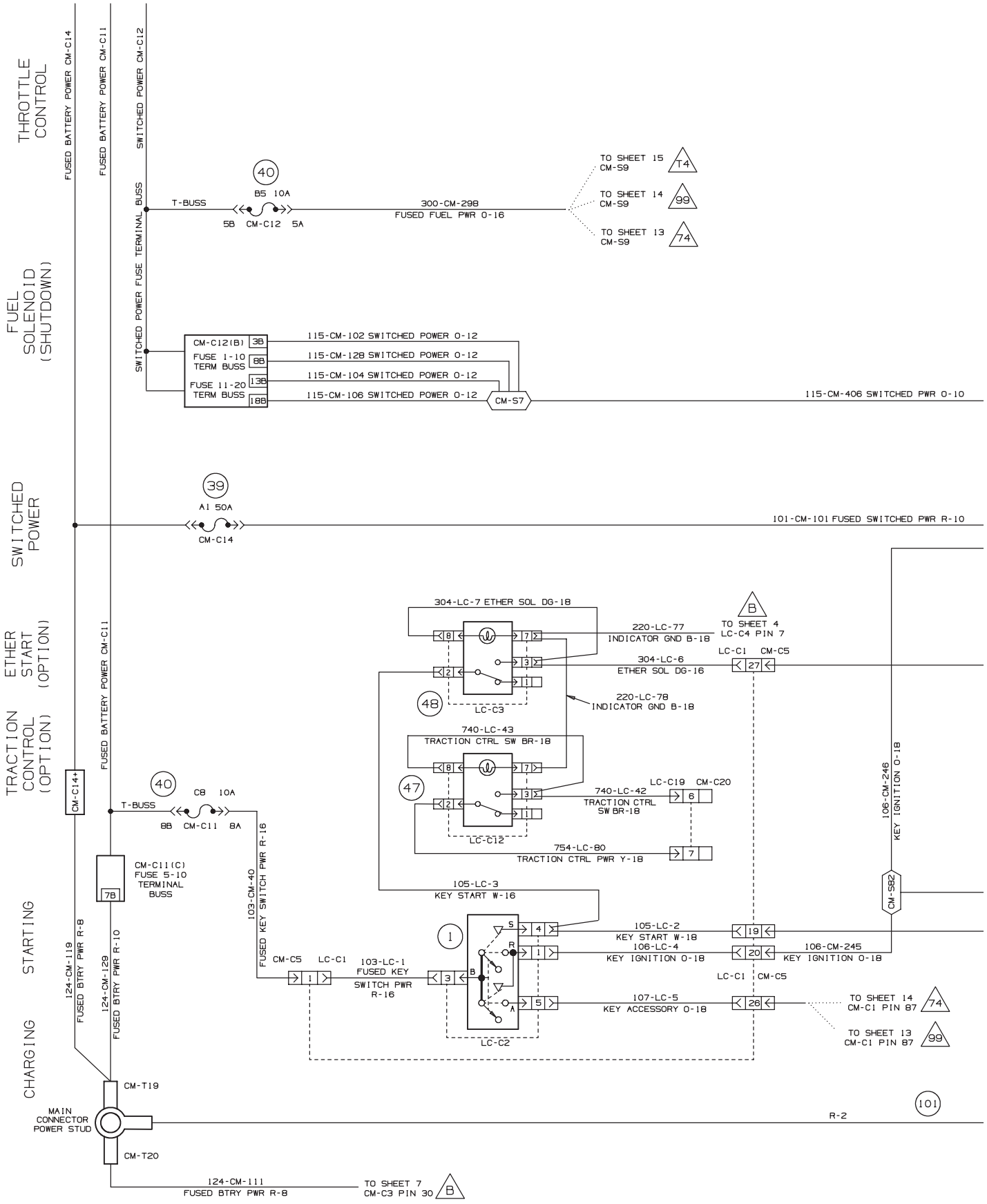
ELECTRONIC SYMBOLS



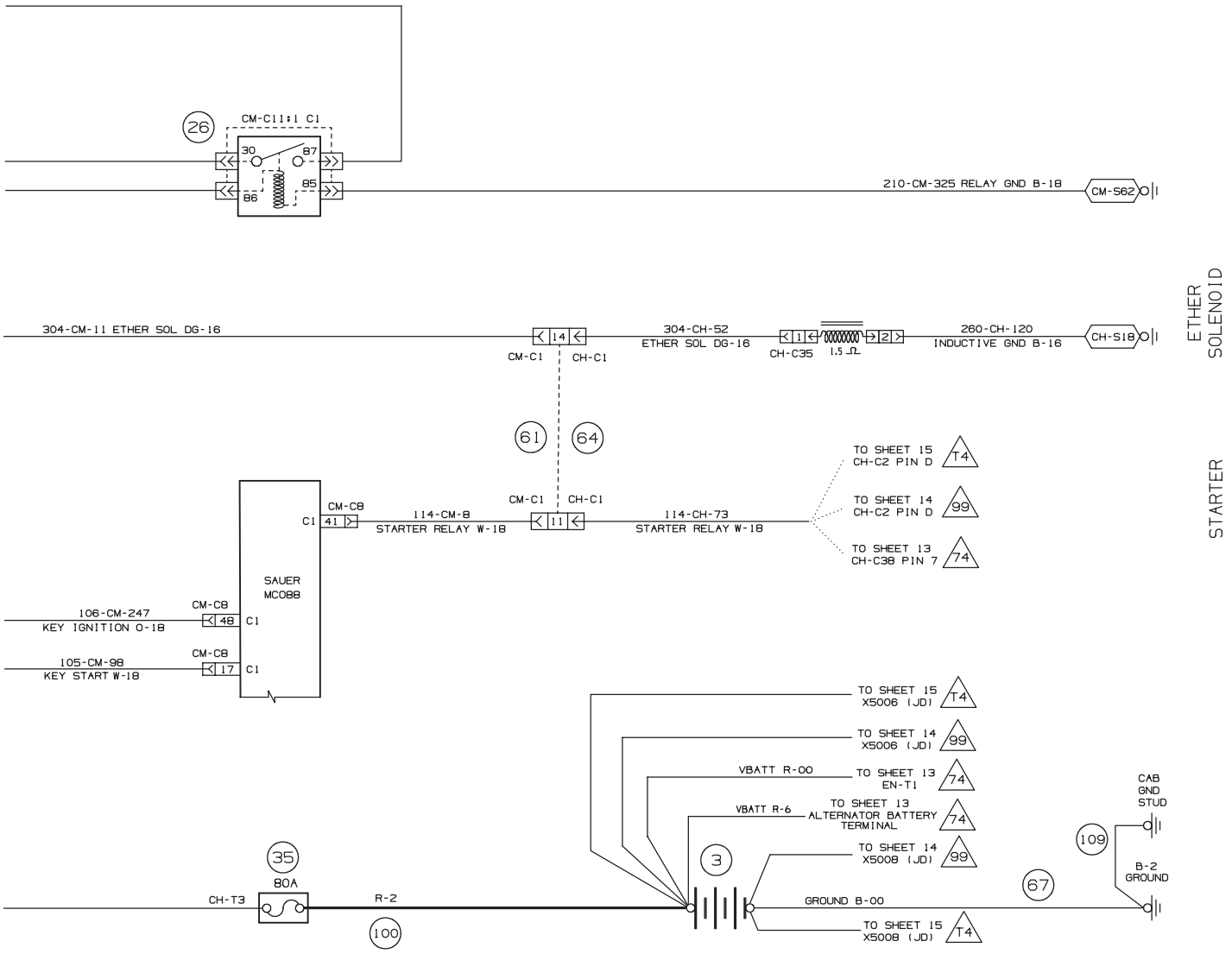


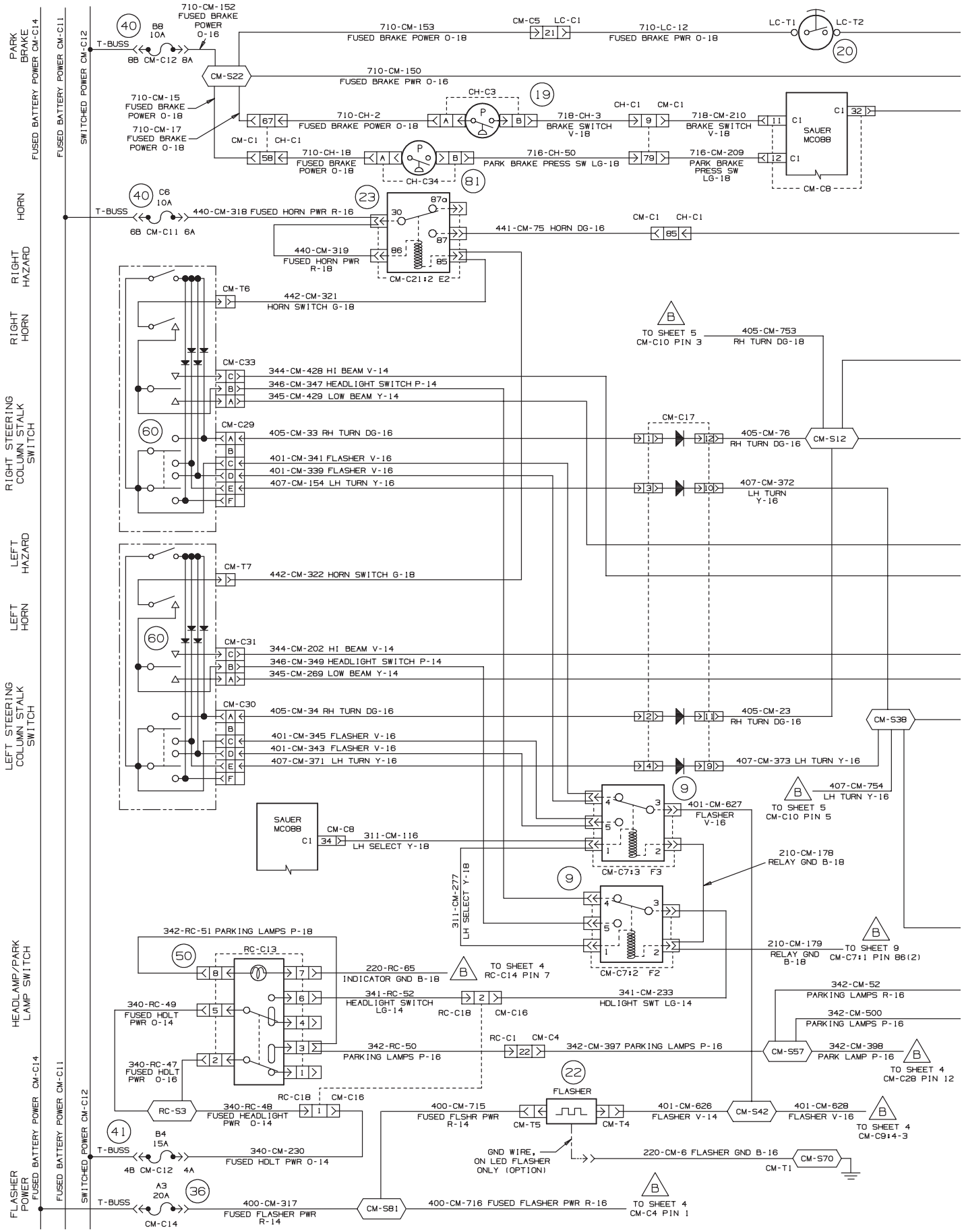
SCHEMATIC IS SHOWN WITH KEY SWITCH TURNED TO THE "OFF" POSITION AND PARK BRAKE SET TO THE "ON" POSITION

SHEET 1 OF 16

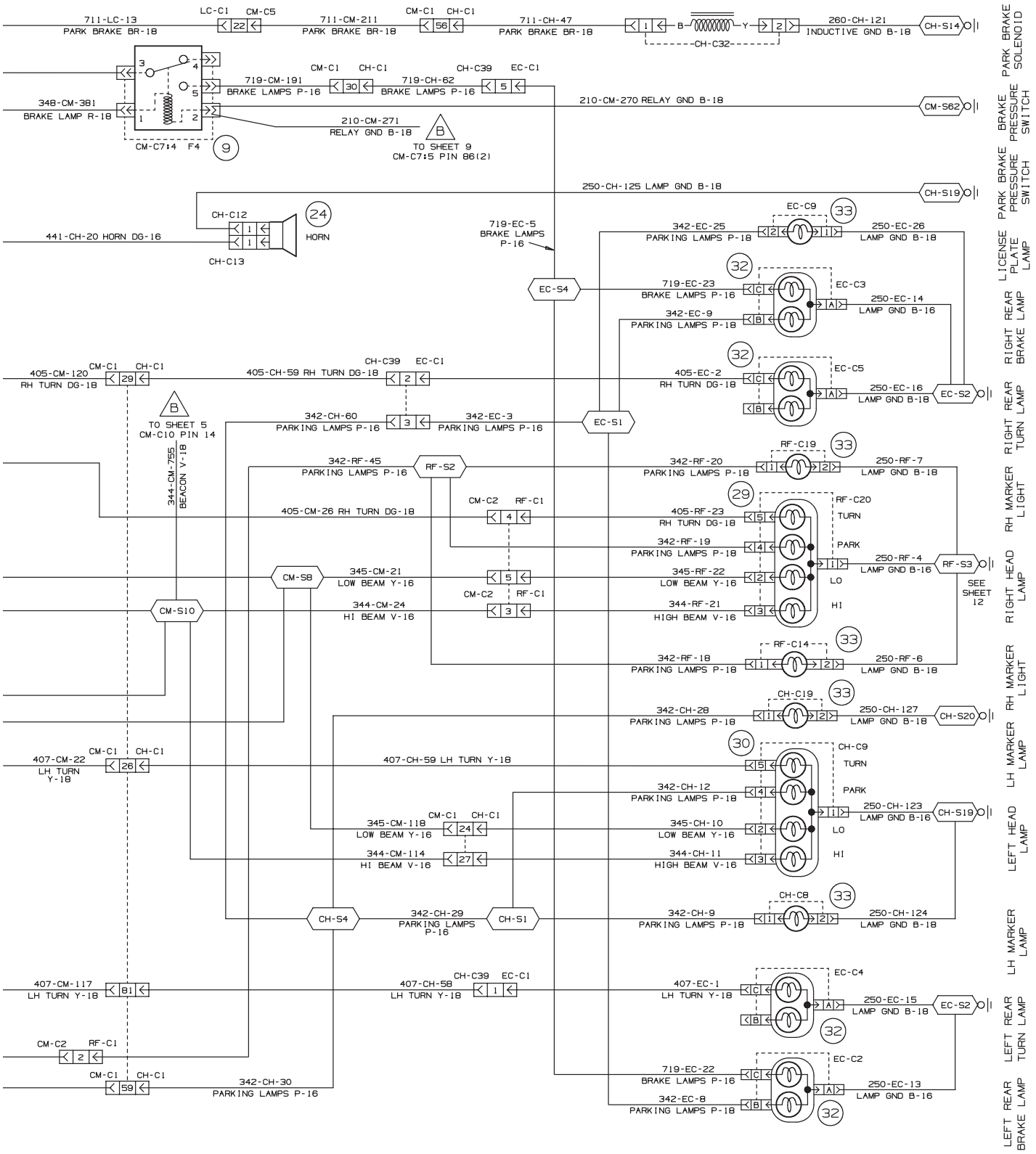

THROTTLE CONTROL
FUEL SOLENOID (SHUTDOWN)
SWITCHED POWER
ETHER START (OPTION)
TRACTION CONTROL (OPTION)
STARTING
CHARGING
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWITCHED POWER FUSE TERMINAL BUSS
40
B5 10A
T-BUSS
5B CM-C12 5A
300-CM-298
FUSED FUEL PWR O-16
TO SHEET 15 CM-S9 T4
TO SHEET 14 CM-S9 99
TO SHEET 13 CM-S9 74
CM-C12(B) 3B
FUSE 1-10 TERM BUSS 8B
FUSE 11-20 TERM BUSS 13B
18B
115-CM-102 SWITCHED POWER O-12
115-CM-128 SWITCHED POWER O-12
115-CM-104 SWITCHED POWER O-12
115-CM-106 SWITCHED POWER O-12
CM-S7
115-CM-406 SWITCHED PWR O-10
39
A1 50A
CM-C14
101-CM-101 FUSED SWITCHED PWR R-10
304-LC-7 ETHER SOL DG-18
220-LC-77
INDICATOR GND B-18
TO SHEET 4 LC-C4 PIN 7
LC-C1 CM-C5
304-LC-6
ETHER SOL DG-16
27
48
LC-C3
220-LC-78
INDICATOR GND B-18
740-LC-43
TRACTION CTRL SW BR-18
47
LC-C19 CM-C20
740-LC-42
TRACTION CTRL SW BR-18
6
LC-C12
754-LC-80
TRACTION CTRL PWR Y-18
7
106-CM-246
KEY IGNITION O-18
CM-S82
CM-C14+
40
C8 10A
T-BUSS
8B CM-C11 8A
CM-C11(C)
FUSE 5-10 TERMINAL BUSS
7B
103-CM-40
FUSED KEY SWITCH PWR R-16
105-LC-3
KEY START W-16
1
S
R
B
A
105-LC-2
KEY START W-18
106-LC-4
KEY IGNITION O-18
19
20
106-CM-245
KEY IGNITION O-18
LC-C1 CM-C5
107-LC-5
KEY ACCESSORY O-18
26
TO SHEET 14 CM-C1 PIN 87 74
TO SHEET 13 CM-C1 PIN 87 99
CM-C5 LC-C1
103-LC-1
FUSED KEY SWITCH PWR R-16
LC-C2
124-CM-119
FUSED BTRY PWR R-8
124-CM-129
FUSED BTRY PWR R-10
CM-T19
MAIN CONNECTOR POWER STUD
CM-T20
101
R-2
124-CM-111
FUSED BTRY PWR R-8
TO SHEET 7 CM-C3 PIN 30 B

