Doosan Infracore
Portable Power

ELECTRONIC SERVICE MANUAL

COMPRESSOR MODELS

HP1600WCU-T4F (F76)
XHP1170WCU-T4F (F77)
XHP1170WCU-T4F (F78)

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General Information

Operational Theory

The HP1600WCU Tier 4F and XHP1170 compressors have an electronic system using the Titan controller to provide discharge air pressure control and package monitoring functions. The electrical system connects all the necessary switches, sensors, and transducers to the Titan controller.

Titan Controller

The Titan controller is the heart of the compressor monitoring and control system and provides data collection, package monitoring, and control functions for compressor operations. The Titan controller is a microprocessor-based controller with analog and digital inputs and outputs.

The Titan controller is mounted inside the Control Panel enclosure.

The first function of the Titan controller is to scan all inputs at a fixed interval. The analog values are compared to preset minimum and maximum values and an ALERT or FAULT is issued when a value is out of range. The various ALERTS and FAULTS are listed in the Compressor Diagnostic Code Troubleshooting section.

The second function of the Titan controller is compressor discharge pressure control. The Titan monitors the regulation system air pressure and varies the engine throttle to maintain the setpoint discharge air pressure. The setpoint pressure is set by adjusting the pressure regulator. For compressors equipped with dual pressure option, the setpoint pressure for each mode is set by adjusting the high and low pressure regulators.

The third function of the Titan controller is to communicate diagnostic and control information between the Titan, engine ECM, ViewPort, and other optional controllers via the J1939 CAN network. The engine throttle setting is sent from the Titan to the engine ECM. The control system schematic shows the connection layout between the Titan controller and engine ECM.

Temperature Sensors and Pressure Transducers

The electronics system uses temperature sensors and pressure transducers to monitor the compressor operation. The temperature sensors used to measure compressor temperatures are thermistor type devices. The resistance output of the temperature sensor changes with a corresponding temperature change of the parameter being monitored. The Titan controller receives the resistance value of the sensor and converts it to a temperature value. The Titan uses the temperature value to ensure the parameter being monitored is within its operating limits and relays the value to the ViewPort for operator viewing.

The pressure sensors used to measure compressor pressures are transducer type devices. These sensors have an output signal range of 0.5 VDC to 4.5 VDC, where 0.5 VDC corresponds to 0 PSI and 4.5 VDC corresponds to the maximum PSI rating for a particular transducer. Pressure sensors are provided with 5 VDC excitation voltage from the Titan controller. Also, the sensor return or ground connects to the Titan controller. The output voltage of the pressure sensor changes with a corresponding pressure change of the parameter being monitored. The Titan controller receives the voltage of the sensor and converts it to a pressure value. The Titan uses the pressure value to ensure the parameter being monitored is within its operating limits and relays the value to the ViewPort for operator

viewing.

Digital Input and Output

The Titan controller scans digital inputs such as switch contacts. Inputs are 24 VDC, 12 VDC, or 0 VDC. Digital inputs with 24 VDC or 12 VDC represent a closed switch contact. Digital inputs with 0 VDC represent an open switch contact.

The Titan controller provides 24 VDC digital outputs to control solenoids, relays, and other devices. Outputs are 24 VDC ON and 0 VDC OFF and are current limited and short circuit protected.

Controller Outputs

The Titan controller has 24 VDC digital (ON/OFF) type outputs.

Pressure Control

The discharge pressure is controlled by manipulating engine speed and compressor inlet valve position. The inlet valve position is controlled pneumatically and the engine speed is controlled by the Titan controller. The Titan measures the pneumatic system regulation pressure and computes the engine throttle setting. The throttle setting is sent to the engine ECM via the J1939 CAN network. This throttle technique is referred to as J1939 throttle. The engine ECM will control engine speed to the J1939 throttle setting.

Engine Electronics

The HP1600WCU and XHP1170WCU model compressors contain a Tier 4F emissions certified diesel engine. This engine has an electronic control system, engine ECM, which handles all monitor, alarm, and control functions for the engine. The Titan controller communicates with the engine ECM via the J1939 CAN network.

ViewPort Display Module

The ViewPort display module displays compressor and engine operational information to the operator. The ViewPort contsists of a 7-inch color display and a navigation button to navigate through the information screens.

The ViewPort is connected to the J1939 CAN network for communication with other devices on the network. The ViewPort stores various events in the system log for historical use and also contains an onboard manual documentation package.

J1939 CAN Network

The J1939 CAN network is a twisted pair of wires located in the compressor and engine harnesses. These wires are the network link between all electronic control modules. The wires are color coded yellow and dark green. The yellow wire is referred to as CAN High (+) and the dark green wire is referred to as CAN Low (-). **Figure 1-2** shows the connection layout of the CAN network.

Located on each end of the J1939 CAN network are termination resistors (terminator). The terminators prevent reflections on the transmission line and must be in place for the network to function properly.

Electrical System

The electrical system consists of the wiring harnesses and associated electrical devices such as relays, switches, sensors, and solenoids. There are six wiring harnesses on this compressor:

- Gauge Panel Harness
- Control Panel Harness
- Compressor Harness
- Engine Harness
- Airend Harness
- Regulation System Harness

Figure 1-3 shows the connection layout of the harness system.

The electrical circuits are protected by ATM mini style fuses. A fuse should only be replaced with one of the same rating. Installing a larger rated fuse could lead to wiring harness damage.

Figure 1-2 : J1939 CAN BUS CONNECTION LAYOUT

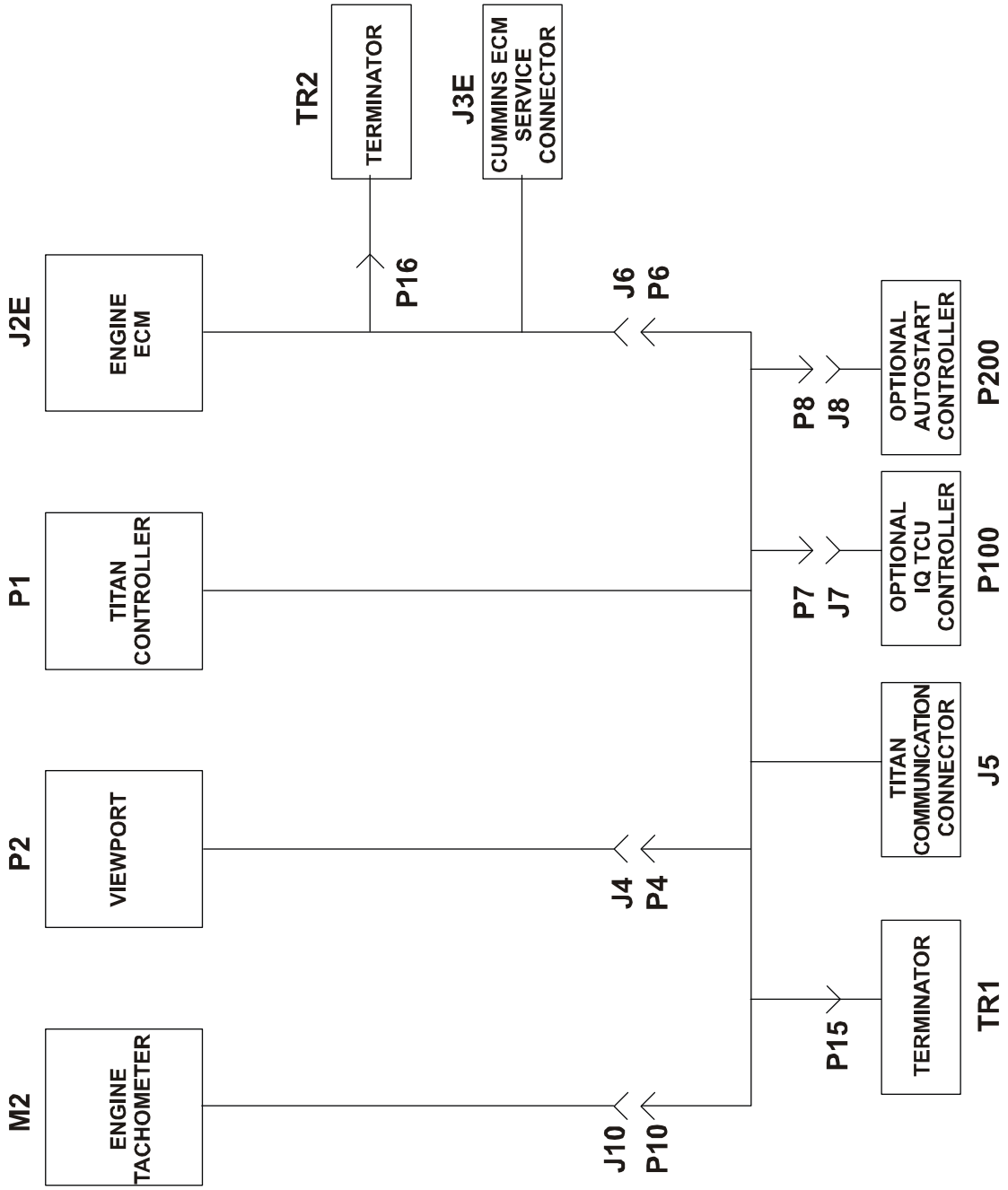
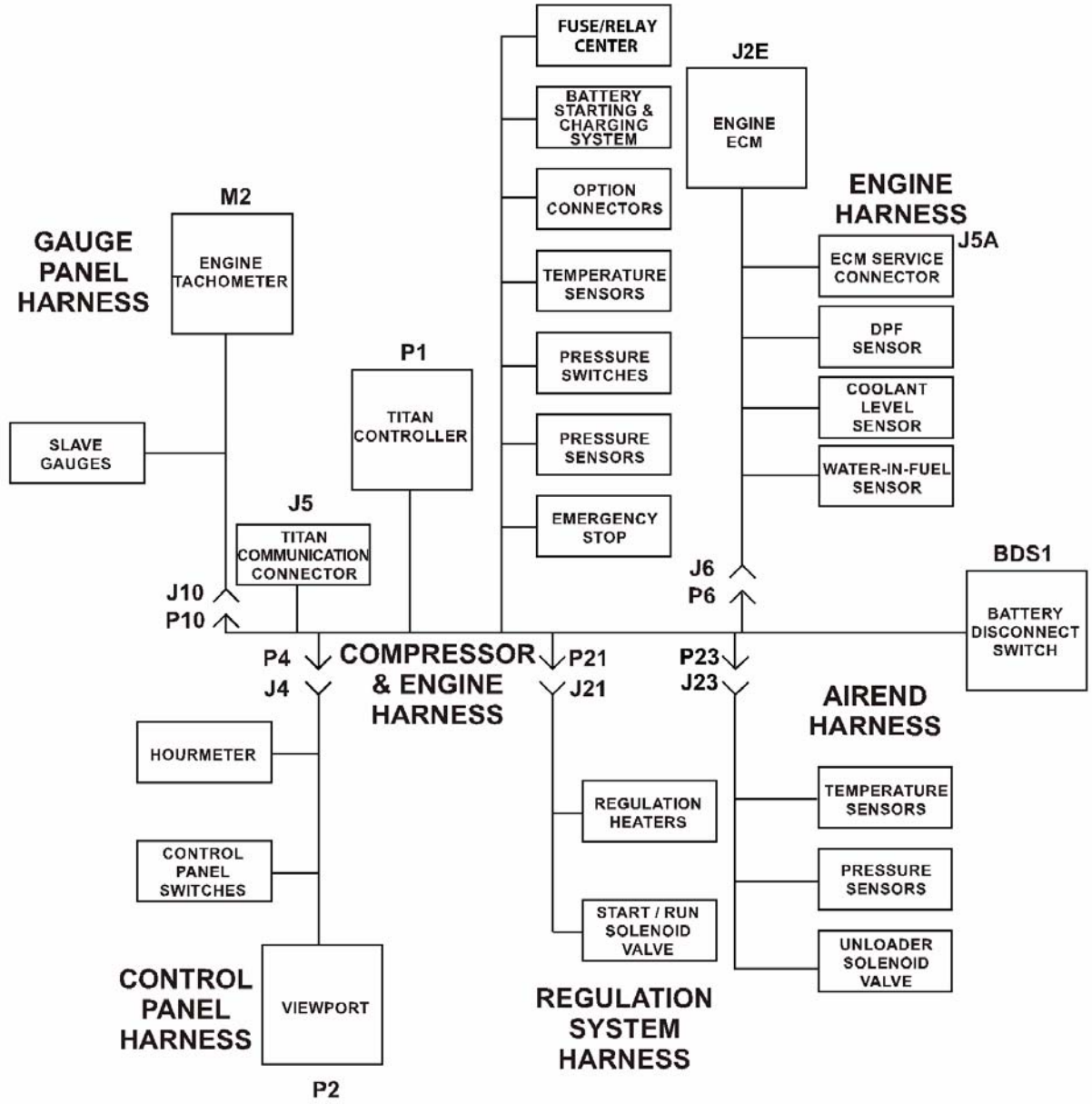


Figure 1-3 : HARNESS SYSTEM CONNECTION LAYOUT



Compressor Operation Sequence

Power On

When the Main Control Switch is moved to the ON position:

1. Key ON/OFF signal (24 VDC) supplied to Titan controller, ViewPort display, Switched Power Relay (FB1-K13), and ECM Power-on Relay (FB2-K23).
2. ViewPort display and gauges will initialize.
3. Panel lamp and gauge backlights power on.
4. Regulation heaters are powered on if ambient temperature is below 45°F.

Run

When the Main Control Switch is moved to the RUN position:

1. Keyswitch signal (24 VDC) supplied to engine ECM from Titan.
2. Start compressor is powered on for 10 seconds.
3. Unloader Solenoid Valve (L2) is closed (HP de-energized), (XHP energized).

Start

When the Start Button is pressed:

1. Start compressor is powered on.
2. Start/Run Solenoid Valve (L1) is opened (energized).
3. Unloader Solenoid Valve (L2) is closed (HP de-energized), (XHP energized).
4. Engine starter is energized.

When the engine speed reaches 600 RPM (engine start declared):

1. Engine starter is de-energized.
2. Engine speed is set to 1500 RPM.

When the engine speed reaches 1450 RPM:

1. Start/Run Solenoid Valve (L1) is closed (de-energized).
2. Unloader Solenoid Valve (L2) is opened (HP energized), (XHP de-energized).
3. Start compressor is powered off.

When the separator tank reaches 50 psi:

1. Start/Run Solenoid Valve (L1) is opened (energized).
2. Engine speed remains at 1500 RPM until engine coolant temperature reaches 100°F. Engine speed set to idle speed, 1200 RPM.
3. Service Air Button is unavailable for 5 seconds.

Load

When the Service Air Button is pressed:

1. Engine speed is set to 1800 RPM.

When engine speed reaches 1700 RPM:

2. Start/Run Solenoid Valve (L1) is closed (de-energized).

After 2 seconds, if the regulation system pressure is 4 psi or greater:

3. Engine speed control is engaged.

Shutdown

Close the service valve(s). Allow the compressor to run at idle speed, 1200 RPM, for 3 to 5 minutes to allow cool down. Use Emergency Stop only for emergency conditions.

When the Main Control Switch is moved to the ON position:

1. Keyswitch signal (24 VDC) from Titan to engine ECM is de-energized.
2. The engine will shutdown.
3. Key ON/OFF signal (24 VDC) will remain supplied to Titan controller, ViewPort display, Switched Power Relay (FB1-K13), and ECM Power-on Relay (FB2-K23).
4. The ViewPort will remain on for viewing operating parameters and any active diagnostic codes.
5. Compressor gauges will remain active. Engine gauges will power off.
6. Panel lamp and gauge backlights will remain on.

When the Main Control Switch is moved to the OFF position:

1. Key ON/OFF signal (24 VDC) supplied to Titan controller, ViewPort display, Switched Power Relay (FB1-K13) is de-energized, and ECM Power-on Relay FB2-L23) remains engergized unitl de-energized by engine ECM.
2. ViewPort display, gauges, and compressor control system will power off.

Compressor Diagnostic Code Troubleshooting

General

A thorough analysis of the problem is the key to successful troubleshooting. The more information known about a problem, the faster and easier the problem can be solved.

Troubleshooting charts are included to act as a guide to the troubleshooting process.

The charts are organized so the easiest and most logical things are performed first. It is not possible to include all the solutions to problems that can occur or list all possible problems.

The charts are designed to stimulate a thinking process that will lead to the solution of a problem.

Basic Troubleshooting Steps

- Review the controller fault log for clues to the problem.
- Collect all facts concerning the problem.
- Analyze the problem thoroughly.
- Relate the symptoms to the basic electrical/electronic systems and components.
- Consider any recent repairs that could relate to the problem.

General Measuring Guidelines

Since the electrical system uses sealed connectors and splices, access of test points can be difficult. It is recommended a test probe kit be used to access the signals to prevent damage to wires and connectors. Back-probing connectors and insulation piercing test probes can cause damage that can cause future failures.

Measuring Voltage

A digital voltmeter is recommended to make measurements. Voltage measurements are made by connecting the Red (+) lead to the desired signal and the Black (-) lead to the common. The test lead connections must be secure or incorrect readings will result. Do NOT use chassis ground or other metal connection. Circuit common will be any of the brown wires or battery Negative.

IMPORTANT INFORMATION

DO NOT USE MACHINE FRAME, SHEET METAL, PIPING, OR OTHER METAL COMPONENTS AS COMMON OR GROUND WHEN MAKING VOLTAGE OR FREQUENCY MEASUREMENTS.

Measuring Resistance

Extra care must be taken when making resistance measurements. Test probe connections are crucial to correct readings. Ensure the test probe makes a solid connection with the wire(s) or connector pin(s) under test. The test probe kit may help with these types of measurements. Electrical system must be powered OFF while making resistance measurements.

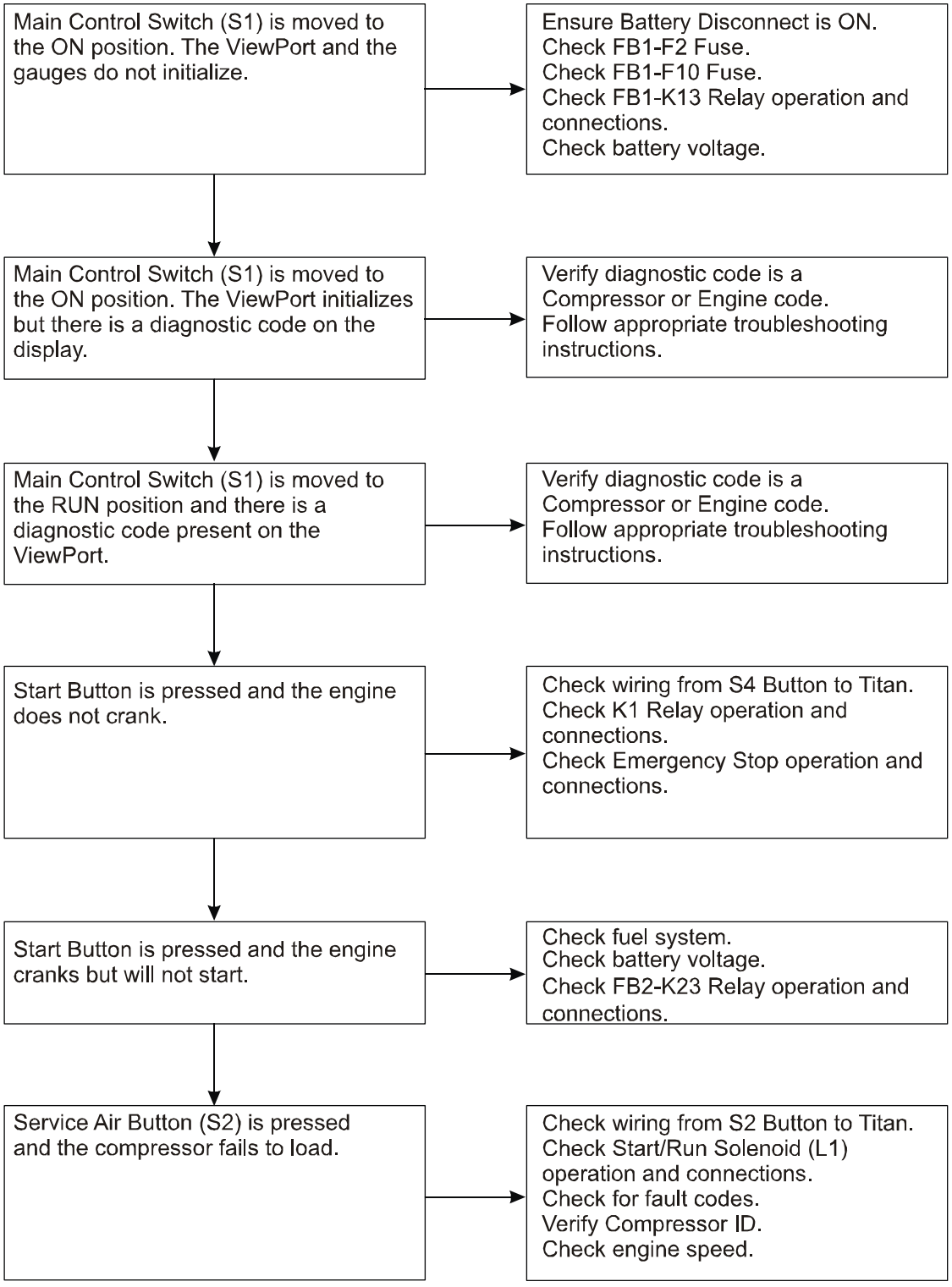
Measuring Frequency

Frequency is measured in the same manner as voltage, but the meter is set for HZ or frequency. Good connections are important or false readings will occur.

Measuring Duty Cycle

To measure duty cycle, set up the meter as if measuring frequency or voltage. Select the % or duty cycle function and take the measurements.

Trouble Shooting Flow Chart



Compressor Diagnostic Codes

Compressor Code	Display Name	Description	Code Type
1	Low Engine Speed	Engine speed less than 900 RPM for 30 seconds.	FAULT
2	High Engine Speed	Engine speed greater than 1900 RPM for 30 seconds.	FAULT
3	Engine Crank Timeout	Engine crank attempt longer than 15 seconds.	ALERT
4	Out of Fuel	Fuel level in tank below usable limit.	FAULT
9	Engine Diagnostic Code	Engine diagnostic code present in ViewPort history log.	ALERT
10	Engine Speed Response	Engine target idle speed not met within 10 seconds after loading compressor.	ALERT
11	AutoStart Attempts Exceeded	Compressor not started after 3 crank attempts.	FAULT
12	Low Fuel Level	Fuel level in tank approaching empty.	ALERT
29	Engine Shutdown Unknown	Engine stopped without an engine diagnostic code.	FAULT
30	High Airend Discharge Temperature	Airend discharge temperature greater than or equal to 248°F.	FAULT
31	Low Airend Oil Pressure	Airend oil pressure below 10 psi.	FAULT
32	Airend Discharge Temperature Sensor	Airend Discharge Temperature Sensor reading out of range.	FAULT
33	Separator Tank Pressure Sensor	Separator Tank Pressure Sensor reading out of range.	FAULT
34	High Separator Tank Pressure At Start	Separator tank pressure greater than 20 psi at crank attempt.	ALERT

Compressor Code	Display Name	Description	Code Type
35	High Separator Tank Pressure	Air pressure in the separator tank exceeded limit.	FAULT
36	Safety Valve Open	Safety relief valve on separator tank opened.	FAULT
38	Intake Air Filters Restricted	Intake filters restricting air flow.	ALERT
39	Low System Voltage	Electrical system voltage below 25.5VDC.	ALERT
41	Airend Oil Pressure Sensor	Airend Oil Pressure Sensor reading out of range.	FAULT
42	Fuel Level Sensor	Fuel Level Sensor reading out of range.	ALERT
43	Low Separator Tank Pressure	Separator tank pressure below 40 psi after compressor is loaded.	FAULT
44	High IQ Filter Restriction	IQ filters restricting air flow.	ALERT
50	High Separator Tank Temperature	Separator tank temperature greater than or equal to 248°F.	FAULT
51	Compressor ID Invalid	The Titan controller and ViewPort do not have a valid compressor ID.	FAULT
52	IQ Filters Restricted	IQ filters restricted past usable level.	FAULT
53	Separator Tank Temperature Sensor	Separator Tank Temperature Sensor reading out of range.	FAULT
54	Regulation System Pressure Sensor	Regulation System Pressure Sensor reading out of range.	FAULT
55	Emergency Stop Activated	Emergency Stop Button has been activated.	FAULT
56	Low Start Pressure	Separator tank pressure below 50 psi 20 seconds after start.	ALERT
58	Ambient Temperature Sensor	Ambient Temperature Sensor reading out of range.	ALERT

Compressor Code	Display Name	Description	Code Type
61	IQ Filter Pressure Error	IQ filter outlet pressure reading higher than inlet pressure.	ALERT
62	IQ System Louvers Malfunction	Louvers or louver actuator not operating properly.	ALERT
63	Primary IQ Differential Pressure Sensor	IQ Differential Pressure Sensor reading out of range.	ALERT
64	Secondary IQ Differential Pressure Sensor	IQ Differential Pressure Sensor reading out of range.	ALERT
66	IQ Aftercooler Temperature Sensor	IQ Aftercooler Temperature Sensor reading out of range.	ALERT
67	IQ Actuator Position Sensor	IQ Louver Actuator Position Sensor reading out of range.	ALERT
71	Engine ECM Communication	Communication between Titan controller and engine ECM not functional.	FAULT
73	AutoStart Controller Communication	Communication between Titan controller and AutoStart controller not functional.	ALERT
75	IQ TCU Controller Communication	Communication between Titan controller and IQ TCU controller not functional.	ALERT
76	Titan Controller Communication	Communication between Titan controller and ViewPort not functional.	ALERT

COMPRESSOR CODE 1

Low Engine Speed

Explanation:
The Titan controller has received an engine speed value less than 900 RPM for 30 seconds from the engine ECM.

Effect:
Code 1 is a FAULT condition and will shut down the compressor. Code 1 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check ViewPort display for active engine diagnostic codes.	If active engine diagnostic codes are present, resolve the issues.
Step 2: Start and run the compressor at idle. Check ViewPort display to verify the engine target (RPM). If the engine coolant temperature is below 100°F, the engine target (RPM) will be 1500 RPM. If the engine coolant temperature is 100°F or above, the engine target (RPM) will be 1200 RPM.	If the engine target (RPM) is 1500 for cold idle or 1200 for hot idle, the electronic system is commanding the engine to run at the correct speed. Proceed to Step 3.
Step 3: Check the engine fuel system for restrictions.	If the fuel filters are dirty or have not been changed during regular service, replace fuel filters. If dirty fuel has been used, add clean fuel and replace fuel filters. If air has gotten into the fuel system, refer to Engine Manual for directions for changing filters and for bleeding the fuel system. If fuel hoses are damaged, replace fuel hoses.
Step 4: If Steps 1 thru 3 checkout OK, refer to the engine manufacturer service dealer.	

COMPRESSOR CODE 2

High Engine Speed

Explanation:

The Titan controller has received an engine speed value greater than 1900 RPM for 30 seconds from the engine ECM.

Effect:

Code 2 is a FAULT condition and will shut down the compressor. Code 2 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check ViewPort display for active engine diagnostic codes.	If active engine diagnostic codes are present, resolve the issues.
Step 2: Start and run the compressor at idle. Press the Service Air Button. Check ViewPort display to verify the engine target (RPM) is 1800.	If the engine target (RPM) is 1800, the electronic system is commanding the engine to run at the correct speed. Proceed to Step 3.
Step 3: If Steps 1 and 2 checkout OK, refer to the engine manufacturer service dealer.	

COMPRESSOR CODE 3

Engine Crank Timeout

Explanation:

The operator has attempted to start the compressor longer than 15 seconds.

Effect:

Code 3 is a FAULT condition and will prevent further cranking. Code 3 and the FAULT name will be displayed on the ViewPort. Operator must wait 1 minute before electronic system will allow another start attempt.

