



**Doosan Infracore**  
Portable Power

# **ELECTRONIC SERVICE MANUAL**

**HP1300WCU (25/300) B84  
HP1600WCU (25/330) B83**

**COMPRESSOR MODELS**

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# SECTION 1

## MANUAL DESCRIPTION

This manual contains all of the information concerning the electrical and electronic systems for the HP1600/1300 compressor. It provides all information necessary to service, troubleshoot and order parts for this machine.

It is organized into 12 sections.

Sections 2 - 4 cover systems operation and troubleshooting procedures.

Sections 5 - 7 have location diagrams, drawings of specific circuits and systems schematics.

Section 8 has information concerning the electrical connectors used, including removal and replacement.

Section 9 contains the parts list with ordering information.

Section 10 contains the list of Alerts and Shutdowns.

Section 11 contains a list of recommended spare parts for servicing.

Section 12 contains software information.

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**SECTION 2**

**GENERAL INFORMATION**  
**and**  
**OPERATIONAL THEORY**

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## **GENERAL INFORMATION AND OPERATIONAL THEORY**

### **General**

The HP1600/1300 machine has an electronic monitor and control system to provide discharge air pressure control and engine and package monitor functions. The system uses the WEDGE controller to perform these functions. The electrical system connects all the necessary switches, sensors and transducers to the WEDGE controller in order for it to perform the monitor and control functions.

### **WEDGE Controller**

The WEDGE controller is the heart of the machine monitor and control system. It provides data collection, alarming and control functions for compressor operations. It is a microcontroller based unit with analog and digital inputs and outputs.

The WEDGE controller is attached to the back of the control panel. The LED annunciators are part of the front panel of the WEDGE. They can be seen through the laminate on the front of the control panel.

The WEDGE is attached to the control panel with four #10 size nuts.

The first function of the WEDGE controller is to scan all analog and digital inputs at a fixed interval. These inputs are scanned every 50 milliseconds. The analog values are then compared against minimum and maximum values and an ALERT or SHUTDOWN is issued, if a value is out of range. The various ALERTS and SHUTDOWNS are listed in Section 10 of this manual.

The second function of the WEDGE controller is machine discharge pressure control. The WEDGE monitors the regulation system air pressure and varies the engine throttle to maintain the setpoint discharge air pressure. The setpoint pressure is set using the regulator on the separator tank.

The third function of the WEDGE controller is to communicate with the diesel engine via the J1939 CAN network. The WEDGE controller provides the engine throttle setting (software versions 2.0 and greater) to the engine controller via the J1939 CAN network and retrieves diagnostic information from the engine.