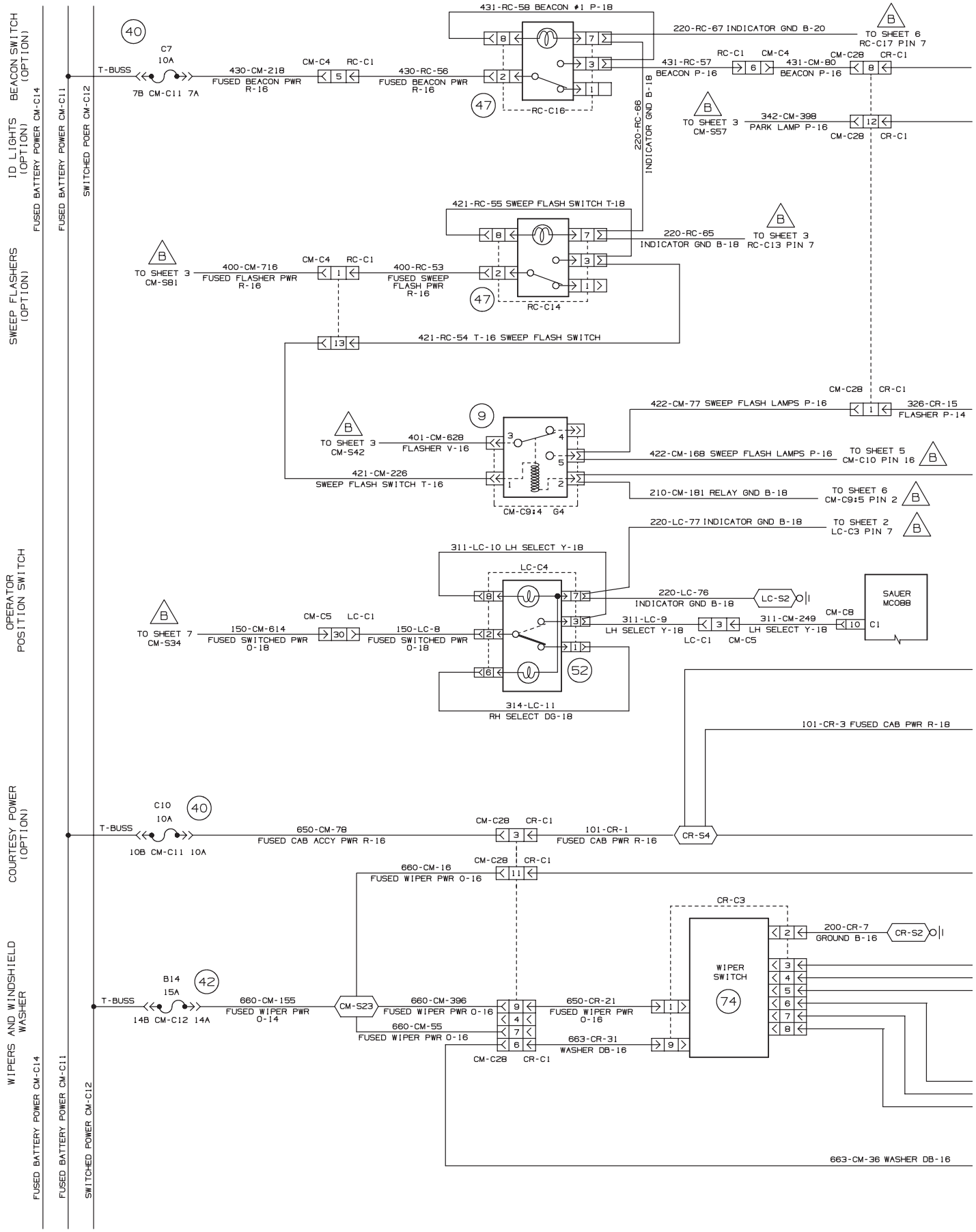
SHEET 2 OF 16


26
CM-C11#1 C1
30
87
85
86
210-CM-325 RELAY GND B-18
CM-S62
ETHER SOLENOID
304-CM-11 ETHER SOL DG-16
CM-C1
14
CH-C1
304-CH-52
ETHER SOL DG-16
CH-C35
1
2
1.5 Ω
260-CH-120
INDUCTIVE GND B-16
CH-S18
61
64
STARTER
TO SHEET 15
CH-C2 PIN D
T4
TO SHEET 14
CH-C2 PIN D
99
TO SHEET 13
CH-C38 PIN 7
74
CM-C8
C1
41
114-CM-8
STARTER RELAY W-18
CM-C1
CH-C1
11
114-CH-73
STARTER RELAY W-18
SAUER
MC088
106-CM-247
KEY IGNITION O-18
CM-C8
48
C1
105-CM-98
KEY START W-18
CM-C8
17
C1
TO SHEET 15
X5006 (JD)
T4
TO SHEET 14
X5006 (JD)
99
VBATT R-00
TO SHEET 13
EN-T1
74
VBATT R-6
TO SHEET 13
ALTERNATOR BATTERY
TERMINAL
74
TO SHEET 14
X5008 (JD)
99
CAB
GND
STUD
109
B-2
GROUND
67
3
35
80A
CH-T3
R-2
100
GROUND B-00
TO SHEET 15
X5008 (JD)
T4

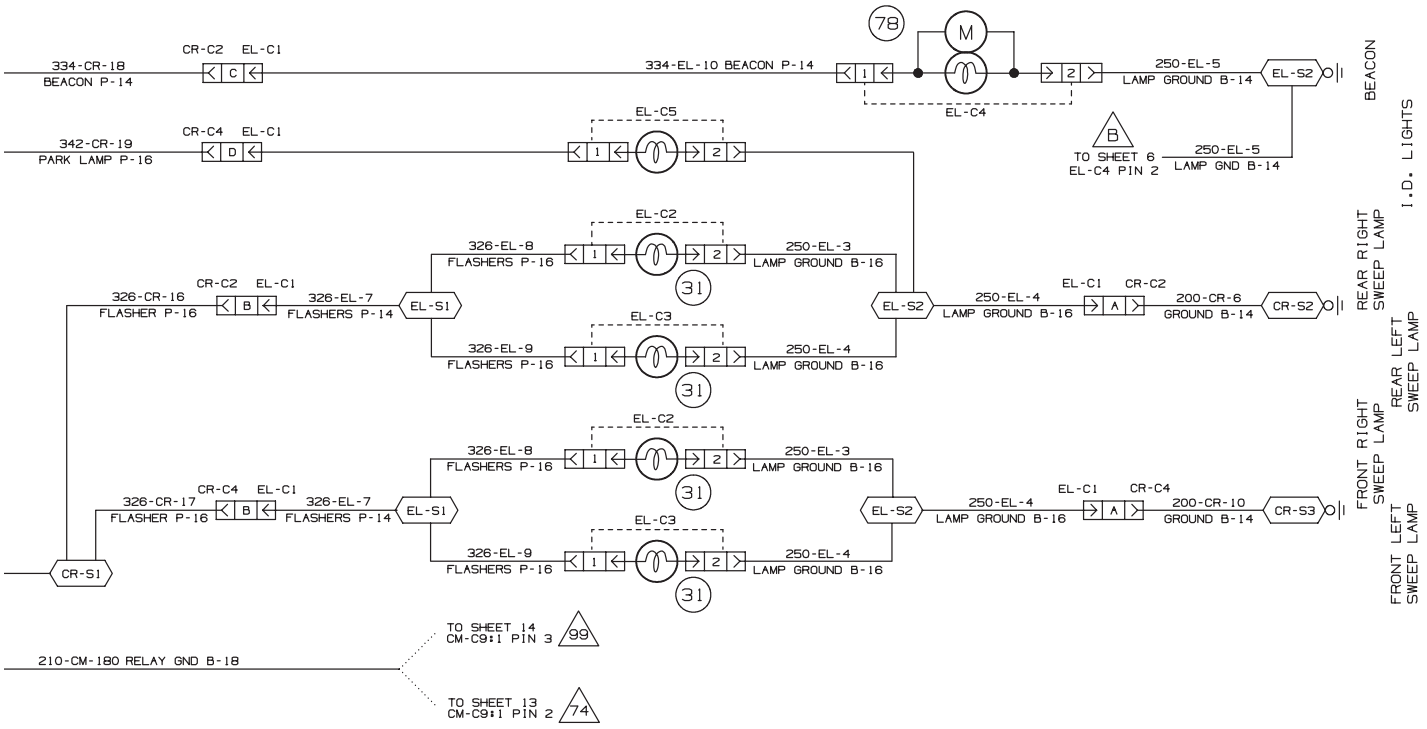

PARK BRAKE
FUSED BATTERY POWER CM-C14
SWITCHED POWER CM-C12
FUSED BATTERY POWER CM-C11
HORN
RIGHT HAZARD
RIGHT HORN
RIGHT STEERING COLUMN STALK SWITCH
LEFT HAZARD
LEFT HORN
LEFT STEERING COLUMN STALK SWITCH
HEADLAMP/PARK LAMP SWITCH
FLASHER POWER
T-BUSS
B8 10A
8B CM-C12 8A
710-CM-152 FUSED BRAKE POWER O-16
710-CM-153 FUSED BRAKE POWER O-18
CM-C5 LC-C1
710-LC-12 FUSED BRAKE PWR O-18
LC-T1 LC-T2
CM-S22
710-CM-150 FUSED BRAKE PWR O-16
710-CM-15 FUSED BRAKE POWER O-18
710-CM-17 FUSED BRAKE POWER O-18
CH-C3
710-CH-2 FUSED BRAKE POWER O-18
718-CH-3 BRAKE SWITCH V-18
718-CM-210 BRAKE SWITCH V-18
SAUER MC088
710-CH-18 FUSED BRAKE POWER O-18
CH-C34
716-CH-50 PARK BRAKE PRESS SW LG-18
716-CM-209 PARK BRAKE PRESS SW LG-18
CM-C8
C6 10A
6B CM-C11 6A
440-CM-318 FUSED HORN PWR R-16
441-CM-75 HORN DG-16
440-CM-319 FUSED HORN PWR R-18
CM-C21:2 E2
CM-T6
442-CM-321 HORN SWITCH G-18
CM-T7
442-CM-322 HORN SWITCH G-18
CM-C33
344-CM-428 HI BEAM V-14
346-CM-347 HEADLIGHT SWITCH P-14
345-CM-429 LOW BEAM Y-14
CM-C29
405-CM-33 RH TURN DG-16
401-CM-341 FLASHER V-16
401-CM-339 FLASHER V-16
407-CM-154 LH TURN Y-16
CM-C31
344-CM-202 HI BEAM V-14
346-CM-349 HEADLIGHT SWITCH P-14
345-CM-269 LOW BEAM Y-14
CM-C30
405-CM-34 RH TURN DG-16
401-CM-345 FLASHER V-16
401-CM-343 FLASHER V-16
407-CM-371 LH TURN Y-16
TO SHEET 5 CM-C10 PIN 3
405-CM-753 RH TURN DG-18
CM-C17
405-CM-76 RH TURN DG-16
CM-S12
407-CM-372 LH TURN Y-16
405-CM-23 RH TURN DG-16
CM-S38
407-CM-373 LH TURN Y-16
407-CM-754 LH TURN Y-16
TO SHEET 5 CM-C10 PIN 5
401-CM-627 FLASHER V-16
CM-C7:3 F3
SAUER MC088
CM-C8
311-CM-116 LH SELECT Y-18
311-CM-277 LH SELECT Y-18
210-CM-178 RELAY GND B-18
CM-C7:2 F2
210-CM-179 RELAY GND B-18
TO SHEET 9 CM-C7:1 PIN 86(2)
342-RC-51 PARKING LAMPS P-18
RC-C13
220-RC-65 INDICATOR GND B-18
TO SHEET 4 RC-C14 PIN 7
340-RC-49 FUSED HDLT PWR O-14
341-RC-52 HEADLIGHT SWITCH LG-14
RC-C18
CM-C16
341-CM-233 HDLIGHT SWT LG-14
342-CM-52 PARKING LAMPS R-16
342-CM-500 PARKING LAMPS P-16
340-RC-47 FUSED HDLT PWR O-16
342-RC-50 PARKING LAMPS P-16
RC-C1 CM-C4
342-CM-397 PARKING LAMPS P-16
CM-S57
342-CM-398 PARK LAMP P-16
TO SHEET 4 CM-C28 PIN 12
RC-S3
340-RC-48 FUSED HEADLIGHT PWR O-14
FLASHER
400-CM-715 FUSED FLSHR PWR R-14
CM-T5
CM-T4
401-CM-626 FLASHER V-14
CM-S42
401-CM-628 FLASHER V-16
TO SHEET 4 CM-C9:4-3
B4 15A
4B CM-C12 4A
340-CM-230 FUSED HDLT PWR O-14
GND WIRE, ON LED FLASHER ONLY (OPTION)
220-CM-6 FLASHER GND B-16
CM-S70
CM-T1
A3 20A
CM-C14
400-CM-317 FUSED FLASHER PWR R-14
CM-S81
400-CM-716 FUSED FLASHER PWR R-16
TO SHEET 4 CM-C4 PIN 1