Troubleshooting Steps

Action	Result
Step 1: Wait 1 minute before attempting to start compressor.	After 1 minute, the electronic system will allow another 15 second start attempt.
Step 2: Check the engine fuel system for restrictions.	If the fuel filters are dirty or have not been changed during regular service, replace fuel filters. If dirty fuel has been used, add clean fuel and replace fuel filters. If air has gotten into the fuel system, refer to Engine Manual for directions for changing filters and for bleeding the fuel system. If fuel hoses are damaged, replace fuel hoses.
Step 3: If ambient temperature is below 10°F, verify Cold Weather Kit is functioning (if equipped).	If Cold Weather Kit is not functioning, repair as needed. If Cold Weather Kit is not installed, it is required to start compressor in ambient temperatures below 10°F.

COMPRESSOR CODE 4

Out Of Fuel

Explanation:

The Titan controller has detected a condition from U1 Fuel Level Sensor indicating the fuel level in the tank is below a usable limit.

Effect:

Code 4 is a FAULT condition and will shut down the compressor. Code 4 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check fuel level in tank.	If the fuel level is low, add fuel.
Step 2: Check all harness connections between Titan and U1 Fuel Level Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Remove fuel level sensor from fuel tank. With the fuel level sensor connected to the harness, turn the sensor upside down so float will go to the top. Turn the Main Control Switch to the ON position. Verify the fuel level on the gauge is FULL and code 4 clears from the ViewPort.	If code 4 clears and the fuel level gauge shows FULL, the fuel level sensor is operating properly. If code 4 does not clear and the fuel level gauge shows EMPTY, replace U1 Fuel Level Sensor.
Step 4: With the fuel level sensor still removed from the tank and the Main Control Switch in the ON position, tilt the fuel sensor so the float will move down. Verify the fuel level gauge is moving down the scale.	If the float in the fuel level sensor appears to be sticking while moving, replace U1 Fuel Level Sensor.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 9

Engine Diagnostic Code

Explanation:

Compressor Code 9 is used to define the list of engine diagnostic codes stored in the ViewPort history log.

Effect:

When viewing ALERT and FAULT history log stored in the ViewPort, the engine diagnostic codes stored will be found under Compressor Code 9.

COMPRESSOR CODE 10

Engine Speed Response

Explanation:

The engine has failed to reach target idle speed within 10 seconds after starting.

Effect:

Code 10 is an ALERT condition and will not shut down the compressor, however minimum start pressure will not be met and pressure control will not be engaged. Code 10 and the ALERT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Use the ViewPort to verify the correct compressor ID is loaded.	If the correct compressor ID is not loaded, refer to the section Entering Compressor ID in the Operation and Maintenance Manual.
Step 2: Check the engine fuel system for restrictions.	If the fuel filters are dirty or have not been changed during regular service, replace fuel filters. If dirty fuel has been used, add clean fuel and replace fuel filters. If air has gotten into the fuel system, refer to Engine Manual for directions for changing filters and for bleeding the fuel system. If fuel hoses are damaged, replace fuel hoses.
Step 3: If Steps 1 and 2 checkout OK, refer to the engine manufacturer’s service manual or service dealer.	

COMPRESSOR CODE 11

AutoStart Attempts Exceeded

Explanation:

The Titan controller has made three attempts to start the compressor as commanded by the AutoStart controller and the compressor failed to start.

Effect:

Code 11 is a FAULT condition and will prevent further cranking. Code 11 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Start compressor manually to verify proper operation.	If the compressor operates properly in the manual mode, try starting the compressor in AutoStart mode again. If the compressor does not operate properly in the manual mode, proceed to step 2.
Step 2: Check the engine fuel system for restrictions.	If the fuel filters are dirty or have not been changed during regular service, replace fuel filters. If dirty fuel has been used, add clean fuel and replace fuel filters. If air has gotten into the fuel system, refer to Engine Manual for directions for changing filters and for bleeding the fuel system. If fuel hoses are damaged, replace fuel hoses.
Step 3: Check the condition of the compressor batteries.	If the batteries are discharged or not able to be charged, replace batteries.
Step 4: Verify the battery charger is operating properly.	If the battery charger is not operating properly, replace the battery charger.
Step 5: If ambient temperature is below 10°F, verify Cold Weather Kit is functioning (if equipped).	If Cold Weather Kit is not functioning, then repair. If Cold Weather Kit is not installed, it is required to start compressor in ambient temperatures below 10°F.

COMPRESSOR CODE 12

Low Fuel Level

Explanation:

The Titan controller has detected a condition from U1 Fuel Level Sensor indicating the fuel level in the tank is approaching empty.

Effect:

Code 12 is an ALERT condition and will not shut down the compressor. Code 12 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check fuel level in tank.	If the fuel level is low, add fuel.
Step 2: Check all harness connections between Titan and U1 Fuel Level Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Remove fuel level sensor from fuel tank. With the fuel level sensor connected to the harness, turn the sensor upside down so float will go to the top. Move the Main Control Switch to the ON position. Verify the fuel level on the gauge is FULL and code 12 clears from the ViewPort.	If code 12 clears and the fuel level gauge shows FULL, the fuel level sensor is operating properly. If code 12 does not clear and the fuel level gauge shows EMPTY, replace U1 Fuel Level Sensor.
Step 4: With the fuel level sensor still removed from the tank and the Main Control Switch in the ON position, tilt the fuel sensor so the float will move down. Verify the fuel level gauge is moving down the scale.	If the float in the fuel level sensor appears to be sticking while moving, replace U1 Fuel Level Sensor.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 29

Engine Shutdown Unknown

Explanation:

The engine has shut down and the Titan did not detect an Engine Diagnostic Code from the engine ECM.

Effect:

Code 29 is a FAULT condition and will shut down the compressor. Code 29 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check engine ECM Fuse FB2-F1.	If fuse is blown, replace FB2-F1 Fuse.
Step 2: Check the engine fuel system for restrictions.	If the fuel filters are dirty or have not been changed during regular service, replace fuel filters. If dirty fuel has been used, add clean fuel and replace fuel filters. If air has gotten into the fuel system, refer to Engine Manual for directions for changing filters and for bleeding the fuel system. If fuel hoses are damaged, replace fuel hoses.
Step 3: Check battery Positive and Negative connections to the engine ECM.	If harness connections are loose or damaged, repair harness as needed.
Step 4: Move Main Control Switch to the RUN position. Using a multimeter, measure the Engine Keyswitch signal voltage at J2E-5.	Voltage measured should be 24 VDC at J2E-5. If not, check all harness connections in the keyswitch signal circuit from Titan to engine ECM.
Step 5: If Steps 1 thru 4 checkout OK, refer to the engine manufacturer service dealer.	

COMPRESSOR CODE 30

High Airend Discharge Temperature

Explanation:

The Titan controller has detected a temperature from RT2 Temperature Sensor that is greater than or equal to 248°F.

Effect:

Code 30 is a FAULT condition and will shut down the compressor. Code 30 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check the coolers for air flow restrictions.	If the air flow through the coolers is being restricted, correct the issue.
Step 2: Check all harness connections between Titan and RT2 Temperature Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect RT2 from harness and plug Thermistor Simulator (Part No. 22073878) into the RT2 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Airend Temperature value is between -3°F and -13°F.	If temperature value on ViewPort is not between -3°F and -13°F, check for defective harness connections. If temperature value on ViewPort is between -3°F and -13°F, replace RT2 Temperature Sensor.
Step 4: If Steps 1 thru 3 checkout OK, replace Titan controller.	

COMPRESSOR CODE 31

Low Airend Oil Pressure

Explanation:

The Titan controller has detected a pressure from PT3 Pressure Sensor that is below 10 psi.

Effect:

Code 31 is a FAULT condition and will shut down the compressor. Code 31 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check the compressor oil level in Separator Tank.	If the compressor oil level is low, add compressor oil as needed.
Step 2: Check all harness connections between Titan and PT3 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect PT3 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT3 harness connector. Move the Main Control Sswitch to the ON position. Check ViewPort display to verify Airend Oil Presssure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT3 Pressure Sensor.
Step 4: If Steps 1 thru 3 checkout OK, replace Titan controller.	

COMPRESSOR CODE 32

Airend Discharge Temperature Sensor

Explanation:

The Titan controller has detected an out of range reading from the RT2 Temperature Sensor.

Effect:

Code 32 is a FAULT condition and will shut down the compressor. Code 32 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The RT2 Temperature Sensor connects to the Titan controller as illustrated in the circuit diagram. RT2 is a 10K ohm thermistor type temperature sensor. The yellow wire is the sense line to the Titan. The brown-white wire is the sensor ground.

Component Location:

RT2 Temperature Sensor is located in the discharge pipe of the Airend.

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and RT2 temperature sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect RT2 from harness and plug thermistor simulator (Part No. 22073878) into the RT2 harness connector. Turn the main control switch to the ON position. Check ViewPort display to verify Airend Temperature value is between -3°F and -13°F.	If temperature value on ViewPort is not between -3°F and -13°F, check for defective harness connections. If temperature value on ViewPort is between -3°F and -13°F, replace RT2 temperature sensor.
Step 3: If Steps 1 and 2 checkout OK, replace Titan controller.	

COMPRESSOR CODE 33

Separator Tank Pressure Sensor

Explanation:

The Titan controller has detected an out of range reading from the PT1 Pressure Sensor.

Effect:

Code 33 is a FAULT condition and will shut down the compressor. Code 33 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The PT1 Pressure Sensor connects to the Titan controller as illustrated in the circuit diagram. The purple wire is the 5 VDC excitation supply from the Titan. The orange wire is the signal output to the Titan with a range of 0.5 to 4.5 VDC. The brown-white wire is the sensor ground. The pressure range of PT1 is 0 psig (0.5 VDC) to 225 psig (4.5 VDC).

Component Location: PT1 Pressure Sensor is located on top of the Separator Tank.

COMPRESSOR CODE 33

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and PT1 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect PT1 connector from the harness. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between PT1-1 and PT1-2.	Voltage measured should be 5 VDC between PT1-1 and PT1-2. If voltage measured is not 5 VDC, check for defective harness connections.
Step 3: Disconnect PT1 connector from the harness and P1 connector from the Titan. Using a multimeter, measure resistance between PT1-1 and P1-26. Using a multimeter, measure resistance between PT1-2 and P1-14. Using a multimeter, measure resistance between PT1-3 and P1-23.	Continuity should be shorted between PT1-1 and P1-26. Continuity should be shorted between PT1-2 and P1-14. Continuity should be shorted between PT1-3 and P1-23. If not, check for defective harness connections.
Step 4: Disconnect PT1 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Air Presssure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT1 Pressure Sensor.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 34

High Separator Tank Pressure At Start

Explanation:

The Titan controller has detected a pressure from PT1 Pressure Sensor that is greater than 20 psi at the time of engine start.

Effect:

Code 34 is a FAULT condition and will prevent starting until the Separator Tank pressure is below 20 psi. Code 34 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Wait until air pressure is below 20 psi before trying to start the compressor.	If air pressure is not below 20 psi and the system continues to hold pressure, proceed to Step 2.
Step 2: Open the Manual Service Valve to ensure the system is completely blown down. Check the air pressure value on the ViewPort display and the mechanical display to verify the value is 0 psi.	If the air system is completely blown down and the air pressure value on the ViewPort display is 20 psi or greater, proceed to Step 3.
Step 3: Check all harness connections between Titan and PT1 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 4: Disconnect PT1 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Air Pressure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT1 Pressure Sensor.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 35

High Separator Tank Pressure

Explanation:

The Titan controller has detected a pressure from PT1 Pressure Sensor greater than or equal to 185 psi and a pressure from PT2 Pressure Sensor less than 15 psi.

Effect:

Code 35 is a FAULT condition and will shut down the compressor. Code 35 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Start and load compressor. With the Service Valve closed and the engine speed at idle, check ViewPort display to verify air pressure value is close to the same pressure as the air pressure gauge. Also check ViewPort display to verify regulation pressure value is above 15 psi.	If the air pressure value on the ViewPort is different than the mechanical gauge, proceed to Step 2. If the regulation pressure value is below 15 psi, proceed to Step 4.
Step 2: Check all harness connections between Titan and PT1 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect PT1 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify air pressure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT1 Pressure Sensor.
Step 4: Check all harness connections between Titan and PT2 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.

COMPRESSOR CODE 35

Troubleshooting Steps

Action	Result
Step 5: Disconnect PT2 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT2 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Regulation Pressure value is between 33 psi and 43 psi.	If pressure value on ViewPort is not between 35 psi and 45 psi, check for defective harness connections. If pressure value on ViewPort is between 33 psi and 43 psi, replace PT2 Pressure Sensor.
Step 6: If Steps 1 thru 5 checkout OK, replace Titan controller.	

COMPRESSOR CODE 36

Safety Valve Open

Explanation:

The Titan controller has detected an open contact from S14 Pressure Switch indicating the Safety Valve has opened.

Effect:

Code 36 is a FAULT condition and will shut down the compressor. Code 36 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The S14 Pressure Switch connects to the Titan controller as illustrated in the circuit diagram. S14 is a normally closed pressure switch that opens when the pressure rises above 12 psi. When the switch opens, the 12 VDC input to the Titan is removed. The purple-white wire is the switch common supply voltage (12 VDC). The light-blue wire is the input to the Titan.

Component Location:

S14 Pressure Switch is located in the Safety Valve on the Separator Tank.

COMPRESSOR CODE 36

Troubleshooting Steps

Action	Result
Step 1: Verify that the Safety Valve is operating properly.	If the Safety Valve is not operating properly, replace the Safety Valve.
Step 2: Check all harness connections between Titan and S14 Pressure Switch.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect S14 connector from the harness. Using a multimeter, check resistance across pins 1 and 2 of the pressure switch to verify the switch is closed.	If there is no continuity across the pressure switch terminals, replace S14 Pressure Switch.
Step 4: Disconnect S14 connector from the harness. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between S14-1 and battery Negative.	Voltage measured should be 12 VDC between S14-1 and battery Negative. If voltage measured is not 12 VDC, check for defective harness connections.
Step 5: Disconnect P1 connector from the Titan. Ensure S14 Pressure Switch is connected to the harness. Using a multimeter, check resistance between P1-15 and P1-20.	Continuity should be shorted between P1-15 and P1-20. If not, check for defective harness connections.
Step 6: If Steps 1 thru 5 checkout OK, replace Titan controller.	

COMPRESSOR CODE 38

Intake Air Filters Restricted

Explanation:

The Titan controller has detected a closed contact from S10 (Engine Air Filter) and/or S11 (Airend Air Filter) pressure switch indicating the filter(s) is restricted.

Effect:

Code 38 is an ALERT condition and will not shut down the compressor. Code 38 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The air filter restriction switches connect to the Titan controller as illustrated in the circuit diagram. S10 and S11 are normally open pressure switches that close when the air filter restriction reaches 20 inches of water. When S10 and/or S11 switch contacts close, a 12 VDC input is sent to the Titan. The purple-white wire is the switch common supply (12 VDC). The gray wire is the input to the Titan.

Component Location:

S10 Air Filter Restriction Switch is located behind the Engine Air Filter housing.
S11 Air Filter Restriction Switch is located behind the Airend Air Filter housing.

COMPRESSOR CODE 38

Troubleshooting Steps

Action	Result
Step 1: Check the engine and airend filters.	If the filters are dirty or clogged, replace filters as needed.
Step 2: Check all harness connections between Titan and S10 Engine and S11 Airend Filter Restriction Switches.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect the harness from S10 and S11 air filter restriction switches. Using a multimeter, check resistance across S10 and S11 switch terminals to verify the switches are open.	If there is continuity across S10 and/ or S11 switch terminals, replace the bad pressure switch(s).
Step 4: Disconnect the harness from S10 and S11 air filter restriction switches. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage from the purple-white wire at S10 and S11 to battery Negative.	Voltage measured should be 12 VDC between the purple-white wire at S10 and S11 to battery Negative. If voltage measured is not 12 VDC, check for defective harness connections.
Step 5: Disconnect P1 connector from the Titan. Ensure S10 and S11 filter restriction switches are connected to the harness. Using a multimeter, check resistance between P1-15 and P1-25.	Continuity should be open between P1-15 and P1-25. If not, check for defective harness connections.
Step 6: If Steps 1 thru 5 checkout OK, replace Titan controller.	

COMPRESSOR CODE 39

Low System Voltage

Explanation:

The Titan controller has detected the system voltage during compressor operation has reached a level below 25.5 VDC.

Effect:

Code 39 is an ALERT condition and will not shut down the compressor; however, if the system voltage reaches too low of a level the electronics will shut off and the compressor will shut down. Code 39 and the ALERT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check alternator circuit breaker CB1.	If circuit breaker is tripped, reset CB1 circuit breaker.
Step 2: Check to ensure the alternator circuit breaker is operating properly.	If the alternator circuit breaker is not operating properly, replace the CB1 alternator circuit breaker.
Step 3: Check all harness connections between alternator and battery system.	If harness connections are loose or damaged, repair harness as needed.
Step 4: Start and run compressor at idle. Using a multimeter, measure the voltage between the Alternator G1-POS and battery Negative.	Voltage measured should be 27 VDC or above between Alternator G1-POS and battery Negative. If voltage measured is less than 27 VDC, replace G1 Alternator.

COMPRESSOR CODE 39

Troubleshooting Steps

Action	Result
Step 5: Start and run compressor at idle. Using a multimeter, measure the voltage between the Titan P1-1 and battery Negative. Using a multimeter, measure the voltage between P1-13 and battery Negative. Using a multimeter, measure the voltage between P1-24 and battery Negative.	Voltage measured should be 27 VDC or above at all 3 measured points. If voltage measured is not 27 VDC or above at all 3 measured points, check for defective harness connections.
Step 6: Disconnect battery cables from the batteries. Using a battery load tester, test each battery.	If the one or both batteries test bad using the load tester, replace the defective battery(s).
Step 7: If Steps 1 thru 6 checkout OK, replace Titan controller.	

COMPRESSOR CODE 41

Airend Oil Pressure Sensor

Explanation:

The Titan controller has detected an out of range reading from the PT3 Pressure Sensor.

Effect:

Code 41 is a FAULT condition and will shut down the compressor. Code 41 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The PT3 Pressure Sensor connects to the Titan controller as illustrated in the circuit diagram. The purple wire is the 5 VDC excitation supply from the Titan. The orange wire is the signal output to the Titan with a range of 0.5 to 4.5 VDC. The brown-white wire is the sensor ground. The pressure range of PT3 is 0 psig (0.5 VDC) to 225 psig (4.5 VDC).

Component Location:

PT3 Pressure Sensor is located on the Airend, near the oil supply port.

COMPRESSOR CODE 41

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and PT3 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect PT1 connector from the harness. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between PT3-1 and PT3-2.	Voltage measured should be 5 VDC between PT3-1 and PT3-2. If voltage measured is not 5 VDC, check for defective harness connections.
Step 3: Disconnect PT3 connector from the harness and P1 connector from the Titan. Using a multimeter, measure resistance between PT3-1 and P1-26. Using a multimeter, measure resistance between PT3-2 and P1-14. Using a multimeter, measure resistance between PT3-3 and P1-16.	Continuity should be shorted between PT3-1 and P1-26. Continuity should be shorted between PT3-2 and P1-14. Continuity should be shorted between PT3-3 and P1-16. If not, check for defective harness connections.
Step 4: Disconnect PT3 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT3 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Airend Oil Pressure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT3 Pressure Sensor.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 42

Fuel Level Sensor

Explanation:

The Titan controller has detected an out of range reading from the U1 Fuel Level Sensor.

Effect:

Code 42 is an ALERT condition and will not shut down the compressor; however, if the fuel level in the tank reaches a level below the pickup tube the compressor will shut down with no indication of reason. Code 42 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The U1 Fuel Level Sensor connects to the Titan controller as illustrated in the circuit diagram. The purple wire is the 5 VDC excitation supply from the Titan. The orange wire is the signal output to the Titan with a range of 0.5 to 4.5 VDC. The brown-white wire is the sensor ground. The level range of U1 is EMPTY (0.5 VDC) to FULL (4.5 VDC).

Component Location:

U1 Fuel Level Sensor is located in the Fuel Tank.

COMPRESSOR CODE 42

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and U1 Fuel Level Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect U1 connector from the harness. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between U1-A and U1-B.	Voltage measured should be 5 VDC between U1-A and U1-B. If voltage measured is not 5 VDC, check for defective harness connections.
Step 3: Disconnect U1 connector from the harness and P1 connector from the Titan. Using a multimeter, measure resistance between U1-B and P1-26. Using a multimeter, measure resistance between U1-A and P1-14. Using a multimeter, measure resistance between U1-C and P1-18.	Continuity should be shorted between U1-B and P1-26. Continuity should be shorted between U1-A and P1-14. Continuity should be shorted between U1-C and P1-18. If not, check for defective harness connections.
Step 4: Remove fuel level sensor from fuel tank. With the fuel level sensor connected to the harness, turn the sensor upside down so float will go to the top. Move the Main Control Switch to the ON position. Verify the fuel level on the gauge is FULL and code 42 clears from the ViewPort.	If code 42 clears and the fuel level gauge shows FULL, the fuel level sensor is operating properly. If code 42 does not clear and the fuel level gauge shows EMPTY, replace U1 Fuel Level Sensor.
Step 5: With the fuel level sensor still removed from the tank and the Main Control Switch in the ON position, tilt the fuel sensor so the float will move down. Verify the fuel level gauge is moving down the scale.	If the float in the fuel level sensor appears to be sticking while moving, replace U1 Fuel Level Sensor.
Step 6: If Steps 1 thru 5 checkout OK, replace Titan controller.	

COMPRESSOR CODE 43

Low Separator Tank Pressure

Explanation:

The Titan controller has detected a pressure from PT1 Pressure Sensor less than 40 psi after the compressor is loaded.

Effect:

Code 43 is a FAULT condition and will shut down the compressor. Code 43 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check for leaking air hoses and pipes.	If air hoses or pipes are found to be leaking, tighten or replace as needed.
Step 2: Check all harness connections between Titan and PT1 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect PT1 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Air Pressure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT1 Pressure Sensor.
Step 4: If Steps 1 thru 3 checkout OK, replace Titan controller.	

COMPRESSOR CODE 44

High IQ Filter Restriction

Explanation:

The Titan controller has received a message via the J1939 CAN network from the IQ TCU controller indicating the IQ Filters are starting to restrict air flow.

Effect:

Code 44 is an ALERT condition and will not shut down the compressor. Code 44 and the ALERT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check for leaking air hoses and pipes.	If air hoses or pipes are found to be leaking, tighten or replace as needed.
Step 2: Replace IQ Filters.	If replacing the IQ Filters does not correct the problem, proceed to Step 3.
Step 3: Check all harness connections between IQ TCU and S100 and S101 Differential Pressure Switches.	If harness connections are loose or damaged, repair harness as needed.
Step 4: Disconnect the harness from S100 and S101 air filter restriction switches. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage from the purple-white wire at S100 and S101 to battery Negative.	Voltage measured should be 12 VDC between the purple-white wire at S100 and S101 to battery Negative. If voltage measured is not 12 VDC, check for defective harness connections.
Step 5: Disconnect P1 connector from the Titan. Ensure S100 and S101 filter restriction switches are connected to the harness. Using a multimeter, check resistance between P1-15 and P1-25.	Continuity should be open between P1-15 and P1-25. If not, check for defective harness connections.

COMPRESSOR CODE 44

Troubleshooting Steps

Action	Result
Step 6: If Steps 1 thru 5 checkout OK, replace IQ TCU controller.	

COMPRESSOR CODE 50

High Separator Tank Temperature

Explanation:

The Titan controller has detected a temperature from RT1 Temperature Sensor that is greater than or equal to 248°F.

Effect:

Code 50 is a FAULT condition and will shut down the compressor. Code 50 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and RT1 Temperature Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect RT1 from harness and plug Thermistor Simulator (Part No. 22073878) into the RT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Separator Tank Temperature value between -3°F and -13°F.	If temperature value on ViewPort is not between -3°F and -13°F, check for defective harness connections. If temperature value on ViewPort is between -3°F and -13°F, replace RT1 Temperature Sensor.
Step 3: If Steps 1 and 2 checkout OK, replace Titan controller.	

COMPRESSOR CODE 51

Compressor ID Invalid

Explanation:

The Titan controller and the ViewPort display do not have a valid compressor ID. Code 51 will occur only when a new Titan and a new ViewPort are installed at the same time. The compressor ID defines the proper operational profile of the compressor. Absence of code 51 does not ensure the compressor ID is correct.

Effect:

Code 51 is a FAULT condition and will prevent any operation of the compressor. Code 51 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Use the ViewPort to verify the correct Compressor ID is loaded.	If the correct compressor ID is not loaded, refer to the section Entering Compressor ID in the Operation and Maintenance Manual.

COMPRESSOR CODE 52

IQ Filters Restricted

Explanation:

The Titan controller has received a message via the J1939 CAN network from the IQ TCU controller indicating the IQ Filters are restricting air flow past a usable level.

Effect:

Code 52 is a FAULT condition and will shut down the compressor. Code 52 and the FAULT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Replace IQ Filters.	If replacing the IQ Filters does not correct the problem, proceed to Step 2.
Step 2: Check all harness connections between IQ TCU and S100 and S101 Differential Pressure Sensors.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect the harness from S100 and S101 air filter restriction switches. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage from the purple-white wire at S100 and S101 to battery Negative.	Voltage measured should be 12 VDC between the purple-white wire at S100 and S101 to battery Negative. If voltage measured is not 12 VDC, check for defective harness connections.
Step 4: Disconnect P1 connector from the Titan. Ensure S100 and S101 filter restriction switches are connected to the harness. Using a multimeter, check resistance between P1-15 and P1-25.	Continuity should be open between P1-15 and P1-25. If not, check for defective harness connections.
Step 5: If Steps 1 thru 4 checkout OK, replace IQ TCU controller.	

COMPRESSOR CODE 53

Separator Tank Temperature Sensor

Explanation:

The Titan controller has detected an out of range reading from the RT1 Temperature Sensor.

Effect:

Code 53 is a FAULT condition and will shut down the compressor. Code 53 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The RT1 Temperature Sensor connects to the Titan controller as illustrated in the circuit diagram. RT1 is a 10K ohm thermistor type temperature sensor. The yellow wire is the sense line to the Titan. The brown-white wire is the sensor ground.

Component Location:

RT1 Temperature Sensor is located on the side of the Separator Tank near the Safety Valve.

COMPRESSOR CODE 53

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and RT1 Temperature Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect RT1 from harness and plug Thermistor Simulator (Part No. 22073878) into the RT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Separator Tank Temperature value between -3°F and -13°F.	If temperature value on ViewPort is not between -3°F and -13°F, check defective harness connections. If temperature value on ViewPort is between -3°F and -13°F, replace RT1 Temperature Sensor.
Step 3: If Steps 1 and 2 checkout OK, replace Titan controller.	

COMPRESSOR CODE 54

Regulation System Pressure Sensor

Explanation:

The Titan controller has detected an out of range reading from the PT2 Pressure Sensor.

Effect:

Code 54 is a FAULT condition and will shut down the compressor. Code 54 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The PT2 Pressure Sensor connects to the Titan controller as illustrated in the circuit diagram. The purple wire is the 5 VDC excitation supply from the Titan. The orange wire is the signal output to the Titan with a range of 0.5 to 4.5 VDC. The brown-white wire is the sensor ground. The pressure range of PT2 is 0 psig (0.5 VDC) to 100 psig (4.5 VDC).

Component Location:

PT2 Pressure Sensor is located in the regulation system on top of the Airend.