# HP-XHP VIKING HARNESS SYSTEM SCHEMATIC

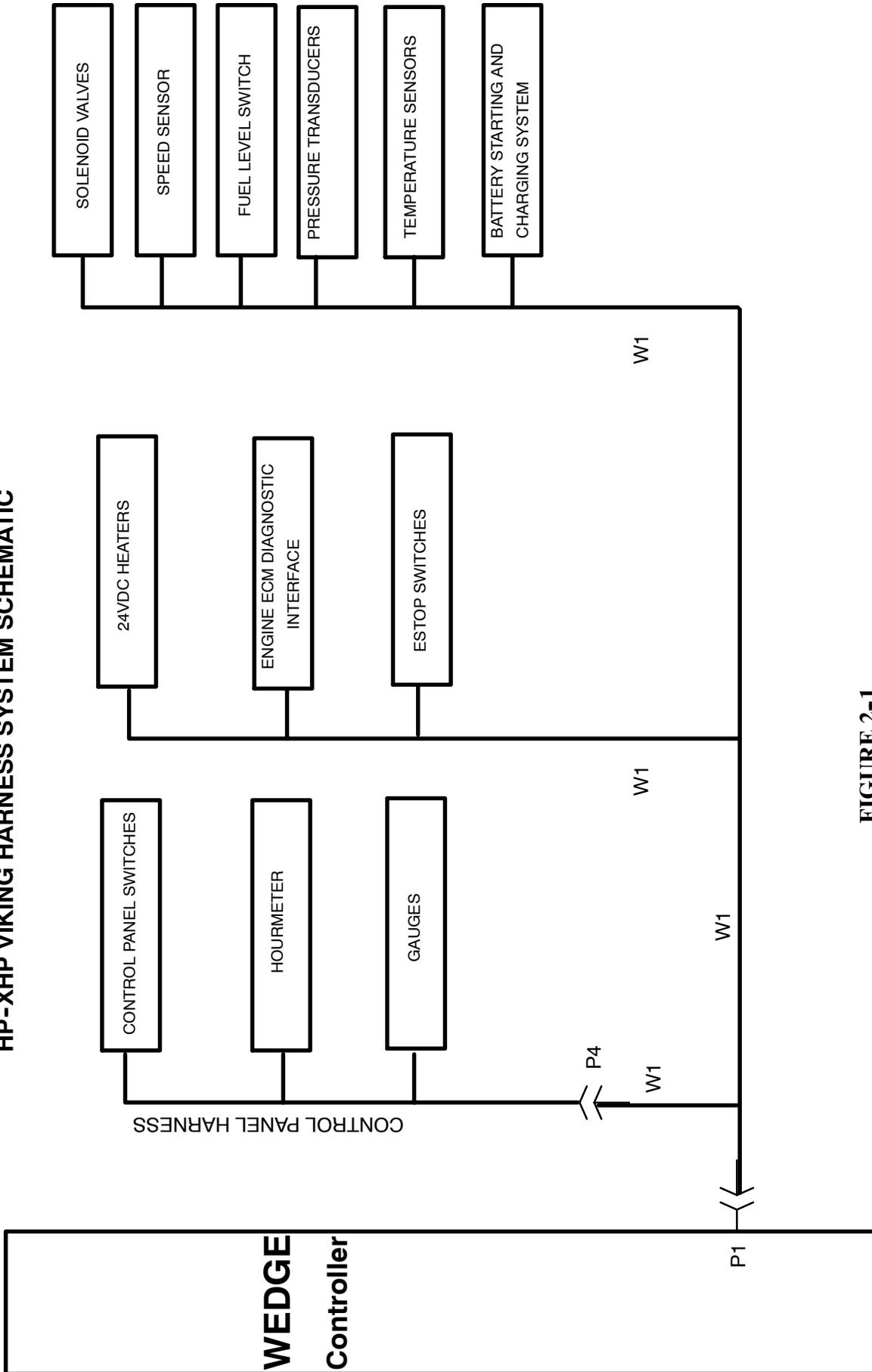
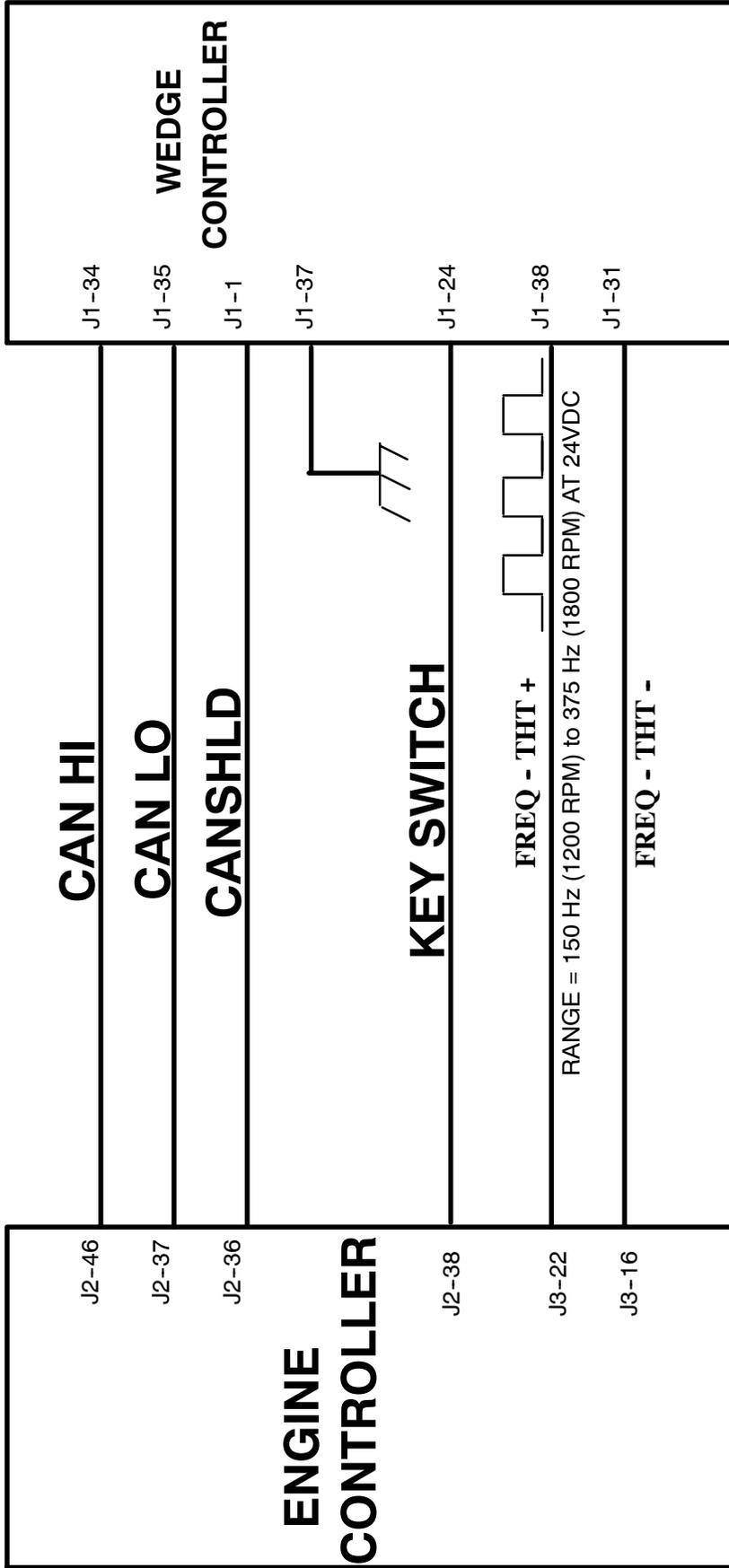