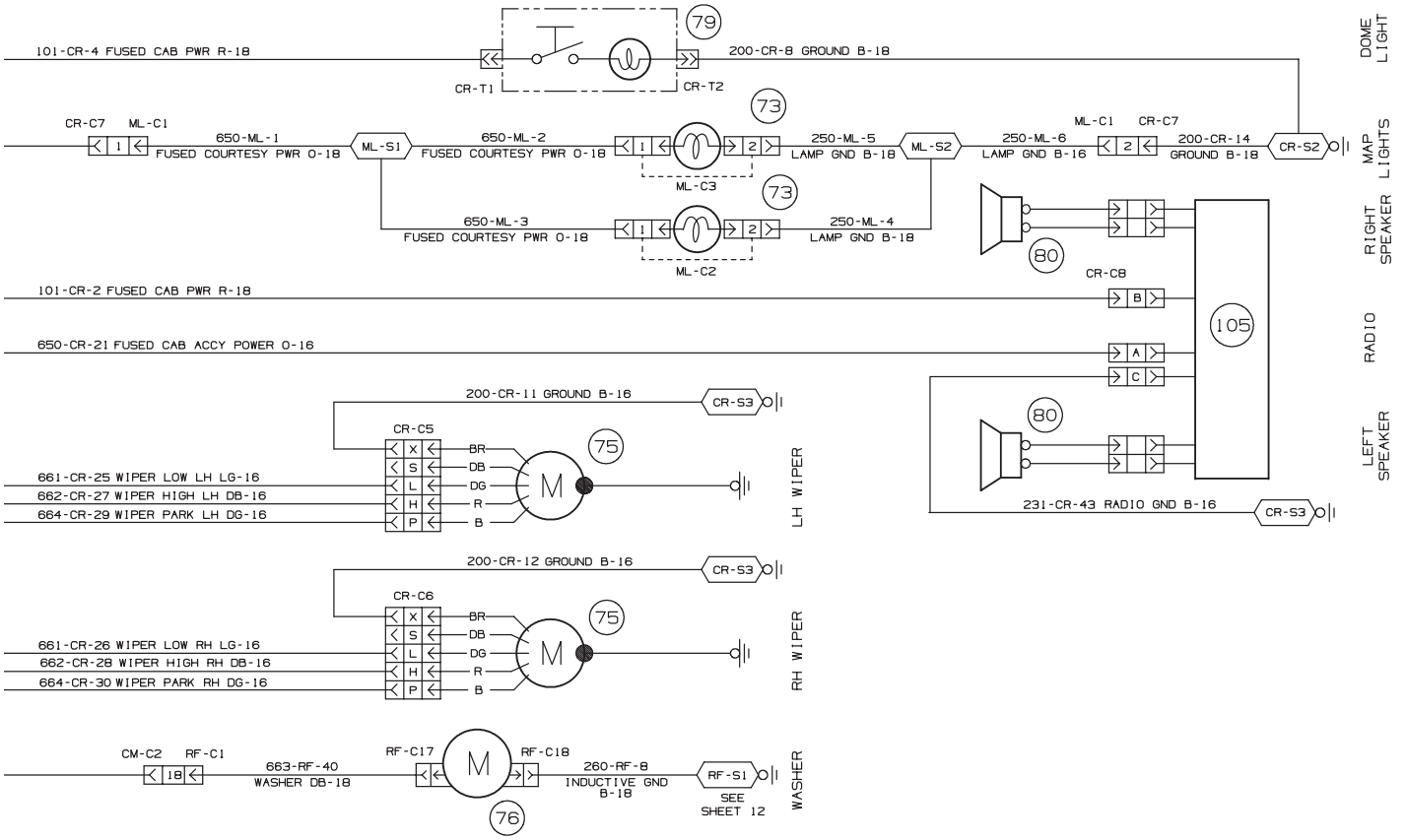
SHEET 3 OF 16

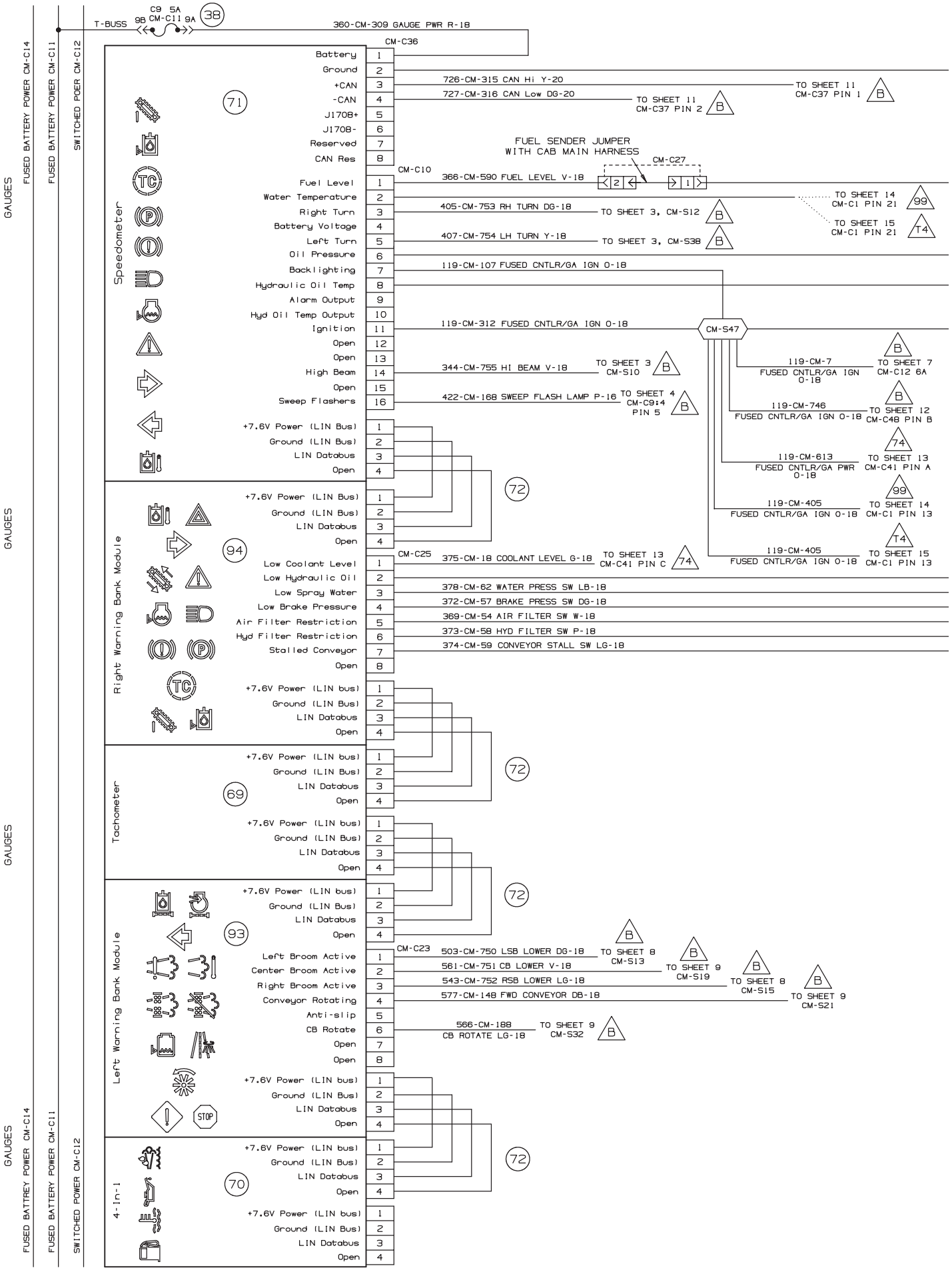

711-LC-13
PARK BRAKE BR-18
LC-C1
CM-C5
22
711-CM-211
PARK BRAKE BR-18
CM-C1
CH-C1
56
711-CH-47
PARK BRAKE BR-18
1
B
Y
2
260-CH-121
INDUCTIVE GND B-18
CH-S14
PARK BRAKE SOLENOID
CH-C32
3
4
5
1
2
348-CM-381
BRAKE LAMP R-18
CM-C1
CH-C1
719-CM-191
BRAKE LAMPS P-16
30
CH-C39
EC-C1
719-CH-62
BRAKE LAMPS P-16
5
210-CM-270 RELAY GND B-18
CM-S62
BRAKE PRESSURE SWITCH
210-CM-271
RELAY GND B-18
B
TO SHEET 9
CM-C7:5 PIN 86(2)
CM-C7:4 F4
9
250-CH-125 LAMP GND B-18
CH-S19
PARK BRAKE PRESSURE SWITCH
CH-C12
24
441-CH-20 HORN DG-16
HORN
CH-C13
719-EC-5
BRAKE LAMPS
P-16
EC-C9
33
342-EC-25
PARKING LAMPS P-18
250-EC-26
LAMP GND B-18
LICENSE PLATE LAMP
32
EC-S4
719-EC-23
BRAKE LAMPS P-16
EC-C3
250-EC-14
LAMP GND B-16
342-EC-9
PARKING LAMPS P-18
RIGHT REAR BRAKE LAMP
405-CM-120
RH TURN DG-18
CM-C1
CH-C1
29
CH-C39
EC-C1
405-CH-59 RH TURN DG-18
2
405-EC-2
RH TURN DG-18
EC-C5
250-EC-16
LAMP GND B-18
EC-S2
RIGHT REAR TURN LAMP
B
TO SHEET 5
CM-C10 PIN 14
342-CH-60
PARKING LAMPS P-16
3
342-EC-3
PARKING LAMPS P-16
EC-S1
344-CM-755
BEACON V-18
342-RF-45
PARKING LAMPS P-16
RF-S2
RF-C19
342-RF-20
PARKING LAMPS P-18
250-RF-7
LAMP GND B-18
RH MARKER LIGHT
CM-C2
RF-C1
405-CM-26 RH TURN DG-18
4
29
RF-C20
405-RF-23
RH TURN DG-18
TURN
342-RF-19
PARKING LAMPS P-18
PARK
CM-S8
345-CM-21
LOW BEAM Y-16
5
250-RF-4
LAMP GND B-16
RF-S3
LO
345-RF-22
LOW BEAM Y-16
SEE SHEET 12
CM-C2
RF-C1
CM-S10
344-CM-24
HI BEAM V-16
3
344-RF-21
HIGH BEAM V-16
HI
RH HEAD LAMP
RF-C14
33
342-RF-18
PARKING LAMPS P-18
250-RF-6
LAMP GND B-18
RH MARKER LIGHT
CH-C19
33
342-CH-28
PARKING LAMPS P-18
250-CH-127
LAMP GND B-18
CH-S20
LH MARKER LAMP
CM-C1
CH-C1
407-CM-22
LH TURN
Y-18
26
407-CH-59 LH TURN Y-18
30
CH-C9
TURN
342-CH-12
PARKING LAMPS P-18
PARK
250-CH-123
LAMP GND B-16
CH-S19
345-CM-118
LOW BEAM Y-16
CM-C1
CH-C1
24
345-CH-10
LOW BEAM Y-16
LO
344-CM-114
HI BEAM V-16
27
344-CH-11
HIGH BEAM V-16
HI
LEFT HEAD LAMP
CH-C8
33
CH-S4
342-CH-29
PARKING LAMPS
P-16
CH-S1
342-CH-9
PARKING LAMPS P-18
250-CH-124
LAMP GND B-18
LH MARKER LAMP
407-CM-117
LH TURN Y-18
81
CH-C39
EC-C1
407-CH-58
LH TURN Y-18
1
EC-C4
407-EC-1
LH TURN Y-18
250-EC-15
LAMP GND B-18
EC-S2
LEFT REAR TURN LAMP
32
CM-C2
RF-C1
2
EC-C2
CM-C1
CH-C1
59
342-CH-30
PARKING LAMPS P-16
719-EC-22
BRAKE LAMPS P-16
250-EC-13
LAMP GND B-16
342-EC-8
PARKING LAMPS P-18
LEFT REAR BRAKE LAMP


BEACON SWITCH (OPTION)
ID LIGHTS (OPTION)
SWEEP FLASHERS (OPTION)
OPERATOR POSITION SWITCH
COURTESY POWER (OPTION)
WIPERS AND WINDSHIELD WASHER
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POER CM-C12
SWITCHED POWER CM-C12
431-RC-58 BEACON #1 P-18
220-RC-67 INDICATOR GND B-20
TO SHEET 6 RC-C17 PIN 7
C7 10A
T-BUSS
7B CM-C11 7A
430-CM-218 FUSED BEACON PWR R-16
CM-C4 RC-C1
430-RC-56 FUSED BEACON PWR R-16
RC-C16
431-RC-57 BEACON P-16
RC-C1 CM-C4
431-CM-80 BEACON P-16
CM-C28 CR-C1
220-RC-66 INDICATOR GND B-18
TO SHEET 3 CM-S57
342-CM-398 PARK LAMP P-16
421-RC-55 SWEEP FLASH SWITCH T-18
220-RC-65 INDICATOR GND B-18
TO SHEET 3 RC-C13 PIN 7
TO SHEET 3 CM-S81
400-CM-716 FUSED FLASHER PWR R-16
400-RC-53 FUSED SWEEP FLASH PWR R-16
RC-C14
421-RC-54 T-16 SWEEP FLASH SWITCH
422-CM-77 SWEEP FLASH LAMPS P-16
326-CR-15 FLASHER P-14
TO SHEET 3 CM-S42
401-CM-628 FLASHER V-16
422-CM-168 SWEEP FLASH LAMPS P-16
TO SHEET 5 CM-C10 PIN 16
421-CM-226 SWEEP FLASH SWITCH T-16
210-CM-181 RELAY GND B-18
TO SHEET 6 CM-C9:5 PIN 2
CM-C9:4 G4
220-LC-77 INDICATOR GND B-18
TO SHEET 2 LC-C3 PIN 7
311-LC-10 LH SELECT Y-18
LC-C4
220-LC-76 INDICATOR GND B-18
LC-S2
SAUER MC088
CM-C8
TO SHEET 7 CM-S34
150-CM-614 FUSED SWITCHED PWR O-18
CM-C5 LC-C1
150-LC-8 FUSED SWITCHED PWR O-18
311-LC-9 LH SELECT Y-18
311-CM-249 LH SELECT Y-18
LC-C1 CM-C5
314-LC-11 RH SELECT DG-18
101-CR-3 FUSED CAB PWR R-18
C10 10A
T-BUSS
10B CM-C11 10A
650-CM-78 FUSED CAB ACCY PWR R-16
CM-C28 CR-C1
101-CR-1 FUSED CAB PWR R-16
CR-S4
660-CM-16 FUSED WIPER PWR O-16
CR-C3
200-CR-7 GROUND B-16
CR-S2
WIPER SWITCH
B14 15A
T-BUSS
14B CM-C12 14A
660-CM-155 FUSED WIPER PWR O-14
CM-S23
660-CM-396 FUSED WIPER PWR O-16
660-CM-55 FUSED WIPER PWR O-16
650-CR-21 FUSED WIPER PWR O-16
663-CR-31 WASHER DB-16
663-CM-36 WASHER DB-16

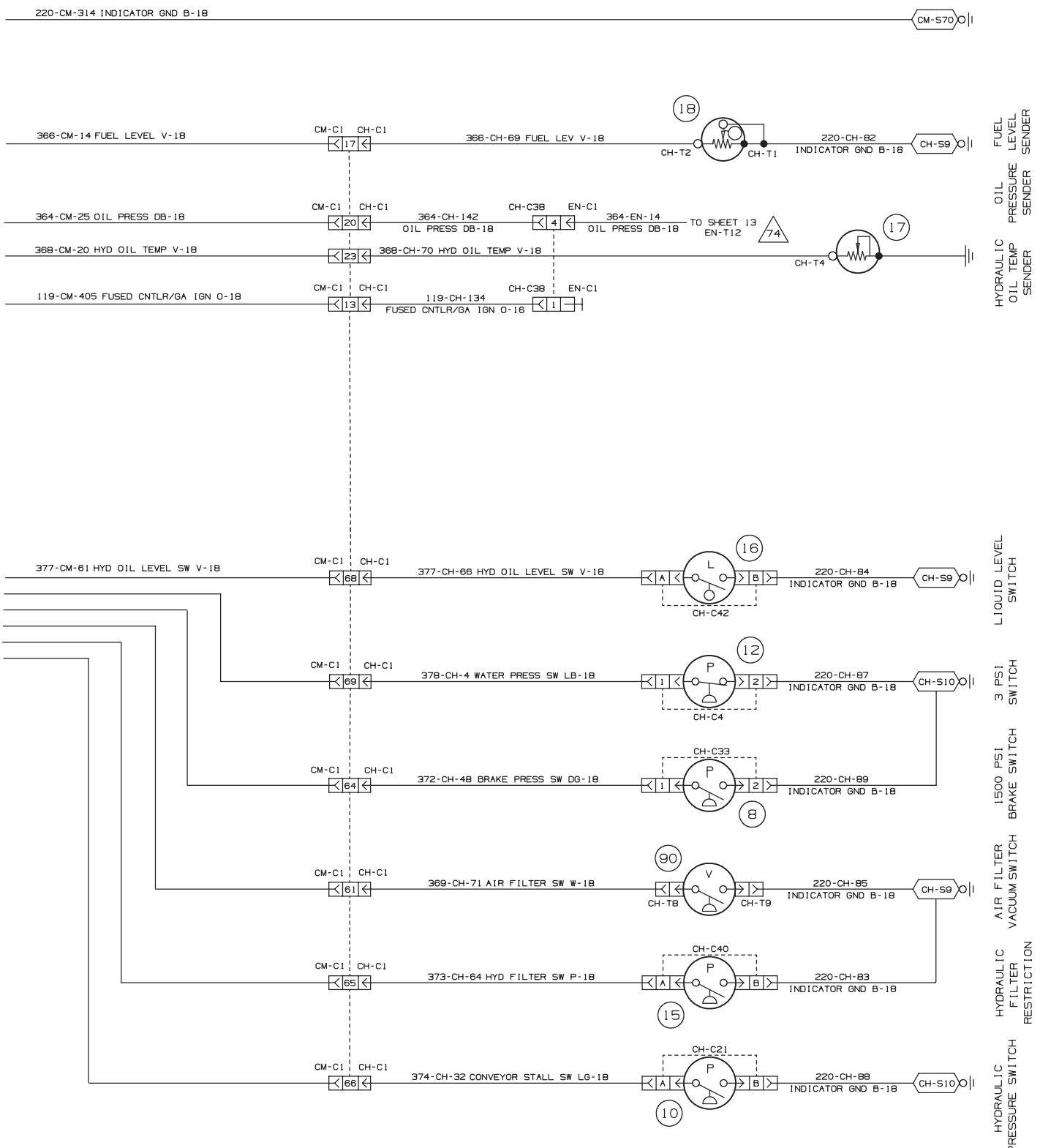
SHEET 4 OF 16

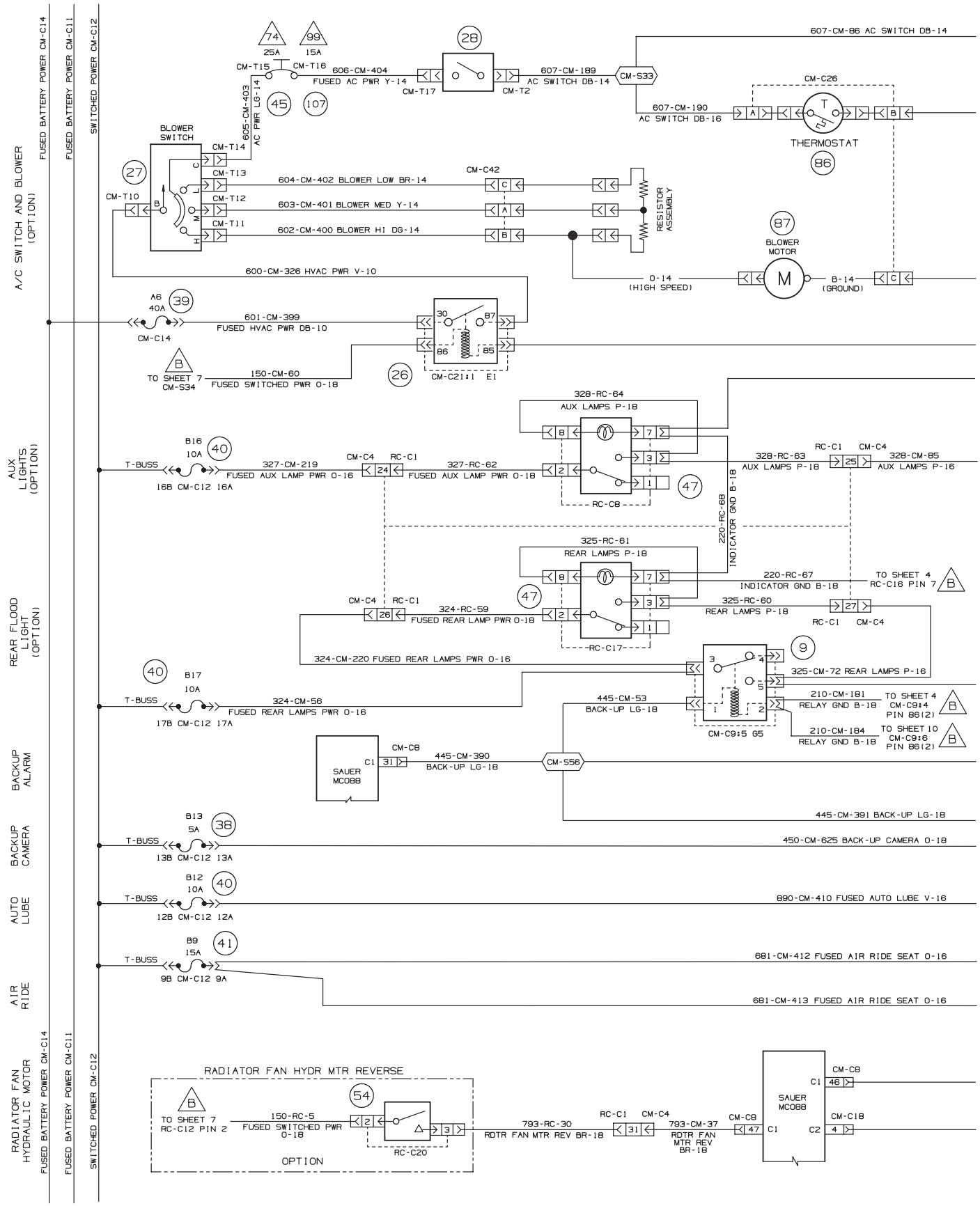

78
M
334-CR-18
BEACON P-14
CR-C2 EL-C1
334-EL-10 BEACON P-14
EL-C4
250-EL-5
LAMP GROUND B-14
EL-S2
BEACON
342-CR-19
PARK LAMP P-16
CR-C4 EL-C1
EL-C5
B
TO SHEET 6
EL-C4 PIN 2
250-EL-5
LAMP GND B-14
I.D. LIGHTS
EL-C2
326-EL-8
FLASHERS P-16
250-EL-3
LAMP GROUND B-16
31
326-CR-16
FLASHER P-16
CR-C2 EL-C1
326-EL-7
FLASHERS P-14
EL-S1
EL-S2
250-EL-4
LAMP GROUND B-16
EL-C1 CR-C2
200-CR-6
GROUND B-14
CR-S2
REAR RIGHT
SWEEP LAMP
EL-C3
326-EL-9
FLASHERS P-16
250-EL-4
LAMP GROUND B-16
31
REAR LEFT
SWEEP LAMP
EL-C2
326-EL-8
FLASHERS P-16
250-EL-3
LAMP GROUND B-16
31
326-CR-17
FLASHER P-16
CR-C4 EL-C1
326-EL-7
FLASHERS P-14
EL-S1
EL-S2
250-EL-4
LAMP GROUND B-16
EL-C1 CR-C4
200-CR-10
GROUND B-14
CR-S3
FRONT RIGHT
SWEEP LAMP
EL-C3
326-EL-9
FLASHERS P-16
250-EL-4
LAMP GROUND B-16
31
FRONT LEFT
SWEEP LAMP
CR-S1
TO SHEET 14
CM-C9:1 PIN 3
99
210-CM-180 RELAY GND B-18
TO SHEET 13
CM-C9:1 PIN 2
74


79
101-CR-4 FUSED CAB PWR R-18
200-CR-8 GROUND B-18
DOME
LIGHT
CR-T1
CR-T2
73
CR-C7 ML-C1
650-ML-1
FUSED COURTESY PWR O-18
ML-S1
650-ML-2
FUSED COURTESY PWR O-18
250-ML-5
LAMP GND B-18
ML-S2
250-ML-6
LAMP GND B-16
ML-C1 CR-C7
200-CR-14
GROUND B-18
CR-S2
MAP
LIGHTS
ML-C3
73
650-ML-3
FUSED COURTESY PWR O-18
250-ML-4
LAMP GND B-18
ML-C2
80
RIGHT
SPEAKER
CR-C8
101-CR-2 FUSED CAB PWR R-18
105
650-CR-21 FUSED CAB ACCY POWER O-16
RADIO
200-CR-11 GROUND B-16
CR-S3
CR-C5
75
661-CR-25 WIPER LOW LH LG-16
662-CR-27 WIPER HIGH LH DB-16
664-CR-29 WIPER PARK LH DG-16
LH WIPER
80
LEFT
SPEAKER
231-CR-43 RADIO GND B-16
CR-S3
200-CR-12 GROUND B-16
CR-S3
CR-C6
75
661-CR-26 WIPER LOW RH LG-16
662-CR-28 WIPER HIGH RH DB-16
664-CR-30 WIPER PARK RH DG-16
RH WIPER
CM-C2 RF-C1
663-RF-40
WASHER DB-18
RF-C17
RF-C18
260-RF-8
INDUCTIVE GND
B-18
RF-S1
SEE
SHEET 12
76
WASHER