COMPRESSOR CODE 54

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and PT2 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect PT2 connector from the harness. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between PT2-1 and PT2-2.	Voltage measured should be 5 VDC between PT2-1 and PT2-2. If voltage measured is not 5 VDC, check for defective harness connections.
Step 3: Disconnect PT2 connector from the harness and P1 connector from the Titan. Using a multimeter, measure resistance between PT2-1 and P1-26. Using a multimeter, measure resistance between PT2-2 and P1-14. Using a multimeter, measure resistance between PT2-3 and P1-12.	Continuity should be shorted between PT2-1 and P1-26. Continuity should be shorted between PT2-2 and P1-14. Continuity should be shorted between PT2-3 and P1-12. If not, check for defective harness connections.
Step 4: Disconnect PT2 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT2 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Regulation Pressure value is between 33 psi and 43 psi.	If pressure value on ViewPort is not between 33 psi and 43 psi, check for defective harness connections. If pressure value on ViewPort is between 33 psi and 43 psi, replace PT2 Pressure Sensor.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 55

Emergency Stop Activated

Explanation:

The Titan controller has detected an open contact from EM1 Emergency Stop indicating it has been activated.

Effect:

Code 55 is a FAULT condition and will shut down the compressor. Code 55 and the FAULT name will be displayed on the ViewPort.

Circuit Description:

The EM1 Emergency Stop connects to the Titan controller as illustrated in the circuit diagram. The Emergency Stop is in series with the Titan outputs that control Engine Keyswitch Signal and K1 Starter Relay Coil. Pressing the Emergency Stop opens both circuits simultaneously. The Titan uses a 24 VDC input at P1-29 from the Emergency Stop to determine if it has been activated. When the 24 VDC input at P1-29 is lost, that indicates to the Titan that Emergency Stop has been activated.

Component Location:

EM1 Emergency Stop is located below the Control Panel.

COMPRESSOR CODE 55

Troubleshooting Steps

Action	Result
Step 1: Check Emergency Stop to ensure it has not been activated.	If the Emergency Stop has been activated, pull the red operator to de-activate the Emergency Stop.
Step 2: Check to ensure Emergency Stop is operating properly.	If the Emergency Stop is not operating properly, replace the EM1 Emergency Stop.
Step 3: Check all harness connections between Titan and EM1 Emergency Stop.	If harness connections are loose or damaged, repair harness as needed.
Step 4: Ensure Emergency Stop is not activated. Move the Main Control Switch to the RUN position. Using a multimeter, measure the voltage between P1-29 and battery Negative.	Voltage measured should be 24 VDC between P1-29 and battery Negative. If voltage measured is not 24 VDC, check for defective harness connections.
Step 5: If Steps 1 thru 4 checkout OK, replace Titan controller.	

COMPRESSOR CODE 56

Low Start Pressure

Explanation:

The minimum start pressure (50 psi) has not been met within 20 seconds of compressor start.

Effect:

Code 56 is an ALERT condition and will not shut down the compressor; however, the compressor will not load. Code 56 and the ALERT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Check for leaking air hoses and pipes.	If air hoses or pipes are found to be leaking, tighten or replace as needed
Step 2: Check all harness connections between Titan and PT1 Pressure Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect PT1 from harness and plug Pressure Transducer Simulator (Part No. 22168868) into the PT1 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Air Pressure value is between 80 psi and 90 psi.	If pressure value on ViewPort is not between 80 psi and 90 psi, check for defective harness connections. If pressure value on ViewPort is between 80 psi and 90 psi, replace PT1 Pressure Sensor.
Step 4: If Steps 1 thru 3 checkout OK, replace Titan controller.	

COMPRESSOR CODE 58

Ambient Temperature Sensor

Explanation:

The Titan controller has detected an out of range reading from the RT3 Ambient Temperature Sensor.

Effect:

Code 58 is an ALERT condition and will not stop the compressor. Code 58 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The RT3 Ambient Temperature Sensor connects to the Titan controller as illustrated in the circuit diagram. RT3 is a 10K ohm thermistor type temperature sensor. The yellow wire is the sense line to the Titan. The brown-white wire is the sensor ground.

Component Location:

RT3 Ambient Temperature Sensor is located in the front behind the air intake louvers on the street side of the compressor.

COMPRESSOR CODE 58

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between Titan and RT3 Temperature Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect RT3 from harness and plug Thermistor Simulator (Part No. 22073878) into the RT3 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Ambient Temperature value is between -3°F and -13°F.	If temperature value on ViewPort is not between -3°F and -13°F, check for defective harness connections. If temperature value on ViewPort is between -3°F and -13°F, replace RT3 Temperature Sensor.
Step 3: If Steps 1 and 2 checkout OK, replace Titan controller.	

COMPRESSOR CODE 62

IQ System Louvers Malfunction

Explanation:

The Titan controller has received a message via the J1939 CAN network from the IQ TCU controller indicating the louvers or louver actuator is not operating properly.

Effect:

Code 62 is an ALERT condition and will not shut down the compressor; however, the IQ Discharge Air may not be maintained at the desired temperature. Code 62 and the ALERT name will be displayed on the ViewPort.

Troubleshooting Steps

Action	Result
Step 1: Disconnect the actuator from the louvers. Verify the IQ mechanical louvers operate properly when manually closing and opening.	If the IQ louvers are not operating properly, correct the issue.
Step 2: Move the Main Control Switch to the ON position. Observe the louvers during the power up test for closing and opening.	If louvers do not close and open during power up test, replace louver actuator.
Step 3: If Steps 1 and 2 checkout OK, replace IQ TCU controller.	

COMPRESSOR CODE 66

IQ Aftercooler Temperature Sensor

Explanation:

The Titan controller has received a message via the J1939 CAN network from the IQ TCU controller indicating an out of range reading from the RT100 IQ Aftercooler Temperature Sensor.

Effect:

Code 66 is an ALERT condition and will not shut down the compressor. Code 66 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The RT100 IQ Aftercooler Temperature Sensor connects to the IQ TCU controller as illustrated in the circuit diagram. RT100 is a 10K ohm thermistor type temperature sensor. The yellow wire is the sense line to the IQ TCU. The brown-white wire is the sensor ground.

Component Location:

RT100 IQ Aftercooler Temperature Sensor is located in the bottom of the IQ Aftercooler.

COMPRESSOR CODE 66

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between IQ TCU and RT100 IQ Aftercooler Temperature Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect RT100 from harness and plug Thermistor Simulator (Part No. 22073878) into the RT100 harness connector. Move the Main Control Switch to the ON position. Check ViewPort display to verify Aftercooler Temperature value is between -3°F and -13°F.	If temperature value on ViewPort is not between -3°F and -13°F, check for defective harness connections. If temperature value on ViewPort is between -3°F and -13°F, replace RT100 IQ Aftercooler Temperature Sensor.
Step 3: If Steps 1 and 2 checkout OK, replace IQ TCU controller.	

COMPRESSOR CODE 67

IQ Actuator Position Sensor

Explanation:

The Titan controller has received a message via the J1939 CAN network from the IQ TCU controller indicating an out of range reading from the ACT100 Actuator Position Sensor.

Effect:

Code 67 is an ALERT condition and will not shut down the compressor. Code 67 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The ACT100 Actuator Position Sensor connects to the IQ TCU controller as illustrated in the circuit diagram. ACT100 Actuator Position Sensor is a potentiometer. The purple wire is the 5 VDC excitation supply from the IQ TCU. The white wire is the position signal output to the IQ TCU. The brown-white wire is the sensor ground.

Component Location:

ACT100 Actuator Position Sensor is mounted on the IQ louvers.

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between IQ TCU and ACT100 Actuator Position Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Ensure the ACT100 Actuator Position Sensor is connected to the harness. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between ACT100-D and ACT100-E.	Voltage measured should be in the range of 0.2 VDC to 2.25 VDC between ACT100-D and ACT100-E. If voltage measured is not in the range of 0.2 VDC to 2.25 VDC, replace ACT100 Actuator Position Sensor .
Step 3: If Steps 1 and 2 checkout OK, replace IQ TCU controller.	

COMPRESSOR CODE 71

Engine ECM Communication

Explanation:

The Titan controller cannot communicate with the engine ECM via J1939 CAN BUS network.

Effect:

Code 71 is a FAULT condition and will shut down the compressor. Code 71 and the FAULT name will be displayed on the Viewport.

Circuit Description:

The twisted pair yellow and dark green wires are the communications link (J1939 CAN BUS) connecting the Titan controller and the engine ECM as illustrated in the circuit diagram. The yellow wire is referred to as J1939 CAN High (+). The dark green wire is referred to as J1939 CAN Low (-).The compressor harness and the engine harness are connected together at P6/J6 connection point.

The CAN network has two terminating resistors TR1 and TR2. The resistance value of each terminator is 120 ohms. The terminators are connected together in parallel across the High (+) and Low (-) wires. When connected the resistance value between the High (+) and Low (-) wires is 60 ohms.

Component Location:

P1 connector is connected to the Titan controller and the J3 connector is connected to the engine ECM. Terminating resistor TR1 is located on the compressor harness inside the control panel. Terminating resistor TR2 is located on the engine harness near the engine ECM.

COMPRESSOR CODE 71

Troubleshooting Steps

Action	Result
Step 1: Check engine ECM FB2-F1 Fuse.	If fuse is blown, replace FB2-F1 Fuse.
Step 2: Check battery Positive and Negative connections to the engine ECM.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Move Main Control Switch to the RUN position. Using a multimeter, measure the Engine Keyswitch signal voltage at J2E-5.	Voltage measured should be 24 VDC at J2E-5. If voltage measured is not 24 VDC, check for defective harness connections.
Step 4: Disconnect P1 connector from the Titan, J2E connector from the engine ECM, P2 connector from the ViewPort display, M2-B connector from the Engine Tachometer, and any other devices connected to the J1939 CAN BUS. Using a multimeter, measure the resistance between J2E-22 and J2E-46. Using a multimeter, measure the resistance between J3-17 and J3-18.	Resistance value measured should be 60 ohms between P1-32 and P1-34. Resistance value measured should be 60 ohms between J2E-22 and J2E-46. If resistance value measured is not 60 ohms, measure resistance value of each terminator (120 ohms) and/or check for defective harness connections.

Action	Result
Step 5: Disconnect P1 connector from the Titan, J2E connector from the engine ECM, P2 connector from the ViewPort display, M2-B connector from the Engine Tachometer, and any other devices connected to the J1939 CAN BUS. Disconnect TR1 and TR2 from the harness. Using a multimeter, measure resistance between P1-32 and J2E-22. Using a multimeter, measure resistance between P1-34 and J2E-46. Using a multimeter, measure resistance between P1-32 and P1-34.	Continuity should be shorted between P1-32 and J2E-22. Continuity should be shorted between P1-34 and J2E-46. Continuity should be open between P1-32 and P1-34. If not, check for defective harness connections.
Step 6: If Steps 1 thru 5 checkout OK, replace Titan controller.	
Step 7: If Steps 1 thru 6 checkout OK, replace engine ECM.	

COMPRESSOR CODE 73

AutoStart Controller Communication

Explanation:

The Titan controller cannot communicate with the AutoStart controller via J1939 CAN BUS network.

Effect:

Code 73 is an ALERT condition and will not shut down the compressor. Code 73 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The twisted pair yellow and dark green wires are the communications link (J1939 CAN BUS) that connects the Titan controller and the AutoStart controller together as illustrated in the circuit diagram. The yellow wire is referred to as J1939 CAN High (+). The dark green wire is referred to as J1939 CAN Low (-).The compressor harness and the AutoStart harness are connected together at P8/J8 connection point.

Component Location:

P1 connector is connected to the Titan controller and the P200 connector is connected to the AutoStart controller. P8/J8 connectors are located behind the Control Panel.

COMPRESSOR CODE 73

Troubleshooting Steps

Action	Result
Step 1: Check AutoStart controller FB1-F10 Fuse.	If fuse is blown, replace FB1-F10 Fuse.
Step 2: Check battery Positive and Negative connections to the AutoStart controller.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Verify operation of FB1-K13 Relay.	If relay is not operating properly, replace FB1-K13 Relay.
Step 4: Disconnect P200 connector from the AutoStart controller. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between P200-16 and battery Negative.	Voltage measured should be 24 VDC between P200-16 and battery Negative. If not, check for defective harness connections.
Step 5: Ensure the Main Control Switch is in the OFF position. Disconnect P200 connector from the AutoStart controller. Using a multimeter, measure resistance between P200-22 and battery Negative.	Continuity should be shorted between P200-22 and battery Negative. If not, check for defective harness connections.
Step 6: Disconnect P1 connector from the Titan, J2E connector from the engine ECM, P2 connector from the ViewPort display, M2-B connector from the Engine Tachometer, P200 connector from the AutoStart controller, and any other devices connected to the J1939 CAN BUS. Using a multimeter, measure the resistance between P200-20 and P200-23.	Resistance value measured should be 60 ohms between P200-20 and P200-23. If resistance value measured is not 60 ohms, measure resistance value of each terminator (120 ohms) and/or check for defective harness connections.
Step 7: If Steps 1 thru 6 checkout OK, replace AutoStart controller.	

COMPRESSOR CODE 75

IQ TCU Controller Communication

Explanation:

The Titan controller cannot communicate with the IQ TCU controller via J1939 CAN BUS network.

Effect:

Code 75 is an ALERT condition and will not shut down the compressor. Code 75 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The twisted pair yellow and dark green wires are the communications link (J1939 CAN BUS) that connects the Titan controller and the IQ TCU controller together as shown in the circuit diagram. The yellow wire is referred to as J1939 CAN High (+). The dark green wire is referred to as J1939 CAN Low (-).The compressor harness and the IQ harness are connected together at P7/J7 connection point.

Component Location:

P1 connector is connected to the Titan controller and the P100 connector is connected to the IQ TCU controller. P7/J7 connectors are located behind the Control Panel.

COMPRESSOR CODE 75

Troubleshooting Steps

Action	Result
Step 1: Check IQ TCU controller FB1-F9 Fuse.	If fuse is blown, replace FB1-F9 Fuse.
Step 2: Check battery Positive and Negative connections to the IQ TCU controller.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Verify operation of FB1-K13 Relay.	If relay is not operating properly, replace FB1-K13 Relay.
Step 4: Disconnect P100 connector from the IQ TCU controller. Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between P100-1 and battery Negative. Using a multimeter, measure the voltage between P100-9 and battery Negative. Using a multimeter, measure the voltage between P100-16 and battery Negative.	Voltage measured should be 24 VDC between P100-1 and battery Negative. Voltage measured should be 24 VDC between P100-9 and battery Negative. Voltage measured should be 24 VDC between P100-16 and battery Negative. If not, check for defective harness connections.
Step 5: Ensure the Main Control Switch is in the OFF position. Disconnect P100 connector from the IQ TCU controller. Using a multimeter, measure resistance between P100-12 and battery Negative. Using a multimeter, measure resistance between P100-21 and battery Negative.	Continuity should be shorted between P100-12 and battery Negative. Continuity should be shorted between P100-21 and battery Negative. If not, check for defective harness connections.

COMPRESSOR CODE 75

Troubleshooting Steps

Action	Result
Step 6: Disconnect P1 connector from the Titan, J2E connector from the engine ECM, P2 connector from the ViewPort display, M2-B connector from the Engine Tachometer, P100 connector from the IQ TCU controller, and any other devices connected to the J1939 CAN BUS. Using a multimeter, measure the resistance between P100-22 and P100-23.	Resistance value measured should be 60 ohms between P100-22 and P100-23. If resistance value measured is not 60 ohms, measure resistance value of each terminator (120 ohms) and/or check for defective harness connections.
Step 7: If Steps 1 thru 6 checkout OK, replace IQ TCU controller.	

COMPRESSOR CODE 76

Titan Controller Communication

Explanation:

The ViewPort display cannot communicate with the Titan controller via J1939 CAN BUS network.

Effect:

Code 76 is an ALERT condition and will not stop the compressor. Code 76 and the ALERT name will be displayed on the ViewPort.

Circuit Description:

The twisted pair yellow and dark green wires are the communications link (J1939 CAN BUS) that connects the ViewPort display and the Titan controller together as shown in the circuit diagram. The yellow wire is referred to as J1939 CAN High (+). The dark green wire is referred to as J1939 CAN Low (-).The compressor harness and the control panel harness are connected together at P4/J4 connection point.

Component Location:

P1 connector is connected to the Titan controller and the P2 connector is connected to the ViewPort display. P4/J4 connectors are located inside the Control Panel.

COMPRESSOR CODE 76

Troubleshooting Steps

Action	Result
Step 1: Check Titan controller FB1-F1 Fuse.	If fuse is blown, replace FB1-F1 Fuse.
Step 2: Check battery Positive and Negative connections to the Titan controller.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Disconnect the P1 connector from the Titan controller. Move the Main Control Switch to the ON position. Using a multimeter, measure voltage between P1-2 and battery Negative.	Voltage measured should be 24 VDC between P1-2 and battery Negative. If not, check for defective harness connections and/or verify operation of S1 Main Control Switch.
Step 4: Disconnect P1 connector from the Titan controller. Move the Main Control Switch to the ON position. Using a multimeter measure the voltage between P1-1 and battery Negative. Using a multimeter measure the voltage between P1-13 and battery Negative. Using a multimeter measure the voltage between P1-24 and battery Negative.	Voltage measured should be 24 VDC between P1-1 and battery Negative. Voltage measured should be 24 VDC between P1-13 and battery Negative. Voltage measured should be 24 VDC between P1-24 and battery Negative. If not, check for defective harness connections.
Step 5: Ensure the Main Control Switch is in the OFF position. Disconnect P1 connector from the Titan controller. Using a multimeter, measure resistance between P1-33 and battery Negative. Using a multimeter, measure resistance between P1-35 and battery Negative.	Continuity should be shorted between P1-33 and battery Negative. Continuity should be shorted between P1-35 and battery Negative. If not, check for defective harness connections.

COMPRESSOR CODE 76

Troubleshooting Steps

Action	Result
Step 6: Disconnect P1 connector from the Titan, J2E connector from the engine ECM, P2 connector from the ViewPort display, M2-B connector from the Engine Tachometer, and any other devices connected to the J1939 CAN BUS. Using a multimeter, measure the resistance between P1-32 and P1-34.	Resistance value measured should be 60 ohms across P1-32 and P1-34. If resistance value measure is not 60 ohms, measure resistance value of each terminator (120 ohms) and/or check for defective harness connections.
Step 7: If Steps 1 thru 6 checkout OK, replace Titan controller.	

Engine Diagnostic Code Troubleshooting

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
27	4	2272	Engine Exhaust Gas Recirculation 1 Valve Position	Voltage Below Normal, or Shorted to Low Source	EGR Valve Position Circuit - Voltage Below Normal, or Shorted to Low Source
81	16	2754	Engine Diesel Particulate Filter Intake Pressure	Data Valid but Above Normal Operating Range - Moderately Severe Level	Engine Particulate Trap Inlet Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
84	2	241	Wheel-Based Vehicle Speed	Data Erratic, Intermittent or Incorrect	Vehicle Speed Sensor Circuit - Data Erratic, Intermittent, or Incorrect
84	10	242	Wheel-Based Vehicle Speed	Abnormal Rate of Change	Vehicle Speed Sensor Circuit tampering has been detected – Abnormal Rate of Change
91	0	148	Accelerator Pedal Position 1	Data Valid but Above Normal Operational Range - Most Severe Level	Accelerator Pedal or Lever Position Sensor Circuit – Abnormal Frequency, Pulse Width, or Period
91	1	147	Accelerator Pedal Position 1	Data Valid but Below Normal Operational Range - Most Severe Level	Accelerator Pedal or Lever Position Sensor Circuit – Abnormal Frequency, Pulse Width, or Period
91	2	1242	Accelerator Pedal Position 1	Data Erratic, Intermittent or Incorrect	Accelerator Pedal or Lever Position Sensor 1 and 2 - Data Erratic, Intermittent, or Incorrect
91	3	131	Accelerator Pedal Position 1	Voltage Above Normal, or Shorted to High Source	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
91	4	132	Accelerator Pedal Position 1	Voltage Below Normal, or Shorted to Low Source	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
91	9	3326	Accelerator Pedal Position 1	Abnormal Update Rate	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Abnormal update rate
91	19	287	Accelerator Pedal Position 1	Received Network Data in Error	SAE J1939 Multiplexing Accelerator Pedal or Lever Sensor System Error - Received Network Data In Error
93	2	528	Engine Net Brake Torque	Data Erratic, Intermittent or Incorrect	Auxiliary Constrained Operation Curve Validation Switch - Data Erratic, Intermittent, or Incorrect
95	16	2372	Fuel Pressure	Data Valid but Above Normal Operating Range - Moderately Severe Level	Fuel Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
97	3	428	Water in Fuel Indicator	Voltage Above Normal, or Shorted to High Source	Water in Fuel Sensor Circuit - Voltage Above Normal, or Shorted to High Source
97	4	429	Water in Fuel Indicator	Voltage Below Normal, or Shorted to Low Source	Water in Fuel Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
97	15	418	Water in Fuel Indicator	Data Valid but Above Normal Operating Range - Least Severe Level	Water in Fuel Indicator High - Data Valid but Above Normal Operational Range – Least Severe Level
97	16	1852	Water in Fuel Indicator	Data Valid but Above Normal Operating Range - Moderately Severe Level	Water in Fuel Indicator - Data Valid but Above Normal Operational Range - Moderately Severe Level
100	1	415	Engine Oil Pressure	Data Valid but Below Normal Operational Range - Most Severe Level	Oil Pressure Low – Data Valid but Below Normal Operational Range - Most Severe Level
100	2	435	Engine Oil Pressure	Data Erratic, Intermittent or Incorrect	Oil Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
100	3	135	Engine Oil Pressure	Voltage Above Normal, or Shorted to High Source	Oil Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
100	4	141	Engine Oil Pressure	Voltage Below Normal, or Shorted to Low Source	Oil Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
100	18	143	Engine Oil Pressure	Data Valid but Below Normal Operating Range - Moderately Severe Level	Oil Pressure Low – Data Valid but Below Normal Operational Range - Moderately Severe Level
101	0	556	Engine Crankcase Pressure	Data Valid but Above Normal Operational Range - Most Severe Level	Crankcase Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
101	2	1942	Engine Crankcase Pressure	Data Erratic, Intermittent or Incorrect	Crankcase Pressure - Data Erratic, Intermittent or Incorrect
101	3	1843	Engine Crankcase Pressure	Voltage Above Normal, or Shorted to High Source	Crankcase Pressure Circuit - Voltage Above Normal, or Shorted to High Source
101	4	1844	Engine Crankcase Pressure	Voltage Below Normal, or Shorted to Low Source	Crankcase Pressure Circuit - Below Normal, or Shorted to Low Source
101	15	1974	Engine Crankcase Pressure	Data Valid but Above Normal Operating Range - Least Severe Level	Crankcase Pressure - Data Valid But Above Normal Operating Range - Least Severe Level
101	16	555	Engine Crankcase Pressure	Data Valid but Above Normal Operating Range - Moderately Severe Level	Crankcase Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
102	2	2973	Engine Intake Manifold #1 Pressure	Data Erratic, Intermittent or Incorrect	Intake Manifold Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
102	3	122	Engine Intake Manifold #1 Pressure	Voltage Above Normal, or Shorted to High Source	Intake Manifold Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source
102	4	123	Engine Intake Manifold #1 Pressure	Voltage Below Normal, or Shorted to Low Source	Intake Manifold Pressure Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
102	18	125	Engine Intake Manifold #1 Pressure	Data Valid but Below Normal Operating Range - Moderately Severe Level	Intake Manifold 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level
103	15	2288	Engine Turbocharger 1 Speed	Data Valid but Above Normal Operating Range - Least Severe Level	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Least Severe Level
103	16	595	Engine Turbocharger 1 Speed	Data Valid but Above Normal Operating Range - Moderately Severe Level	Turbocharger #1 Speed High - Data Valid but Above Normal Operational Range – Moderately Severe Level
103	18	687	Engine Turbocharger 1 Speed	Data Valid but Below Normal Operating Range - Moderately Severe Level	Turbocharger #1 Speed Low - Data Valid but Below Normal Operational Range – Moderately Severe Level
105	0	155	Engine Intake Manifold 1 Temperature	Data Valid but Above Normal Operational Range - Most Severe Level	Intake Manifold Air Temperature High – Data Valid but Above Normal Operational Range - Most Severe Level
105	3	153	Engine Intake Manifold 1 Temperature	Voltage Above Normal, or Shorted to High Source	Intake Manifold Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
105	4	154	Engine Intake Manifold 1 Temperature	Voltage Below Normal, or Shorted to Low Source	Intake Manifold Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
105	16	488	Engine Intake Manifold 1 Temperature	Data Valid but Above Normal Operating Range - Moderately Severe Level	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
108	2	295	Barometric Pressure	Data Erratic, Intermittent or Incorrect	Barometric Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
108	3	221	Barometric Pressure	Voltage Above Normal, or Shorted to High Source	Barometric Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source
108	4	222	Barometric Pressure	Voltage Below Normal, or Shorted to Low Source	Barometric Pressure Sensor Circuit – Voltage Below Normal, or Shorted to Low Source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
108	9	3372	Barometric Pressure	Abnormal Update Rate	Turbocharger 1 Compressor Inlet Pressure - Abnormal Update Rate
108	19	3373	Barometric Pressure	Received Network Data in Error	Turbocharger 1 Compressor Inlet Pressure - Received Network Data In Error
110	0	151	Engine Coolant Temperature	Data Valid but Above Normal Operational Range - Most Severe Level	Coolant Temperature High - Data Valid but Above Normal Operational Range - Most Severe Level
110	3	144	Engine Coolant Temperature	Voltage Above Normal, or Shorted to High Source	Coolant Temperature Sensor Circuit – Voltage Above Normal, or Shorted to High Source
110	4	145	Engine Coolant Temperature	Voltage Below Normal, or Shorted to Low Source	Coolant Temperature Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
110	14	1847	Engine Coolant Temperature	Special Instructions	Engine Coolant Temperature - Special Instructions
110	16	146	Engine Coolant Temperature	Data Valid but Above Normal Operating Range - Moderately Severe Level	Coolant Temperature High - Data Valid but Above Normal Operational Range - Moderately Severe Level
110	18	2789	Engine Coolant Temperature	Data Valid but Below Normal Operating Range - Moderately Severe Level	Engine Coolant Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level
110	31	2646	Engine Coolant Temperature	Not Available or Condition Exists	Engine Coolant Temperature - Condition Exists
110	31	2659	Engine Coolant Temperature	Not Available or Condition Exists	Engine Coolant Temperature - Condition Exists
111	1	235	Engine Coolant Level	Data Valid but Below Normal Operational Range - Most Severe Level	Coolant Level Low - Data Valid but Below Normal Operational Range - Most Severe Level
111	2	422	Engine Coolant Level	Data Erratic, Intermittent or Incorrect	Coolant Level - Data Erratic, Intermittent, or Incorrect
111	3	195	Engine Coolant Level	Voltage Above Normal, or Shorted to High Source	Coolant Level Sensor Circuit - Voltage Above Normal, or Shorted to High Source
111	4	196	Engine Coolant Level	Voltage Below Normal, or Shorted to Low Source	Coolant Level Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
111	17	2448	Engine Coolant Level	Data Valid but Below Normal Operating Range - Least Severe Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level
111	18	197	Engine Coolant Level	Data Valid but Below Normal Operating Range - Moderately Severe Level	Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe Level
157	0	449	Engine Injector Metering Rail 1 Pressure	Data Valid but Above Normal Operational Range - Most Severe Level	Fuel Pressure High - Data Valid but Above Normal Operational Range – Moderately Severe Level
157	0	1911	Engine Injector Metering Rail 1 Pressure	Data Valid but Above Normal Operational Range - Most Severe Level	Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level
157	1	2249	Engine Injector Metering Rail 1 Pressure	Data Valid but Below Normal Operational Range - Most Severe Level	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Most Severe Level
157	3	451	Engine Injector Metering Rail 1 Pressure	Voltage Above Normal, or Shorted to High Source	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
157	4	452	Engine Injector Metering Rail 1 Pressure	Voltage Below Normal, or Shorted to Low Source	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
157	16	553	Engine Injector Metering Rail 1 Pressure	Data Valid but Above Normal Operating Range - Moderately Severe Level	Injector Metering Rail #1 Pressure High – Data Valid but Above Normal Operational Range - Moderately Severe Level
157	18	559	Engine Injector Metering Rail 1 Pressure	Data Valid but Below Normal Operating Range - Moderately Severe Level	Injector Metering Rail #1 Pressure Low – Data Valid but Below Normal Operational Range - Moderately Severe Level
166	2	951	Engine Rated Power	Data Erratic, Intermittent or Incorrect	Cylinder Power Imbalance Between Cylinders - Data erratic, intermittent or incorrect
168	16	442	Battery Potential / Power Input 1	Data Valid but Above Normal Operating Range - Moderately Severe Level	Battery #1 Voltage High - Data Valid but Above Normal Operational Range – Moderately Severe Level
168	18	441	Battery Potential / Power Input 1	Data Valid but Below Normal Operating Range - Moderately Severe Level	Battery #1 Voltage Low - Data Valid but Below Normal Operational Range – Moderately Severe Level
171	9	3369	Ambient Air Temperature	Abnormal Update Rate	Turbocharger 1 Compressor Inlet Temperature Sensor - Abnormal Update Rate
171	19	3371	Ambient Air Temperature	Received Network Data in Error	Turbocharger 1 Compressor Inlet Temperature Sensor - Received Network Data In Error
190	0	234	Engine Speed	Data Valid but Above Normal Operational Range - Most Severe Level	Engine Speed High - Data Valid but Above Normal Operational Range - Most Severe Level
190	0	2468	Engine Speed	Data Valid but Above Normal Operational Range - Most Severe Level	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level
190	2	689	Engine Speed	Data Erratic, Intermittent or Incorrect	Primary Engine Speed Sensor Error – Data Erratic, Intermittent, or Incorrect
190	2	2321	Engine Speed	Data Erratic, Intermittent or Incorrect	Engine Speed / Position Sensor #1 - Data Erratic, Intermittent, or Incorrect
191	9	3328	Transmission Output Shaft Speed	Abnormal Update Rate	Transmission Output Shaft Speed - Abnormal update rate
191	16	349	Transmission Output Shaft Speed	Data Valid but Above Normal Operating Range - Moderately Severe Level	Transmission Output Shaft Speed - Data Valid but Above Normal Operational Range - Moderately Severe Level
191	18	489	Transmission Output Shaft Speed	Data Valid but Below Normal Operating Range - Moderately Severe Level	Transmission Output Shaft Speed - Data Valid but Below Normal Operational Range - Moderately Severe Level
411	2	1866	Engine Exhaust Gas Recirculation 1 Differential Pressure	Data Erratic, Intermittent or Incorrect	Exhaust Gas Recirculation (EGR) Valve Delta Pressure - Data Erratic, Intermittent or Incorrect
411	3	2273	Engine Exhaust Gas Recirculation 1 Differential Pressure	Voltage Above Normal, or Shorted to High Source	Exhaust Gas Recirculation (EGR) Valve Delta Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
411	4	2274	Engine Exhaust Gas Recirculation 1 Differential Pressure	Voltage Below Normal, or Shorted to Low Source	Exhaust Gas Recirculation (EGR) Valve Delta Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
412	3	2375	Engine Exhaust Gas Recirculation 1 Temperature	Voltage Above Normal, or Shorted to High Source	Exhaust Gas Recirculation (EGR) Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
412	4	2376	Engine Exhaust Gas Recirculation 1 Temperature	Voltage Below Normal, or Shorted to Low Source	Exhaust Gas Recirculation (EGR) Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
412	15	2961	Engine Exhaust Gas Recirculation 1 Temperature	Data Valid but Above Normal Operating Range - Least Severe Level	Exhaust Gas Recirculation (EGR) Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
412	16	2962	Engine Exhaust Gas Recirculation 1 Temperature	Data Valid but Above Normal Operating Range - Moderately Severe Level	Exhaust Gas Recirculation (EGR) Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
441	3	293	Auxiliary Temperature 1	Voltage Above Normal, or Shorted to High Source	Auxiliary Temperature Sensor Input # 1 Circuit - Voltage Above Normal, or Shorted to High Source
441	4	294	Auxiliary Temperature 1	Voltage Below Normal, or Shorted to Low Source	Auxiliary Temperature Sensor Input # 1 Circuit - Voltage Below Normal, or Shorted to Low Source
441	14	292	Auxiliary Temperature 1	Special Instructions	Auxiliary Temperature Sensor Input 1 - Special Instructions
441	14	1381	Auxiliary Temperature 1	Special Instructions	Auxiliary Temperature Sensor Input 1 - Special Instructions
558	2	431	Accelerator Pedal 1 Low Idle Switch	Data Erratic, Intermittent or Incorrect	Accelerator Pedal or Lever Idle Validation Circuit - Data Erratic, Intermittent, or Incorrect
558	13	432	Accelerator Pedal 1 Low Idle Switch	Out of Calibration	Accelerator Pedal or Lever Idle Validation Circuit - Out of Calibration
597	3	769	Brake Switch	Voltage Above Normal, or Shorted to High Source	Brake Switch Circuit - Voltage Above Normal, or Shorted to High Source
597	4	771	Brake Switch	Voltage Below Normal, or Shorted to Low Source	Brake Switch Circuit - Voltage Below Normal, or Shorted to Low Source
611	2	523	System Diagnostic Code #1	Data Erratic, Intermittent or Incorrect	OEM Intermediate (PTO) Speed switch Validation - Data Erratic, Intermittent, or Incorrect
611	4	2186	System Diagnostic Code #1	Voltage Below Normal, or Shorted to Low Source	Sensor Supply 4 Circuit-Voltage Below Normal, or Shorted to Low Source
611	16	2292	System Diagnostic Code #1	Data Valid but Above Normal Operating Range - Moderately Severe Level	Fuel Inlet Meter Device - Data Valid but Above Normal Operational Range - Moderately Severe Level
611	18	2293	System Diagnostic Code #1	Data Valid but Below Normal Operating Range - Moderately Severe Level	Fuel Inlet Meter Device Flow Demand Lower Than Expected - Data Valid But Below Normal Operational Range - Moderately Severe Level
612	2	115	System Diagnostic Code #2	Data Erratic, Intermittent or Incorrect	Engine Speed/Position Sensor Circuit lost both of two signals from the magnetic pickup sensor - Data Erratic, Intermittent, or incorrect
623	4	244	Red Stop Lamp	Voltage Below Normal, or Shorted to Low Source	Red Stop Lamp Driver Circuit - Voltage Below Normal, or Shorted to Low Source
627	2	1117	Power Supply	Data Erratic, Intermittent or Incorrect	Power Lost With Ignition On - Data Erratic, Intermittent, or Incorrect
627	12	351	Power Supply	Bad Intelligent Device or Component	Injector Power Supply - Bad Intelligent Device or Component
629	12	343	Controller #1	Bad Intelligent Device or Component	Engine Control Module Warning internal hardware failure - Bad Intelligent Device or Component
633	31	2311	Engine Fuel Actuator 1 Control Command	Not Available or Condition Exists	Fueling Actuator #1 Circuit Error – Condition Exists
639	2	426	J1939 Network #1, Primary Vehicle Network	Data Erratic, Intermittent or Incorrect	J1939 Network #1 - Data erratic, intermittent or incorrect
639	9	285	J1939 Network #1, Primary Vehicle Network	Abnormal Update Rate	SAE J1939 Multiplexing PGN Timeout Error - Abnormal Update Rate
639	13	286	J1939 Network #1, Primary Vehicle Network	Out of Calibration	SAE J1939 Multiplexing Configuration Error – Out of Calibration