FIGURE 2-1

**WEDGE TO ENGINE INTERFACE  
CUMMINS QSX15 ENGINE**



**FIGURE 2-2**

HP-XHP VIKING J1939 CAN COMMUNICATIONS SCHEMATIC

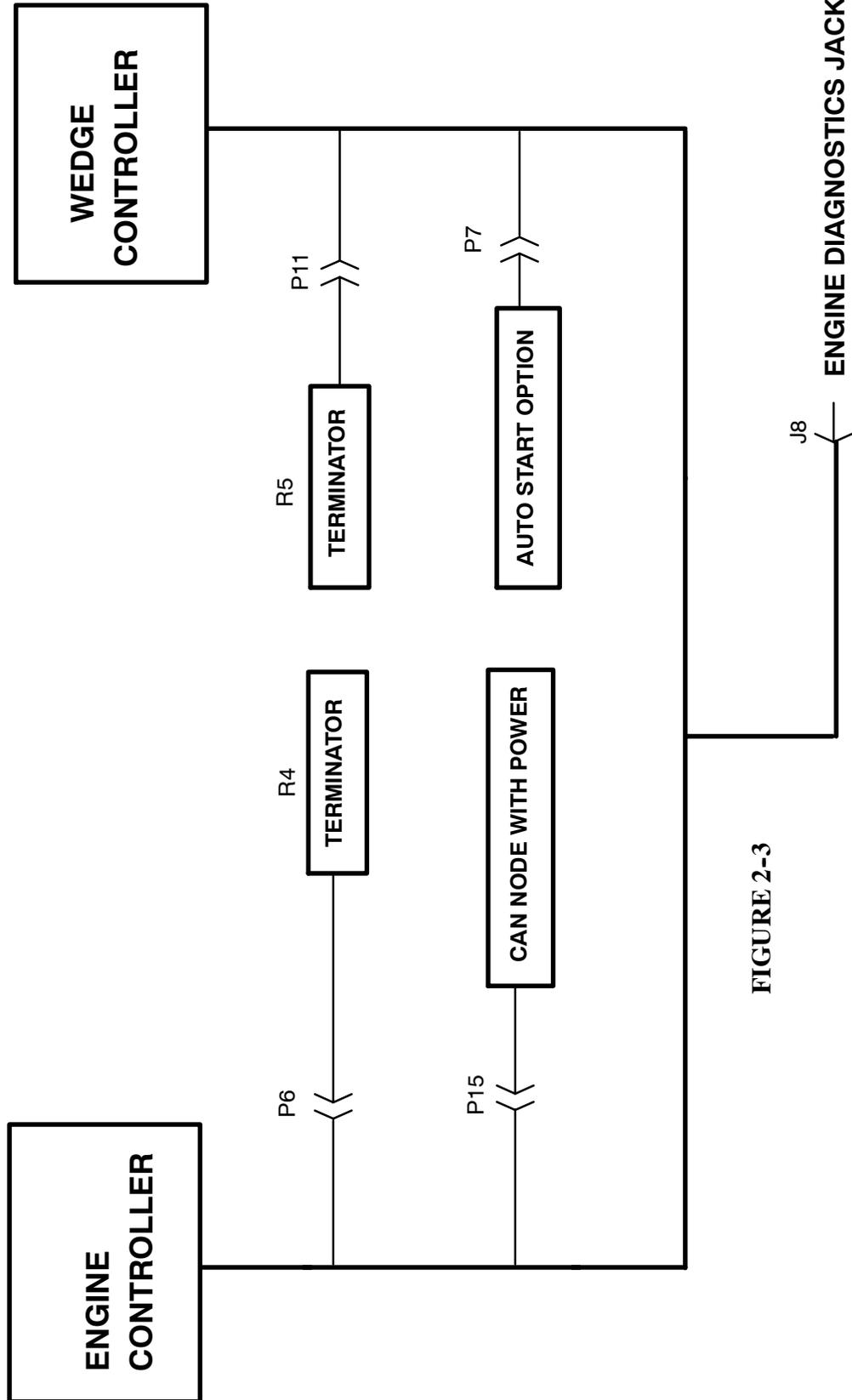


FIGURE 2-3

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Software versions under 2.0 use the frequency throttle to communicate with the engine. A square wave frequency signal from 150 Hz to 375 Hz is sent from the WEDGE controller to the engine controller.

The signal is a linear signal from 150 Hz at engine idle (1200 RPM) to 375 Hz at maximum run speed (1800 RPM).

Figure 2-2 shows the signals between the engine controller and the WEDGE controller.

### **Sensors and Transducers**

The electronics system contains sensors and transducers that are used to collect data from the compressor. The temperature is measured by a thermistor. This device exhibits a change in resistance as the temperature changes. The resistance causes an input voltage change to the WEDGE controller input and is interpreted as a temperature change.

The electronics system also uses pressure transducers to measure compressor pressure changes. These devices have an output signal of .45 VDC to 4.5 VDC, corresponding to 0 psi and the maximum measured psi for a particular device. The maximum pressure transducer ranges are 100 or 225 psi. The 100 and 225 psi devices are gauge pressure devices. These transducers are provided with 5 VDC excitation to power the device. These are three wire devices: excitation, signal and ground.

### **Digital Inputs and Outputs**

The WEDGE controller scans digital inputs such as switch contacts. These are either "ON" (24VDC) or "OFF" (0 VDC). These digital inputs are connected to switches within the package such as the key start switch, air filter switches and IQ filter switches.

The WEDGE controller provides 24 VDC digital outputs to control solenoids, start compressor and DC heaters. These are 24 VDC "ON" and 0 VDC "OFF". They are current limited and short circuit protected.

### **Controller Outputs**

The WEDGE controller has three types of outputs: frequency, pulse width modulated (PWM) and 24 VDC digital (ON /OFF). The frequency output is used as a throttle signal for the engine (software revisions less than 2.0).

The WEDGE controller varies the frequency from 150 Hz to 375 Hz, corresponding to 1200 to 1800 RPM. The frequency signal is a 50% duty cycle, 24 VDC, square wave. This throttle signal is used with the Cummins engine.

The PWM signal is used as a throttle signal for the Caterpillar engine. It has a base frequency of 500 Hz and the duty cycle varies from 10% to 90%.

### **Pressure Control**

The discharge pressure is controlled by manipulating the engine speed and compressor inlet valve position. The inlet valve position is controlled pneumatically and the engine speed is determined by the WEDGE controller. The WEDGE measures the pneumatic system regulation pressure and computes an engine throttle setting. This throttle setting is sent to the engine via the frequency throttle, PWM or J1939 throttle, depending on which technique is used. The engine controller will control engine speed to this throttle setting.

### **Electronic Engine**

The HP1600/1300 machine contains an emissions certified diesel engine. In order to meet the emissions requirements, the engine has an electronic control system.

The control system handles all monitor, alarm and control functions for the engine. The WEDGE controller communicates with the engine controller over the J1939 CAN network.

The WEDGE controller sends throttle settings to the engine (software revisions 2.0 and greater) and receives diagnostic and run time data from the engine over the J1939 CAN network. A frequency throttle interface with the engine is used for software revisions earlier than 2.0. Figure 2-2 shows the connections between the WEDGE controller and the engine controller.

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### **J1939 Data Link**

The CAN network is a single pair shielded cable located with the W1 main harness. Figure 2-3 shows a layout of the CAN harness or “backbone” as it is referred to. The termination resistors (Terminator) are important to prevent reflections on the transmission line and must be in place for the network to function properly. The shield from the cable is connected to the machine metal at the WEDGE controller end.

This connection must be properly made with good metal-to-metal contact between the wire terminal and the machine metal.

The engine diagnostics connector is located on the left side of the engine. This is used to connect the engine manufacturer’s service tools to the CAN network. This connector also provides 24 VDC to power these service tools.

### **Electrical System**

The electrical system consists of the wiring harnesses and associated electrical devices such as relays, switches, lights, solenoids and alarm horn. There are two wiring harnesses in the HP1600 machine. They are as follows:

- 22614424 W1 Chassis Main Harness
- 22108682 Control Panel Wiring Harness

The schematic diagrams show the connections for these harnesses. Figure 2-1 is a system schematic showing harness connection with devices and controllers. Section 8 includes information on connectors used in the harnesses.

The electrical circuits are protected using ATC style fuses. A fuse should only be replaced with one of the same rating. Replacing a fuse with one of a large rating could lead to harness damage. If a fault occurs and the circuit does not have the appropriate size fuse, wires could be burned in the harness and damage other circuits.

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## KEY ELECTRICAL COMPONENTS FUNCTION

**PT1:**

PT1 is a 0–225 psi gauge pressure transducer that measures discharge air pressure.