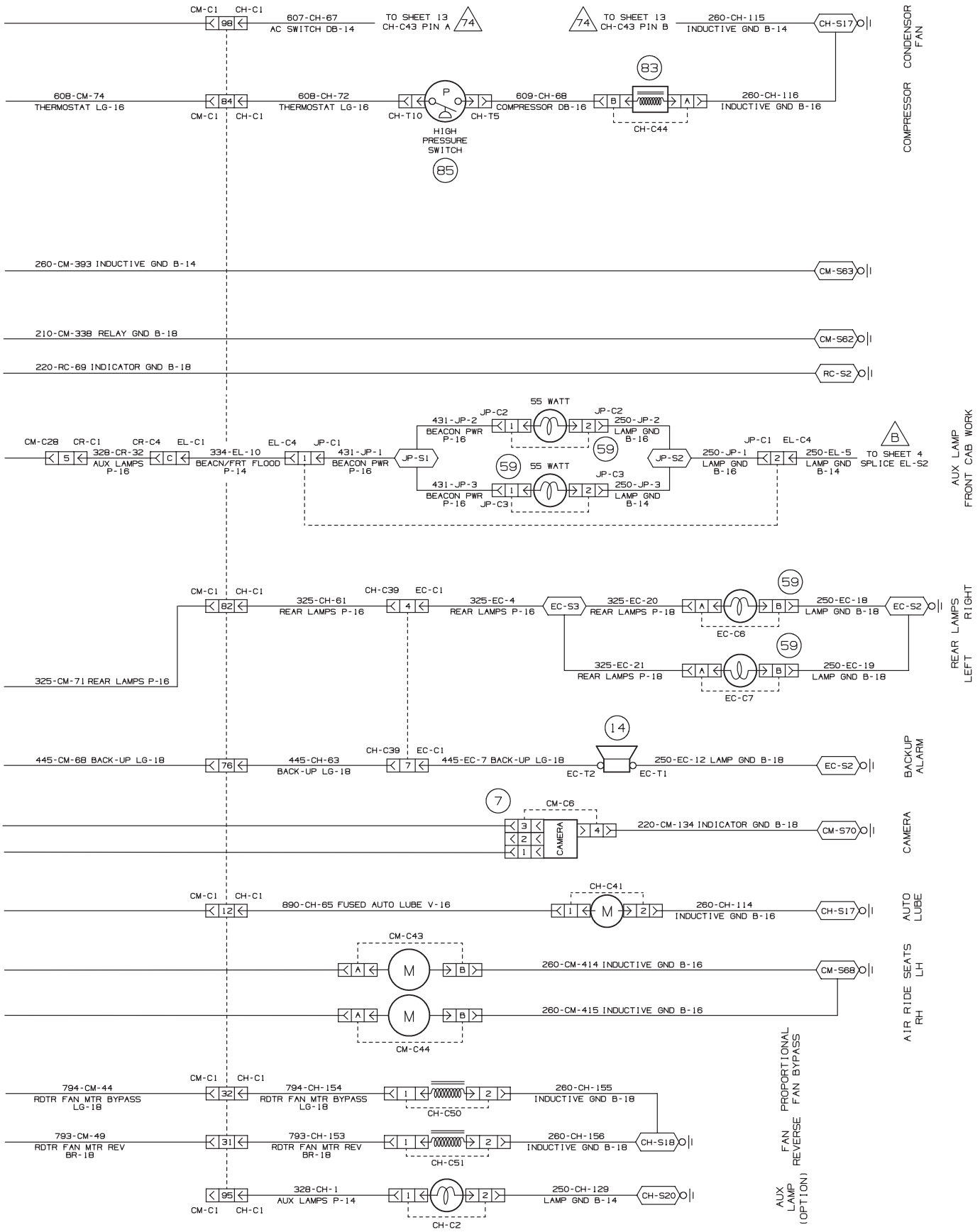

GAUGES
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POER CM-C12
T-BUSS
C9 5A
9B CM-C11 9A
38
360-CM-309 GAUGE PWR R-18
CM-C36
Speedometer
71
Battery
Ground
+CAN
-CAN
J1708+
J1708-
Reserved
CAN Res
Fuel Level
Water Temperature
Right Turn
Battery Voltage
Left Turn
Oil Pressure
Backlighting
Hydraulic Oil Temp
Alarm Output
Hyd Oil Temp Output
Ignition
Open
Open
High Beam
Open
Sweep Flashers
+7.6V Power (LIN Bus)
Ground (LIN Bus)
LIN Databus
Open
726-CM-315 CAN Hi Y-20
TO SHEET 11
CM-C37 PIN 1
727-CM-316 CAN Low DG-20
TO SHEET 11
CM-C37 PIN 2
FUEL SENDER JUMPER
WITH CAB MAIN HARNESS
CM-C27
CM-C10
366-CM-590 FUEL LEVEL V-18
TO SHEET 14
CM-C1 PIN 21
99
TO SHEET 15
CM-C1 PIN 21
T4
405-CM-753 RH TURN DG-18
TO SHEET 3, CM-S12
407-CM-754 LH TURN Y-18
TO SHEET 3, CM-S38
119-CM-107 FUSED CNTLR/GA IGN O-18
119-CM-312 FUSED CNTLR/GA IGN O-18
CM-S47
344-CM-755 HI BEAM V-18
TO SHEET 3
CM-S10
422-CM-168 SWEEP FLASH LAMP P-16
TO SHEET 4
CM-C9:4
PIN 5
119-CM-7
FUSED CNTLR/GA IGN
O-18
TO SHEET 7
CM-C12 6A
119-CM-746
FUSED CNTLR/GA IGN O-18
TO SHEET 12
CM-C48 PIN B
74
119-CM-613
FUSED CNTLR/GA PWR
O-18
TO SHEET 13
CM-C41 PIN A
99
119-CM-405
FUSED CNTLR/GA IGN O-18
TO SHEET 14
CM-C1 PIN 13
T4
119-CM-405
FUSED CNTLR/GA IGN O-18
TO SHEET 15
CM-C1 PIN 13
72
Right Warning Bank Module
94
+7.6V Power (LIN Bus)
Ground (LIN Bus)
LIN Databus
Open
Low Coolant Level
Low Hydraulic Oil
Low Spray Water
Low Brake Pressure
Air Filter Restriction
Hyd Filter Restriction
Stalled Conveyor
Open
+7.6V Power (LIN bus)
Ground (LIN Bus)
LIN Databus
Open
CM-C25
375-CM-18 COOLANT LEVEL G-18
TO SHEET 13
CM-C41 PIN C
74
378-CM-62 WATER PRESS SW LB-18
372-CM-57 BRAKE PRESS SW DG-18
369-CM-54 AIR FILTER SW W-18
373-CM-58 HYD FILTER SW P-18
374-CM-59 CONVEYOR STALL SW LG-18
Tachometer
69
+7.6V Power (LIN bus)
Ground (LIN Bus)
LIN Databus
Open
Left Warning Bank Module
93
+7.6V Power (LIN bus)
Ground (LIN Bus)
LIN Databus
Open
Left Broom Active
Center Broom Active
Right Broom Active
Conveyor Rotating
Anti-slip
CB Rotate
Open
Open
+7.6V Power (LIN bus)
Ground (LIN Bus)
LIN Databus
Open
CM-C23
503-CM-750 LSB LOWER DG-18
TO SHEET 8
CM-S13
561-CM-751 CB LOWER V-18
TO SHEET 9
CM-S19
543-CM-752 RSB LOWER LG-18
TO SHEET 8
CM-S15
577-CM-148 FWD CONVEYOR DB-18
TO SHEET 9
CM-S21
566-CM-188
CB ROTATE LG-18
TO SHEET 9
CM-S32
STOP
4-in-1
70
+7.6V Power (LIN bus)
Ground (LIN Bus)
LIN Databus
Open
+7.6V Power (LIN bus)
Ground (LIN Bus)
LIN Databus
Open

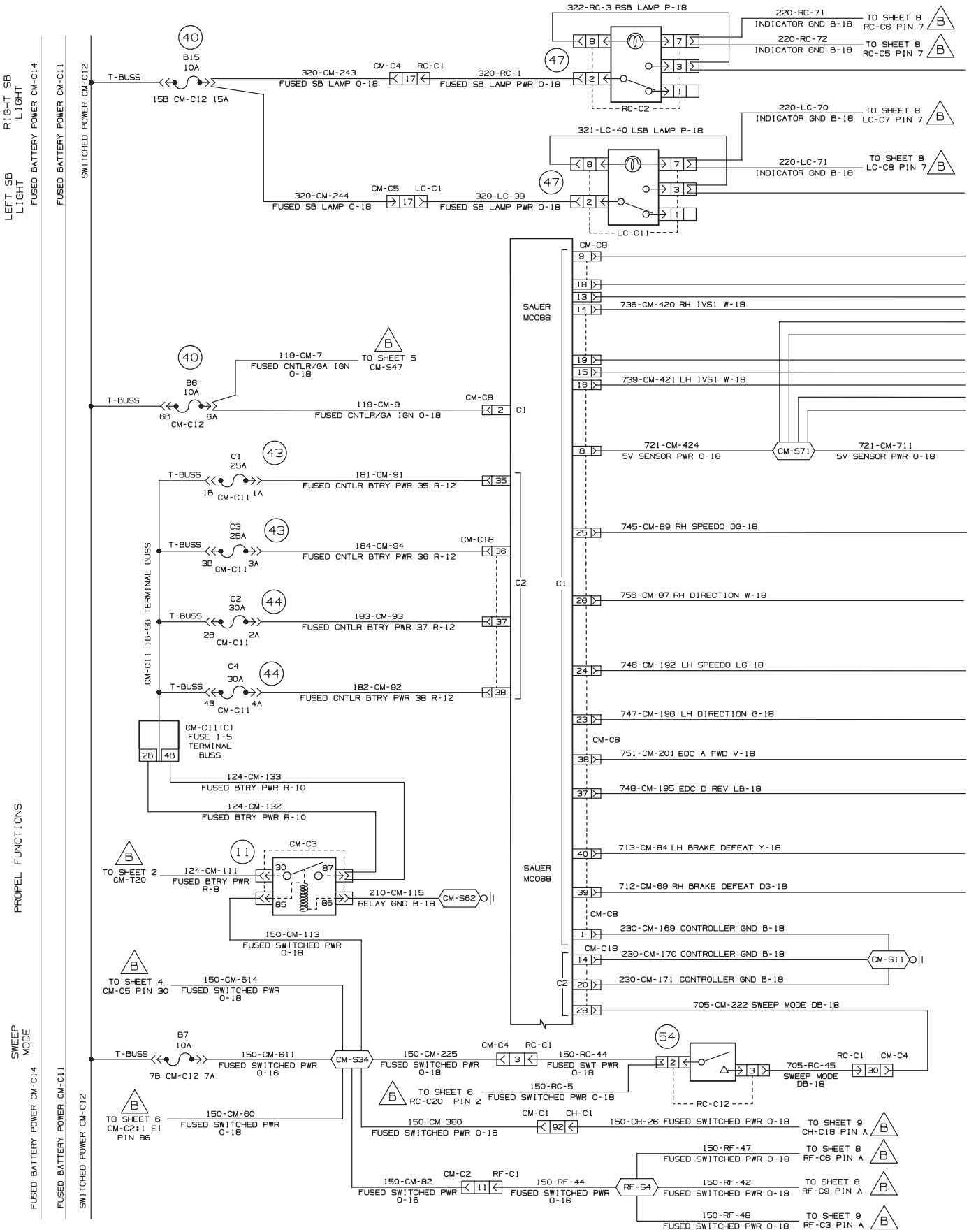
SHEET 5 OF 16


220-CM-314 INDICATOR GND B-18
CM-S70
366-CM-14 FUEL LEVEL V-18
CM-C1 CH-C1
17
366-CH-69 FUEL LEV V-18
18
CH-T2
CH-T1
220-CH-82
INDICATOR GND B-18
CH-S9
FUEL LEVEL SENDER
364-CM-25 OIL PRESS DB-18
CM-C1 CH-C1
20
364-CH-142
OIL PRESS DB-18
CH-C38 EN-C1
4
364-EN-14
OIL PRESS DB-18
TO SHEET 13
EN-T12
74
OIL PRESSURE SENDER
368-CM-20 HYD OIL TEMP V-18
23
368-CH-70 HYD OIL TEMP V-18
17
CH-T4
HYDRAULIC OIL TEMP SENDER
119-CM-405 FUSED CNTLR/GA IGN O-18
13
119-CH-134
FUSED CNTLR/GA IGN O-16
1
377-CM-61 HYD OIL LEVEL SW V-18
68
377-CH-66 HYD OIL LEVEL SW V-18
16
L
A
B
CH-C42
220-CH-84
INDICATOR GND B-18
LIQUID LEVEL SWITCH
378-CH-4 WATER PRESS SW LB-18
69
12
P
1
2
CH-C4
220-CH-87
INDICATOR GND B-18
CH-S10
3 PSI SWITCH
372-CH-48 BRAKE PRESS SW DG-18
64
CH-C33
8
220-CH-89
INDICATOR GND B-18
1500 PSI BRAKE SWITCH
369-CH-71 AIR FILTER SW W-18
61
90
V
CH-T8
CH-T9
220-CH-85
INDICATOR GND B-18
AIR FILTER VACUUM SWITCH
373-CH-64 HYD FILTER SW P-18
65
CH-C40
15
220-CH-83
INDICATOR GND B-18
HYDRAULIC FILTER RESTRICTION
374-CH-32 CONVEYOR STALL SW LG-18
66
CH-C21
10
220-CH-88
INDICATOR GND B-18
HYDRAULIC PRESSURE SWITCH

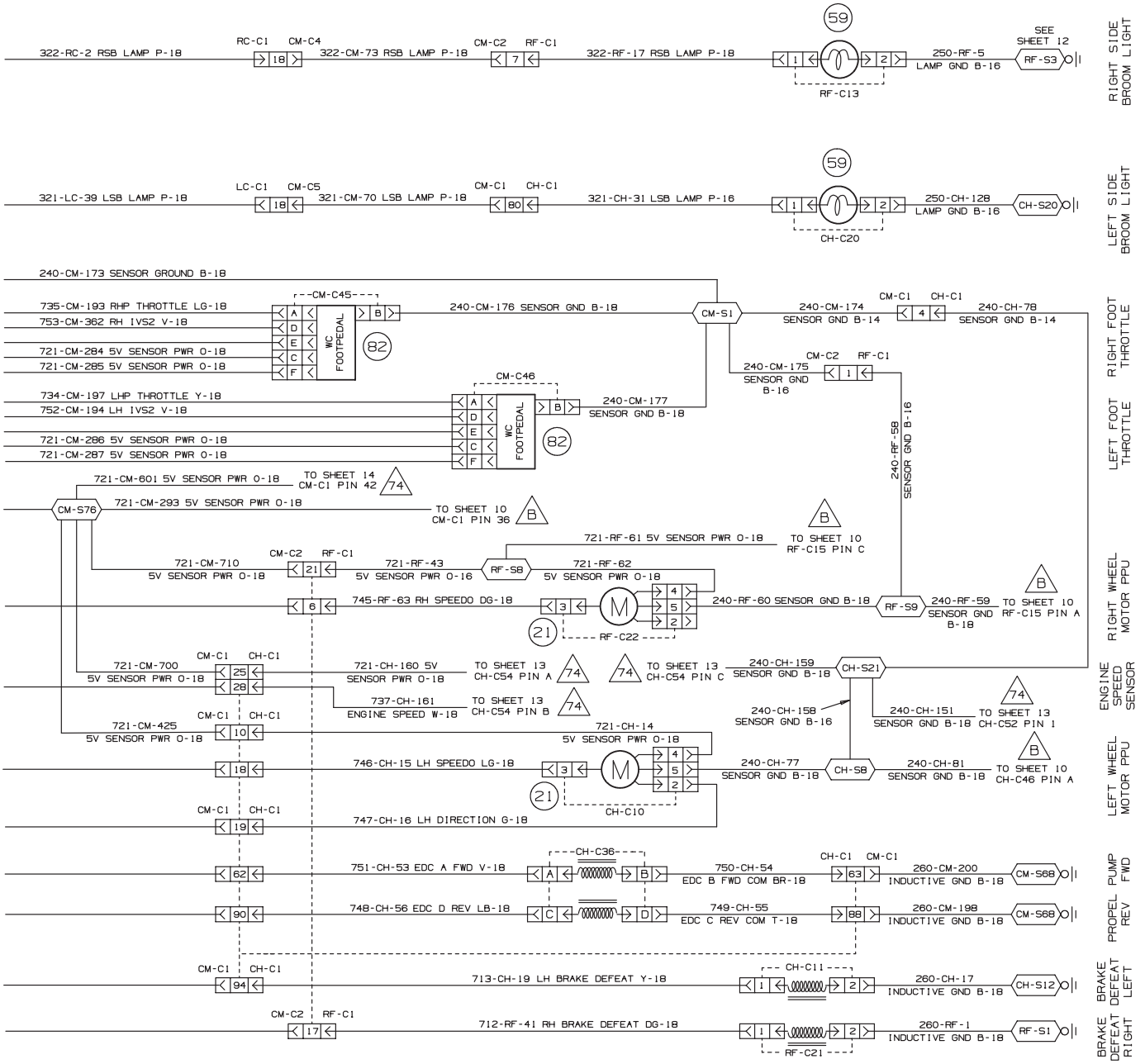

A/C SWITCH AND BLOWER (OPTION)
AUX LIGHTS (OPTION)
REAR FLOOD LIGHT (OPTION)
BACKUP ALARM
BACKUP CAMERA
AUTO LUBE
AIR RIDE
RADIATOR FAN HYDRAULIC MOTOR
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
607-CM-86 AC SWITCH DB-14
607-CM-189 AC SWITCH DB-14
607-CM-190 AC SWITCH DB-16
606-CM-404 FUSED AC PWR Y-14
605-CM-403 AC PWR LG-14
CM-S33
CM-C26
THERMOSTAT
BLOWER SWITCH
CM-C42
604-CM-402 BLOWER LOW BR-14
603-CM-401 BLOWER MED Y-14
602-CM-400 BLOWER HI DG-14
RESISTOR ASSEMBLY
BLOWER MOTOR
600-CM-326 HVAC PWR V-10
O-14 (HIGH SPEED)
B-14 (GROUND)
601-CM-399 FUSED HVAC PWR DB-10
150-CM-60 FUSED SWITCHED PWR O-18
TO SHEET 7 CM-S34
CM-C21:1 E1
328-RC-64 AUX LAMPS P-18
327-CM-219 FUSED AUX LAMP PWR O-16
327-RC-62 FUSED AUX LAMP PWR O-18
328-RC-63 AUX LAMPS P-18
328-CM-85 AUX LAMPS P-16
RC-C8
220-RC-68 INDICATOR GND B-18
325-RC-61 REAR LAMPS P-18
220-RC-67 INDICATOR GND B-18
TO SHEET 4 RC-C16 PIN 7
324-RC-59 FUSED REAR LAMP PWR O-18
325-RC-60 REAR LAMPS P-18
RC-C17
324-CM-220 FUSED REAR LAMPS PWR O-16
325-CM-72 REAR LAMPS P-16
324-CM-56 FUSED REAR LAMPS PWR O-16
445-CM-53 BACK-UP LG-18
210-CM-181 RELAY GND B-18
TO SHEET 4 CM-C9:4 PIN 86(2)
210-CM-184 RELAY GND B-18
TO SHEET 10 CM-C9:6 PIN 86(2)
CM-C9:5 G5
SAUER MC088
445-CM-390 BACK-UP LG-18
CM-S56
445-CM-391 BACK-UP LG-18
450-CM-625 BACK-UP CAMERA O-18
890-CM-410 FUSED AUTO LUBE V-16
681-CM-412 FUSED AIR RIDE SEAT O-16
681-CM-413 FUSED AIR RIDE SEAT O-16
RADIATOR FAN HYDR MTR REVERSE
TO SHEET 7 RC-C12 PIN 2
150-RC-5 FUSED SWITCHED PWR O-18
RC-C20
OPTION
793-RC-30 RDTR FAN MTR REV BR-18
793-CM-37 RDTR FAN MTR REV BR-18
CM-C18