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
640	14	599	Engine External Protection Input	Special Instructions	Auxiliary Commanded Dual Output Shutdown - Special Instructions
641	7	2387	Engine Variable Geometry Turbocharger Actuator #1	Mechanical System not Responding or Out of Adjustment	VGT Actuator Driver Circuit (Motor) - Mechanical System Not Responding or Out of Adjustment
641	9	2636	Engine Variable Geometry Turbocharger Actuator #1	Abnormal Update Rate	VGT Actuator Driver Circuit - Abnormal Update Rate
641	12	2634	Engine Variable Geometry Turbocharger Actuator #1	Bad Intelligent Device or Component	VGT Actuator Controller - Bad intelligent Device or Component
641	13	2449	Engine Variable Geometry Turbocharger Actuator #1	Out of Calibration	VGT Actuator Controller - Out of Calibration
641	15	1962	Engine Variable Geometry Turbocharger Actuator #1	Data Valid but Above Normal Operating Range - Least Severe Level	VGT/VFT Actuator Driver Over Temperature (Calculated) - Data Valid But Above Normal Operating Range - Least Severe Level
641	31	2635	Engine Variable Geometry Turbocharger Actuator #1	Not Available or Condition Exists	VGT Actuator Driver Circuit - Condition Exists
644	2	237	Engine External Speed Command Input	Data Erratic, Intermittent or Incorrect	External Speed Input (Multiple Unit Synchronization) - Data Erratic, Intermittent, or Incorrect
647	3	2377	Engine Fan Clutch 1 Output Device Driver	Voltage Above Normal, or Shorted to High Source	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source
647	4	245	Engine Fan Clutch 1 Output Device Driver	Voltage Below Normal, or Shorted to Low Source	Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source
651	5	322	Engine Injector Cylinder #01	Current Below Normal or Open Circuit	Injector Solenoid Cylinder #1 Circuit – Current Below Normal, or Open Circuit
652	5	331	Engine Injector Cylinder #02	Current Below Normal or Open Circuit	Injector Solenoid Cylinder #2 Circuit – Current Below Normal, or Open Circuit
653	5	324	Engine Injector Cylinder #03	Current Below Normal or Open Circuit	Injector Solenoid Cylinder #3 Circuit – Current Below Normal, or Open Circuit
654	5	332	Engine Injector Cylinder #04	Current Below Normal or Open Circuit	Injector Solenoid Cylinder #4 Circuit – Current Below Normal, or Open Circuit
655	5	323	Engine Injector Cylinder #05	Current Below Normal or Open Circuit	Injector Solenoid Cylinder #5 Circuit – Current Below Normal, or Open Circuit
656	5	325	Engine Injector Cylinder #06	Current Below Normal or Open Circuit	Injector Solenoid Cylinder #6 Circuit – Current Below Normal, or Open Circuit
677	3	584	Engine Starter Motor Relay	Voltage Above Normal, or Shorted to High Source	Starter Relay Driver Circuit- Voltage Above Normal, or Shorted to High Source
697	3	2557	Auxiliary PWM Driver #1	Voltage Above Normal, or Shorted to High Source	Auxiliary PWM Driver #1 - Voltage Above Normal, or Shorted to High Source
697	4	2558	Auxiliary PWM Driver #1	Voltage Below Normal, or Shorted to Low Source	Auxiliary PWM Driver #1 - Voltage Below Normal, or Shorted to Low Source
702	3	527	Auxiliary I/O #02	Voltage Above Normal, or Shorted to High Source	Auxiliary Input/Output 2 Circuit - Voltage Above Normal, or Shorted to High Source
703	3	529	Auxiliary I/O #03	Voltage Above Normal, or Shorted to High Source	Auxiliary Input/Output 3 Circuit - Voltage Above Normal, or Shorted to High Source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
703	11	779	Auxiliary I/O #03	Root Cause Not Known	Warning Auxiliary Equipment Sensor Input # 3 (OEM Switch) - Root Cause Not Known
703	14	2195	Auxiliary I/O #03	Special Instructions	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions
723	2	778	Engine Speed 2	Data Erratic, Intermittent or Incorrect	Engine Speed Sensor (Camshaft) Error – Data Erratic, Intermittent, or Incorrect
723	2	2322	Engine Speed 2	Data Erratic, Intermittent or Incorrect	Engine Speed / Position Sensor #2 - Data Erratic, Intermittent, or Incorrect
723	7	731	Engine Speed 2	Mechanical System not Responding or Out of Adjustment	Engine Speed/Position #2 Mechanical Misalignment Between Camshaft and Crankshaft Sensors - Mechanical System Not Responding Properly or Out of
729	3	2555	Engine Intake Air Heater Driver #1	Voltage Above Normal, or Shorted to High Source	Intake Air Heater #1 Circuit - Voltage Above Normal, or Shorted to High Source
729	4	2556	Engine Intake Air Heater Driver #1	Voltage Below Normal, or Shorted to Low Source	Intake Air Heater #1 Circuit - Voltage Below Normal, or Shorted to Low Source
974	3	133	Remote Accelerator Pedal Position	Voltage Above Normal, or Shorted to High Source	Remote Accelerator Pedal or Lever Position Sensor Circuit – Voltage Above Normal, or Shorted to High Source
974	4	134	Remote Accelerator Pedal Position	Voltage Below Normal, or Shorted to Low Source	Remote Accelerator Pedal or Lever Position Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
974	19	288	Remote Accelerator Pedal Position	Received Network Data in Error	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Data Error - Received Network Data In Error
1073	3	2367	Engine (Compression) Brake Output #2	Voltage Above Normal, or Shorted to High Source	Engine Brake Actuator Driver Output 2 Circuit - Voltage Above Normal, or Shorted to High Source
1073	4	2363	Engine (Compression) Brake Output #2	Voltage Below Normal, or Shorted to Low Source	Engine Brake Actuator Driver Output 2 Circuit - Voltage Below Normal, or Shorted to Low Source
1075	3	2265	Engine Electric Lift Pump for Engine Fuel Supply	Voltage Above Normal, or Shorted to High Source	Fuel Priming Pump Control Signal Circuit – Voltage Above Normal, or Shorted to High Source
1075	4	2266	Engine Electric Lift Pump for Engine Fuel Supply	Voltage Below Normal, or Shorted to Low Source	Fuel Priming Pump Control Signal Circuit – Voltage Below Normal, or Shorted to Low Source
1112	3	2368	Engine (Compression) Brake Output #3	Voltage Above Normal, or Shorted to High Source	Engine Brake Actuator Driver 3 Circuit - Voltage Above Normal, or Shorted to High Source
1112	4	2365	Engine (Compression) Brake Output #3	Voltage Below Normal, or Shorted to Low Source	Engine Brake Actuator Driver Output 3 Circuit - Voltage Below Normal, or Shorted to Low Source
1136	3	697	Engine ECU Temperature	Voltage Above Normal, or Shorted to High Source	ECM Internal Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
1136	4	698	Engine ECU Temperature	Voltage Below Normal, or Shorted to Low Source	ECM Internal Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
1172	3	691	Engine Turbocharger 1 Compressor Intake Temperature	Voltage Above Normal, or Shorted to High Source	Turbocharger 1 Compressor Inlet Temperature Circuit-Voltage Above Normal, or Shorted to High Source
1188	2	3925	Engine Turbocharger Wastegate Actuator 1 Position	Data Erratic, Intermittent or Incorrect	Engine Turbocharger Wastegate Actuator 1 Position - Data erratic, intermittent or incorrect
1209	2	2554	Engine Exhaust Gas Pressure	Data Erratic, Intermittent or Incorrect	Exhaust Gas Pressure - Data Erratic, Intermittent or Incorrect

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
1209	3	2373	Engine Exhaust Gas Pressure	Voltage Above Normal, or Shorted to High Source	Exhaust Gas Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
1209	4	2374	Engine Exhaust Gas Pressure	Voltage Below Normal, or Shorted to Low Source	Exhaust Gas Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
1209	16	2764	Engine Exhaust Gas Pressure	Data Valid but Above Normal Operating Range - Moderately Severe Level	Exhaust Gas Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
1231	2	3329	J1939 Network #2	Data Erratic, Intermittent or Incorrect	J1939 Network #2 - Data Erratic, Intermittent or Incorrect
1235	2	3331	J1939 Network #3	Data Erratic, Intermittent or Incorrect	J1939 Network #3 - Data Erratic, Intermittent or Incorrect
1347	3	272	Engine Fuel Pump Pressurizing Assembly #1	Voltage Above Normal, or Shorted to High Source	High Fuel Pressure Solenoid Valve Circuit – Voltage Above Normal, or Shorted to High Source
1347	4	271	Engine Fuel Pump Pressurizing Assembly #1	Voltage Below Normal, or Shorted to Low Source	High Fuel Pressure Solenoid Valve Circuit – Voltage Below Normal, or Shorted to Low Source
1347	7	281	Engine Fuel Pump Pressurizing Assembly #1	Mechanical System not Responding or Out of Adjustment	High Fuel Pressure Solenoid Valve #1 – Mechanical System Not Responding Properly or Out of Adjustment
1377	2	497	Engine Synchronization Switch	Data Erratic, Intermittent or Incorrect	Multiple Unit Synchronization Switch Circuit - Data Erratic, Intermittent, or Incorrect
1378	31	649	Engine Oil Change Interval	Not Available or Condition Exists	Change Lubricating Oil and Filter – Condition Exists
1388	3	297	Auxiliary Pressure #2	Voltage Above Normal, or Shorted to High Source	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Above Normal, or Shorted to High Source
1388	4	298	Auxiliary Pressure #2	Voltage Below Normal, or Shorted to Low Source	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Below Normal, or Shorted to Low Source
1388	14	296	Auxiliary Pressure #2	Special Instructions	Auxiliary Pressure Sensor Input 1 - Special Instructions
1623	2	3213	Tachograph Output Shaft Speed	Data Erratic, Intermittent or Incorrect	Tachograph Output Shaft Speed - Received Network Data In Error
1623	9	3186	Tachograph Output Shaft Speed	Abnormal Update Rate	Tachograph Output Shaft Speed - Abnormal update rate
1632	14	2998	Engine Torque Limit Feature	Special Instructions	Engine Torque Limit Feature - Special Instructions
1675	11	3737	Engine Starter Mode	Root Cause Not Known	Engine Starter Mode Overcrank Protection - Condition Exists
1800	16	2263	Battery 1 Temperature	Data Valid but Above Normal Operating Range - Moderately Severe Level	Battery Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
1800	18	2264	Battery 1 Temperature	Data Valid but Below Normal Operating Range - Moderately Severe Level	Battery Temperature - Data Valid but Below Normal Operational Range - Moderately Severe Level
2623	3	1239	Accelerator Pedal #1 Channel 2	Voltage Above Normal, or Shorted to High Source	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Above Normal, or Shorted to High Source
2623	4	1241	Accelerator Pedal #1 Channel 2	Voltage Below Normal, or Shorted to Low Source	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Below Normal, or Shorted to Low Source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
2630	3	2571	Engine Charge Air Cooler 1 Outlet Temperature	Voltage Above Normal, or Shorted to High Source	Engine Charge Air Cooler Outlet Temperature - Voltage Above Normal, or Shorted to High Source
2630	4	2572	Engine Charge Air Cooler 1 Outlet Temperature	Voltage Below Normal, or Shorted to Low Source	Engine Charge Air Cooler Outlet Temperature - Voltage Below Normal, or Shorted to Low Source
2789	15	2346	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Data Valid but Above Normal Operating Range - Least Severe Level	Turbocharger Turbine Inlet Temperature (Calculated) - Data Valid but Above Normal Operational Range – Least Severe Level
2791	4	2351	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	Voltage Below Normal, or Shorted to Low Source	EGR Valve Control Circuit - Voltage below normal, or shorted to low source
2791	5	2349	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	Current Below Normal or Open Circuit	EGR Valve Control Circuit - Current below normal or open circuit
2791	6	2353	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	Current Above Normal or Grounded Circuit	EGR Valve Control Circuit - Current above normal or grounded circuit
2791	7	2357	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	Mechanical System not Responding or Out of Adjustment	EGR Valve Control Circuit - Mechanical system not responding or out of adjustment
2791	13	1896	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	Out of Calibration	EGR Valve Controller - Out of Calibration
2797	13	2765	Engine Injector Group 1	Out of Calibration	Engine Injector Bank 1 Barcodes - Out of Calibration
3050	11	2637	Catalyst Bank 1 System Monitor	Root Cause Not Known	Aftertreatment Diesel Oxidation Catalyst Face Plugged - Root Cause Not Known
3050	17	2638	Catalyst Bank 1 System Monitor	Data Valid but Below Normal Operating Range - Least Severe Level	Aftertreatment Diesel Oxidation Catalyst System - Data Valid But Below Normal Operating Range - Least Severe Level
3050	18	1691	Catalyst Bank 1 System Monitor	Data Valid but Below Normal Operating Range - Moderately Severe Level	Aftertreatment Diesel Oxidation Catalyst System - Data Valid But Below Normal Operating Range - Moderately Severe Level
3058	31	2774	EGR System Monitor	Not Available or Condition Exists	Engine Exhaust Gas Recirculation (EGR) System - Condition Exists
3241	2	1667	Aftertreatment 1 Exhaust Gas Temperature 1	Data Erratic, Intermittent or Incorrect	Aftertreatment Exhaust Gas Temperature 1 - Data Erratic, Intermittent or Incorrect
3241	3	1666	Aftertreatment 1 Exhaust Gas Temperature 1	Voltage Above Normal, or Shorted to High Source	Aftertreatment Exhaust Gas Temperature 1 Circuit - Voltage Below Normal, or Shorted to Low Source
3241	4	1665	Aftertreatment 1 Exhaust Gas Temperature 1	Voltage Below Normal, or Shorted to Low Source	Aftertreatment Exhaust Gas Temperature 1 Circuit - Voltage Below Normal, or Shorted to Low Source
3241	13	1663	Aftertreatment 1 Exhaust Gas Temperature 1	Out of Calibration	Aftertreatment Exhaust Gas Temperature 1 Swapped - Out of Calibration
3242	0	3311	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Data Valid but Above Normal Operational Range - Most Severe Level	Aftertreatment Diesel Particulate Filter Intake Gas Temperature – Data valid but above normal operational range – Most Severe Level
3242	2	3318	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Data Erratic, Intermittent or Incorrect	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data erratic, intermittent or incorrect
3242	3	3317	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Voltage Above Normal, or Shorted to High Source	Aftertreatment 1 Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source
3242	4	3316	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Voltage Below Normal, or Shorted to Low Source	Aftertreatment 1 Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
3242	15	3254	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Data Valid but Above Normal Operating Range - Least Severe Level	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
3242	16	3253	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment 1 Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
3245	2	1878	Aftertreatment 1 Exhaust Gas Temperature 3	Data Erratic, Intermittent or Incorrect	Aftertreatment Exhaust Gas Temperature 3 - Data Erratic, Intermittent or Incorrect
3245	3	1876	Aftertreatment 1 Exhaust Gas Temperature 3	Voltage Above Normal, or Shorted to High Source	Aftertreatment Exhaust Gas Temperature 3 Circuit - Voltage Above Normal, or Shorted to High Source
3245	4	1877	Aftertreatment 1 Exhaust Gas Temperature 3	Voltage Below Normal, or Shorted to Low Source	Aftertreatment Exhaust Gas Temperature 3 Circuit - Voltage Below Normal, or Shorted to Low Source
3245	16	1972	Aftertreatment 1 Exhaust Gas Temperature 3	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment Exhaust Gas Temperature 3 - Data Valid But Above Normal Operating Range - Moderately Severe Level
3246	0	3312	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Data Valid but Above Normal Operational Range - Most Severe Level	Aftertreatment Diesel Particulate Filter Outlet Gas Temperature – Data valid but above normal operational range – Most Severe Level
3249	2	1676	Aftertreatment 1 Exhaust Gas Temperature 2	Data Erratic, Intermittent or Incorrect	Aftertreatment Exhaust Gas Temperature 2 - Data erratic, intermittent or incorrect
3249	3	1675	Aftertreatment 1 Exhaust Gas Temperature 2	Voltage Above Normal, or Shorted to High Source	Aftertreatment Exhaust Gas Temperature 2 Circuit - Voltage Below Normal, or Shorted to Low Source
3249	4	1674	Aftertreatment 1 Exhaust Gas Temperature 2	Voltage Below Normal, or Shorted to Low Source	Aftertreatment Exhaust Gas Temperature 2 Circuit - Voltage Below Normal, or Shorted to Low Source
3249	16	1968	Aftertreatment 1 Exhaust Gas Temperature 2	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Above Normal Operating Range - Moderately Severe Level
3249	17	2742	Aftertreatment 1 Exhaust Gas Temperature 2	Data Valid but Below Normal Operating Range - Least Severe Level	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Least Severe Level
3249	18	2743	Aftertreatment 1 Exhaust Gas Temperature 2	Data Valid but Below Normal Operating Range - Moderately Severe Level	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Moderately Severe Level
3251	0	1922	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Data Valid but Above Normal Operational Range - Most Severe Level	Aftertreatment Particulate Filter Differential Pressure - Data Valid But Above Normal Operational Range - Most Severe Level
3251	2	1883	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Data Erratic, Intermittent or Incorrect	Aftertreatment Particulate Filter Differential Pressure Sensor - Data Erratic, Intermittent or Incorrect
3251	3	1879	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Voltage Above Normal, or Shorted to High Source	Aftertreatment Particulate Filter Differential Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
3251	4	1881	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Voltage Below Normal, or Shorted to Low Source	Aftertreatment Particulate Filter Differential Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
3251	15	2639	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Data Valid but Above Normal Operating Range - Least Severe Level	Aftertreatment Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range - Least Severe Level
3251	16	1921	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
3481	16	2778	Aftertreatment 1 Fuel Rate	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment Fuel Rate - Data Valid But Above Normal Operating Range - Moderately Severe Level
3509	3	386	Sensor supply voltage 1	Voltage Above Normal, or Shorted to High Source	Sensor Supply Voltage #1 Circuit – Voltage Above Normal, or Shorted to High Source

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
3509	4	352	Sensor supply voltage 1	Voltage Below Normal, or Shorted to Low Source	Sensor Supply Voltage #1 Circuit – Voltage Below Normal, or Shorted to Low Source
3510	3	227	Sensor supply voltage 2	Voltage Above Normal, or Shorted to High Source	Sensor Supply Voltage #2 Circuit – Voltage Above Normal, or Shorted to High Source
3510	4	187	Sensor supply voltage 2	Voltage Below Normal, or Shorted to Low Source	Sensor Supply Voltage #2 Circuit – Voltage Below Normal, or Shorted to Low Source
3511	3	239	Sensor supply voltage 3	Voltage Above Normal, or Shorted to High Source	Sensor Supply Voltage #3 Circuit - Voltage Above Normal, or Shorted to High Source
3511	4	238	Sensor supply voltage 3	Voltage Below Normal, or Shorted to Low Source	Sensor Supply Voltage #3 Circuit – Voltage Below Normal, or Shorted to Low Source
3512	3	2185	Sensor supply voltage 4	Voltage Above Normal, or Shorted to High Source	Sensor Supply 4 Circuit - Voltage above normal, or shorted to high source
3513	3	1695	Sensor supply voltage 5	Voltage Above Normal, or Shorted to High Source	Sensor Supply 5 - Voltage Above Normal, or Shorted to High Source
3513	4	1696	Sensor supply voltage 5	Voltage Below Normal, or Shorted to Low Source	Sensor Supply 5 - Voltage Below Normal, or Shorted to Low Source
3514	3	515	Sensor supply voltage 6	Voltage Above Normal, or Shorted to High Source	Sensor Supply 6 Circuit - Voltage above normal, or shorted to high source
3514	4	516	Sensor supply voltage 6	Voltage Below Normal, or Shorted to Low Source	Sensor Supply 6 Circuit - Voltage below normal, or shorted to low source
3555	17	1943	Ambient Air Density	Data Valid but Below Normal Operating Range - Least Severe Level	Ambient Air Density - Data Valid But Below Normal Operating Range - Least Severe Level
3556	16	2728	Aftertreatment 1 Hydrocarbon Doser	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment Fuel Injector 1 - Data Valid But Above Normal Operating Range - Moderately Severe Level
3597	3	1939	ECU Power Output Supply Voltage #1	Voltage Above Normal, or Shorted to High Source	ECU Power Output Supply Voltage 1 - Voltage Above Normal, or Shorted to High Source
3597	4	1941	ECU Power Output Supply Voltage #1	Voltage Below Normal, or Shorted to Low Source	ECU Power Output Supply Voltage 1 - Voltage Below Normal, or Shorted to Low Source
3597	18	1938	ECU Power Output Supply Voltage #1	Data Valid but Below Normal Operating Range - Moderately Severe Level	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level
3610	2	3135	Diesel Particulate Filter Outlet Pressure 1	Data Erratic, Intermittent or Incorrect	Aftertreatment Diesel Particulate Filter Outlet Pressure - Data Erratic, Intermittent or Incorrect
3610	3	3133	Diesel Particulate Filter Outlet Pressure 1	Voltage Above Normal, or Shorted to High Source	Aftertreatment Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
3610	4	3134	Diesel Particulate Filter Outlet Pressure 1	Voltage Below Normal, or Shorted to Low Source	Aftertreatment Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
3667	3	3139	Engine Air Shutoff Status	Voltage Above Normal, or Shorted to High Source	Engine Air Shutoff Circuit - Voltage above normal, or shorted to high source
3667	4	3141	Engine Air Shutoff Status	Voltage Below Normal, or Shorted to Low Source	Engine Air Shutoff Circuit - Voltage below normal, or shorted to low source
3703	31	2777	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch	Not Available or Condition Exists	Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch - Condition Exists