**PT2:**

PT2 is a 0–100 psi gauge pressure transducer that measures regulation system pressure.

**U1:**

U1 is resistive level detector that measures the fuel level in the fuel tank.

It provides a continuous reading of fuel level. It also has a switch for low fuel level and low fuel shutdown. These switches connect to WEDGE.

**RT1:**

RT1 is a 10K ohm Thermistor temperature sensor that measures separator tank temperature.

Its range is –30 to 255° F.

**RT2:**

RT2 is a 10K ohm Thermistor temperature sensor that measures aircend discharge temperature.

Its range is –30 to 255°F.

**K1:**

K1 is SPST, 24VDC relay used to activate the engine starter.

**K2:**

K2 is a SPDT, 24VDC relay used to activate the start compressor.

**K3:**

K3 is a SPDT, 24VDC relay used to power the IQ system.

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# OPERATIONAL INFORMATION

## Power “ON” at Control Panel:

1. Key switch signal (24VDC) supplied to engine controller by WEDGE controller
2. Frequency throttle signal OFF
3. Unloader solenoid valve (L2) is closed (de-energized)
4. Start-up compressor is turned on for 10 seconds

## Engine Start-up:

When the key is switched to the engine crank position:

1. Unloader solenoid valve (L2) is closed (de-energized).
2. Start compressor is turned on.
3. Key switch signal (24VDC) is supplied to engine controller.
4. K1 auxiliary start relay is energized.
5. Run/Start solenoid valve (L1) is opened (energized).

Note: Start compressor remains on, run/start solenoid stays open and unloader solenoid valve stays closed for 10 seconds after the key is released if the engine does not start.

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

1. Engine speed is set to 1500 RPM.

When the engine speed reaches 1450 RPM:

1. Unloader solenoid valve is opened (energized), L1.
2. Start compressor is turned off.
3. Run/Start solenoid valve is closed (de-energized), L2.

When the separator tank pressure reaches 50 psi:

1. Run/Start solenoid valve is opened (energized), L1.

After 5 seconds:

1. Engine speed is set to idle (1200 RPM if air end discharge temperature is approximately 150 degrees F or (if J1939 CAN is functioning). The engine coolant is 100 degrees F. Otherwise, the engine idle stays at 1500 RPM.

## Loading:

When the “Service Air” switch is pushed:

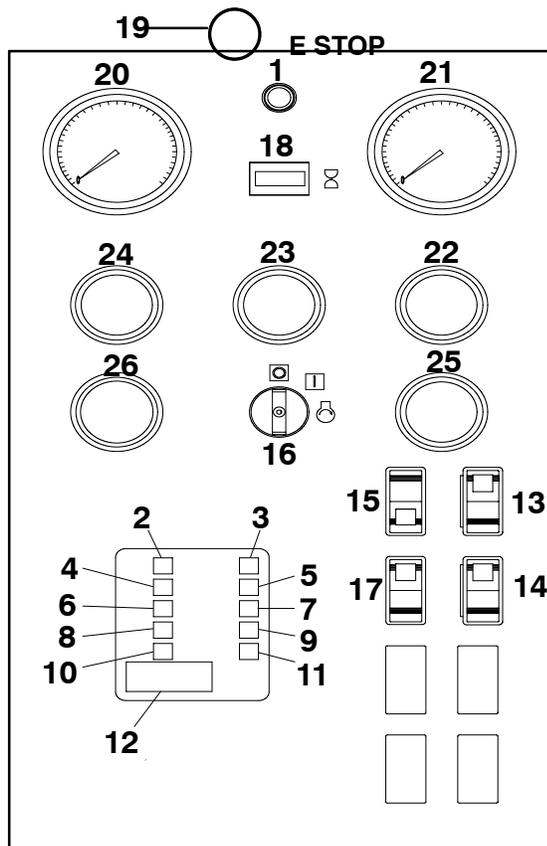
1. Engine speed is set to 1800 RPM

When engine speed reaches 1700 RPM:

1. Run/Start solenoid valve is closed (de-energized).

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

1. Compressor pressure control is engaged.



### OPERATING CONTROLS AND INSTRUMENTS

The operating controls and instruments are arranged on the control panel as shown above. A description of each panel device is as follows:

1. **Panel Light:** Illuminates instrument and control panel. Controlled by Switch 14.
2. **High Compressor Temp:** Fault indicator lamp. Indicates shutdown due to high compressor temperature.
3. **Low Radiator Coolant Level:** Alarm indicator lamp. Indicates engine coolant needs service.
4. **Low Engine Oil Pressure:** Fault indicator lamp. Indicates shutdown due to low engine oil pressure.
5. **Restricted Air Filter:** Alarm indicator lamp. Indicates engine/compressor air inlet filters need service.
6. **High Engine Coolant Temp:** Fault indicator lamp. Indicates shutdown due to high engine water temperature.
7. **Restricted IQ Air Filters:** Fault indicator lamp. Indicates shutdown due to dirty IQ air filters (if equipped).
8. **Low Fuel Level:** Fault indicator lamp. Indicates shutdown due to low fuel level. Lamp blinks at low fuel warning.
9. **Compressor Malfunction:** Fault indicator lamp. Indicates shutdown due to compressor system fault. Refer to Fault Code List.
10. **Low Battery Voltage:** Alarm indicator lamp. Indicates battery or charging system requires service.
11. **Engine Malfunction:** Engine Fault code. Refer to service card, engine manual or this manual for codes and service requirements.
12. **Malfunction Code (4 Digit):** Compressor or engine fault. Refer to manual for list of codes and service requirements.
13. **Ether Inject:** Injects a measured shot of ether for aid in cold weather starting of engine. Caution: Use Sparingly.
14. **Panel Light Switch:** Controls panel lamp # 1.
15. **Service Air:** Momentary contact switch. Allows engine to warm up at low compressor pressure.
16. **Main Power Control Switch:** ON/OFF Start Switch.
17. **Heaters:** ON/OFF Power Switch for regulation and IQ heaters. Prevents freeze up in cold weather.
18. **Hourmeter:** Indicates machine operating hours.
19. **E-STOP:** Emergency Stop Push Button (ESA units only). Push to stop, turn to release.
20. **Discharge Air Pressure Gage:** Indicates pressure in receiver tank, normally from 0 psi(kPa) to the rated pressure of the machine.
21. **Engine Tachometer:** Indicates engine speed in RPM from 0 when stopped to full speed.
22. **Engine Water Temp**
23. **Fuel Level Gauge:** Not used on "S" Models.
24. **Compressor Oil Temp**
25. **Engine Oil Pressure**
26. **Battery Voltage**

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# READING AND SETTING THE DISPLAY UNITS

**The WEDGE has four choices for display units:**

- °F, PSI
- °C, Bars
- °C, kPa
- °C, Kg/cm<sup>2</sup>

**To determine which units the WEDGE has been configured for:**

1. With the machine power off (Key turned OFF)
2. Press and hold the “Service Air” Switch
3. Turn the key switch directly to the crank position.
4. Hold these switch positions until the 4 digit LED display on the WEDGE goes blank.
5. Release “Service Air” switch, release key switch to “ON”.