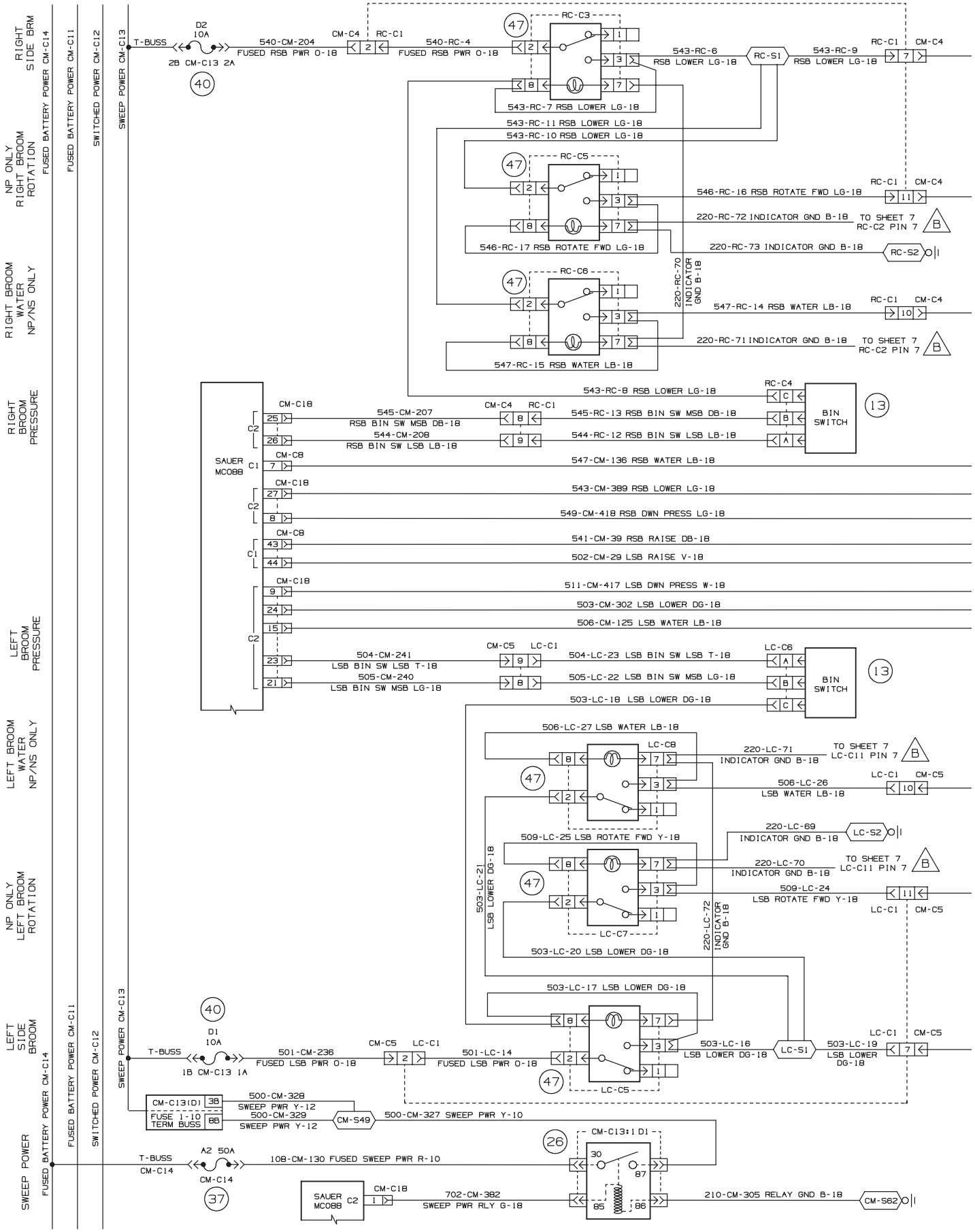
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CM-C1 CH-C1
98
607-CH-67
AC SWITCH DB-14
TO SHEET 13
CH-C43 PIN A
74
74
TO SHEET 13
CH-C43 PIN B
260-CH-115
INDUCTIVE GND B-14
CH-S17
COMPRESSOR CONDENSOR FAN
83
608-CM-74
THERMOSTAT LG-16
84
CM-C1 CH-C1
608-CH-72
THERMOSTAT LG-16
CH-T10
P
HIGH PRESSURE SWITCH
85
CH-T5
609-CH-68
COMPRESSOR DB-16
B
A
CH-C44
260-CH-116
INDUCTIVE GND B-16
260-CM-393 INDUCTIVE GND B-14
CM-S63
210-CM-338 RELAY GND B-18
CM-S62
220-RC-69 INDICATOR GND B-18
RC-S2
55 WATT
JP-C2
431-JP-2
BEACON PWR P-16
JP-C2
250-JP-2
LAMP GND B-16
59
CM-C28 CR-C1 CR-C4 EL-C1 EL-C4 JP-C1
5
328-CR-32
AUX LAMPS P-16
C
334-EL-10
BEACN/FRT FLOOD P-14
1
431-JP-1
BEACON PWR P-16
JP-S1
JP-S2
250-JP-1
LAMP GND B-16
JP-C1 EL-C4
2
250-EL-5
LAMP GND B-14
B
TO SHEET 4
SPLICE EL-S2
AUX LAMP FRONT CAB WORK
59
55 WATT
JP-C3
431-JP-3
BEACON PWR P-16
JP-C3
250-JP-3
LAMP GND B-14
CM-C1 CH-C1
82
325-CH-61
REAR LAMPS P-16
CH-C39 EC-C1
4
325-EC-4
REAR LAMPS P-16
EC-S3
325-EC-20
REAR LAMPS P-18
59
A
B
250-EC-18
LAMP GND B-18
EC-S2
EC-C6
59
325-EC-21
REAR LAMPS P-18
250-EC-19
LAMP GND B-18
EC-C7
325-CM-71 REAR LAMPS P-16
REAR LAMPS LEFT RIGHT
14
CH-C39 EC-C1
445-CM-68 BACK-UP LG-18
76
445-CH-63
BACK-UP LG-18
7
445-EC-7 BACK-UP LG-18
EC-T2
EC-T1
250-EC-12 LAMP GND B-18
EC-S2
BACKUP ALARM
7
CM-C6
3
2
1
CAMERA
4
220-CM-134 INDICATOR GND B-18
CM-S70
CAMERA
CM-C1 CH-C1
12
890-CH-65 FUSED AUTO LUBE V-16
CH-C41
1
M
2
260-CH-114
INDUCTIVE GND B-16
CH-S17
AUTO LUBE
CM-C43
A
M
B
260-CM-414 INDUCTIVE GND B-16
CM-S68
260-CM-415 INDUCTIVE GND B-16
CM-C44
AIR RIDE SEATS LH RH
CM-C1 CH-C1
794-CM-44
RDTR FAN MTR BYPASS LG-18
32
794-CH-154
RDTR FAN MTR BYPASS LG-18
CH-C50
260-CH-155
INDUCTIVE GND B-18
PROPORTIONAL FAN BYPASS
793-CM-49
RDTR FAN MTR REV BR-18
31
793-CH-153
RDTR FAN MTR REV BR-18
CH-C51
260-CH-156
INDUCTIVE GND B-18
CH-S18
FAN REVERSE
95
328-CH-1
AUX LAMPS P-14
CH-C2
250-CH-129
LAMP GND B-14
CH-S20
AUX LAMP (OPTION)

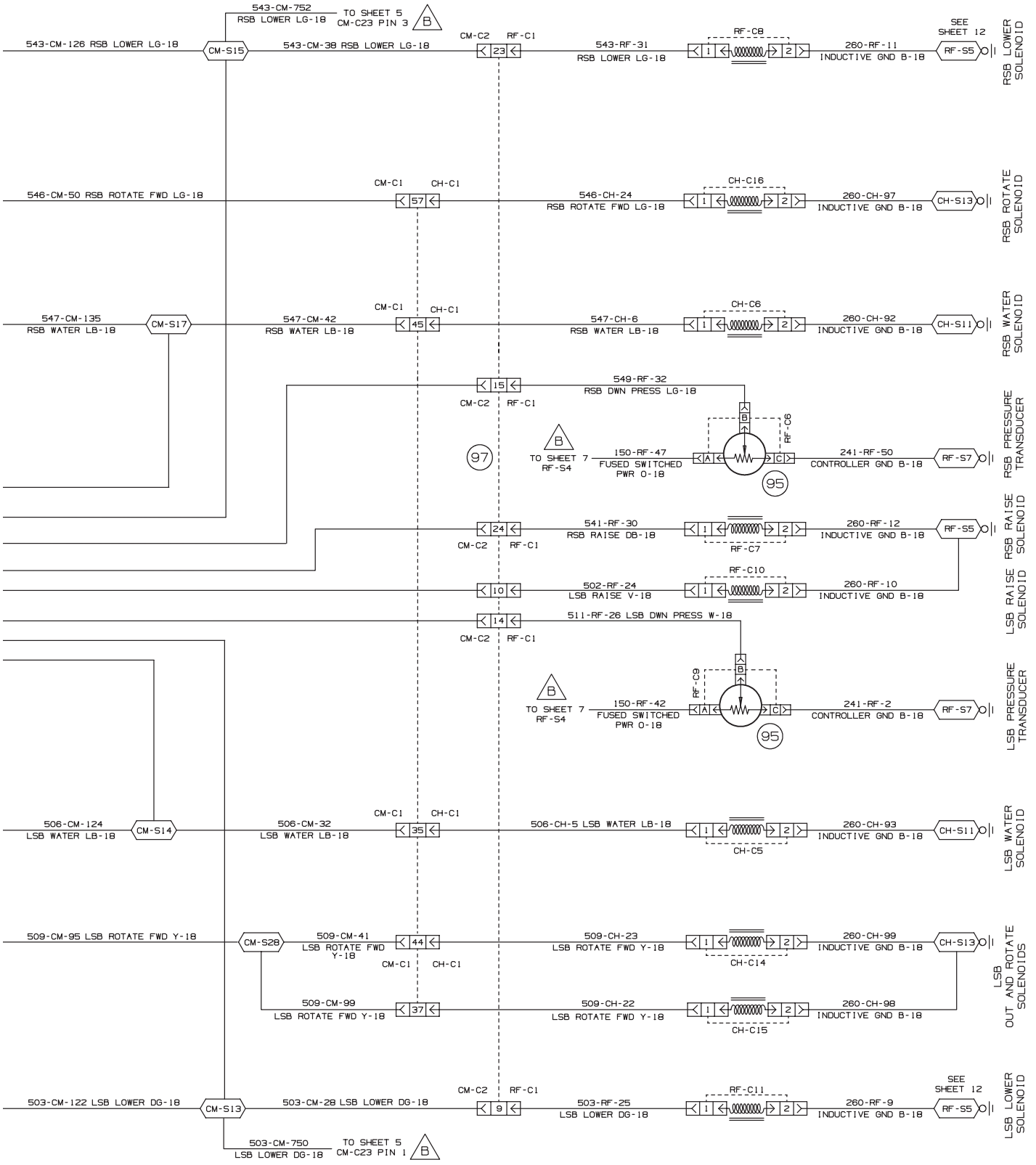

RIGHT SB LIGHT
LEFT SB LIGHT
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
PROPEL FUNCTIONS
SWEEP MODE
322-RC-3 RSB LAMP P-18
321-LC-40 LSB LAMP P-18
220-RC-71 INDICATOR GND B-18
220-RC-72 INDICATOR GND B-18
220-LC-70 INDICATOR GND B-18
220-LC-71 INDICATOR GND B-18
TO SHEET 8 RC-C6 PIN 7
TO SHEET 8 RC-C5 PIN 7
TO SHEET 8 LC-C7 PIN 7
TO SHEET 8 LC-C8 PIN 7
T-BUSS
B15 10A
15B CM-C12 15A
320-CM-243 FUSED SB LAMP O-18
320-RC-1 FUSED SB LAMP PWR O-18
320-CM-244 FUSED SB LAMP O-18
320-LC-38 FUSED SB LAMP PWR O-18
CM-C4 RC-C1
CM-C5 LC-C1
RC-C2
LC-C11
B6 10A
6B CM-C12 6A
119-CM-7 FUSED CNTLR/GA IGN O-18
TO SHEET 5 CM-S47
119-CM-9 FUSED CNTLR/GA IGN O-18
C1 25A
C3 25A
C2 30A
C4 30A
1B CM-C11 1A
3B CM-C11 3A
2B CM-C11 2A
4B CM-C11 4A
181-CM-91 FUSED CNTLR BTRY PWR 35 R-12
184-CM-94 FUSED CNTLR BTRY PWR 36 R-12
183-CM-93 FUSED CNTLR BTRY PWR 37 R-12
182-CM-92 FUSED CNTLR BTRY PWR 38 R-12
CM-C11 1B-5B TERMINAL BUSS
CM-C11(C) FUSE 1-5 TERMINAL BUSS
124-CM-133 FUSED BTRY PWR R-10
124-CM-132 FUSED BTRY PWR R-10
124-CM-111 FUSED BTRY PWR R-8
TO SHEET 2 CM-T20
210-CM-115 RELAY GND B-18
CM-S62
150-CM-113 FUSED SWITCHED PWR O-18
TO SHEET 4 CM-C5 PIN 30
150-CM-614 FUSED SWITCHED PWR O-18
B7 10A
7B CM-C12 7A
150-CM-611 FUSED SWITCHED PWR O-16
CM-S34
150-CM-225 FUSED SWITCHED PWR O-18
150-RC-44 FUSED SWT PWR O-18
705-RC-45 SWEEP MODE DB-18
TO SHEET 6 RC-C20 PIN 2
150-RC-5 FUSED SWITCHED PWR O-18
TO SHEET 6 CM-C2:1 E1 PIN 86
150-CM-60 FUSED SWITCHED PWR O-18
150-CM-380 FUSED SWITCHED PWR O-18
150-CH-26 FUSED SWITCHED PWR O-18
TO SHEET 9 CH-C18 PIN A
150-RF-47 FUSED SWITCHED PWR O-18
TO SHEET 8 RF-C6 PIN A
150-CM-82 FUSED SWITCHED PWR O-16
150-RF-44 FUSED SWITCHED PWR O-16
RF-S4
150-RF-42 FUSED SWITCHED PWR O-18
TO SHEET 8 RF-C9 PIN A
150-RF-48 FUSED SWITCHED PWR O-18
TO SHEET 9 RF-C3 PIN A
SAUER MC088
736-CM-420 RH IVS1 W-18
739-CM-421 LH IVS1 W-18
721-CM-424 5V SENSOR PWR O-18
CM-S71
721-CM-711 5V SENSOR PWR O-18
745-CM-89 RH SPEEDO DG-18
756-CM-87 RH DIRECTION W-18
746-CM-192 LH SPEEDO LG-18
747-CM-196 LH DIRECTION G-18
751-CM-201 EDC A FWD V-18
748-CM-195 EDC D REV LB-18
713-CM-84 LH BRAKE DEFEAT Y-18
712-CM-69 RH BRAKE DEFEAT DG-18
230-CM-169 CONTROLLER GND B-18
230-CM-170 CONTROLLER GND B-18
CM-S11
230-CM-171 CONTROLLER GND B-18
705-CM-222 SWEEP MODE DB-18