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
3936	15	1981	Aftertreatment Diesel Particulate Filter System	Data Valid but Above Normal Operating Range - Least Severe Level	Aftertreatment Diesel Particulate Filter System - Data Valid But Above Normal Operating Range - Least Severe Level
3936	16	3168	Aftertreatment Diesel Particulate Filter System	Data Valid but Above Normal Operating Range - Moderately Severe Level	Aftertreatment Diesel Particulate Filter System - Data Valid But Above Normal Operating Range - Moderately Severe Level
4765	0	3251	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Data Valid but Above Normal Operational Range - Most Severe Level	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
4765	2	3315	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Data Erratic, Intermittent or Incorrect	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect
4765	3	3314	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Voltage Above Normal, or Shorted to High Source	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source
4765	4	3313	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Voltage Below Normal, or Shorted to Low Source	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source
4765	13	3325	Aftertreatment 1 Diesel Oxidation Catalyst Intake Gas Temperature	Out of Calibration	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Swapped - Out of Calibration
4795	31	1993	Aftertreatment 1 Diesel Particulate Filter Missing	Not Available or Condition Exists	Aftertreatment Diesel Particulate Filter Missing - Condition Exists
4796	31	1664	Aftertreatment 1 Diesel Oxidation Catalyst Missing	Not Available or Condition Exists	Aftertreatment Diesel Oxidation Catalyst Missing - Condition Exists
5246	0	3712	Aftertreatment SCR Operator Inducement Severity	Data Valid but Above Normal Operational Range - Most Severe Level	Aftertreatment SCR Operator Inducement - Data valid but above normal operational range - Most Severe Level
5421	5	3922	Engine Turbocharger Wastegate Actuator 1	Current Below Normal or Open Circuit	Engine Turbocharger Wastegate Actuator - Current below normal or open circuit
5421	6	3923	Engine Turbocharger Wastegate Actuator 1	Current Above Normal or Grounded Circuit	Engine Turbocharger Wastegate Actuator - Current above normal or grounded circuit
5421	7	3921	Engine Turbocharger Wastegate Actuator 1	Mechanical System not Responding or Out of Adjustment	Engine Turbocharger Wastegate Actuator - Mechanical system not responding or out of adjustment
5421	11	3927	Engine Turbocharger Wastegate Actuator 1	Root Cause Not Known	Engine Turbocharger Wastegate Actuator - Root Cause Not Known
5421	11	3928	Engine Turbocharger Wastegate Actuator 1	Root Cause Not Known	Engine Turbocharger Wastegate Actuator - Condition Exists
5421	13	3918	Engine Turbocharger Wastegate Actuator 1	Out of Calibration	Engine Turbocharger Wastegate Actuator - Out of Calibration
5571	7	3727	High Pressure Common Rail Fuel Pressure Relief Valve	Mechanical System not Responding or Out of Adjustment	High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment
520199	3	193	Cruise Control (Resistive) Signal Circuit	Voltage Above Normal, or Shorted to High Source	Cruise Control (Resistive) Signal Circuit - Voltage Above Normal, or Shorted to High Source
520199	4	194	Cruise Control (Resistive) Signal Circuit	Voltage Below Normal, or Shorted to Low Source	Cruise Control (Resistive) Signal Circuit - Voltage Below Normal, or Shorted to Low Source
520320	7	2699	Crankcase Depression Valve	Mechanical System not Responding or Out of Adjustment	Crankcase Depression Valve - Mechanical System Not Responding or Out of Adjustment
520435	12	3222	Glow Plug Module	Bad Intelligent Device or Component	Glow Plug Module - Bad intelligent device or component

J1939 SPN	J1939 FMI	Cummins Code	J1939 SPN Description	J1939 FMI Description	Cummins Description
520441	3	3136	Engine Exhaust Gas Recirculation (EGR) Outlet Pressure Sensor Circuit	Voltage Above Normal, or Shorted to High Source	Engine Exhaust Gas Recirculation (EGR) Outlet Pressure Sensor Circuit - Above Normal, or Shorted to High Source
520441	4	3137	Engine Exhaust Gas Recirculation (EGR) Outlet Pressure Sensor Circuit	Voltage Below Normal, or Shorted to Low Source	Engine Exhaust Gas Recirculation (EGR) Outlet Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
520442	3	3295	Engine Exhaust Gas Recirculation (EGR) Mixer Inlet Temperature Sensor Circuit	Voltage Above Normal, or Shorted to High Source	Engine Exhaust Gas Recirculation (EGR) Mixer Inlet Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
520442	4	3296	Engine Exhaust Gas Recirculation (EGR) Mixer Inlet Temperature Sensor Circuit	Voltage Below Normal, or Shorted to Low Source	Engine Exhaust Gas Recirculation (EGR) Mixer Inlet Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
520448	31	3377	Engine Crankcase Ventilation Hose Disconnected	Not Available or Condition Exists	Engine Crankcase Ventilation Hose Disconnected - Condition Exists
520553	11	3924	Utility Reverse kW Fault	Root Cause Not Known	Utility Reverse kW Fault - Condition Exists
524286	31	952	Reserved for temporary use	Not Available or Condition Exists	Reserved for temporary use - Condition Exists
524286	31	953	Reserved for temporary use	Not Available or Condition Exists	Reserved for temporary use - Condition Exists

Electrical Circuit Troubleshooting

Electrical Circuit Troubleshooting

Introduction

All electrical circuits throughout the compressor do not have a Compressor Diagnostic Code for when a problem arises. This section includes troubleshooting steps to help resolve some common electrical circuit problems. It is not possible to include all the solutions to problems that can occur or list all possible problems. A thorough analysis of the problem is the key to successful troubleshooting. The more information known about a problem, the faster and easier the problem can be solved. Start with simple troubleshooting first and then work up to the more complex troubleshooting methods.

Engine Starter Relay Circuit

Operation Description:

The K1 Engine Starter Relay provides positive battery voltage to the engine starter for cranking the engine. When the Main Control Switch is moved to the START position, a signal is sent to the Titan controller requesting the engine to start cranking. The Titan controls the engine cranking by energizing and de-energizing the engine starter relay. The Main Control Switch must be held in the START position for the Titan to energize the engine starter relay. If the switch is released back to the RUN position at any point, the Titan will de-energize the engine starter relay. The control signal from the Titan to the engine starter relay can be locked out by pressing the Emergency Stop. This will prevent cranking of the engine.

Engine Starter Relay Circuit

Circuit Description:

The K1 Engine Starter Relay connects to the Titan controller as illustrated in the wiring diagrams and control system schematic. The purple-white wire is the switch supply (12 VDC) from the Titan. The light blue wire connects to R1 and the light green wire is the start signal (12 VDC) to the Titan. The yellow wire is the output control (24 VDC) from the Titan to the K1 Relay Coil. The red-yellow wire is the output from the relay to the Engine Starter Solenoid.

Component Location:

K1 Engine Starter Relay is located inside the lift bail near the engine starter. S1 Main Control Switch is located on the control panel. The EM1 Emergency Stop is located below the Control Panel.

Troubleshooting Steps

Action	Result
Step 1: Check ViewPort display for active diagnostic codes.	If active diagnostic codes are present, resolve the issues.
Step 2: Check Emergency Stop to ensure it has not been activated.	If the Emergency Stop has been activated, pull the red operator to de-activate the Emergency Stop.
Step 3: Check all harness connections throughout engine start circuit.	If harness connections are loose or damaged, repair harness as needed.
Step 4: Check the condition of the compressor batteries.	If the batteries are discharged or not able to be charged, replace batteries.
Step 5: Move the Main Control Switch to the ON position. Using a multimeter, measure the voltage between P1-15 and battery Negative.	Voltage measured should be 12 VDC between P1-15 and battery Negative. If voltage measured is not 12 VDC, replace Titan controller.

Engine Starter Relay Circuit

Troubleshooting Steps

Action	Result
Step 6: Hold the Main Control Switch in the START position. Using a multimeter, complete the following measurements: 1. Voltage between S1-5 and battery Negative. 2. Voltage between S1-6 and battery Negative. 3. Voltage between P1-17 and battery Negative. 4. Voltage between P1-3 and battery Negative. 5. Voltage between EM1-C and battery Negative. 6. Voltage between EM1-D and battery Negative. 7. Voltage between K1-1 and battery Negative. 8. Resistance between K1-B and battery Negative. 9. Voltage between K1-A and battery Negative. 10.Voltage between K1-2 and battery Negative. 11.Voltage between B1-S and battery Negative.	1. Voltage measured should be 12 VDC. If not, check for defective harness connections. 2. Voltage measured should be 12 VDC. If not, replace S1 Main Control Switch. 3. Voltage measured should be 12 VDC. If not, check for defective harness connections. 4. Voltage measured should be 24 VDC. If not, replace Titan controller. 5. Voltage measured should be 24 VDC. If not, check for defective harness connections. 6. Voltage measured should be 24 VDC. If not, replace EM1 Emergency Stop. 7. Voltage measured should be 24 VDC. If not, check for defective harness connections. 8. Continuity should be shorted. If not, check for defective harness connections. 9. Voltage measured should be 24 VDC. If not, check for defective harness connections. 10.Voltage measured should be 24 VDC. If not, replace K1 Engine Starter Relay. 11.Voltage measured should be 24 VDC. If not, check for defective harness connections. If 24 VDC is measured, replace B1 Engine Starter.

Start Compressor Circuit

Operation Description:

The B2 Start Compressor provides air to close the Airend Unloader Valve for ease of engine starting. The Titan controls the start compressor by energizing and de-energizing the Start Compressor Relay. When the Main Control Switch is moved to the RUN position, the start compressor will be energized for 10 seconds. The start compressor will de-energize after 10 seconds if no engine start is initiated. When the Main Control Switch is moved to the START position, the start compressor will be enegized and remain energized until the engine speed reaches 1450 RPM. If the engine start is not successful, the start compressor will de-energize after 10 seconds or when the Main Control Switch is moved to the OFF position.

B2 Start Compressor Circuit:

Circuit Description:

The B2 Start Compressor connects to the Titan controller as illustrated in the wiring diagram and control system schematic.The dark blue wire is the output control (24 VDC) from the Titan to the FB1-K11 Relay Coil. The orange wire is the output from the relay to the B2 Start Compressor. The start compressor and relay contacts are protected by FB1-F4 (20 amp) Fuse.

Start Compressor Circuit

Component Location:

B2 Start Compressor is located on top of the Fuel Tank beside the Airend. K11 Relay and F4 fuse are located in the FB1 Fuse/Relay center mounted beside the Battery Disconnect Switch.

Troubleshooting Steps

Action	Result
Step 1: Check B2 Start Compressor FB1-F4 Fuse.	If fuse is blown, replace FB1-F4 Fuse.
Step 2: Check all harness connections throughout start compressor circuit.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Move the Main Control Switch to the RUN position. Start compressor output will only be on for 10 seconds. Using a multimeter, complete the following measurements:. 1. Voltage between P1-4 and battery Negative. 2. Voltage between K11-D2 and battery Negative. 3. Resistance between K11-B2 and battery Negative. 4. Voltage between K11-D1 and battery Negative. 5. Voltage between K11-B1 and battery Negative. 6. Resistance between B2- and battery Negative. 7. Voltage between B2+ and battery Negative	1. Voltage measured should be 24 VDC. If not, replace Titan controller. 2. Voltage measured should be 24 VDC. If not, check fuse and or defective harness connections. 3. Continuity should be shorted. If not, check for defective harness connections. 4. Voltage measured should be 24 VDC. If not, check for defective harness connections. 5. Voltage measured should be 24 VDC. If not, replace K11 relay. 6. Continuity should be shorted. If not, check for defective harness connections. 7. Voltage measured should be 24 VDC. If not, check for defective harness connections. If 24 VDC is measured, replace B2 Start Compressor.

Regulation Heater Circuit

Operation Description:

The regulation heaters provide heat to orifices and regulators that may freeze during cold weather. The Titan controls the regulation heaters by energizing and de-energizing the Regulation Heaters Relay. When the Main Control Switch is moved to the ON position and the ambient temperature is below 45°F, the regulation heaters will be energized. The heaters remain energized, even if the compressor is running, as long as the ambient temperature is below 45°F. When the ambient temperature is above 45°F, the heaters are de-energized.

Regulation Heater Circuit

Circuit Description:

The regulation heaters connect to the Titan controller as illustrated in the wiring diagram. The black wire is the output control (24 VDC) from the Titan to the FB1-K12 Relay Coil. The dark blue wire is the output from the relay to the regulation heaters. The regulation heaters are wired in parallel. The regulation heater and relay contacts are protected by FB1-F5 (15 amp) Fuse.

Component Location:

HR2 is located on the pressure regulator mounted on top of the Separator Tank. HR3 is located on the regulation orifice on the Airend Unloader. HR100-HR103 orifice heaters are located on the bottom of the IQ Filters.

Troubleshooting Steps

Action	Result
Step 1: Check Regulation Heater FB1-F5 Fuse.	If fuse is blown, replace FB1-F5 Fuse.
Step 2: Check all harness connections throughout heater circuit.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Check ViewPort display to verify ambient temperature. If the ambient temperature is below 45°F the heaters will be energized. If the ambient temperature appears abnormal given the outside temperature is below 45°F, the RT3 Ambient Temperature Sensor or circuit could be bad.	If temperature value on ViewPort display is 45°F or below, then proceed to Step 4. Follow troubleshooting steps for Compressor Code 58 to determine if RT3 Ambient Temperature Sensor or circuit is bad.

Regulation Heater Circuit

Troubleshooting Steps

Action	Result
Step 4: Move the Main Control Switch to the ON position. Ensure the ambient temperature on the ViewPort display is 45°F or below with or without the use of Simulator Plug (Part No. 22073878). Using a multimeter, complete the following measurements: 1. Voltage between P1-5 and battery Negative. 2. Voltage between K12-D6 and battery Negative. 3. Resistance between K12-B6 and battery Negative. 4. Voltage between K12-D5 and battery Negative. 5. Voltage between K12-B5 and battery Negative. 6. Resistance between HR1-HR12, and HR100-HR105 pin 2 and battery Negative. 7. Voltage between HR1-HR12, and HR100-HR105 pin 1 and battery Negative.	1. Voltage measured should be 24 VDC. If not, replace Titan controller. 2. Voltage measured should be 24 VDC. If not, check fuse and/or defective harness connections. 3. Continuity should be shorted. If not, check for defective harness connections. 4. Voltage measured should be 24 VDC. If not, check for defective harness connections. 5. Voltage measured should be 24 VDC. If not, replace K12 relay. 6. Continuity should be shorted. If not, check for defective harness connections. 7. Voltage measured should be 24 VDC. If not, check for defective harness connections. If 24 VDC is measured at HR1-HR12, and HR100-HR105 pin 1, replace bad heater(s).

Coolant Level Sensor Circuit

Operation Description:

The J22E Coolant Level Sensor monitors the engine coolant level in the radiator and reports to the engine ECM. When the coolant level reaches too low of a level, the engine will de-rate and after a period of time the engine will shut down. The de-rate time and shutdown time is determined by the engine ECM.

Circuit Description:

The J22E Coolant Level Sensor connects to the engine ECM as illustrated in the wiring diagram and control system schematic. The dark blue wire is the 5 VDC excitation supply from the engine ECM. The light blue wire is the signal output to the engine ECM with a range of 0.75-1.75 VDC (In Water) to 3.75-4.25 VDC (Out Of Water). The black wire is the sensor return.

Component Location:

J22E Coolant Level Sensor is located in the top of the radiator near the pressure cap.

Coolant Level Sensor Circuit

Troubleshooting Steps

Action	Result
Step 1: Check coolant level in radiator..	If the coolant level is low, add coolant.
Step 2: Check all harness connections between engine ECM and J22E Coolant Level Sensor.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Remove J22E Coolant Level Sensor from radiator. Fill a cup full of engine coolant and submerge coolant level sensor probe in coolant. Ensure engine coolant is completely covering the sensor probe. Move the Main Control Switch to the RUN position. Using a multimeter, complete the following measurements: 1. Voltage between J2E-8 and battery Negative. 2. Voltage between J22E-A and battery Negative. 3. Resistance between J2E-35 and U2-C. 4. Voltage between J2E-35 and battery Negative. 5. Voltage between J22E-B and battery Negative.	1. Voltage measured should be 5 VDC. If not, refer to the engine manufacturer’s service manual for instructions. 2. Voltage measured should be 5 VDC. If not, check for defective harness connections. 3. Continuity should be shorted. If not, check for defective harness connections. 4. Voltage measured should be 0.75-1.75 VDC. If not, check for defective harness connections. 5. Voltage measured should be 0.75-1.75 VDC. If not, replace U2 Coolant Level Sensor.

Reconditioning Control Switch Circuit

Operation Description:

The S3 Reconditioning Control Switch controls the reconditioning of the aftertreatment system. When the switch is placed in the NORMAL position (maintained), the engine ECM will automatically perform the reconditioning of the diesel particulate filter when reconditioning timers in theECM necessitate it. When the switch is placed in the INITIATE position (momentary), a request is sent to the engine ECM for a manual (non-mission) reconditioning of the diesel aftertreatment system. Manual reconditioning will only happen when the machine is in a non-mission condition and reconditioning timers allow. When the switch is placed in the DISABLE position (maintained), the engine ECM disallows any automatic or manual (non-mission) reconditioning of the aftertreatment system. Refer to the Engine Owner’s Manual for further operational information.

Circuit Description:

The S3 Regeneration Control Switch connects to the engine ECM as illustrated in the wiring diagram and control system schematic.The white wire is the disable signal to the engine ECM. The dark blue wire is the initiate signal to the engine ECM. The black wire is the switch return. When the switch is in the NORMAL position, there is no signal input to the engine ECM.

Component Location:

S3 Regeneration Control Switch is located on the Control Panel with a lockable cover.

Reconditioning Control Switch Circuit

Troubleshooting Steps

Action	Result
Step 1: Check all harness connections between S3 Regeneration Control Switch and engine ECM.	If harness connections are loose or damaged, repair harness as needed.
Step 2: Disconnect the J2E engine ECM connector. Using a multimeter, complete the following measurements: 1. With the switch in the NORMAL position, measure resistance between J2E-87 and J2E-62. 2. With the switch in the NORMAL position, measure resistance between J2E-91 and J2E-62. 3. With the switch in the NORMAL position, measure resistance between J2E-91 and J2E-87. 4. With the switch in the DISABLE position, measure resistance between J2E-62 to J2E-91. 5. With the switch in the INITIATE position, measure resistance between J2E-62 and J2E-87.	1. Continuity should be open. If not, check for defective harness connections. 2. Continuity should be open. If not, check for defective harness connections. 3. Continuity should be open. If not, check for defective harness connections. 4. Continuity should be shorted. If not, check for defective harness connections and or verify S3 switch operation. 5. Continuity should be shorted. If not, check for defective harness connections and or verify S3 switch operation. If wiring checks out OK in Steps 4 & 5, replace S3 Regeneration Control Switch.

ECM Power Relay Circuit

Operation Description:

The ECM Power Relay provides positive battery voltage to the Engine Control Module and relay control power to DEF system and aftertreatment sensors.The Main Control Switch controls positive battery voltage to these devices by energizing and de-energizing the ECM Power Relay. When the Main Control Switch is moved to the ON position, the ECM Power Relay will be energized. The ECM Power Relay will remain energized until the Main Control Switch is moved to the OFF position. The Engine Control Module will then de-energize the ECM Power Relay when the engine and aftertreatment system has been successfully prepared for shutdown.

ECM Power Relay Circuit

Circuit Description:

The ECM Power Relay connects to the Main Control Switch as illustrated in the wiring diagram and control system schematic.

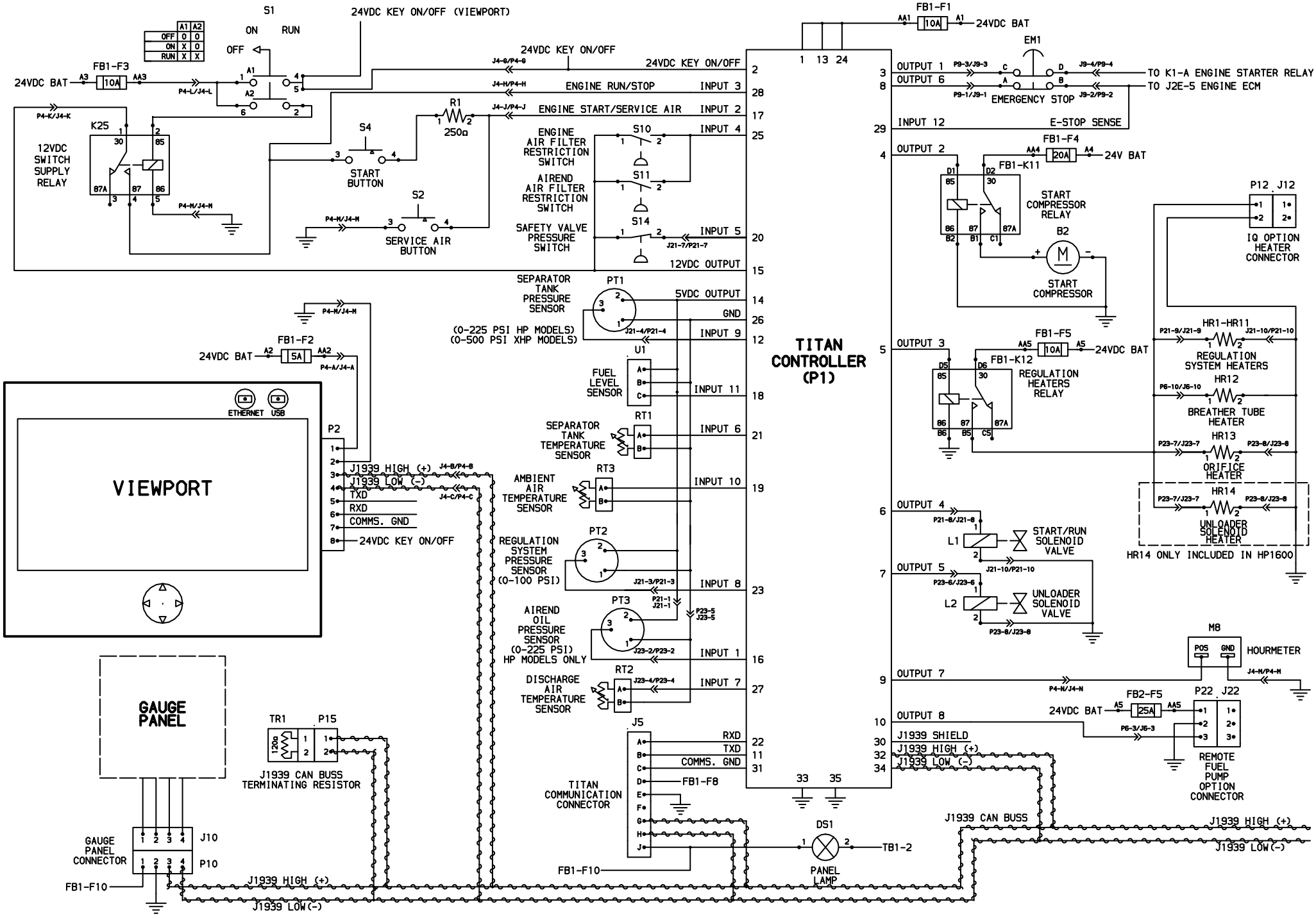
Component Location:

The S1 Main Control Switch is located on the Control Panel. K23, K22, K21 Relays, F1, F3 Fuses, are located in the FB1 and FB2 Fuse/Relay centers mounted beside the Battery Disconnect Switch.

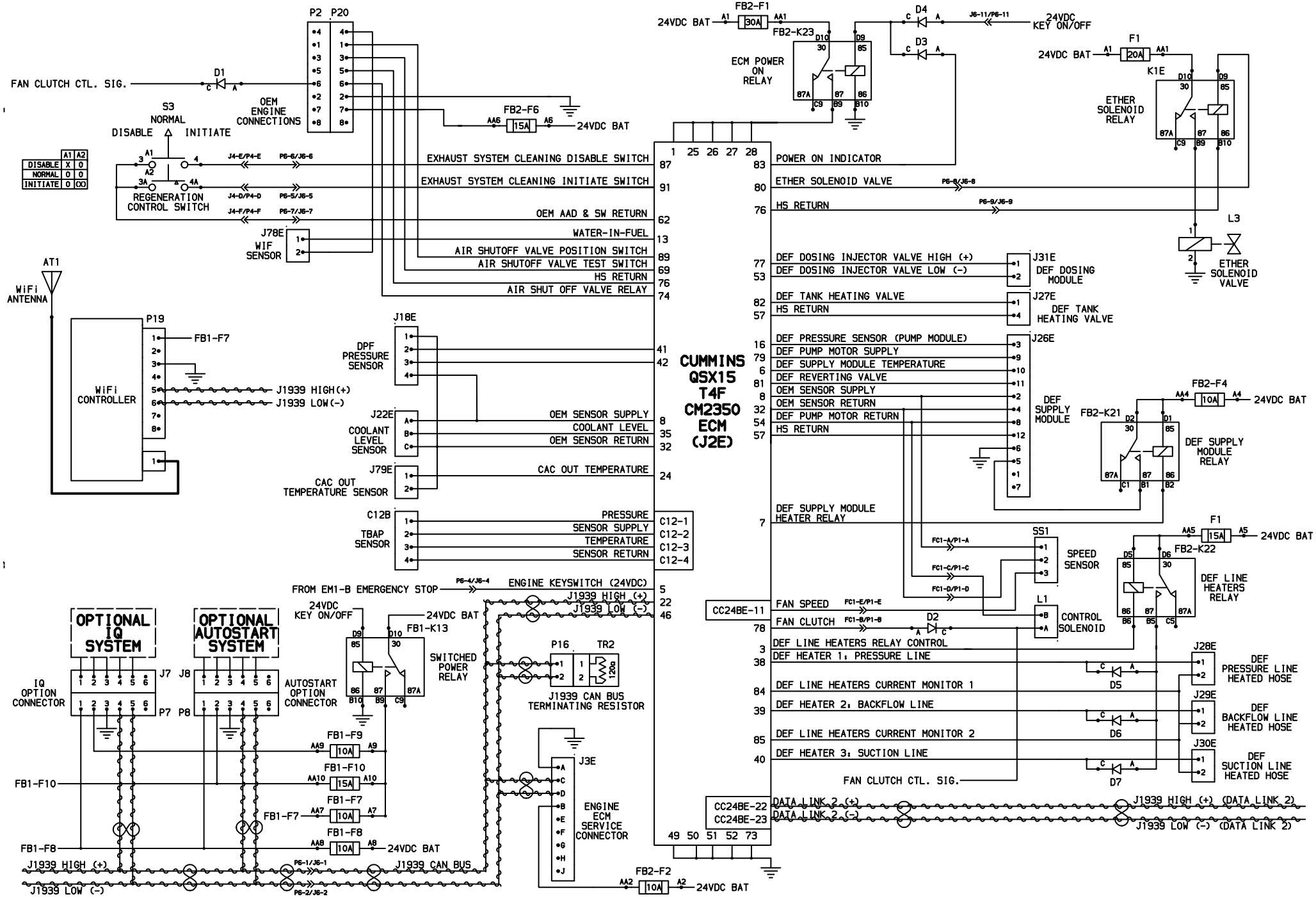
Troubleshooting Steps

Action	Result
Step 1: Check Main Control Switch FB1-F3 Fuse.	If fuse is blown, replace FB1-F3 Fuse.
Step 2: Check all harness connections throughout ECM Power Relay circuit.	If harness connections are loose or damaged, repair harness as needed.
Step 3: Move the Main Control Switch to the ON position. Using a multimeter, complete the following measurements: 1. Voltage between S1-1 and battery Negative. 2. Voltage between S1-2 and battery Negative. 3. Voltage between K23-D9 and battery Negative. 4. Resistance between K23-B10 and battery Negative. 5. Voltage between K23-D10 and battery Negative. 6. Voltage between K23-B9 and battery Negative.	1. Voltage measured should be 24 VDC. If not, check FB1-F3 Fuse and or check for defective harness connections. 2. Voltage measured should be 24 VDC. If not, replace S1 Main Control Switch. 3. Voltage measured should be 24 VDC. If not, check for defective harness connections. 4. Continuity should be shorted. If not, check for defective harness connections. 5. Voltage measured should be 24 VDC. If not, check for defective harness connections. 6. Voltage measured should be 24 VDC. If not, replace K23 Switched Power Relay.