Units will be displayed for 2 seconds after which the current selection will be displayed as:

- °F, PSI will be displayed as “PSI”
- °C, Bars will be displayed as “bAr”
- °C, kPa will be displayed as “HPA”
- °C, Kg/cm<sup>2</sup> will be displayed as “H9C”

**To change the units setting:**

1. With the WEDGE showing the current setting, press and release the “Service Air” switch until the desired setting appears on the display.
2. Once it appears, do not release the “Service Air” switch. Hold it in the ON position until the WEDGE restarts. This will select units selection that was displayed.
3. Release the “Service Air” switch. The compressor is ready to start.

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# WEDGE SERVICE DIAGNOSTICS

The WEDGE controller provides a diagnostic capability that allows various internal parameters to be viewed on the 4-digit LED display. These can be accessed with the machine stopped or while it is operating. If the machine is stopped, the “Service Air” switch on the control panel is used to toggle through the list of parameters. If the machine is operating, the “Start” position of the key switch is used. To view the parameters, toggle the switch or key and a number (2-20) will appear on the LED display. After 3 seconds, it will extinguish and the parameter will be displayed. The toggle only works in the ascending order direction, but it will wrap around and start over.

Display	Parameter	Remarks
2	RPM	From Engine Flywheel Sensor
3	Engine RPM	Filtered RPM Value
4	Reg. Sys. Pressure	PSI
5	Sep. Tank Pressure	PSI
6	Discharge Temperature	Deg F
7	Sep. Tank Temperature	Deg F
8	Engine Target RPM	Wedge Signal to Engine
9	Machine Type	*
10	Engine Coolant Temp.	From CAN, Deg F
11	Engine Oil Temp.	From CAN, Deg F
12	Engine Oil Pressure	From CAN, PSI
13	Intake Manifold Temp.	From CAN, Deg F
14	RPM	From CAN
15	Fault Code List	Cummins/CAT codes
16	Throttle Position	
17	Boost Pressure	
18	Engine Hours	
19	Load At Speed	Percent
20	Set Machine ID	

\* Machine Types: 0 = HP CU    4 = XHP CAT

1 = XHP CU

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## ENTERING MACHINE ID FOR WEDGE CONTROL SYSTEMS with V1.60 or Greater Software

For machines with the WEDGE controller mounted inside the control panel/instrument panel box, the "Service Air" switch is used to enter the machine ID. Disconnect the fuel level gauge (located in the fuel tank) before starting the process and reconnect once the process is completed.

For machines with the WEDGE controller mounted in the engine compartment, the rocker switch beside the WEDGE is used to enter the machine ID.

For the instructions below, the "Service Air" or rocker switch will be referred to as the "data input switch".

1. Examine the machine data plate to confirm the machine model.  
Using the machine model and the machine models list on page 2 of this document, locate the proper machine ID.
2. Turn power to the "ON" position. Machine must not be operating.
3. Toggle the data input switch twice and the number "2" will appear on the WEDGE 4-digit LED display. Continue to toggle the switch until the number "9" is reached. Read the machine ID on the display, if it matches the proper machine ID in Step 1, stop. If not, proceed to step 4.
4. Continue to toggle the switch until number "19" is reached. Push and hold the data input switch and the number "20" will appear. Continue to hold the switch. After 1 second, the current machine ID will appear in the display. Continue to hold for 9 more seconds and a blinking "-" will appear. Release the switch.
5. Toggle the data input switch, the display will show "0". Toggle the data input switch until the proper machine ID appears on the display, then stop the toggle sequence.
6. Wait until the controller performs a reset function (or power up) (approximately 10 seconds). At reset, the controller display first goes blank, then all 10 annunciator LED's light, the 4-digit LED display shows all 8's, the display then shows the installed software version and finally the display goes blank and the engine oil pressure and alternator LED begin flashing. At this point the controller has stored the machine ID selected in step 5.
7. Using the data input switch, toggle to service diagnostic number "9".  
The number "9" will appear for 1 second and then the machine ID will appear. The ID should be the same as the one entered in steps 4-6. If not, go back to step 4 and enter the ID again.

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**ESA Models/Wedge Machine ID**

<b><u>Models</u></b>	<b><u>Machine ID</u></b>
7/120,9/110. 10/105, 14/85	7
7/170. 10/125.14/115	8
9/230,9/270,9/300. 12/235	5
17/235,21/215	6

**MSA Models/Wedge Machine ID**

<b><u>Models</u></b>	<b><u>Machine ID</u></b>
P425AWJD, XP375AWJD, HP375WJD VHP300AWJD	7
P600WJD, HP450WJD, VHP400WJD	8
XP1060WCU, HP935WCU, MHP825WCU VHP750WCU	5
XHP750WCU	6
MHP825WCAT, VHP750WCAT	2
XP1060HACAT,XP950HACAT	
SHP825WCAT, XHP750WCAT. XHP650WCAT	3
HP1300CWCU,HP1600CWCU	0
XHP1170WCU 1	
XHP1070AWCAT, XHP1170WCAT. XHP1170SCAT	4
HP1600WCAT	9
HP675EWCU, XP750EWCU, HP750EWCU, HP750EWCU, XP825EWCU	10

**SIRC Models/Wedge Machine ID**

<b><u>Models</u></b>	<b><u>Machine ID</u></b>
P1060WCAT, XP950WCAT, HP935WCAT MHP825WCAT .VHP750WCAT	2
XHP750WCAT	3

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# **SECTION 3**

# **SERVICE TOOLS**

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# SERVICE TOOLS

## Service Tools

The following special tools are recommended to perform service procedures in this manual. The tools can be purchased from Portable Power or other sources as listed.