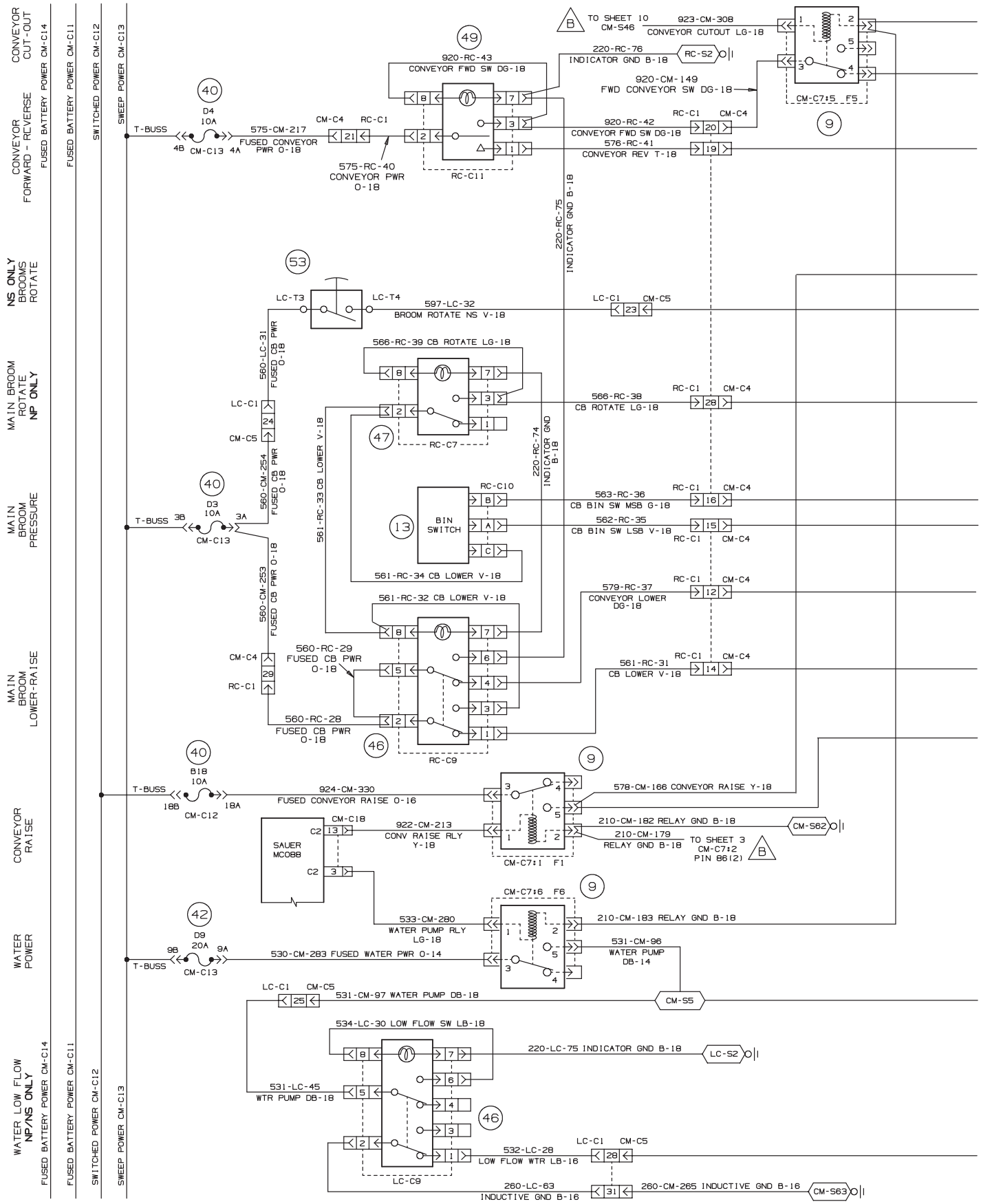
SHEET 7 OF 16


322-RC-2 RSB LAMP P-18
RC-C1
CM-C4
322-CM-73 RSB LAMP P-18
CM-C2
RF-C1
322-RF-17 RSB LAMP P-18
59
RF-C13
250-RF-5
LAMP GND B-16
SEE SHEET 12
RF-S3
RIGHT SIDE BROOM LIGHT
321-LC-39 LSB LAMP P-18
LC-C1
CM-C5
321-CM-70 LSB LAMP P-18
CM-C1
CH-C1
321-CH-31 LSB LAMP P-16
59
CH-C20
250-CH-128
LAMP GND B-16
CH-S20
LEFT SIDE BROOM LIGHT
240-CM-173 SENSOR GROUND B-18
735-CM-193 RHP THROTTLE LG-18
753-CM-362 RH IVS2 V-18
721-CM-284 5V SENSOR PWR O-18
721-CM-285 5V SENSOR PWR O-18
CM-C45
WC FOOTPEDAL
82
240-CM-176 SENSOR GND B-18
CM-S1
240-CM-174
SENSOR GND B-14
CM-C1
CH-C1
240-CH-78
SENSOR GND B-14
RIGHT FOOT THROTTLE
CM-C2
RF-C1
240-CM-175
SENSOR GND B-16
240-RF-58
SENSOR GND B-16
734-CM-197 LHP THROTTLE Y-18
752-CM-194 LH IVS2 V-18
721-CM-286 5V SENSOR PWR O-18
721-CM-287 5V SENSOR PWR O-18
CM-C46
WC FOOTPEDAL
82
240-CM-177
SENSOR GND B-18
LEFT FOOT THROTTLE
721-CM-601 5V SENSOR PWR O-18
TO SHEET 14
CM-C1 PIN 42
74
CM-S76
721-CM-293 5V SENSOR PWR O-18
TO SHEET 10
CM-C1 PIN 36
B
721-RF-61 5V SENSOR PWR O-18
TO SHEET 10
RF-C15 PIN C
721-CM-710
5V SENSOR PWR O-18
CM-C2
RF-C1
721-RF-43
5V SENSOR PWR O-16
RF-S8
721-RF-62
5V SENSOR PWR O-18
745-RF-63 RH SPEEDO DG-18
21
RF-C22
240-RF-60 SENSOR GND B-18
RF-S9
240-RF-59
SENSOR GND B-18
TO SHEET 10
RF-C15 PIN A
RIGHT WHEEL MOTOR PPU
721-CM-700
5V SENSOR PWR O-18
CM-C1
CH-C1
721-CH-160 5V
SENSOR PWR O-18
TO SHEET 13
CH-C54 PIN A
74
TO SHEET 13
CH-C54 PIN C
240-CH-159
SENSOR GND B-18
CH-S21
737-CH-161
ENGINE SPEED W-18
TO SHEET 13
CH-C54 PIN B
240-CH-158
SENSOR GND B-16
240-CH-151
SENSOR GND B-18
TO SHEET 13
CH-C52 PIN 1
ENGINE SPEED SENSOR
721-CM-425
5V SENSOR PWR O-18
721-CH-14
5V SENSOR PWR O-18
746-CH-15 LH SPEEDO LG-18
21
CH-C10
240-CH-77
SENSOR GND B-18
CH-S8
240-CH-81
SENSOR GND B-18
TO SHEET 10
CH-C46 PIN A
LEFT WHEEL MOTOR PPU
747-CH-16 LH DIRECTION G-18
751-CH-53 EDC A FWD V-18
CH-C36
750-CH-54
EDC B FWD COM BR-18
260-CM-200
INDUCTIVE GND B-18
CM-S68
PUMP FWD
748-CH-56 EDC D REV LB-18
749-CH-55
EDC C REV COM T-18
260-CM-198
INDUCTIVE GND B-18
CM-S68
PROPEL REV
713-CH-19 LH BRAKE DEFEAT Y-18
CH-C11
260-CH-17
INDUCTIVE GND B-18
CH-S12
BRAKE DEFEAT LEFT
712-RF-41 RH BRAKE DEFEAT DG-18
RF-C21
260-RF-1
INDUCTIVE GND B-18
RF-S1
BRAKE DEFEAT RIGHT

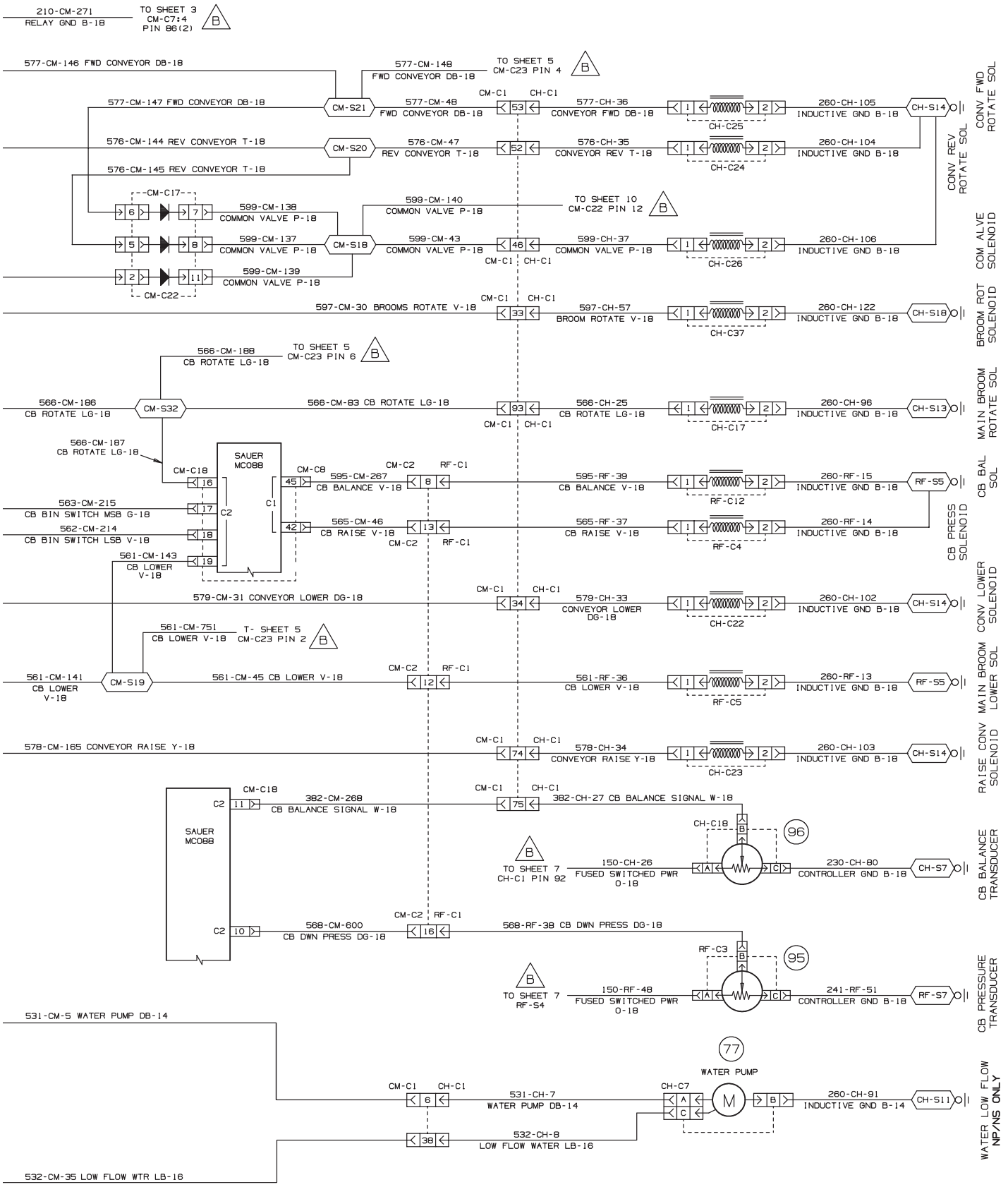

RIGHT SIDE BRM
NP ONLY RIGHT BROOM ROTATION
RIGHT BROOM WATER NP/NS ONLY
RIGHT BROOM PRESSURE
LEFT BROOM PRESSURE
LEFT BROOM WATER NP/NS ONLY
NP ONLY LEFT BROOM ROTATION
LEFT SIDE BROOM
SWEEP POWER
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWEEP POWER CM-C13
T-BUSS
D2 10A
2B CM-C13 2A
540-CM-204 FUSED RSB PWR 0-18
540-RC-4 FUSED RSB PWR 0-18
543-RC-6 RSB LOWER LG-18
543-RC-9 RSB LOWER LG-18
RC-S1
543-RC-7 RSB LOWER LG-18
543-RC-11 RSB LOWER LG-18
543-RC-10 RSB LOWER LG-18
546-RC-16 RSB ROTATE FWD LG-18
220-RC-72 INDICATOR GND B-18
TO SHEET 7 RC-C2 PIN 7
220-RC-73 INDICATOR GND B-18
RC-S2
546-RC-17 RSB ROTATE FWD LG-18
220-RC-70 INDICATOR GND B-18
547-RC-14 RSB WATER LB-18
220-RC-71 INDICATOR GND B-18
547-RC-15 RSB WATER LB-18
543-RC-8 RSB LOWER LG-18
BIN SWITCH
545-CM-207 RSB BIN SW MSB DB-18
544-CM-208 RSB BIN SW LSB LB-18
545-RC-13 RSB BIN SW MSB DB-18
544-RC-12 RSB BIN SW LSB LB-18
SAUER MC088
547-CM-136 RSB WATER LB-18
543-CM-389 RSB LOWER LG-18
549-CM-418 RSB DWN PRESS LG-18
541-CM-39 RSB RAISE DB-18
502-CM-29 LSB RAISE V-18
511-CM-417 LSB DWN PRESS W-18
503-CM-302 LSB LOWER DG-18
506-CM-125 LSB WATER LB-18
504-CM-241 LSB BIN SW LSB T-18
505-CM-240 LSB BIN SW MSB LG-18
504-LC-23 LSB BIN SW LSB T-18
505-LC-22 LSB BIN SW MSB LG-18
503-LC-18 LSB LOWER DG-18
506-LC-27 LSB WATER LB-18
220-LC-71 INDICATOR GND B-18
TO SHEET 7 LC-C11 PIN 7
506-LC-26 LSB WATER LB-18
220-LC-69 INDICATOR GND B-18
LC-S2
509-LC-25 LSB ROTATE FWD Y-18
220-LC-70 INDICATOR GND B-18
509-LC-24 LSB ROTATE FWD Y-18
503-LC-21 LSB LOWER DG-18
220-LC-72 INDICATOR GND B-18
503-LC-20 LSB LOWER DG-18
503-LC-17 LSB LOWER DG-18
D1 10A
1B CM-C13 1A
501-CM-236 FUSED LSB PWR 0-18
501-LC-14 FUSED LSB PWR 0-18
503-LC-16 LSB LOWER DG-18
LC-S1
503-LC-19 LSB LOWER DG-18
CM-C13(D) FUSE 1-10 TERM BUSS
500-CM-328 SWEEP PWR Y-12
500-CM-329 SWEEP PWR Y-12
CM-S49
500-CM-327 SWEEP PWR Y-10
A2 50A
CM-C14
108-CM-130 FUSED SWEEP PWR R-10
CM-C13:1 D1
702-CM-382 SWEEP PWR RLY G-18
210-CM-305 RELAY GND B-18
CM-S62

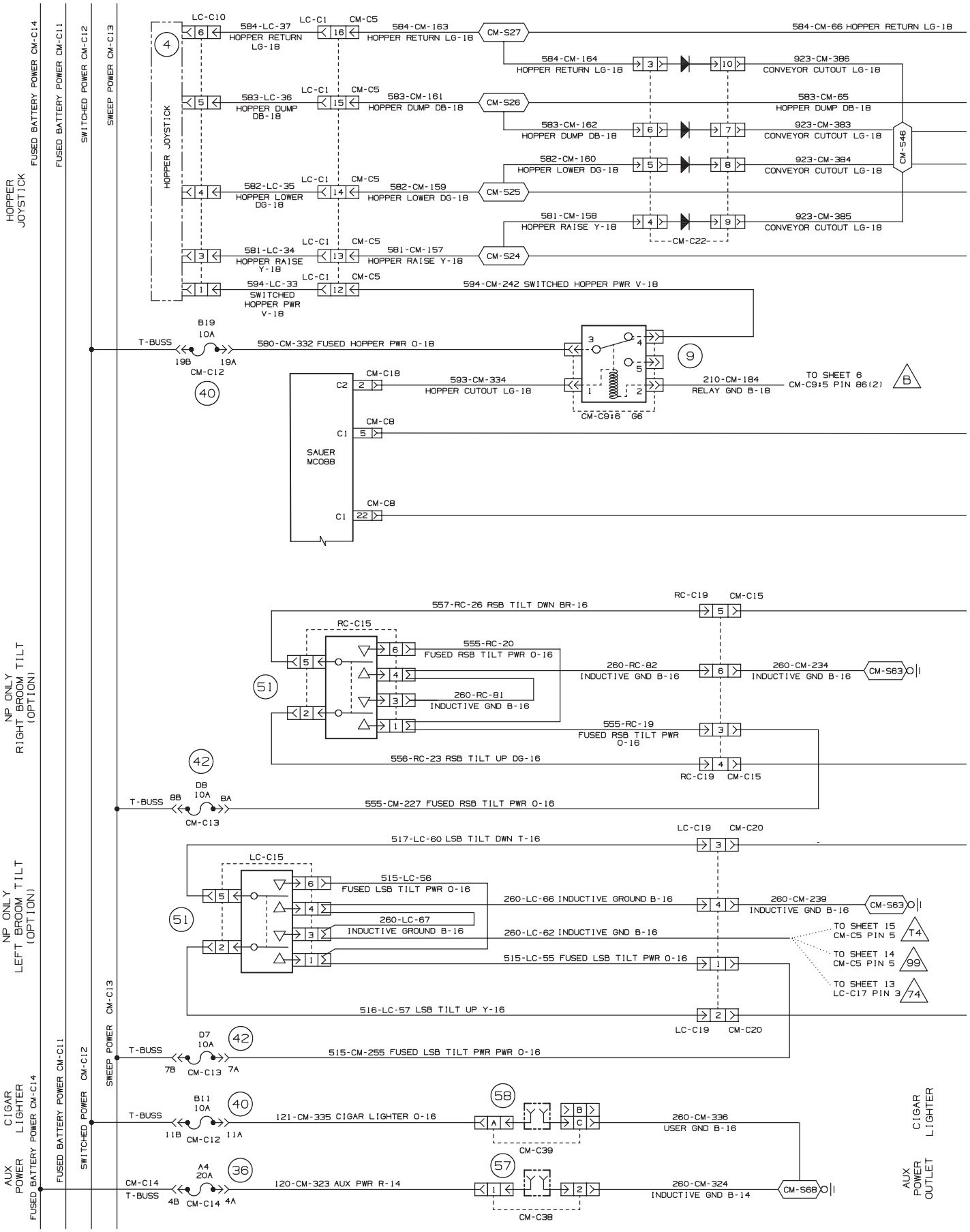
SHEET 8 OF 16


543-CM-752
RSB LOWER LG-18
TO SHEET 5
CM-C23 PIN 3
B
543-CM-126 RSB LOWER LG-18
CM-S15
543-CM-38 RSB LOWER LG-18
CM-C2
RF-C1
23
543-RF-31
RSB LOWER LG-18
RF-C8
260-RF-11
INDUCTIVE GND B-18
SEE
SHEET 12
RF-S5
RSB LOWER
SOLENOID
546-CM-50 RSB ROTATE FWD LG-18
CM-C1
CH-C1
57
546-CH-24
RSB ROTATE FWD LG-18
CH-C16
260-CH-97
INDUCTIVE GND B-18
CH-S13
RSB ROTATE
SOLENOID
547-CM-135
RSB WATER LB-18
CM-S17
547-CM-42
RSB WATER LB-18
45
547-CH-6
RSB WATER LB-18
CH-C6
260-CH-92
INDUCTIVE GND B-18
CH-S11
RSB WATER
SOLENOID
549-RF-32
RSB DWN PRESS LG-18
15
97
TO SHEET
RF-S4
150-RF-47
FUSED SWITCHED
PWR O-18
RF-C6
95
241-RF-50
CONTROLLER GND B-18
RF-S7
RSB PRESSURE
TRANSDUCER
541-RF-30
RSB RAISE DB-18
24
260-RF-12
INDUCTIVE GND B-18
RF-C7
RSB RAISE
SOLENOID
RF-C10
502-RF-24
LSB RAISE V-18
10
260-RF-10
INDUCTIVE GND B-18
LSB RAISE
SOLENOID
511-RF-26 LSB DWN PRESS W-18
14
RF-C9
150-RF-42
FUSED SWITCHED
PWR O-18
241-RF-2
CONTROLLER GND B-18
LSB PRESSURE
TRANSDUCER
506-CM-124
LSB WATER LB-18
CM-S14
506-CM-32
LSB WATER LB-18
35
506-CH-5 LSB WATER LB-18
CH-C5
260-CH-93
INDUCTIVE GND B-18
LSB WATER
SOLENOID
509-CM-95 LSB ROTATE FWD Y-18
CM-S28
509-CM-41
LSB ROTATE FWD
Y-18
44
509-CH-23
LSB ROTATE FWD Y-18
CH-C14
260-CH-99
INDUCTIVE GND B-18
509-CM-99
LSB ROTATE FWD Y-18
37
509-CH-22
LSB ROTATE FWD Y-18
CH-C15
260-CH-98
INDUCTIVE GND B-18
LSB
OUT AND ROTATE
SOLENOIDS
503-CM-122 LSB LOWER DG-18
CM-S13
503-CM-28 LSB LOWER DG-18
9
503-RF-25
LSB LOWER DG-18
RF-C11
260-RF-9
INDUCTIVE GND B-18
SEE
SHEET 12
RF-S5
LSB LOWER
SOLENOID
503-CM-750
LSB LOWER DG-18
TO SHEET 5
CM-C23 PIN 1
B