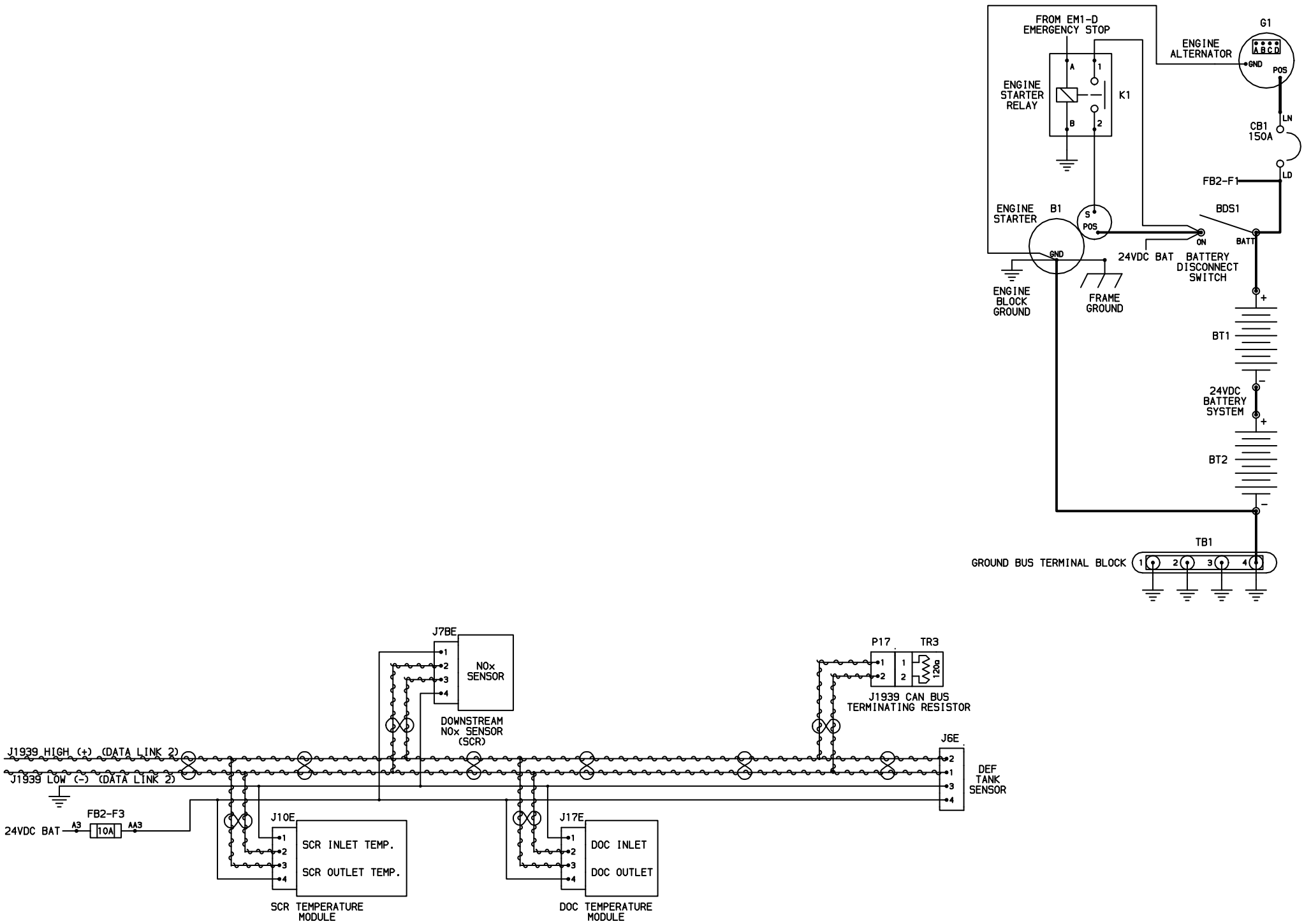
System Schematics and Wiring Diagrams



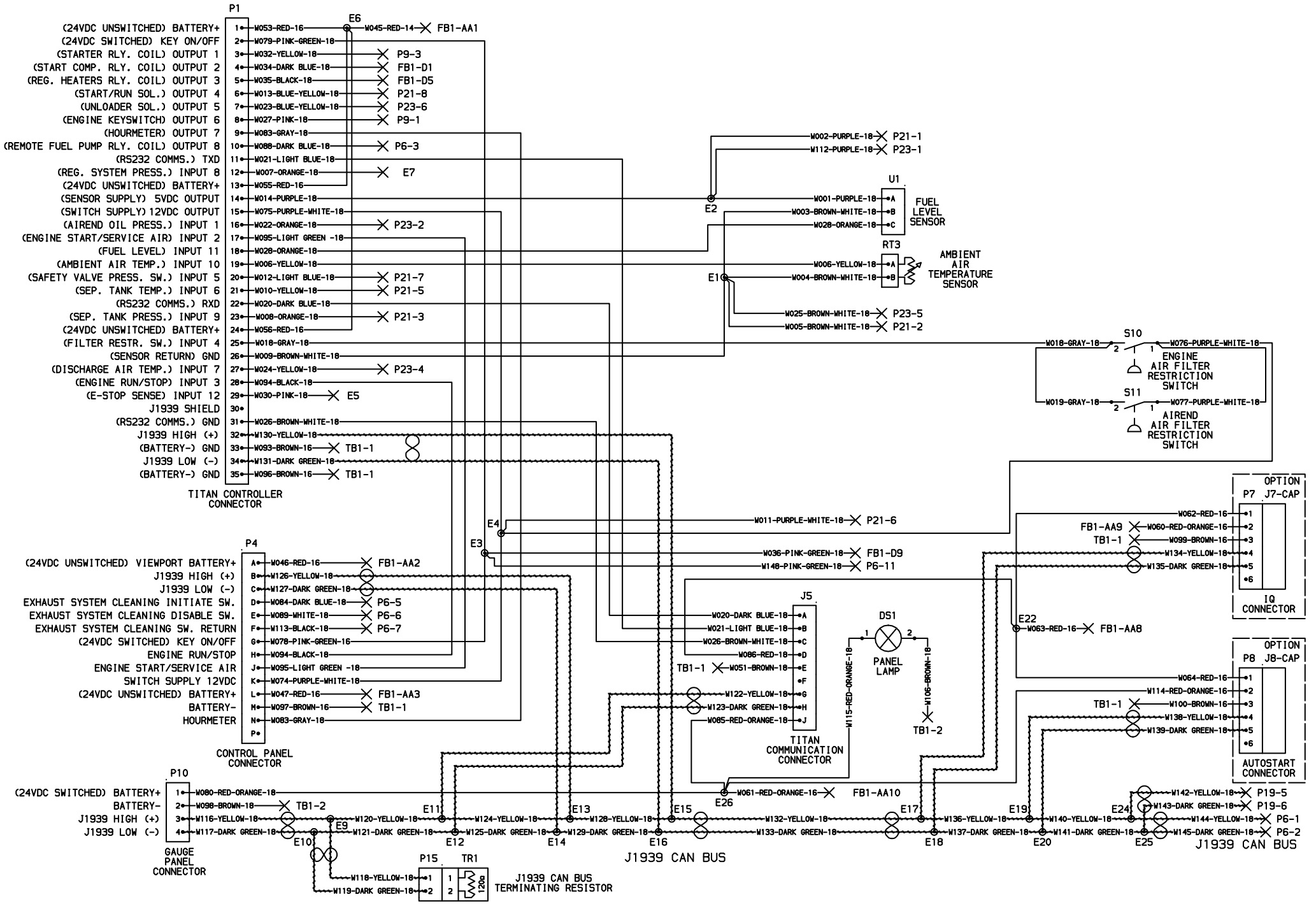
Compressor and Engine Control System Schematic 46664154 Rev. D



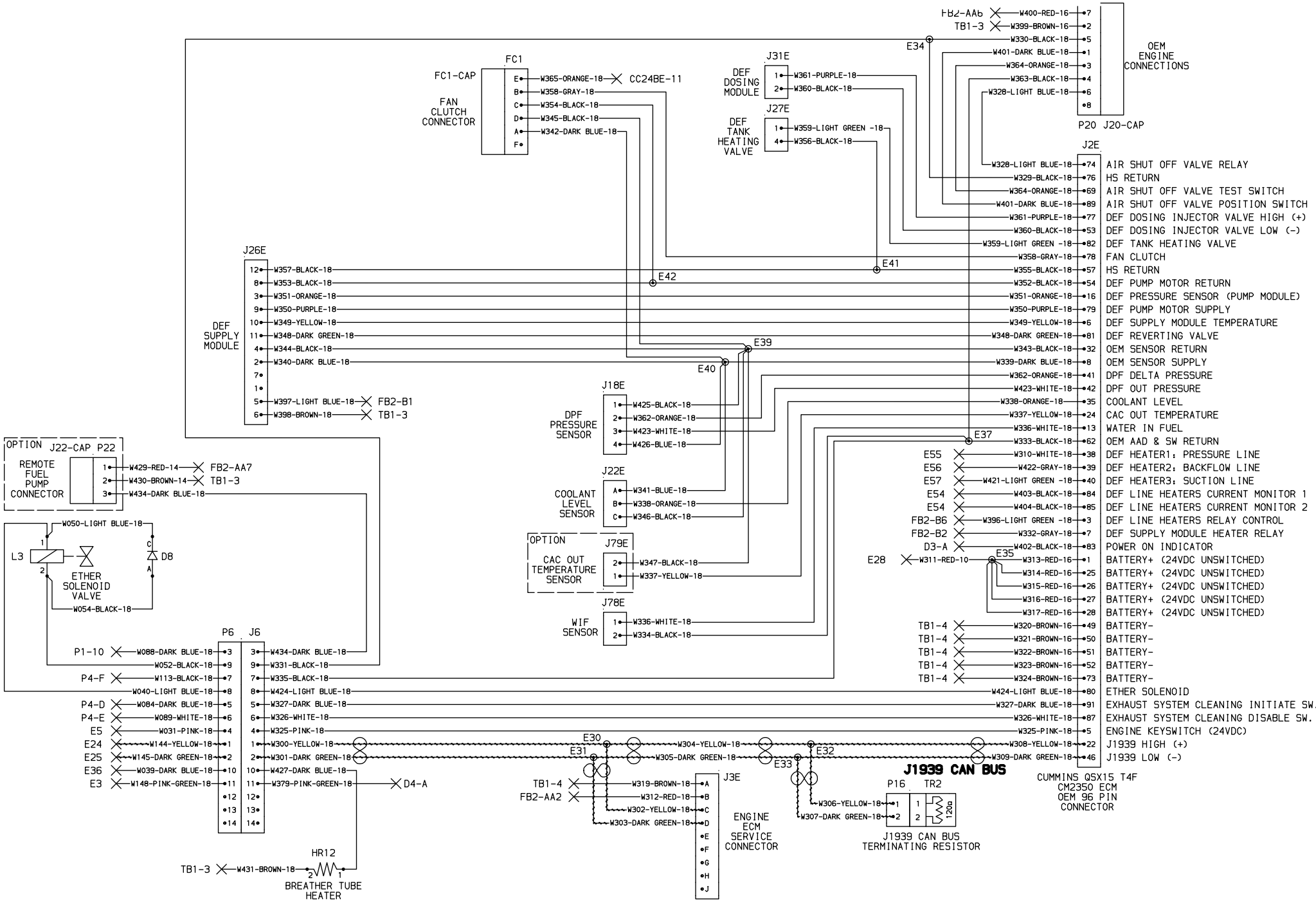
Compressor and Engine Control System Schematic 46664154 Rev. D



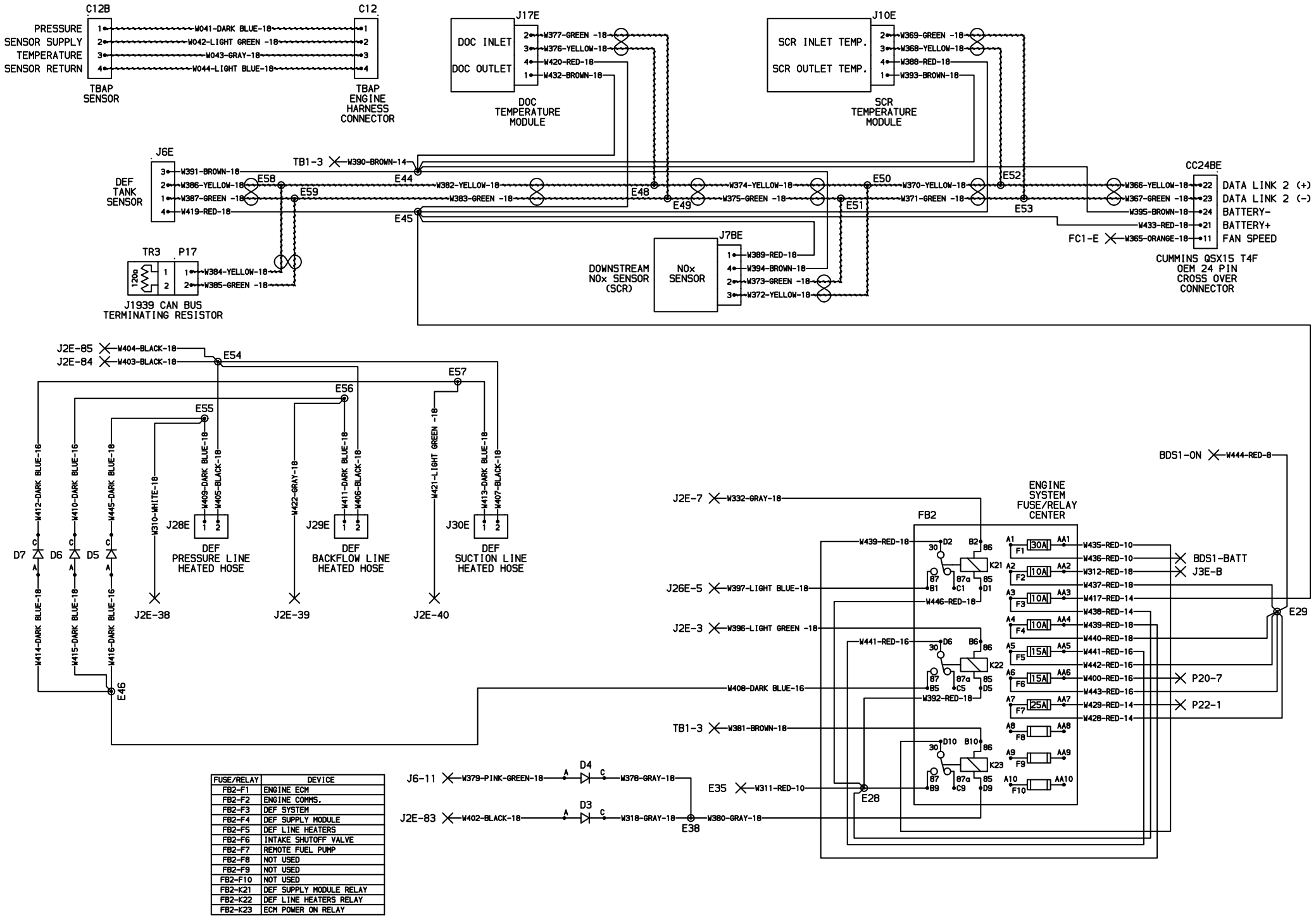
Compressor and Engine Control System Schematic 46664154 Rev. D



Compressor & Engine Harness Wiring Diagram 46653157 Rev D

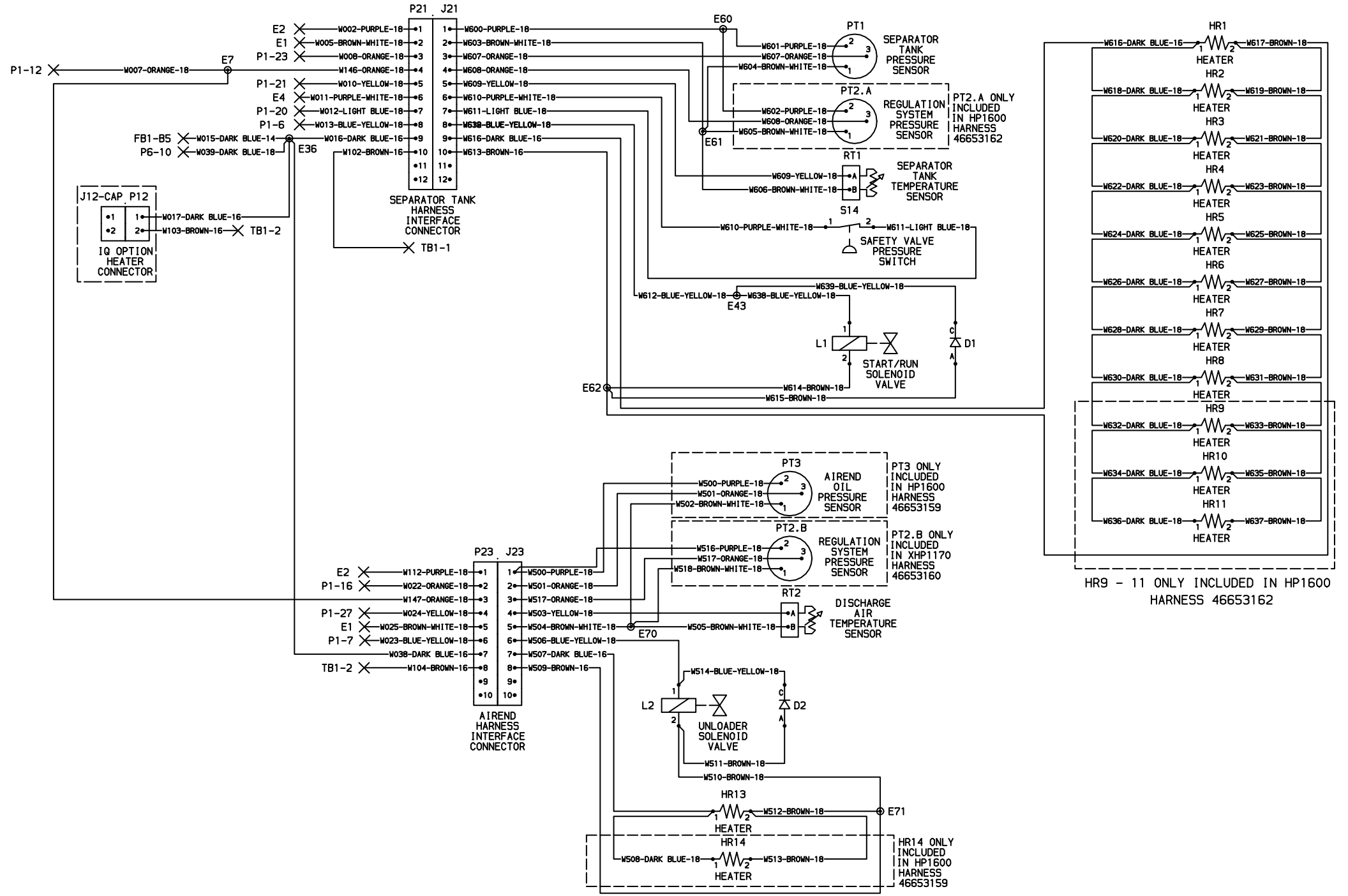


Compressor & Engine Harness Wiring Diagram 46653157 Rev D

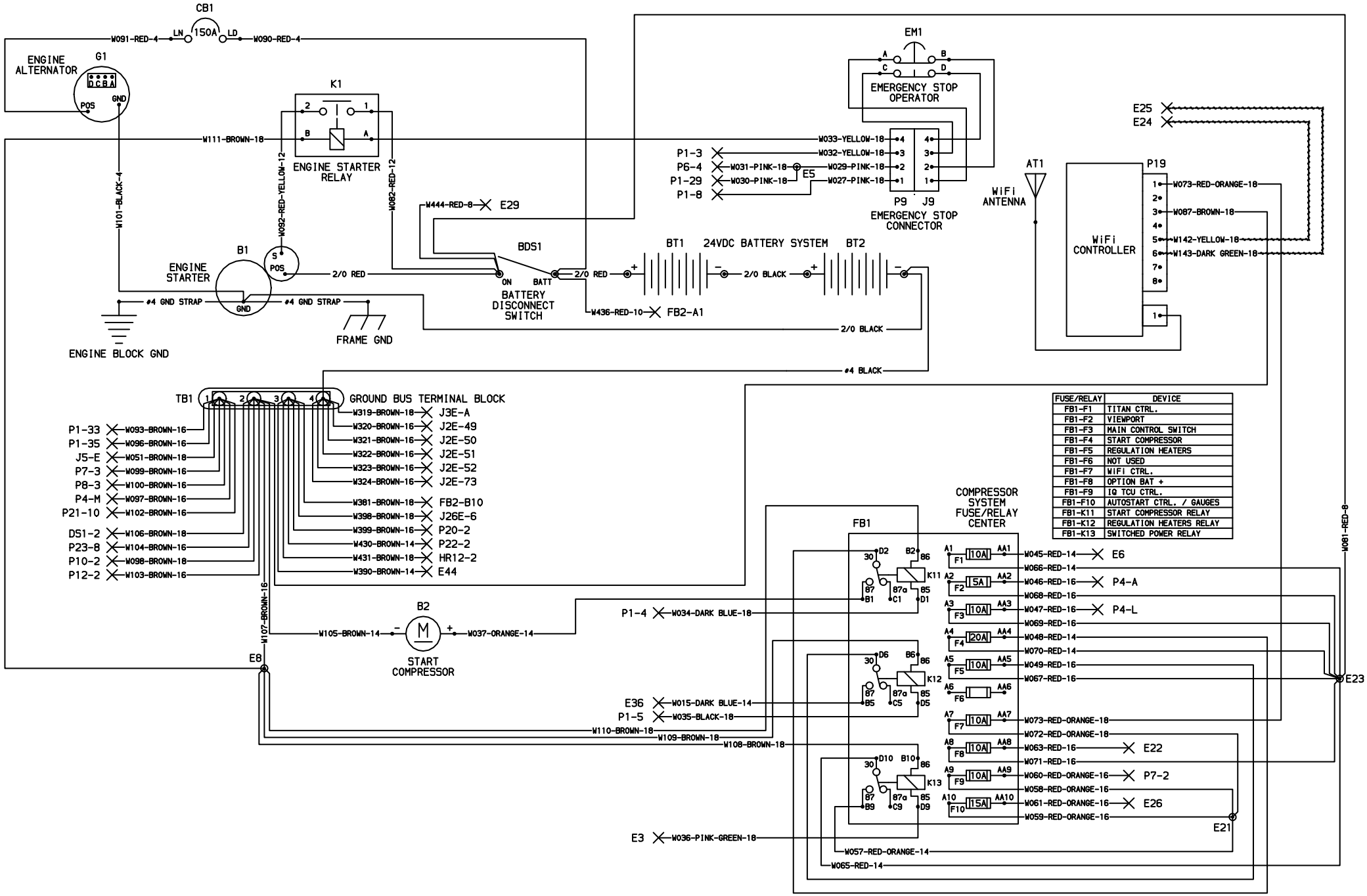


FUSE/RELAY	DEVICE
FB2-F1	ENGINE ECM
FB2-F2	ENGINE COMMS.
FB2-F3	DEF SYSTEM
FB2-F4	DEF SUPPLY MODULE
FB2-F5	DEF LINE HEATERS
FB2-F6	INTAKE SHUTOFF VALVE
FB2-F7	REMOTE FUEL PUMP
FB2-F8	NOT USED
FB2-F9	NOT USED
FB2-F10	NOT USED
FB2-K21	DEF SUPPLY MODULE RELAY
FB2-K22	DEF LINE HEATERS RELAY
FB2-K23	ECM POWER ON RELAY