<b>Tool</b>	<b>Tool Description</b>
22216691	Digital Multimeter (Fluke 87) Used to measure electrical circuits; Volts, amps, ohms
54729660	Packard Weather-Pack Terminal Removal Tool Used to repair Packard Electric Weather-Pack Connectors
54699632	Deutsch Terminal Removal Tool (Blue) Used to repair Deutsch connectors
54699640	Deutsch Terminal Removal Tool (Red) Used to repair Deutsch connectors
54699624	Deutsch Terminal Removal Tool (Yellow)\ Used to repair Deutsch connectors
22216667	Deutsch Terminal Crimp Tool (HDT-48-00) Used to crimp Deutsch connector terminals
54729710	Electrical Contact Cleaner Used to clean electrical contacts and connectors
54729728	PDA Service Tool Used to load software & extract service and fault logs
54699616	Deutsch Terminal Removal Tool Used to repair Deutsch connectors
54749544	RTD Simulator Plug Used to test RTD circuits
54749551	Thermistor Simulator Plug Used to test thermistor circuits for Intellisys controller systems
22073878	Thermistor Simulator Plug Used to test thermistor circuits for WEDGE controller systems
54749635	Connector Repair Kit Used to make connector repairs for Deutsch and Packard Electric Connectors
54699657	Deutsch Terminal removal Tool Used to repair Deutsch connectors
54749643	Packard Metri-Pack Terminal Removal Tool Used to repair Packard Electric onnectors

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22168868	Pressure Transducer Simulator Used to test pressure transducer circuits
22147540	Test Adapter Kit Test adapters for various connectors to be Used when making electrical measurements
22146393	Removal Tool Kit Assortment of most used Deutsch removal tools
22216675	Deutsch Crimp Tool (DTT -20-00) Used to crimp Deutsch connector terminals
22216683	Packard Electric Crimp Tool (12155975) Crimps 150 and 280 series pins
22255947	Packard Electric Crimp Tool (12039500) Crimps 150 series pull to seat pins
22216709	Fluke Test Lead Set (TL20) Contains needle probes, alligator clips, test leads heat shrink tubing that are used on harnesses
22216725	Fluke Insulation Piercing Probe (AC-89) Used to connect to a wire for measurements
22216733	Fluke Meter Case (C25) Case for Fluke 87 meter including storage for test leads and probes
54740675	RS232 Heavy Duty Serial Cable Connects lap top computer or PDA Service Tool to WEDGE or Intellisys controller
22252969	Wire Terminal Kit Contains a selection of terminals with corresponding heat shrink tubing that are used on harnesses
22281588	Connector Wrench
22282107	5/32 "T" hex screwdriver wrench
22282172	1/4" Flex Shaft Nutdriver Used to remove ECM connector on John Deere engines
22252993	WEDGE Connector Kit Includes the 40-pin connector housing and pins for the harness connector
22253009	CAN Communications Adapter Converts RS232 to J1939 CAN, used with lap top computer or PDA Service T 001
22253017	Adhesive Heat Shrink Assortment Selection of most used heat shrink sizes

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22221303

Service Tool Kit

Kit consists of the following P/N's: 22216691 22216667

22216675 22216683 54729660 54749643 54699657

22146393 22147540 22073878 54749635 22168868

22216709 22216725 22216733 54740675

22254775

ATC Fuse Assorlment Kit

Kit contains 5, 7-1/2, 10, 15,20,25, and 30 Amp fuses

22254734

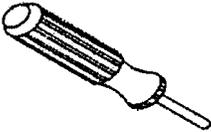
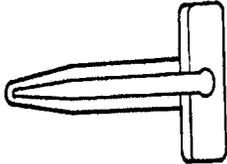
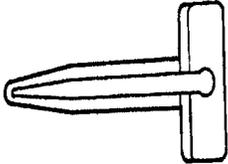
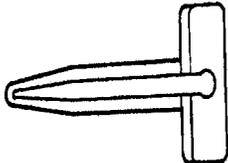
Packard Crimp Tool (12014254) Crimps Sealed

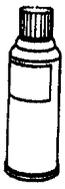
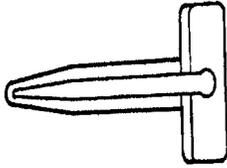
Weather Pack Connector pins

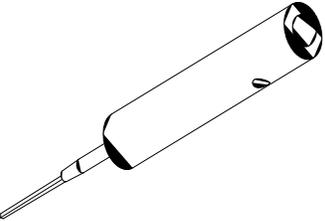
**Tool No.**

**Tool Description**

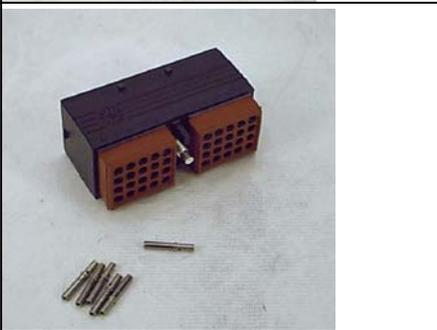
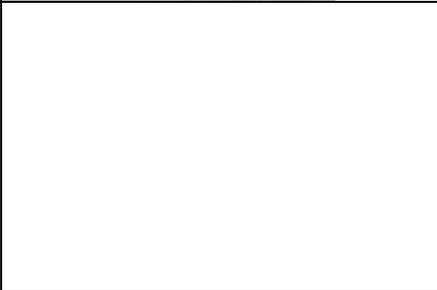
**Tool Illustration**

22216691	Digital Multimeter	
54729660	Weather-Pack Terminal Removal Tool	
54699632	Deutsch Terminal Removal Tool (Blue)	
54699640	Deutsch Terminal Removal Tool (Red)	
54699624	Deutsch Terminal Removal Tool (Yellow)	
22216667	Deutsch Crimp Tool	

54729710	<b>Electrical Contact Cleaner</b>	
54729728	<b>Virtual Technician Service Tool Kit</b>	
54699616	<b>Deutsch Terminal Removal Tool</b>	
54749544	<b>RTD Simulator Plug</b>	
22073878	<b>Thermistor Plug</b>	
54749635	<b>Connector Repair kit</b>	
54699657	<b>Deutsch Terminal Removal Tool</b>	