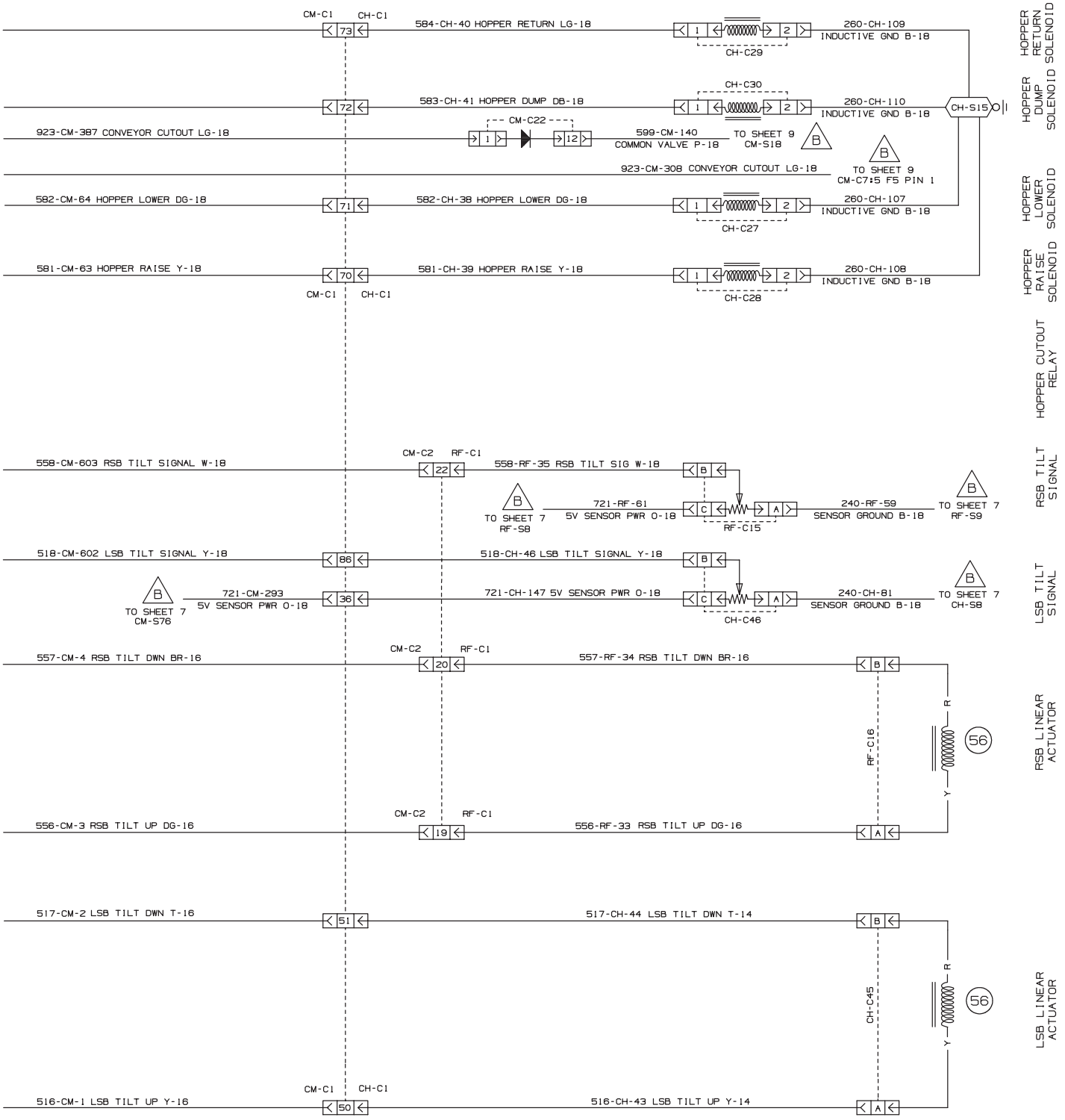

CONVEYOR CUT-OUT
CONVEYOR FORWARD - RCVERSE
MAIN BROOM ROTATE NP ONLY
NS ONLY BROOMS ROTATE
MAIN BROOM PRESSURE
MAIN BROOM LOWER-RAISE
CONVEYOR RAISE
WATER POWER
WATER LOW FLOW NP/NS ONLY
FUSED BATTERY POWER CM-C14
FUSED BATTERY POWER CM-C11
SWITCHED POWER CM-C12
SWEEP POWER CM-C13
T-BUSS
D4 10A
CM-C13
575-CM-217 FUSED CONVEYOR PWR O-18
575-RC-40 CONVEYOR PWR O-18
RC-C11
920-RC-43 CONVEYOR FWD SW DG-18
TO SHEET 10 CM-S46
923-CM-308 CONVEYOR CUTOUT LG-18
220-RC-76 INDICATOR GND B-18
RC-S2
920-CM-149 FWD CONVEYOR SW DG-18
CM-C7:5 F5
920-RC-42 CONVEYOR FWD SW DG-18
576-RC-41 CONVEYOR REV T-18
220-RC-75 INDICATOR GND B-18
LC-T3
LC-T4
597-LC-32 BROOM ROTATE NS V-18
560-LC-31 FUSED CB PWR O-18
566-RC-39 CB ROTATE LG-18
566-RC-38 CB ROTATE LG-18
RC-C7
561-RC-33 CB LOWER V-18
220-RC-74 INDICATOR GND B-18
560-CM-254 FUSED CB PWR O-18
D3 10A
563-RC-36 CB BIN SW MSB G-18
562-RC-35 CB BIN SW LSB V-18
BIN SWITCH
RC-C10
561-RC-34 CB LOWER V-18
560-CM-253 FUSED CB PWR O-18
579-RC-37 CONVEYOR LOWER DG-18
561-RC-32 CB LOWER V-18
560-RC-29 FUSED CB PWR O-18
561-RC-31 CB LOWER V-18
560-RC-28 FUSED CB PWR O-18
RC-C9
B18 10A
924-CM-330 FUSED CONVEYOR RAISE O-16
578-CM-166 CONVEYOR RAISE Y-18
210-CM-182 RELAY GND B-18
CM-S62
922-CM-213 CONV RAISE RLY Y-18
210-CM-179 RELAY GND B-18
TO SHEET 3 CM-C7:2 PIN 86(2)
SAUER MC088
CM-C7:1 F1
CM-C7:6 F6
D9 20A
533-CM-280 WATER PUMP RLY LG-18
210-CM-183 RELAY GND B-18
530-CM-283 FUSED WATER PWR O-14
531-CM-96 WATER PUMP DB-14
531-CM-97 WATER PUMP DB-18
CM-S5
534-LC-30 LOW FLOW SW LB-18
220-LC-75 INDICATOR GND B-18
LC-S2
531-LC-45 WTR PUMP DB-18
LC-C9
532-LC-28 LOW FLOW WTR LB-16
260-LC-63 INDUCTIVE GND B-16
260-CM-265 INDUCTIVE GND B-16
CM-S63

SHEET 9 OF 16


210-CM-271
RELAY GND B-18
TO SHEET 3
CM-C7:4
PIN 86(2)
577-CM-146 FWD CONVEYOR DB-18
577-CM-148
FWD CONVEYOR DB-18
TO SHEET 5
CM-C23 PIN 4
577-CM-147 FWD CONVEYOR DB-18
CM-S21
577-CM-48
FWD CONVEYOR DB-18
CM-C1
CH-C1
53
577-CH-36
CONVEYOR FWD DB-18
CH-C25
260-CH-105
INDUCTIVE GND B-18
CH-S14
CONV FWD ROTATE SOL
576-CM-144 REV CONVEYOR T-18
CM-S20
576-CM-47
REV CONVEYOR T-18
52
576-CH-35
CONVEYOR REV T-18
CH-C24
260-CH-104
INDUCTIVE GND B-18
CONV REV ROTATE SOL
576-CM-145 REV CONVEYOR T-18
CM-C17
599-CM-138
COMMON VALVE P-18
599-CM-140
COMMON VALVE P-18
TO SHEET 10
CM-C22 PIN 12
599-CM-137
COMMON VALVE P-18
CM-S18
599-CM-43
COMMON VALVE P-18
46
599-CH-37
COMMON VALVE P-18
CH-C26
260-CH-106
INDUCTIVE GND B-18
COM ALVE SOLENOID
599-CM-139
COMMON VALVE P-18
CM-C22
597-CM-30 BROOMS ROTATE V-18
33
597-CH-57
BROOM ROTATE V-18
CH-C37
260-CH-122
INDUCTIVE GND B-18
CH-S18
BROOM ROT SOLENOID
566-CM-188
CB ROTATE LG-18
TO SHEET 5
CM-C23 PIN 6
566-CM-186
CB ROTATE LG-18
CM-S32
566-CM-83 CB ROTATE LG-18
93
566-CH-25
CB ROTATE LG-18
CH-C17
260-CH-96
INDUCTIVE GND B-18
CH-S13
MAIN BROOM ROTATE SOL
566-CM-187
CB ROTATE LG-18
SAUER
MC088
CM-C18
16
CM-C8
45
595-CM-267
CB BALANCE V-18
CM-C2
RF-C1
8
595-RF-39
CB BALANCE V-18
RF-C12
260-RF-15
INDUCTIVE GND B-18
RF-S5
CB BAL SOL
563-CM-215
CB BIN SWITCH MSB G-18
17
C2
C1
562-CM-214
CB BIN SWITCH LSB V-18
18
42
565-CM-46
CB RAISE V-18
13
565-RF-37
CB RAISE V-18
RF-C4
260-RF-14
INDUCTIVE GND B-18
CB PRESS SOLENOID
561-CM-143
CB LOWER V-18
19
579-CM-31 CONVEYOR LOWER DG-18
34
579-CH-33
CONVEYOR LOWER DG-18
CH-C22
260-CH-102
INDUCTIVE GND B-18
CH-S14
CONV LOWER SOLENOID
561-CM-751
CB LOWER V-18
T- SHEET 5
CM-C23 PIN 2
561-CM-141
CB LOWER V-18
CM-S19
561-CM-45 CB LOWER V-18
12
561-RF-36
CB LOWER V-18
RF-C5
260-RF-13
INDUCTIVE GND B-18
RF-S5
MAIN BROOM LOWER SOL
578-CM-165 CONVEYOR RAISE Y-18
74
578-CH-34
CONVEYOR RAISE Y-18
CH-C23
260-CH-103
INDUCTIVE GND B-18
CH-S14
RAISE CONV SOLENOID
SAUER
MC088
382-CM-268
CB BALANCE SIGNAL W-18
75
382-CH-27 CB BALANCE SIGNAL W-18
CH-C18
B
96
TO SHEET 7
CH-C1 PIN 92
150-CH-26
FUSED SWITCHED PWR
O-18
A
C
230-CH-80
CONTROLLER GND B-18
CH-S7
CB BALANCE TRANSDUCER
568-CM-600
CB DWN PRESS DG-18
568-RF-38 CB DWN PRESS DG-18
RF-C3
95
TO SHEET 7
RF-S4
150-RF-48
FUSED SWITCHED PWR
O-18
241-RF-51
CONTROLLER GND B-18
RF-S7
CB PRESSURE TRANSDUCER
531-CM-5 WATER PUMP DB-14
77
WATER PUMP
6
531-CH-7
WATER PUMP DB-14
CH-C7
M
260-CH-91
INDUCTIVE GND B-14
CH-S11
38
532-CH-8
LOW FLOW WATER LB-16
WATER LOW FLOW
NP/NS ONLY
532-CM-35 LOW FLOW WTR LB-16



SHEET 10 OF 16

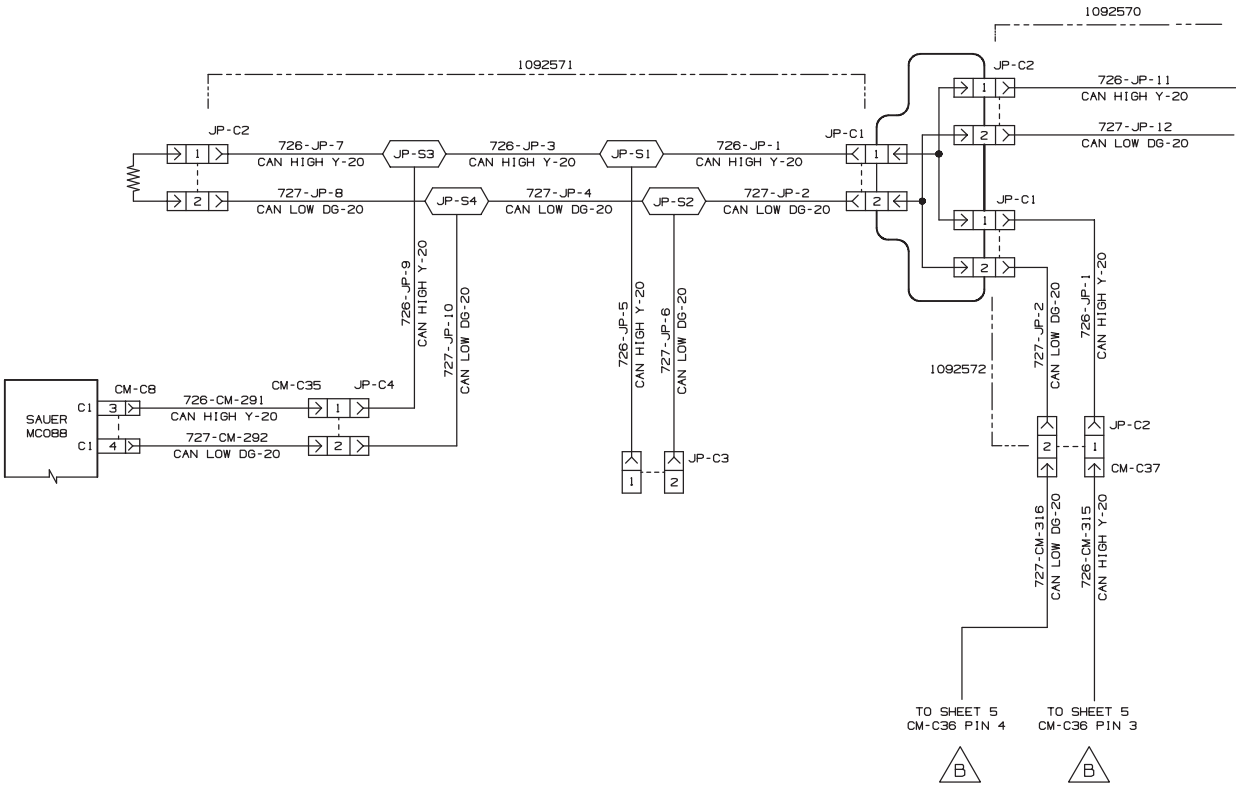

CM-C1
CH-C1
73
584-CH-40 HOPPER RETURN LG-18
260-CH-109
INDUCTIVE GND B-18
CH-C29
HOPPER RETURN SOLENOID
CH-C30
72
583-CH-41 HOPPER DUMP DB-18
260-CH-110
INDUCTIVE GND B-18
CH-S15
HOPPER DUMP SOLENOID
CM-C22
923-CM-387 CONVEYOR CUTOUT LG-18
599-CM-140
COMMON VALVE P-18
TO SHEET 9
CM-S18
923-CM-308 CONVEYOR CUTOUT LG-18
TO SHEET 9
CM-C7:5 F5 PIN 1
582-CM-64 HOPPER LOWER DG-18
71
582-CH-38 HOPPER LOWER DG-18
260-CH-107
INDUCTIVE GND B-18
CH-C27
HOPPER LOWER SOLENOID
581-CM-63 HOPPER RAISE Y-18
70
581-CH-39 HOPPER RAISE Y-18
260-CH-108
INDUCTIVE GND B-18
CH-C28
HOPPER RAISE SOLENOID
HOPPER CUTOUT RELAY
CM-C2
RF-C1
558-CM-603 RSB TILT SIGNAL W-18
22
558-RF-35 RSB TILT SIG W-18
721-RF-61
5V SENSOR PWR O-18
240-RF-59
SENSOR GROUND B-18
TO SHEET 7
RF-S8
TO SHEET 7
RF-S9
RF-C15
RSB TILT SIGNAL
518-CM-602 LSB TILT SIGNAL Y-18
86
518-CH-46 LSB TILT SIGNAL Y-18
721-CM-293
5V SENSOR PWR O-18
36
721-CH-147 5V SENSOR PWR O-18
240-CH-81
SENSOR GROUND B-18
TO SHEET 7
CM-S76
TO SHEET 7
CH-S8
CH-C46
LSB TILT SIGNAL
557-CM-4 RSB TILT DWN BR-16
20
557-RF-34 RSB TILT DWN BR-16
RF-C16
56
RSB LINEAR ACTUATOR
556-CM-3 RSB TILT UP DG-16
19
556-RF-33 RSB TILT UP DG-16
517-CM-2 LSB TILT DWN T-16
51
517-CH-44 LSB TILT DWN T-14
CH-C45
56
LSB LINEAR ACTUATOR
516-CM-1 LSB TILT UP Y-16
50
516-CH-43 LSB TILT UP Y-14

FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

SWITCHED POWER CM-C12

SWEEP POWER CM-C13

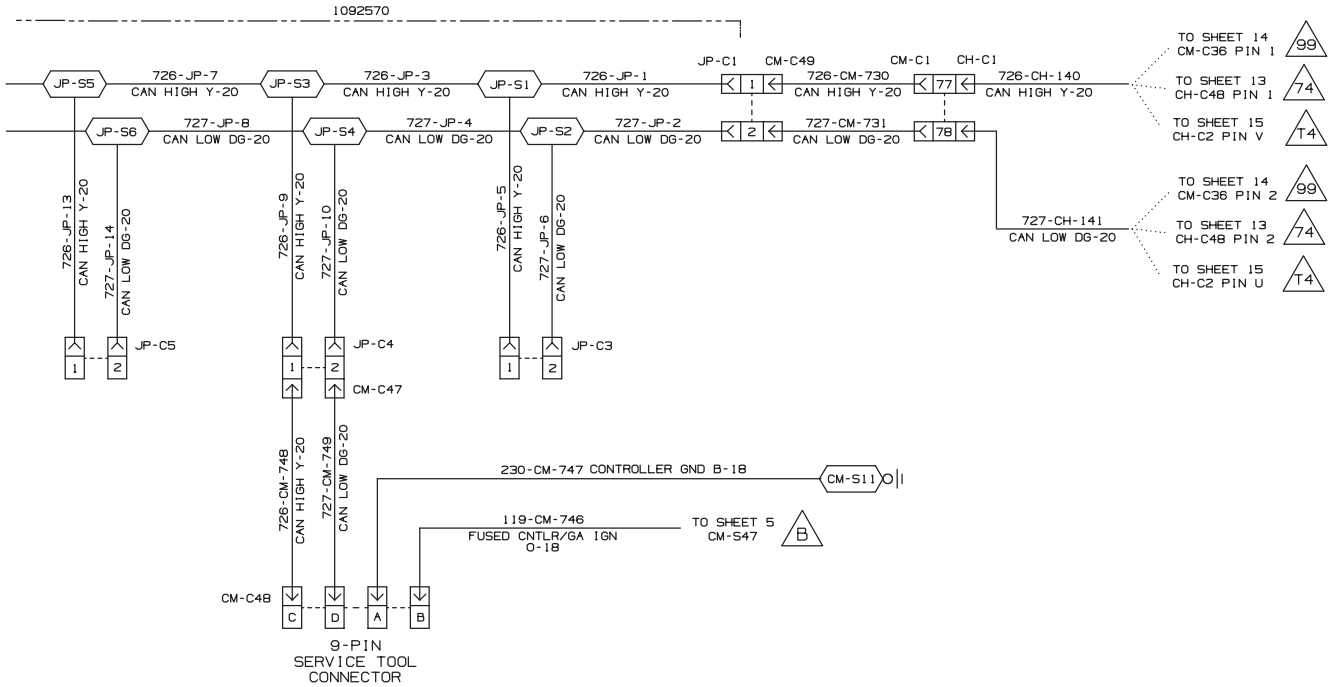


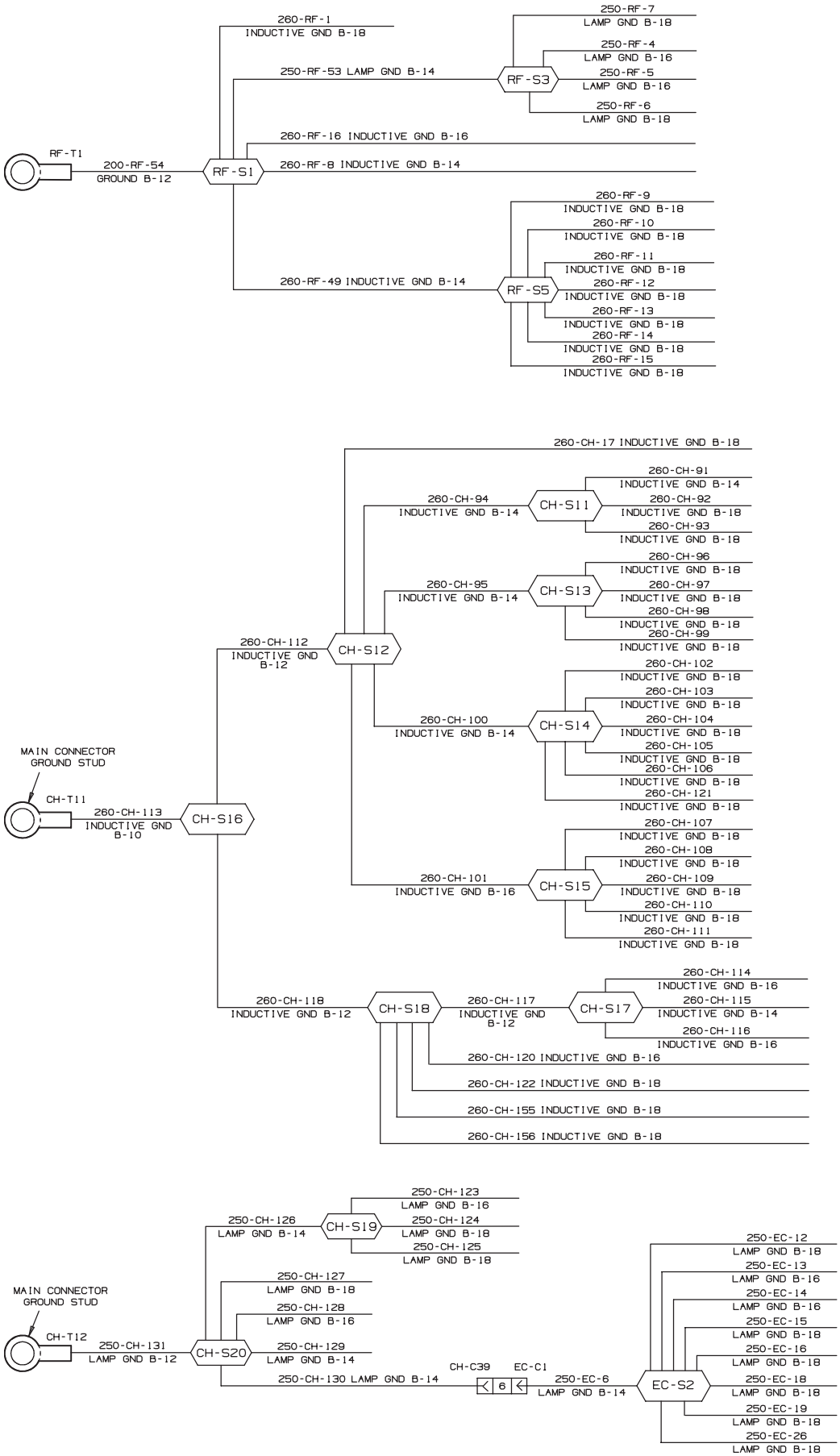
FUSED BATTERY POWER CM-C14

FUSED BATTERY POWER CM-C11

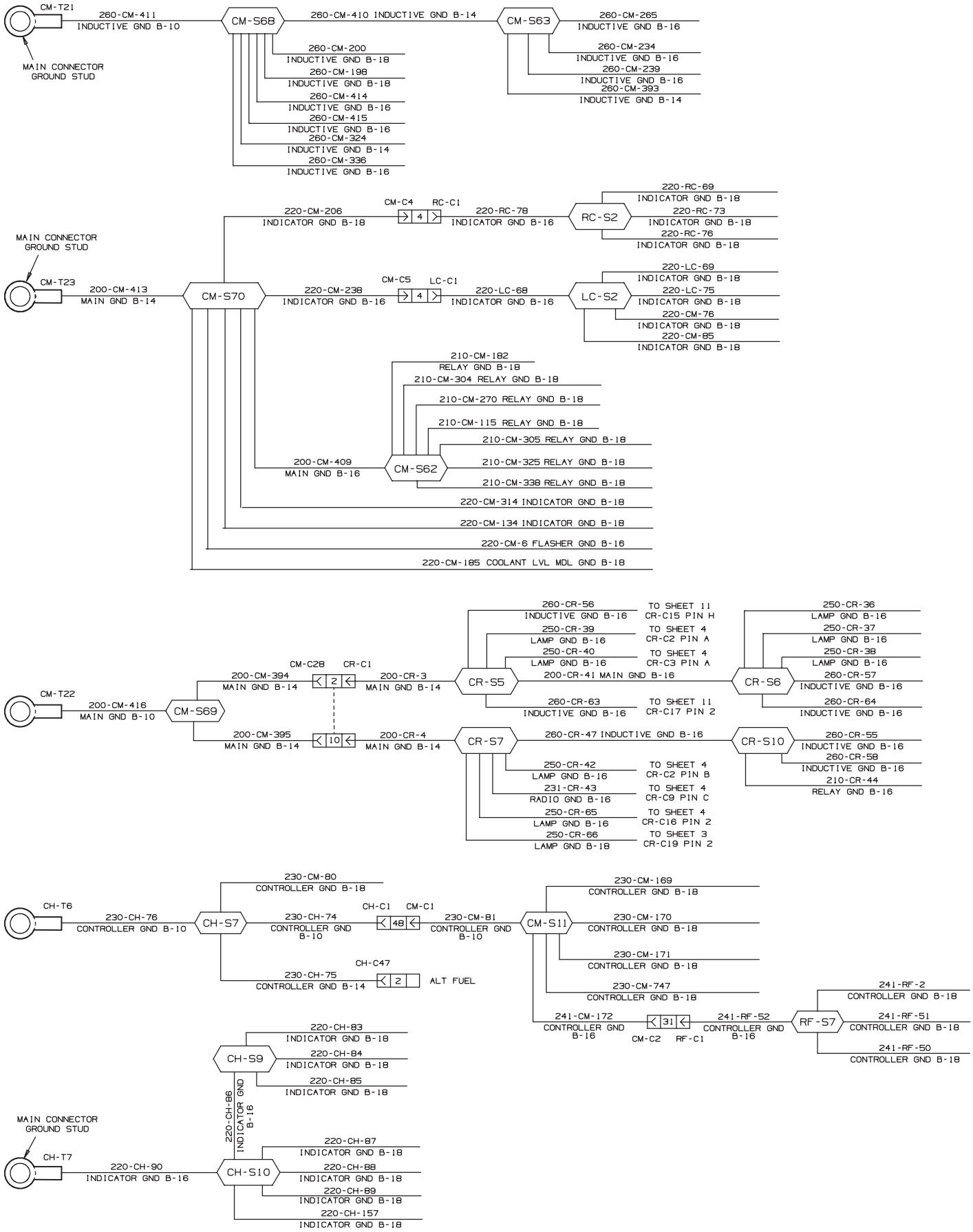
SWITCHED POWER CM-C12

SWEEP POWER CM-C13


1092570
JP-S5
726-JP-7
CAN HIGH Y-20
JP-S3
726-JP-3
CAN HIGH Y-20
JP-S1
726-JP-1
CAN HIGH Y-20
JP-C1
CM-C49
726-CM-730
CAN HIGH Y-20
CM-C1
CH-C1
726-CH-140
CAN HIGH Y-20
TO SHEET 14
CM-C36 PIN 1
99
TO SHEET 13
CH-C48 PIN 1
74
TO SHEET 15
CH-C2 PIN V
T4
JP-S6
727-JP-8
CAN LOW DG-20
JP-S4
727-JP-4
CAN LOW DG-20
JP-S2
727-JP-2
CAN LOW DG-20
727-CM-731
CAN LOW DG-20
727-CH-141
CAN LOW DG-20
TO SHEET 14
CM-C36 PIN 2
TO SHEET 13
CH-C48 PIN 2
TO SHEET 15
CH-C2 PIN U
726-JP-13
CAN HIGH Y-20
727-JP-14
CAN LOW DG-20
JP-C5
726-JP-9
CAN HIGH Y-20
727-JP-10
CAN LOW DG-20
JP-C4
CM-C47
726-JP-5
CAN HIGH Y-20
727-JP-6
CAN LOW DG-20
JP-C3
726-CM-748
CAN HIGH Y-20
727-CM-749
CAN LOW DG-20
230-CM-747 CONTROLLER GND B-18
CM-S11
119-CM-746
FUSED CNTLR/GA IGN
0-18
TO SHEET 5
CM-S47
B
CM-C48
9-PIN
SERVICE TOOL
CONNECTOR



GROUND TREE SPLICES


CM-T21
260-CM-411
INDUCTIVE GND B-10
MAIN CONNECTOR GROUND STUD
CM-S68
260-CM-410 INDUCTIVE GND B-14
CM-S63
260-CM-265
INDUCTIVE GND B-16
260-CM-234
INDUCTIVE GND B-16
260-CM-239
INDUCTIVE GND B-16
260-CM-393
INDUCTIVE GND B-14
260-CM-200
INDUCTIVE GND B-18
260-CM-198
INDUCTIVE GND B-18
260-CM-414
INDUCTIVE GND B-16
260-CM-415
INDUCTIVE GND B-16
260-CM-324
INDUCTIVE GND B-14
260-CM-336
INDUCTIVE GND B-16
220-RC-69
INDICATOR GND B-18
CM-C4
RC-C1
220-CM-206
INDICATOR GND B-18
4
220-RC-78
INDICATOR GND B-16
RC-S2
220-RC-73
INDICATOR GND B-18
220-RC-76
INDICATOR GND B-18
MAIN CONNECTOR GROUND STUD
CM-T23
200-CM-413
MAIN GND B-14
CM-S70
CM-C5
LC-C1
220-CM-238
INDICATOR GND B-16
4
220-LC-68
INDICATOR GND B-16
LC-S2
220-LC-69
INDICATOR GND B-18
220-LC-75
INDICATOR GND B-18
220-CM-76
INDICATOR GND B-18
220-CM-85
INDICATOR GND B-18
210-CM-182
RELAY GND B-18
210-CM-304 RELAY GND B-18
210-CM-270 RELAY GND B-18
210-CM-115 RELAY GND B-18
210-CM-305 RELAY GND B-18
200-CM-409
MAIN GND B-16
CM-S62
210-CM-325 RELAY GND B-18
210-CM-338 RELAY GND B-18
220-CM-314 INDICATOR GND B-18
220-CM-134 INDICATOR GND B-18
220-CM-6 FLASHER GND B-16
220-CM-185 COOLANT LVL MDL GND B-18
260-CR-56
INDUCTIVE GND B-16
TO SHEET 11
CR-C15 PIN H
250-CR-39
LAMP GND B-16
TO SHEET 4
CR-C2 PIN A
250-CR-40
LAMP GND B-16
TO SHEET 4
CR-C3 PIN A
250-CR-36
LAMP GND B-16
250-CR-37
LAMP GND B-16
250-CR-38
LAMP GND B-16
CM-C28
CR-C1
200-CM-394
MAIN GND B-14
2
200-CR-3
MAIN GND B-14
CR-S5
200-CR-41 MAIN GND B-16
CR-S6
260-CR-57
INDUCTIVE GND B-16
CM-T22
200-CM-416
MAIN GND B-10
CM-S69
260-CR-63
INDUCTIVE GND B-16
TO SHEET 11
CR-C17 PIN 2
260-CR-64
INDUCTIVE GND B-16
200-CM-395
MAIN GND B-14
10
200-CR-4
MAIN GND B-14
CR-S7
260-CR-47 INDUCTIVE GND B-16
CR-S10
260-CR-55
INDUCTIVE GND B-16
260-CR-58
INDUCTIVE GND B-16
210-CR-44
RELAY GND B-16
250-CR-42
LAMP GND B-16
TO SHEET 4
CR-C2 PIN B
231-CR-43
RADIO GND B-16
TO SHEET 4
CR-C9 PIN C
250-CR-65
LAMP GND B-16
TO SHEET 4
CR-C16 PIN 2
250-CR-66
LAMP GND B-18
TO SHEET 3
CR-C19 PIN 2
230-CM-80
CONTROLLER GND B-18
230-CM-169
CONTROLLER GND B-18
CH-T6
230-CH-76
CONTROLLER GND B-10
CH-S7
CH-C1
CM-C1
230-CH-74
CONTROLLER GND B-10
48
230-CM-81
CONTROLLER GND B-10
CM-S11
230-CM-170
CONTROLLER GND B-18
230-CM-171
CONTROLLER GND B-18
230-CM-747
CONTROLLER GND B-18
CH-C47
230-CH-75
CONTROLLER GND B-14
2
ALT FUEL
241-RF-2
CONTROLLER GND B-18
241-CM-172
CONTROLLER GND B-16
31
CM-C2
RF-C1
241-RF-52
CONTROLLER GND B-16
RF-S7
241-RF-51
CONTROLLER GND B-18
241-RF-50
CONTROLLER GND B-18
220-CH-83
INDICATOR GND B-18
CH-S9
220-CH-84
INDICATOR GND B-18
220-CH-85
INDICATOR GND B-18
220-CH-86
INDICATOR GND B-16
MAIN CONNECTOR GROUND STUD
CH-T7
220-CH-90
INDICATOR GND B-16
CH-S10
220-CH-87
INDICATOR GND B-18
220-CH-88
INDICATOR GND B-18
220-CH-89
INDICATOR GND B-18
220-CH-157
INDICATOR GND B-18

SPLICES BY SHEET

TOTAL	CH-S1	CH-S4	CH-S7	CH-S8	CH-S9	CH-S10	CH-S11	CH-S12	CH-S13	CH-S14	CH-S15	CH-S16
SHT 2			1									
SHT 3	1	1								1		
SHT 4												
SHT 5					3	2						
SHT 6												
SHT 7				1				1				
SHT 8							2		2			
SHT 9			1				1		1	2		
SHT 10												
SHT 11												
SHT 12			1		1	1	1	1	1	1	1	1
SHT 13						1						
SHT 14												

TOTAL	CM-S12	CM-S13	CM-S14	CM-S15	CM-S17	CM-S18	CM-S19	CM-S20	CM-S21	CM-S22	CM-S23	CM-S24
SHT 2						1						
SHT 3	1									1		
SHT 4											1	
SHT 5												
SHT 6												
SHT 7												
SHT 8		1	1	1	1							
SHT 9						1	1	1	1			
SHT 10				1								1
SHT 11												
SHT 12												
SHT 13												
SHT 14												

TOTAL	CM-S56	CM-S57	CM-S62	CM-S63	CM-S68	CM-S69	CM-S70	CM-S71	CM-S76	CM-S81	CM-S82	CR-S1
SHT 2			1								1	
SHT 3		1	1				1			1		
SHT 4												1
SHT 5							1					
SHT 6	1		1	1	1		1					
SHT 7			1		2			1	1			
SHT 8			1									
SHT 9			1	1								
SHT 10				2	1							
SHT 11												
SHT 12			1	1	1	1	1					
SHT 13			1				1					
SHT 14			1									

	EL-S2	EN-S1	JP-S1	JP-S2	JP-S3	JP-S4	JP-S5	JP-S6	LC-S1	LC-S2	ML-S1	ML-S2
SHT 2												
SHT 3												
SHT 4	2									1	1	1
SHT 5			1	1								
SHT 6			1	1								
SHT 7												
SHT 8									1	1		
SHT 9										1		
SHT 10												
SHT 11			2	2	2	2	1	1				
SHT 12										1		
SHT 13		1										
SHT 14												

CH-S17	CH-S18	CH-S19	CH-S20	CH-S21	CM-S1	CM-S5	CM-S7	CM-S8	CM-S9	CM-S10	CM-S11	
												SHT 2
		2	1					1		1		SHT 3
												SHT 4
												SHT 5
2	1		1									SHT 6
			1	1	1						1	SHT 7
												SHT 8
	1					1						SHT 9
												SHT 10
											1	SHT 11
1	1	1	1								1	SHT 12
									1			SHT 13
			1						1			SHT 14

CM-S25	CM-S26	CM-S27	CM-S28	CM-S32	CM-S33	CM-S34	CM-S38	CM-S42	CM-S47	CM-S48	CM-S49	
												SHT 2
							1	1				SHT 3
												SHT 4
									1			SHT 5
					1							SHT 6
						1						SHT 7
			1								1	SHT 8
				1								SHT 9
1	1	1								1		SHT 10
												SHT 11
												SHT 12
												SHT 13
												SHT 14

CR-S2	CR-S3	CR-S4	CR-S5	CR-S6	CR-S7	CR-S10	EC-S1	EC-S2	EC-S3	EC-S4	EL-S1	
												SHT 2
							1	2		1		SHT 3
3	4	1									2	SHT 4
								2	1			SHT 5
								2	1			SHT 6
												SHT 7
												SHT 8
												SHT 9
												SHT 10
												SHT 11
			1	1	1	1		1				SHT 12
												SHT 13
												SHT 14

RC-S1	RC-S2	RC-S3	RF-S1	RF-S2	RF-S3	RF-S4	RF-S5	RF-S7	RF-S8	RF-S9		
												SHT 2
		1		1	1							SHT 3
			1									SHT 4
												SHT 5
	1											SHT 6
			1		1	1			1	1		SHT 7
1	1						3	2				SHT 8
	1						2	1				SHT 9
												SHT 10
												SHT 11
	1		1		1		1	1				SHT 12
												SHT 13
												SHT 14



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