Compressor & Engine Harness Wiring Diagram 46653157 Rev D

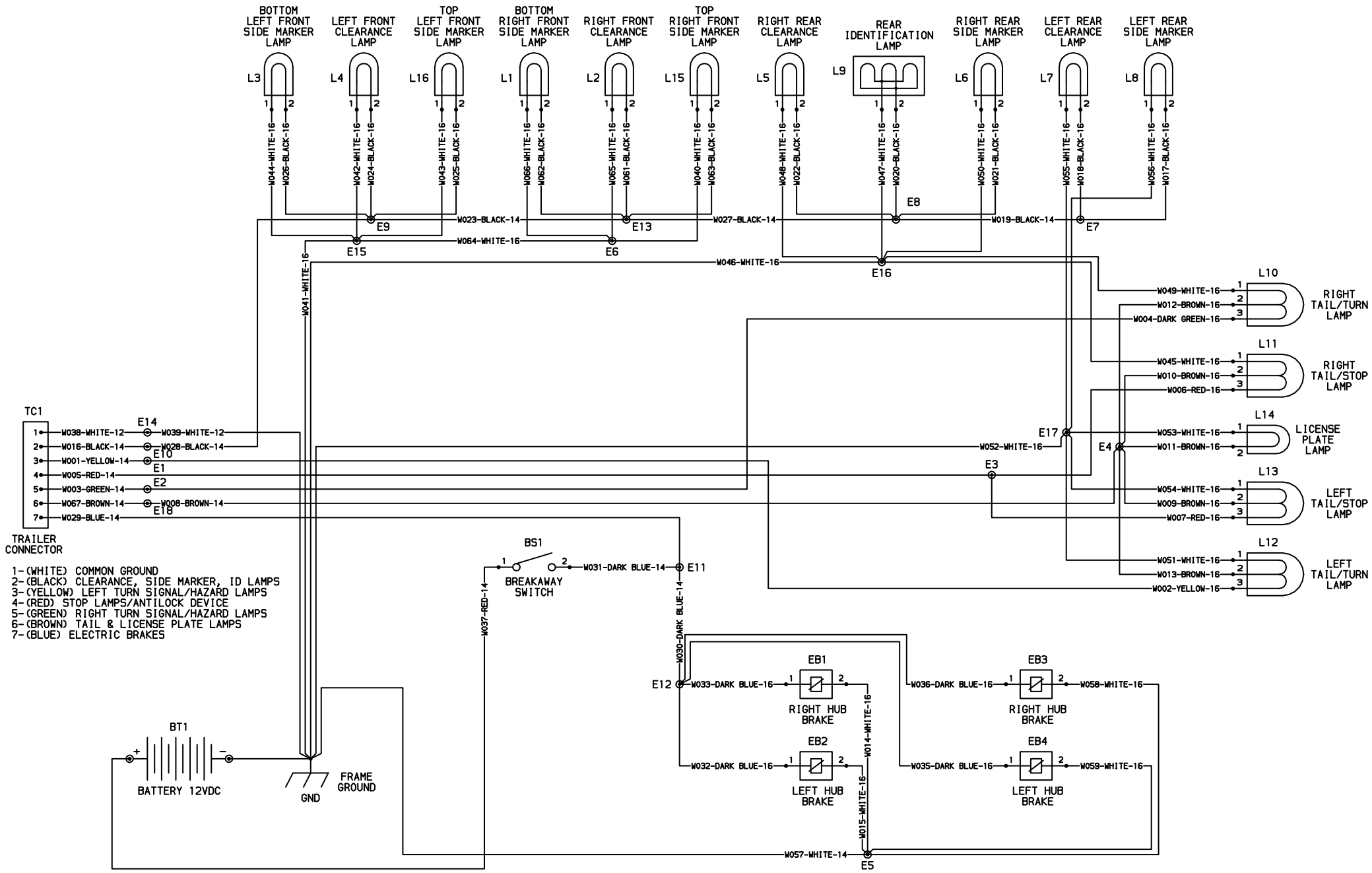


Compressor & Engine Harness Wiring Diagram 46653157 Rev D

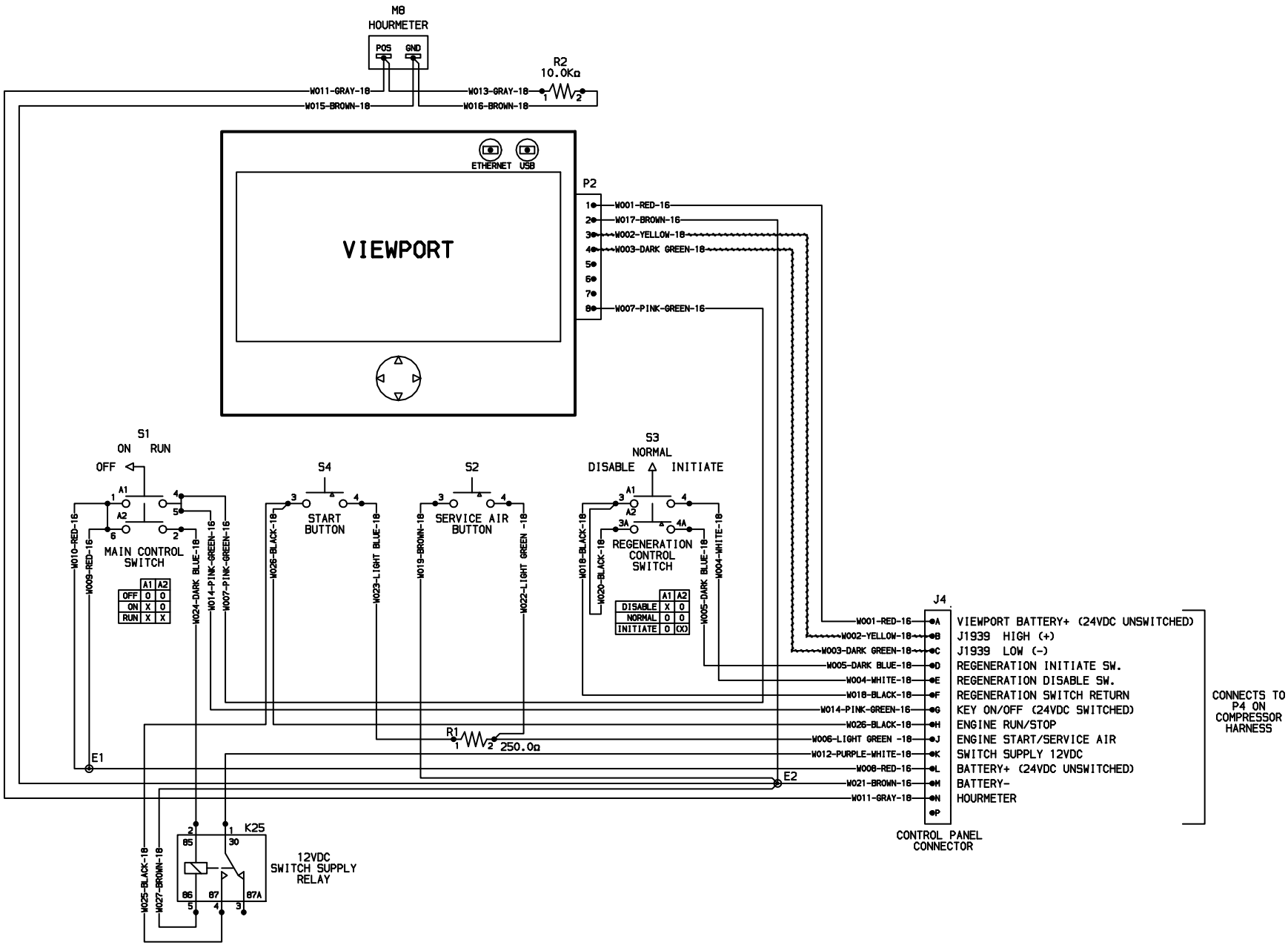


FUSE/RELAY	DEVICE
FB1-F1	TITAN CTRL.
FB1-F2	VIEWPORT
FB1-F3	MAIN CONTROL SWITCH
FB1-F4	START COMPRESSOR
FB1-F5	REGULATION HEATERS
FB1-F6	NOT USED
FB1-F7	WIFI CTRL.
FB1-F8	OPTION BAT +
FB1-F9	IQ TCU CTRL.
FB1-F10	AUTOSTART CTRL. / GAUGES
FB1-K11	START COMPRESSOR RELAY
FB1-K12	REGULATION HEATERS RELAY
FB1-K13	SWITCHED POWER RELAY

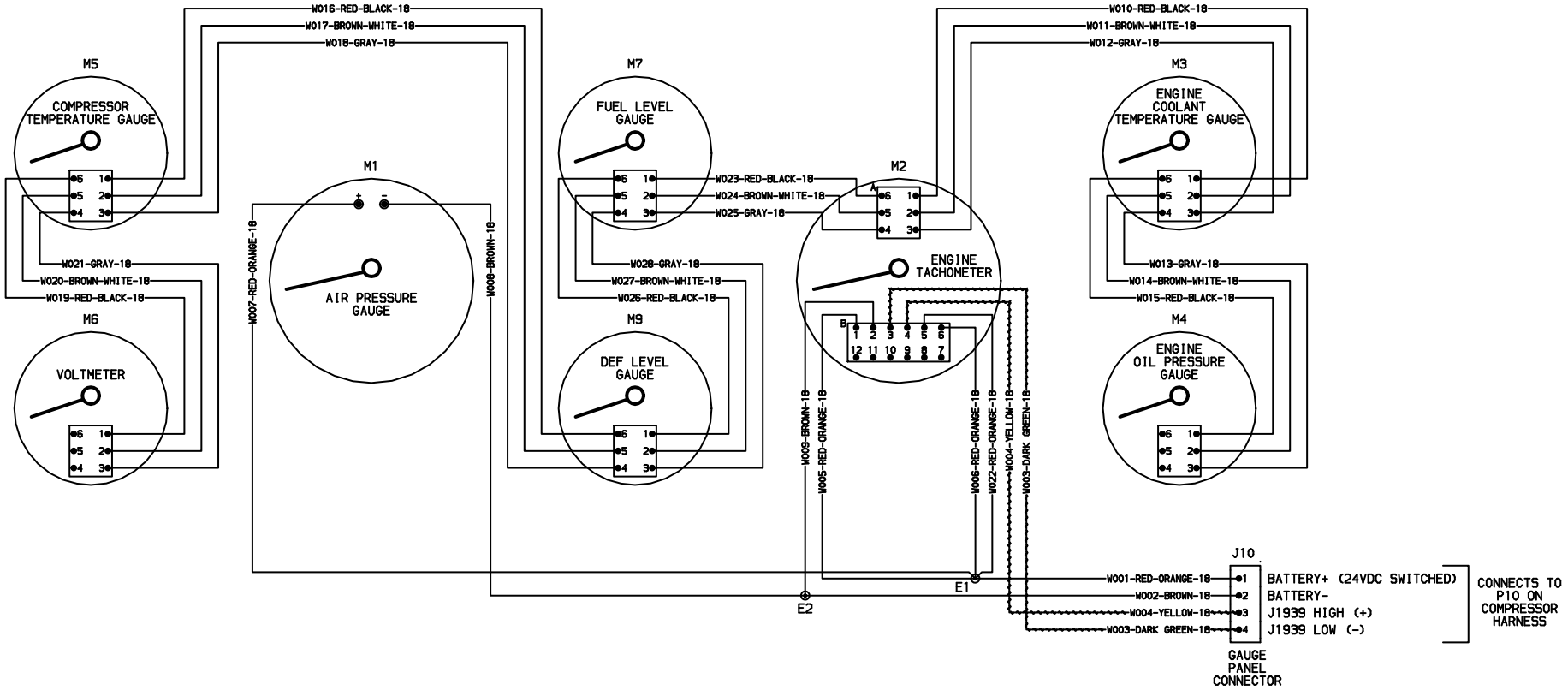
Compressor & Engine Harness Wiring Diagram 46653157 Rev D



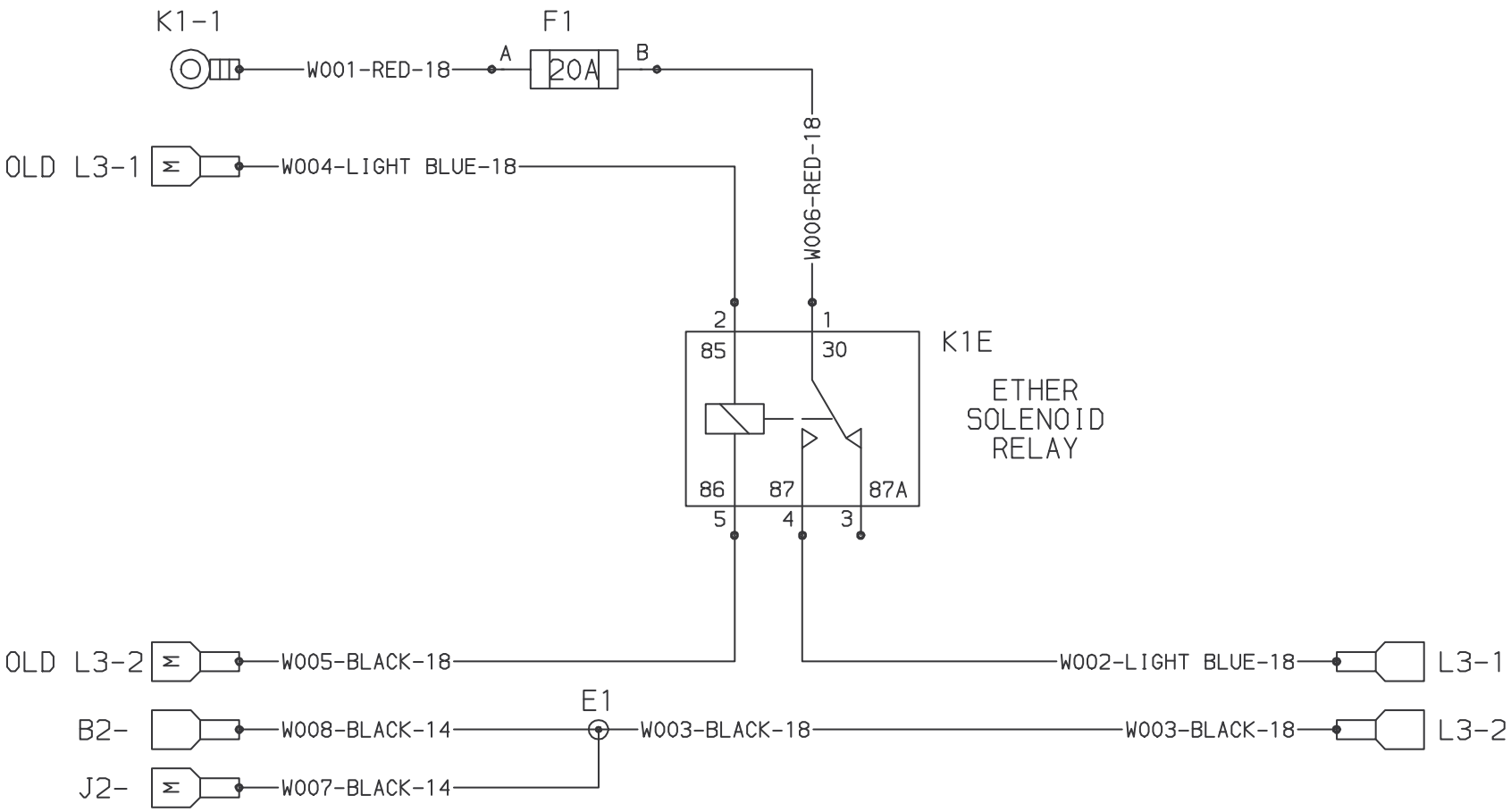
Trailer Harness Wiring Diagram 46578803 Rev. A



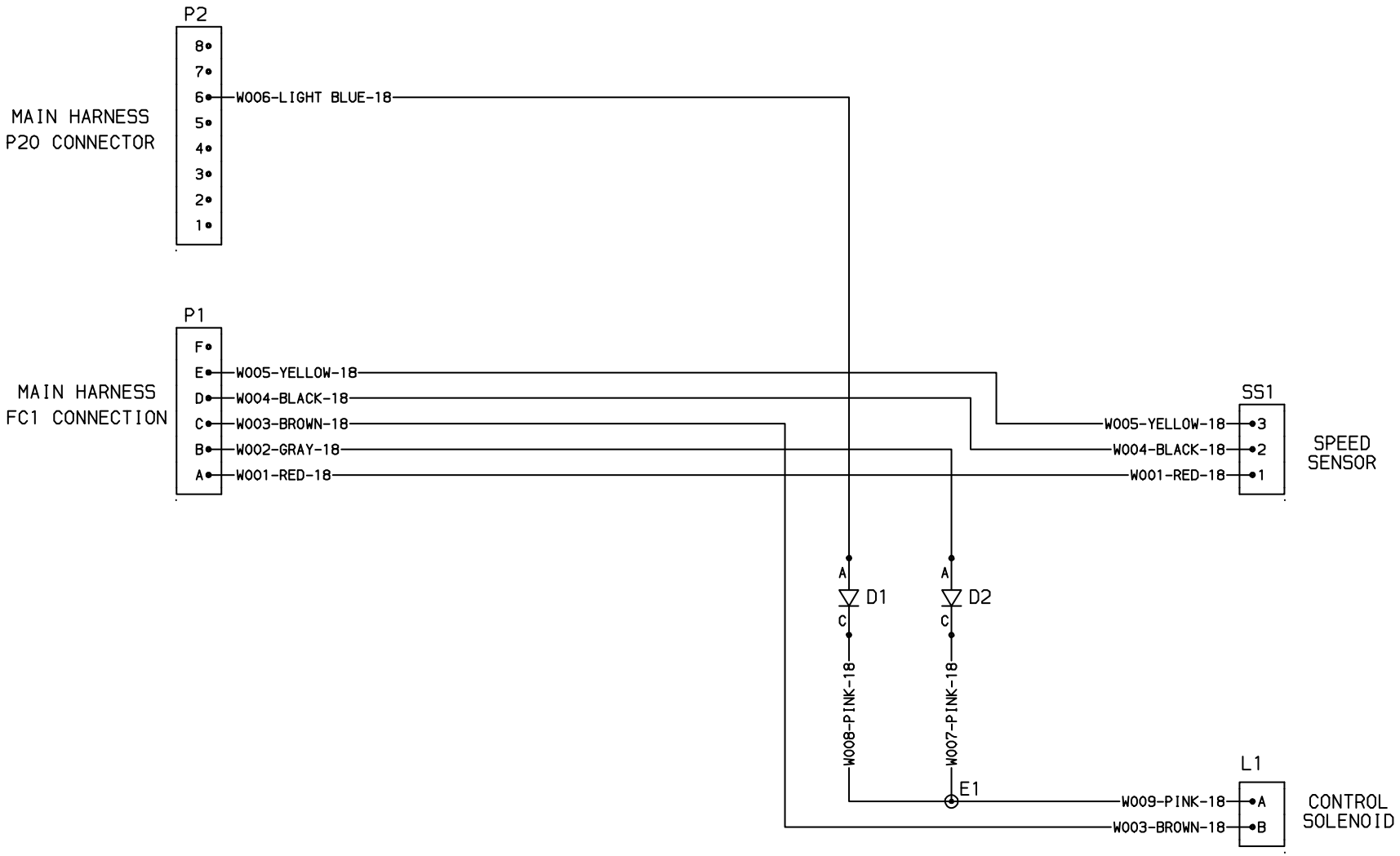
Control Panel Harness Wiring Diagram 46641570 Rev.A



Gauge Panel Harness Wiring Diagram 46636659 Rev.A



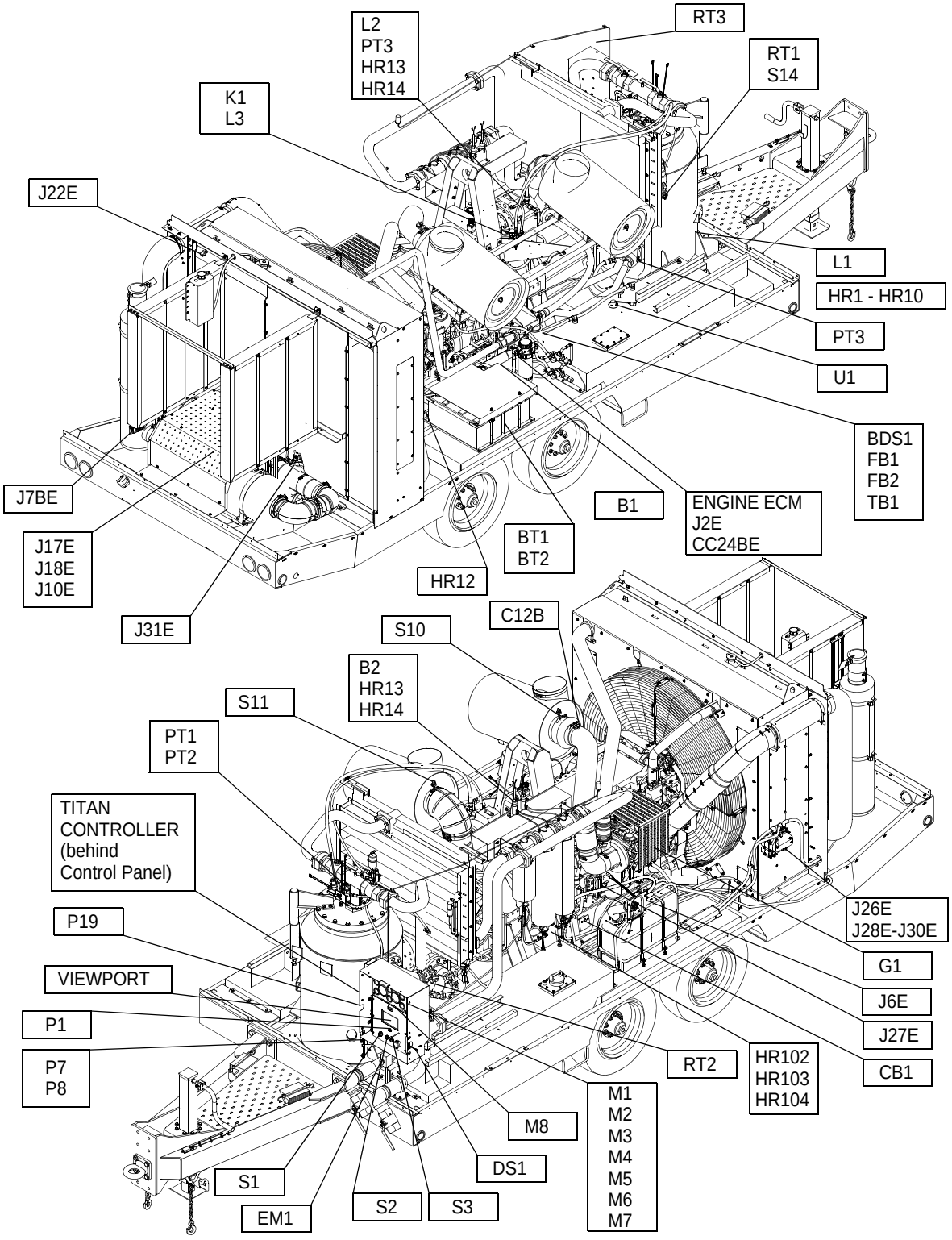
Ether Solenoid Wiring Diagram 46678228 Rev. A



Fan Clutch Wiring Diagram 46678229 Rev. A

Electrical Component Locations

Location Drawing



Harness Connector Locations

C5. 2-Pin connector located near the engine ECM and connects to the engine harness.

C5B. 2-Pin connector that connects to the fuel filter sensor.

C12. 4-Pin connector located near the engine starter and connects to the engine harness.

J2E. 60-Pin connector that connects to the engine ECM.

J5. 9-Pin connector located behind the control panel and is used for Titan controller communications.

J5A. 9-Pin connector located near engine ECM and is used for engine ECM service tool.

J14. 4-Pin connector located on the DPF and connects to the DPF pressure sensor.

J24. 24-Pin connector located near engine ECM and connects to the engine harness.

J25. 10-Pin connector located on the DPF and connects to the DPF temperature sensor.

P1. 35-Pin connector that connects to the Titan controller.

P2. 8-Pin connector that connects to the ViewPort display.

P4 / J4. 14-Pin connector system located behind control panel. Connector system connects the control panel harness to the compressor harness.

P6 / J6. 14-Pin connector system located in wire harness tray near the engine starter on curb side of machine. Connector system connects the compressor harness to the engine harness.

P7 / J7-CAP. 6-Pin connector system located under control panel. Connector system connects the IQ option harness to the compressor harness.

P8 / J8-CAP. 6-Pin connector system located under control panel. Connector system connects the AutoStart option harness to the compressor harness.

P9 / J9. 4-Pin connector system located under control panel. Connector system connects the Emergency Stop to the compressor harness.

P10 / J10. 4-Pin connector system located behind control panel. Connector system connects the gauge panel harness to the compressor harness.

P12 / J12-CAP. 2-Pin connector system located in front of the separator tank. Connector system connects the IQ option heater harness to the compressor harness.

P15. 2-Pin connector located behind control panel for termination resistor TR1 on J1939 CAN BUS.

P16. 2-Pin connector located near engine ECM for termination resistor TR2 on J1939 CAN BUS.

P19. 8-Pin connector system located behind the control panel. Connector system connects the WiFi system controller to the compressor harness.

P21/J21. 4-Pin connector system located beside the separator tank. Connector system connects the compressor harness to the regulation system harness.

P23/J23. 10-Pin connector system located beside the airend on curb side of compressor. Connector system connects the compressor harness to the airend harness.

HP1600 Electrical Parts List

Compressor and Engine

Reference Designator	Description	Part Number
	Titan Controller	46651420
	Compressor Harness	46653158
	Engine Harness	46653161
	Airend Harness	46653159
	Separator Tank Harness	46653162
	Battery Positive Stud to Stud Cable	46590421
	Battery Positive Cable	46590419
	Battery Negative Cable	46590420
	Battery Cable Jumper	35128982
	Frame Ground Strap 350mm	36783488
	Engine Ground Strap 350mm	36783488
B1	Engine Starter	Cummins Part
B2	Start Compressor	46576919
BDS1	Battery Disconnect Switch	46556146
BT1	Battery, 12 VDC	35225788
BT2	Battery, 12 VDC	35225788
C12B	TBAP Sensor	46566779
D1	Diode	35376169
D2	Diode	35376169
D3	Diode	35376169
D4	Diode	35376169
D5	Diode	35376169
D6	Diode	35376169
D7	Diode	35376169
DS1	Panel Lamp	46582799
EM1	Emergency Stop	23281017
CB1	Engine Alternator Circuit Breaker 150A	46615979
FB1	Fuse/Relay Center Replacement	46556356
FB1	Fuse/Relay Center Replacement Cover	23366172

Reference Designator	Description	Part Number
FB1	Fuse/Relay Center Decal Outside Cover	46574381
FB1	Fuse/Relay Center Decal Inside Cover	46666640
FB1-F1	Titan Controller Fuse 10 Amp	23091812
FB1-F2	ViewPort Display Fuse 5 Amp	23326069
FB1-F3	Main Control Switch Fuse 10 Amp	23091812
FB1-F4	Start Compressor Fuse 20 Amp	23091838
FB1-F5	Regulation Heaters Fuse 10 Amp	23091812
FB1-F7	WiFi Controller Fuse 10 Amp	23091812
FB1-F8	Accessory Fuse 10 Amp	23091812
FB1-F9	IQ TCU Controller Fuse 10 Amp	23091812
FB1-F10	AutoStart Controller Fuse 15 Amp	23091820
FB1-K11	Start Compressor Relay	23316250
FB1-K12	Regulation Heaters Relay	23316250
FB1-K13	Switched Power Relay	23316250
FB2	Fuse/Relay Center Replacement	46556356
FB2	Fuse/Relay Center Replacement Cover	23366172
FB2	Fuse/Relay Center Decal Outside Cover	46575499
FB2	Fuse/Relay Center Decal Inside Cover	46666641
FB2-F1	Engine ECM Fuse 30 Amp	23091853
FB2-F2	Engine Communication Fuse 10 Amp	23091812
FB2-F3	DEF System Fuse 10 Amp	23091812
FB2-F4	DEF Supply Module Fuse 10 Amp	23091812
FB2-F5	DEF Line Heaters Fuse 15 Amp	23091815
FB2-F6	Intake Shutoff Valve Fuse 15 Amp	23091815
FB2-K21	DEF Supply Module Relay	23316250
FB2-K22	DEF Line Heaters Relay	23316250
FB2-K23	ECM Power ON Relay	23316250
G1	Engine Alternator	Cummins Part
FB2-F7	Remote Fuel Pump Fuse 25A	23091846

Compressor and Engine (Cont'd)

Reference Designator	Description	Part Number
J10E	SCR Temperature Module	Cummins Part
J17E	DOC Temperature Module	Cummins Part
J22E	Coolant Level Sensor	22769186
J26E	DEF Supply Module	46605124
J27E	DEF Tank Heating Valve	46641521
J28E	DEF Pressure Line Heated Hose	46647161
J29E	DEF Backflow Line Heated Hose	46647160
J30E	DEF Suction Line Heated Hose	46647159
J31E	DEF Dosing Module	Cummins Part
J3E	Replacement Cap with Lanyard	23366768
J5	Replacement Cap with Lanyard	23366768
J6E	DEF Tank Sensor	46642142
J7BE	Downstream Nox Sensor (SCR)	Cummins Part
K1	Engine Starter Relay	36853521
J18E	DPF Pressure Sensor	Cummins Part
HR1	Solenoid Valve Heater	46499687
HR2	Orifice Heater	36841526
HR3	Hex Fitting Heater	36841526
HR4	Hex Fitting Heater	36841526
HR5	Hex Fitting Heater	36841526
HR6	Hex Adapter Heater	46499687
HR7	Hex Fitting Heater	36841526
HR8	Ball Valve Heater	23346612
HR9	Ball Valve Heater	23346612
HR10	Regulator Heater	36854677
HR11	RegulatorHeater	36854677
HR12	Engine Breather Tube Heater	23346612
HR13	Orifice Heater	36841526
HR14	Hex Fitting Heater	36841526

Reference Designator	Description	Part Number
L1	Start/Run Solenoid Valve	46655272
L2	Unloader Solenoid Valve	36840841
PT1	Separator Tank Pressure Sensor	54496773
PT2	Regulation System Pressure Sensor	36920825
PT3	Airend Oil Pressure Sensor	54496773
RT1	Separator Tank Temperature Sensor	23294838
RT2	Discharge Air Temperature Sensor	23294820
RT3	Ambient Air Temperature Sensor	23294838
S10	Engine Air Filter Restriction Switch	36847838
S11	Airend Air Filter Restriction Switch	36847838
S14	Safety Valve Pressure Switch	46568519
TB1	Ground Bus Terminal Block	46567039
TR1	J1939 CAN BUS Terminating Resistor	23091804
TR2	J1939 CAN BUS Terminating Resistor	23091804
TR3	J1939 CAN BUS Terminating Resistor	23091804
U1	Fuel Level Sensor	46570900
J79E	CAC Outlet Temperature Sensor	23294820