54749643	<b>Packard Metri-Pack Removal Tool</b>	
22168868	<b>Pressure Transducer Simulator</b>	
22147540	<b>Test Adapter Kit</b>	
22146393	<b>Removal Tool Kit</b>	
22216675	<b>Deutsch Crimp Tool</b>	
22216683	<b>Packard Electric Crimp Tool</b>	

22216709	<b>Fluke Test Lead Set</b>	
22216725	<b>Fluke Insulation Piercing Probe (single probe)</b>	
22216733	<b>Fluke Meter Case</b>	
54740675	<b>RS232 Serial Cable</b>	
22253969	<b>Wire Terminal Kit</b>	

<p>22281588</p> <p>22282107</p>	<p><b>Connector Wrenches</b></p>	
<p>22282172</p>	<p><b>1/4" Flex Shaft Nutdriver</b></p>	
<p>22252993</p>	<p><b>WEDGE Connector Kit</b></p>	
<p>22253009</p>	<p><b>CAN Communications Adapter</b></p>	
<p>22253017</p>	<p><b>Adhesive Heat Shrink Assortment</b></p>	

22255947	<b>Packard Electric Crimp Tool</b>	
22254734	<b>Packard Electric Crimp Tool</b>	

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## SECTION 4

# ELECTRONIC SYSTEMS TROUBLESHOOTING PROCEDURES AND TECHNIQUES

### 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. They 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 solution of the problem.

### Basic Troubleshooting Steps

- 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
- Double check before replacing components
- Review the controller fault log for clues as to the problem
- Determine the cause of the problem and make a thorough repair

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# MEASURING VOLTAGE, RESISTANCE, FREQUENCY AND DUTY CYCLE

## **General Measuring Guidelines:**

Since the electrical system uses sealed connectors and splices, access of test points can be difficult. It is recommended that 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. Use circuit common for the Black lead, not chassis ground or other metal connection. Circuit common will be any of the BROWN wires or battery negative can be used.

## 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. Make sure system power is turned 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, setup the meter as if measuring frequency or voltage. Select the "%" or duty cycle function and take the measurements. As of the date of this writing, Fluke is the only known digital voltmeter that has the duty cycle feature. The Fluke Model 87 Digital Meter has the duty cycle function.

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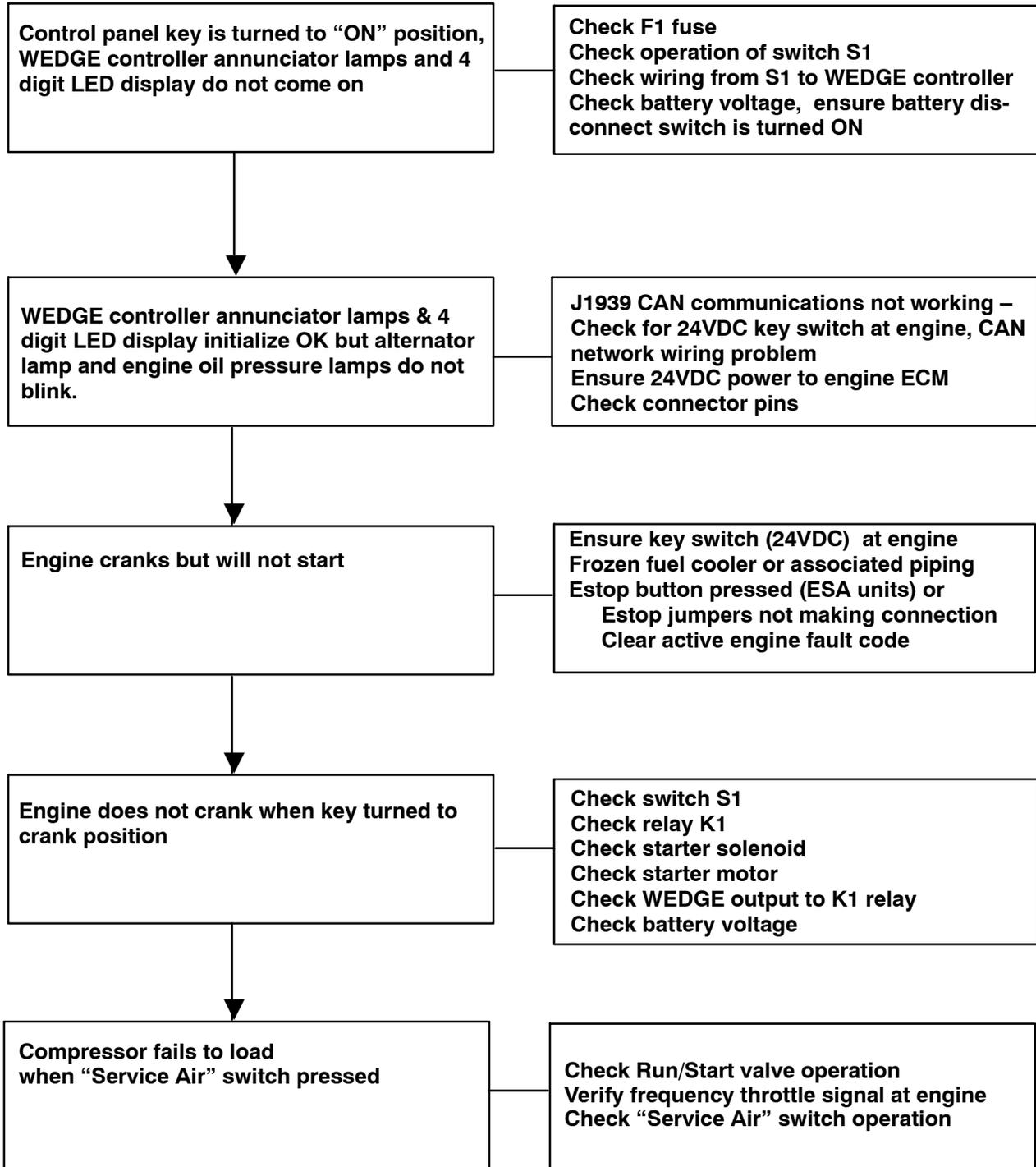
# COMPRESSOR FAULT CODES DESCRIPTION & TROUBLESHOOTING

Following are the descriptions of the COMPRESSOR fault codes. These are indicated when the “COMPRESSOR MALFUNCTION” lamp is illuminated. The compressor malfunction lamp is shown on the control panel picture in Section 2 of this manual. It is indicated by Item number 9.