Ether Injection System

Reference Designator	Description	Part Number
L3	Ether Solenoid	46615380
	Ether Solenoid Relay Harness	46673356
K1E	Ether Solenoid Relay	36892362
F1	Ether Solenoid Fuse 20 Amp	35363464

Control Panel

Reference Designator	Description	Part Number
	ViewPort Display	46594821
	Control Panel Harness	46641571
K25	12VDC Switch Supply Relay	36892362
M8	Hourmeter	46557109
S1	Main Control Switch	46641633
S2	Service Air Button	46663130
S3	Regeneration Control Switch	46556142
S3	Replacement Switch Cover	46556145
S4	Start Button	46663130

Gauge Panel

Reference Designator	Description	Part Number
	Gauge Panel Harness	46636660
M1	Air Pressure Gauge 0-250 psi	46558799
M2	Engine Tachometer	46558802
M3	Engine Coolant Temperature Gauge	46558804
M4	Engine Oil Pressure Gauge	46558803
M5	Compressor Temperature Gauge	46558806
M6	Voltmeter	46558805
M7	Fuel Level Gauge	46565479
M9	DEF Level Gauge	46636464

Trailer

Reference Designator	Description	Part Number
	Trailer Harness	46651563
BS1	Breakaway Switch	46554147
L1	Right Front Side Marker Lamp	35367051
L2	Right Front Clearance Lamp	35367051
L3	Left Front Side Marker Lamp	35367051
L4	Left Front Clearance Lamp	35367051
L5	Right Rear Clearance Lamp	35367044
L6	Right Rear Side Marker Lamp	35367044
L7	Left Rear Clearance Lamp	35367044
L8	Left Rear Side Marker Lamp	35367044
L9	Rear Identification Lamp	36922144
L10	Right Tail/Turn Lamp	36788081
L11	Right Tail/Stop Lamp	36788081
L12	Left Tail/Turn Lamp	36788081
L13	Left Tail/Stop Lamp	36788081
L14	License Plate Lamp	36881910

Fan Clutch

Reference Designator	Description	Part Number
L1	Fan Clutch Control Valve	46655083
	Fan Clutch Harness	46671086
D1	Diode	35376163
D2	Diode	35376163

XHP1170 Electrical Parts List

Compressor and Engine

Reference Designator	Description	Part Number
	Titan Controller	46651420
	Compressor Harness	46653158
	Engine Harness	46653161
	Airend Harness	46653160
	Separator Tank Harness	46655655
	Battery Positive Stud to Stud Cable	46590421
	Battery Positive Cable	46590419
	Battery Negative Cable	46590420
	Battery Cable Jumper	35128982
	Frame Ground Strap 350mm	36783488
	Engine Ground Strap 350mm	36783488
B1	Engine Starter	Cummins Part
B2	Start Compressor	46576919
BDS1	Battery Disconnect Switch	46556146
BT1	Battery, 12 VDC	35225788
BT2	Battery, 12 VDC	35225788
C12B	TBAP Sensor	46566779
D1	Diode	35376169
D2	Diode	35376169
D3	Diode	35376169
D4	Diode	35376169
D5	Diode	35376169
D6	Diode	35376169
D7	Diode	35376169
DS1	Panel Lamp	46582799
EM1	Emergency Stop	23281017
CB1	Engine Alternator Circuit Breaker 150A	46615979
FB1	Fuse/Relay Center Replacement	46556356
FB1	Fuse/Relay Center Replacement Cover	23366172

Reference Designator	Description	Part Number
FB1	Fuse/Relay Center Decal Outside Cover	46574381
FB1	Fuse/Relay Center Decal Inside Cover	46666640
FB1-F1	Titan Controller Fuse 10 Amp	23091812
FB1-F2	ViewPort Display Fuse 5 Amp	23326069
FB1-F3	Main Control Switch Fuse 10 Amp	23091812
FB1-F4	Start Compressor Fuse 20 Amp	23091838
FB1-F5	Regulation Heaters Fuse 10 Amp	23091812
FB1-F7	WiFi Controller Fuse 10 Amp	23091812
FB1-F8	Accessory Fuse 10 Amp	23091812
FB1-F9	IQ TCU Controller Fuse 10 Amp	23091812
FB1-F10	AutoStart Controller Fuse 15 Amp	23091820
FB1-K11	Start Compressor Relay	23316250
FB1-K12	Regulation Heaters Relay	23316250
FB1-K13	Switched Power Relay	23316250
FB2	Fuse/Relay Center Replacement	46556356
FB2	Fuse/Relay Center Replacement Cover	23366172
FB2	Fuse/Relay Center Decal Outside Cover	46575499
FB2	Fuse/Relay Center Decal Inside Cover	46666641
FB2-F1	Engine ECM Fuse 30 Amp	23091853
FB2-F2	Engine Communication Fuse 10 Amp	23091812
FB2-F3	DEF System Fuse 10 Amp	23091812
FB2-F4	DEF Supply Module Fuse 10 Amp	23091812
FB2-F5	DEF Line Heaters Fuse 15 Amp	23091815
FB2-F6	Intake Shutoff Valve Fuse 15 Amp	23091815
FB2-K21	DEF Supply Module Relay	23316250
FB2-K22	DEF Line Heaters Relay	23316250
FB2-K23	ECM Power ON Relay	23316250
G1	Engine Alternator	Cummins Part
FB2-F7	Remote Fuel Pump Fuse 25A	23091846

Compressor and Engine (Cont'd)

Reference Designator	Description	Part Number
J10E	SCR Temperature Module	Cummins Part
J17E	DOC Temperature Module	Cummins Part
J22E	Coolant Level Sensor	22769186
J26E	DEF Supply Module	46605124
J27E	DEF Tank Heating Valve	46641521
J28E	DEF Pressure Line Heated Hose	46647161
J29E	DEF Backflow Line Heated Hose	46647160
J30E	DEF Suction Line Heated Hose	46647159
J31E	DEF Dosing Module	Cummins Part
J3E	Replacement Cap with Lanyard	23366768
J5	Replacement Cap with Lanyard	23366768
J6E	DEF Tank Sensor	46642142
J7BE	Downstream Nox Sensor (SCR)	Cummins Part
K1	Engine Starter Relay	36853521
J18E	DPF Pressure Sensor	Cummins Part
HR1	Conrader Regulator Heater	23346612
HR2	Ball Valve Heater	23346612
HR3	Ball Valve Heater	23346612
HR4	Conrader Regulator Heater	23346612
HR5	Solenoid Valve Heater	46499687
HR6	Shuttle Valve Heater	36841526
HR7	Shuttle Valve Heater	36841526
HR8	Hex Fitting Heater	23346612
HR12	Engine Breather Tube Heater	23346612
HR13	Orifice Heater	36841526

Reference Designator	Description	Part Number
L1	Start/Run Solenoid Valve	46553075
L2	Unloader Solenoid Valve	36842318
PT1	Separator Tank Pressure Sensor	54765946
PT2	Regulation System Pressure Sensor	36920825
RT1	Separator Tank Temperature Sensor	23294838
RT2	Discharge Air Temperature Sensor	23294820
RT3	Ambient Air Temperature Sensor	23294838
S10	Engine Air Filter Restriction Switch	36847838
S11	Airend Air Filter Restriction Switch	36847838
S14	Safety Valve Pressure Switch	46568519
TB1	Ground Bus Terminal Block	46567039
TR1	J1939 CAN BUS Terminating Resistor	23091804
TR2	J1939 CAN BUS Terminating Resistor	23091804
TR3	J1939 CAN BUS Terminating Resistor	23091804
U1	Fuel Level Sensor	46570900
J79E	CAC Outlet Temperature Sensor	23294820

Ether Injection System

Reference Designator	Description	Part Number
L3	Ether Solenoid	46615380
	Ether Solenoid Relay Harness	46673356
K1E	Ether Solenoid Relay	36892362
F1	Ether Solenoid Fuse 20 Amp	35363464

Control Panel

Reference Designator	Description	Part Number
	ViewPort Display	46594821
	Control Panel Harness	46641571
K25	12VDC Switch Supply Relay	36892362
M8	Hourmeter	46557109
S1	Main Control Switch	46641633
S2	Service Air Button	46663130
S3	Regeneration Control Switch	46556142
S3	Replacement Switch Cover	46556145
S4	Start Button	46663130

Gauge Panel

Reference Designator	Description	Part Number
	Gauge Panel Harness	46636660
M1	Air Pressure Gauge 0-600 psi	46558801
M2	Engine Tachometer	46558802
M3	Engine Coolant Temperature Gauge	46558804
M4	Engine Oil Pressure Gauge	46558803
M5	Compressor Temperature Gauge	46558806
M6	Voltmeter	46558805
M7	Fuel Level Gauge	46565479
M9	DEF Level Gauge	46636464

Trailer

Reference Designator	Description	Part Number
	Trailer Harness	46651563
BS1	Breakaway Switch	46554147
L1	Right Front Side Marker Lamp	35367051
L2	Right Front Clearance Lamp	35367051
L3	Left Front Side Marker Lamp	35367051
L4	Left Front Clearance Lamp	35367051
L5	Right Rear Clearance Lamp	35367044
L6	Right Rear Side Marker Lamp	35367044
L7	Left Rear Clearance Lamp	35367044
L8	Left Rear Side Marker Lamp	35367044
L9	Rear Identification Lamp	36922144
L10	Right Tail/Turn Lamp	36788081
L11	Right Tail/Stop Lamp	36788081
L12	Left Tail/Turn Lamp	36788081
L13	Left Tail/Stop Lamp	36788081
L14	License Plate Lamp	36881910

Fan Clutch

Reference Designator	Description	Part Number
L1	Fan Clutch Control Valve	46655083
	Fan Clutch Harness	46671086
D1	Diode	35376169
D2	Diode	35376169

Service Tools and Repair Kits

Service Tools

The following list of special service tools are recommended to perform service and troubleshooting procedures in this manual. These tools can be purchased through.

Service Tools

Part Number	Description
22216691	Digital Multimeter (Fluke 87) Used to measure electrical circuits: Volts, Amps, Ohms
22216733	Fluke Meter Case Storage Case for Fluke meter and test leads
22216733	Fluke Test Lead Set Contains needle probes, alligator clips, and test leads
22216725	Fluke Wire Insulation Piercing Probe Used to pierce wire insulation when making electrical measurements
22147540	Kit, Test Adapters Used to interconnect between devices and harness for electrical measurements
22281588	T-Handle Hex Wrench 5/32” Used to remove Titan, Caterpillar ECM, and Cummins ECM connectors
22282107	Screw Driver Hex 5/32” Used to remove Titan, Caterpillar ECM, and Cummins ECM connectors
22282172	Flex Driver ¼” Used to remove John Deere ECM connector
54740675	RS232 Heavy Duty Serial Cable Used for communication connection to Doosan controllers
54699640	Deutsch Terminal Removal Tool Size 20 Used to remove Deutsch size 20 terminals from connectors

Part Number	Description
54699632	Deutsch Terminal Removal Tool Size 16 Used to remove Deutsch size 16 terminals from connectors
46490942	Deutsch Terminal Removal Tool Size 14 Used to remove Deutsch size 14 terminals from connectors
54699624	Deutsch Terminal Removal Tool Size 12 Used to remove Deutsch size 12 terminals from connectors
54699616	Deutsch Terminal Removal Tool Size 8 Used to remove Deutsch size 8 terminals from connectors
54699657	Deutsch Wedgelock and Terminal Removal Tool Used to remove Deutsch DT style connector Wedgelock and terminals
22146393	Kit, Deutsch Terminal Removal Tool Size 20 Through 8 Used to remove Deutsch size 20 through 8 terminals from connectors
22216667	Deutsch Terminal Crimp Tool Used to crimp Deutsch connector terminals
54729660	Packard Weather-Pack Terminal Removal Tool Used to remove Packard Weather-Pack connector terminals
54749643	Packard Metri-Pack Terminal Removal Tool Used to remove Packard Metri-Pack connector terminals
46490959	Packard Metri-Pack Terminal Removal Tool Used to remove Packard Metri-Pack connector terminals
22254734	Packard Weather-Pack Terminal Crimp Tool Used to crimp Packard Weather-Pack connector terminals
22216683	Packard Metri-Pack Terminal Crimp Tool Used to crimp Packard 150 and 280 series connector terminals

Part Number	Description
22255947	Packard Metri-Pack Terminal Crimp Tool Used to crimp Packard 150 series pull-to-seat connector terminals
46490967	Packard Metri-Pack Terminal Crimp Tool Used to crimp Packard 150-GT series connector terminals
46490975	Packard Metri-Pack Terminal Crimp Tool Used to crimp Packard 630 series connector terminals
54749544	RTD Simulator Used to troubleshoot RTD type temperature sensor problems
54749551	Thermistor Simulator Used to troubleshoot Thermistor type temperature sensor problems
22073878	Thermistor Simulator Used to troubleshoot Thermistor type temperature sensor problems
22168868	Pressure Transducer Simulator Used to troubleshoot pressure sensor problems
54729710	Electrical Contact Cleaner Used to clean electrical terminals and connectors
22409114	Electrical Grease Used to prevent corrosion in connector terminals
46491338	Molex 1.5 Terminal Crimp Tool Used to crimp Molex CMC 1.5 series connector terminals
46491346	Molex 0.6 Terminal Crimp Tool Used to crimp Molex CMC 0.6 series connector terminals
46491653	Molex 1.5 Terminal Removal Tool Used to remove Molex CMC connector terminals

Part Number	Description
46491361	Molex 0.6 Terminal Removal Tool Used to remove Molex CMC connector terminals
46491320	AMP Ampseal Terminal Crimp Tool Used to crimp Ampseal series connector terminals
46490983	Kit, Deutsch Connector Repair Assortment of Deutsch connectors and terminals.
22252969	Kit, Wire Terminal Repair Assortment of ring and quick disconnect terminals.
22254775	Kit, Fuses Assortment of ATC and ATM style fuses.
22253017	Kit, Adhesive Lined Heat Shrink Assortment of adhesive lined heat shrink sizes.
22252993	Kit, Wedge Connector Repair Used to repair 40-Way Wedge connector and terminals.
46491296	Kit, Packard Connector Repair Assortment of Packard connectors and terminals.
46491304	Kit, Caterpillar C9, C15, and C18 Engine ECM Connector Repair Used to repair 70-Way engine ECM connector and terminals.
46491312	Kit, IQ, TCU, OTC, and Auto Start Controller Connector Repair Used to repair 23-Way controller connector and terminals.
46491411	Kit, John Deere and Yanmar Tier 3 Engine ECM Connector Repair Used to repair 48-Way engine ECM connector and terminals.
46491429	Kit, Cummins QSX15 Engine ECM Connector Repair Used to repair 50-Way engine ECM connector and terminals.
46491502	Kit, SECU, Mote and Titan Controller Connector Repair Used to repair 35-Way controller connector and terminals.

Part Number	Description
46491569	Kit, Cummins OSL9 and QSC 8.3 Engine ECM Connector Used to repair 50-Way engine ECM connector and terminals.
46599302	Kit, Cummins T4FCM2250 Engine ECM Connector Repair Used to repair 60-Way engine ECM connector and terminals.
46599303	Kit, ViewPort Connector Repair Used to repair 8-Way ViewPort connector and terminals.
46599319	Kit, Engine Tachometer Connector Repair Used to repair 12-Way and 6-Way Engine Tachometer connector and terminals.

Harness Connector Repair Kits

The following is a list of harness connector repair kits that can be purchased through Doosan Portable Power to service or repair the most common used connectors.

Part Number	Description
46490983	Kit, Deutsch Connector Repair Assortment of Deutsch connectors and terminals.
22252969	Kit, Wire Terminal Repair Assortment of ring and quick disconnect terminals.
22254775	Kit, Fuses Assortment of ATC and ATM style fuses.
22253017	Kit, Adhesive Lined Heat Shrink Assortment of adhesive lined heat shrink sizes.
22252993	Kit, Wedge Connector Repair Used to repair 40-Way Wedge connector and terminals.
46491296	Kit, Packard Connector Repair Assortment of Packard connectors and terminals.

Part Number	Description
46491304	Kit, Caterpillar C9, C15, and C18 Engine ECM Connector Repair Used to repair 70-Way engine ECM connector and terminals.
46491312	Kit, IQ, TCU, OTC, and Auto Start Controller Connector Repair Used to repair 23-Way controller connector and terminals.
46491411	Kit, John Deere and Yanmar Tier 3 Engine ECM Connector Repair Used to repair 48-Way engine ECM connector and terminals.
46491429	Kit, Cummins QSX15 Engine ECM Connector Repair Used to repair 50-Way engine ECM connector and terminals.
46491502	Kit, SECU, Mote and Titan Controller Connector Repair Used to repair 35-Way controller connector and terminals.
46491569	Kit, Cummins OSL9 and QSC 8.3 Engine ECM Connector Used to repair 50 way engine ECM connector and terminals.
46599302	Kit, Cummins T4F CM2250 Engine ECM Connector Repair Used to repair 60-Way engine ECM connector and terminals.
46599303	Kit, ViewPort Connector Repair Used to repair 8-Way ViewPort connector and terminals.
46599319	Kit, Engine Tachometer Connector Repair Used to repair 12-Way and 6-Way Engine Tachometer connector and terminals.

IQ Option

IQ TCU Controller

The IQ TCU controller monitors and controls the IQ system. It is a microprocessor based unit with analog and digital inputs and outputs.

The IQ TCU controller is mounted inside the control panel enclosure.

The first function of the IQ TCU controller is to scan all inputs at a fixed interval. The analog values are compared to minimum and maximum values and an ALERT or FAULT is sent to the Titan controller if a value is out of range. The ALERTS and FAULTS for the IQ system are listed in the Compressor Diagnostic Code Troubleshooting section.

The second function of the IQ TCU controller is IQ discharge air temperature control. The IQ TCU monitors the aftercooler output temperature and adjusts the louvers to maintain that output temperature above 45°F.

The third function of the IQ TCU controller is to monitor the restriction of the primary and secondary IQ filters. When air flow is starting to be restricted across one or both filters, an ALERT is sent to the Titan controller. When air flow is restricted past a usable level across one or both filters, a FAULT is sent to the Titan controller.

Temperature Sensors and Differential Pressure Transducers

The IQ TCU controller uses a temperature sensor and two differential pressure switches to monitor the IQ operation.

The temperature sensor used to measure the aftercooler temperature is a thermistor type device. The resistance output of the temperature sensor changes with a temperature change of the parameter being monitored. The IQ TCU controller receives the resistance value of the sensor and converts it to a temperature value. The IQ TCU controller ensures the parameter being monitored is within its operating limits and sends the temperature value to the Titan controller. The Titan controller sends the temperature value to the ViewPort for operator viewing.

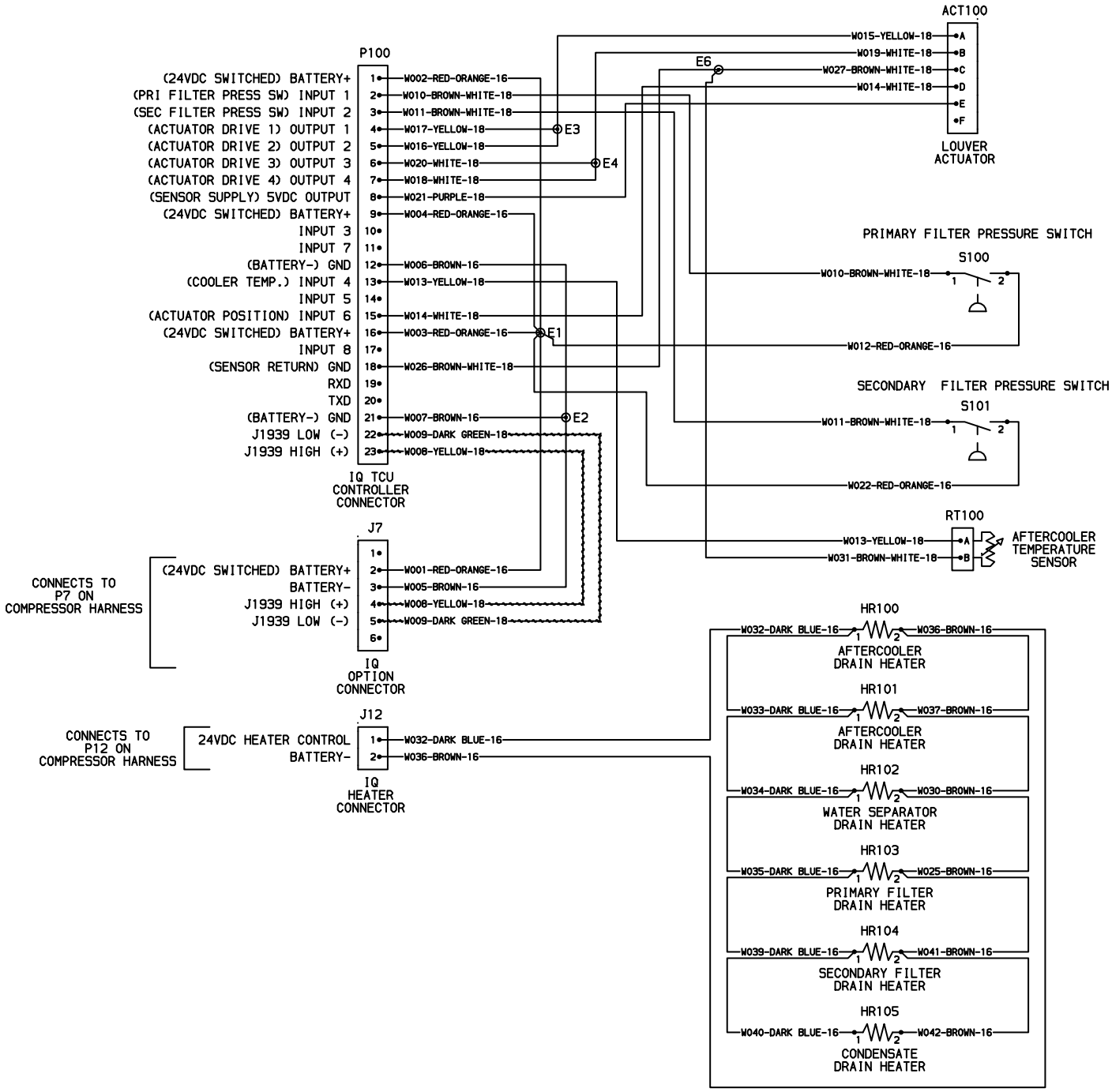
The two differential pressure switches monitor the pressure drop across the primary and secondary filters, respectively. The IQ TCU controller reads the state of the switches and, if either switch indicates an excessive pressure drop, sends a shutdown code to the Titan controller.

IQ Option Harness Connector Locations

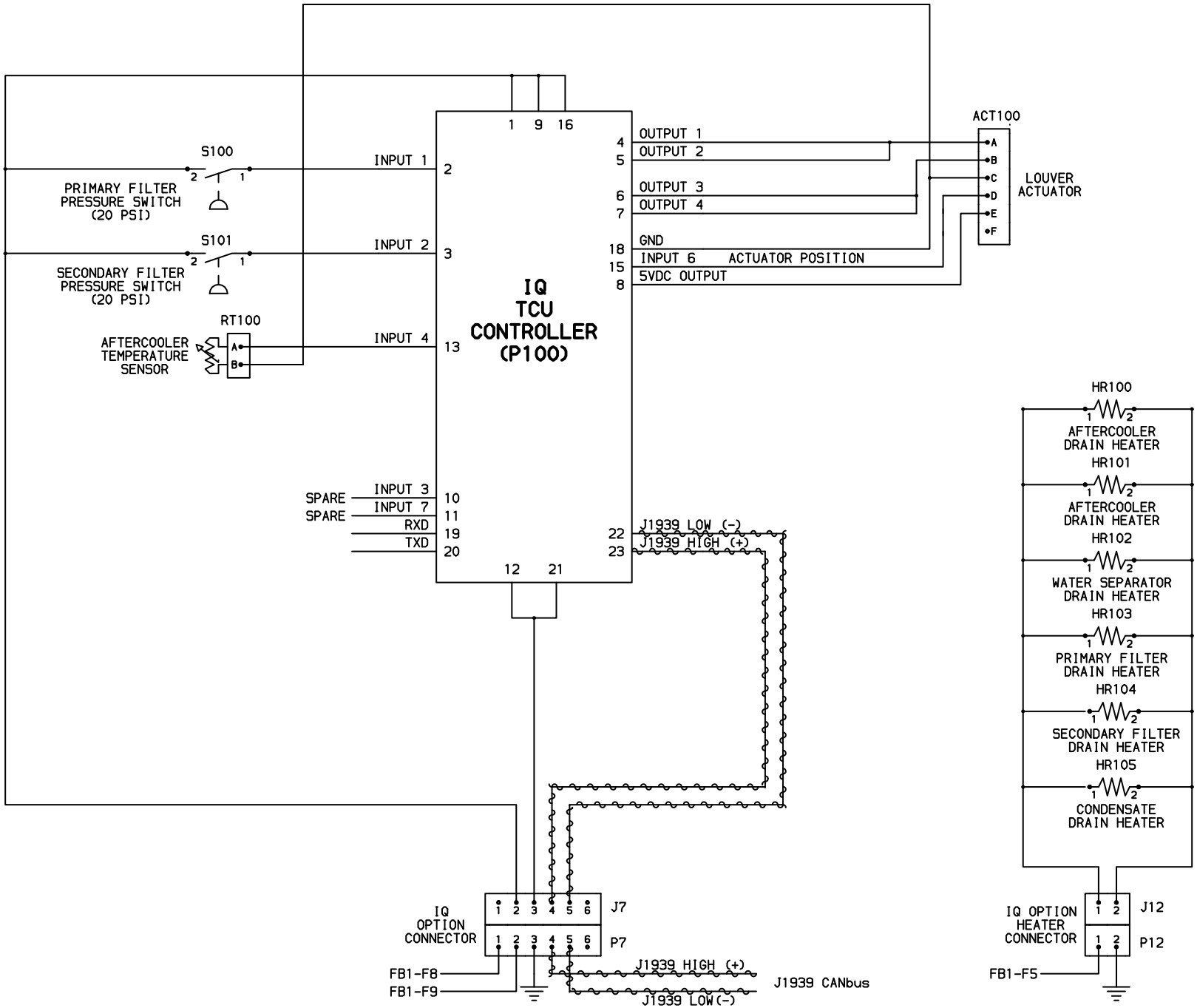
P100: 23-Pin connector that connects to the IQ TCU controller.

P7 / J7-CAP: 6-Pin connector system located under control panel. Connector system connects the IQ option harness to the compressor harness.

P12 / J12-CAP: 2-Pin connector system located in front of the separator tank. Connector system connects the IQ option heater harness to the compressor harness.



IQ Option Harness Wiring Diagram 46656384 Rev. A



IQ Option Harness Control System Schematic 46670349 Rev. A

IQ Option	HP1600/XHP1170WCU-T4F	
Reference Designator	**Description**	**Part Number**
	IQ TCU Controller	46569499
	IQ Harness	46656385
ACT100	Louver Actuator	36898310
HR100	Aftercooler Drain Heater	36841526
HR101	Aftercooler Drain Heater	36841526
HR102	Water Separator Drain Heater	36841526
HR103	Primary Filter Drain Heater	36841526
HR104	Secondary Filter Drain Heater	36841526
HR105	Condensate Drain Heater	36841526
S100	Primary Filter Pressure Switch	36899599
S101	Secondary Filter Pressure Switch	36899599
RT100	Aftercooler Temperature Sensor	23294820

Revision History

Rev.	EC Number	Comments
A	CN036406	Original release
B		Updated Content
C	CN038941	Updated Wiring Diagrams

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Doosan Infracore
Portable Power