The engine fault codes are indicated by the “ENGINE MALFUNCTION” lamp, that is located under the “COMPRESSOR MALFUNCTION” lamp. The engine fault codes are listed in Section 10 of this manual.

**Be sure to determine which malfunction lamp is illuminated before beginning the troubleshooting process.**

# TROUBLE SHOOTING FLOW CHART



# COMPRESSOR CODE 1

## Engine Speed Less Than 800 RPM

**Explanation:**

The WEDGE has received an engine speed less than 800 RPM for 30 seconds.

**Effect:**

Code 1 is a shutdown condition and will shutdown the machine.

## TROUBLESHOOTING STEPS

**Code 1**

Action	Result
Check engine fault codes for an engine shutdown. Check for engine fuel system restriction (filter).	

# COMPRESSOR CODE 2

## Engine Speed Greater Than 1900 RPM

**Explanation:**

The WEDGE has received an engine speed greater than 1900 RPM for 30 seconds.

**Effect:**

Code 2 is a shutdown condition and will shutdown the machine.

## TROUBLESHOOTING STEPS

**Code 2**

Action	Result
Check engine fault codes for an engine shutdown.	

# COMPRESSOR CODE 3

## Engine Crank Time Exceeded

**Explanation:**

The engine crank time has exceeded 15 seconds.

**Effect:**

Code 3 is a shutdown condition and will shutdown the machine.

## TROUBLESHOOTING STEPS

**Code 3**

Action	Result
Crank engine for less than 15 seconds.	

# COMPRESSOR CODE 5

## Engine Oil Temperature

**Explanation:**

The WEDGE has received an engine oil temperature greater than 252 Deg F

**Effect:**

Code 5 is an ALERT condition and will not halt machine operation.

## TROUBLESHOOTING STEPS

**Code 5**

<b>Action</b>	<b>Result</b>
<b>Step1:</b> Refer to the engine manufacturer's service manual for instructions.	

# COMPRESSOR CODE 6

## Engine Intake Manifold Temperature

**Explanation:**

The WEDGE has received an engine intake manifold temperature greater than 180 deg F.

**Effect:**

Code 6 is an ALERT condition and will not halt machine operation.

## TROUBLESHOOTING STEPS

### Code 6

<b>Action</b>	<b>Result</b>
<b>Step1:</b> Refer to the engine manufacturer's service manual for instructions.	

# COMPRESSOR CODE 8

## Water in Fuel

**Explanation:**

The WEDGE has received a water in fuel indication from the engine.

**Effect:**

Code 8 is an ALERT condition and will not halt machine operation.

## TROUBLESHOOTING STEPS

**Code 8**

<b>Action</b>	<b>Result</b>
<b>Step1:</b> Check the machine fuel system and engine fuel filters.	
<b>Step 2:</b> Refer to the engine manufacturer's service manual for instructions.	

# COMPRESSOR CODE 10

## Engine Not Responding To Throttle Command

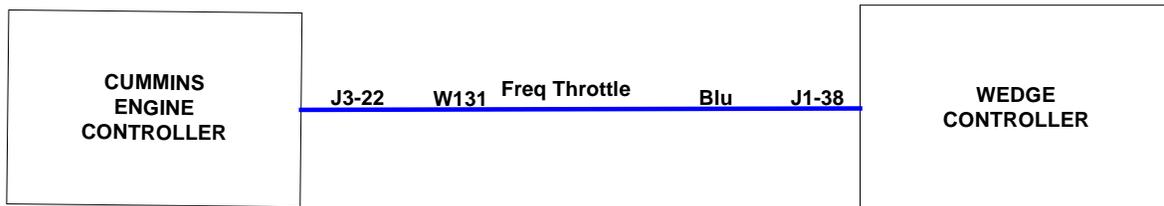
### Explanation:

The engine has not responded to a request from the WEDGE for engine speed change during engine start. This ALERT will only occur during the idle speed time, right after engine start.

### Effect:

Code 10 is an ALERT condition and will not shutdown the machine. The machine will not perform properly due to the low speed condition.

### Throttle Circuits:



## TROUBLESHOOTING STEPS

### Code 10

Action	Result
<b>Step 1:</b> Measure the throttle signal at the engine connector.	If signal not present, check wiring and verify throttle output at WEDGE.
<b>Step 2:</b> Engine may not be able to fuel properly due to restricted fuel filters	Replace fuel filter (s)
<b>Step 3:</b> Verify correct machine ID is installed.	
<b>Step 4:</b> Check connector pins at WEDGE controller and connector at engine controller for corrosion.	

# COMPRESSOR CODE 11

## Too Many Start Attempts During Auto Start

**Explanation:**

The WEDGE has made three attempts to start the machine as commanded by the Auto Start Stop controller. The machine failed to start.

**Effect:**

Code 11 is a SHUTDOWN condition and will shutdown the machine.

## TROUBLESHOOTING STEPS

### Code 11

Action	Result
<b>Step 1:</b> Check the machine fuel system and engine fuel filters.	
<b>Step 2:</b> Check the condition of the machine batteries.	
<b>Step 3:</b> Cycle machine power, activate the Auto Start input so the machine will make another start attempt. Machine will go through 3 crank cycles to attempt start before a Code 11 is issued.	

# COMPRESSOR CODE 29

## Engine shut itself down: reason unknown

**Explanation:**

The engine has shut down. The WEDGE did not shut down the engine.

**Effect:**

Code 29 is a SHUTDOWN condition and will shutdown the machine.

## TROUBLESHOOTING STEPS

### Code 29

Action	Result
<b>Step 1:</b> Check the machine fuel system and engine fuel filters. Check for loose fittings in the fuel piping that could allow air to be drawn into the fuel system.	
<b>Step 2:</b> Verify the throttle signal from the WEDGE is continuously supplied to the engine.	A quick drop in the throttle signal could cause the engine to stop
<b>Step 3:</b> Verify battery + and – connections to the engine controller, inspect harness connections and measure voltage drop at engine ECM.	
<b>Step 4:</b> In the case of the I-R (John Deere) engine, check the connections for the crank sensor which is mounted at the front of the engine. Loose pin connections in the connector will cause code 29.	

# COMPRESSOR CODE 31

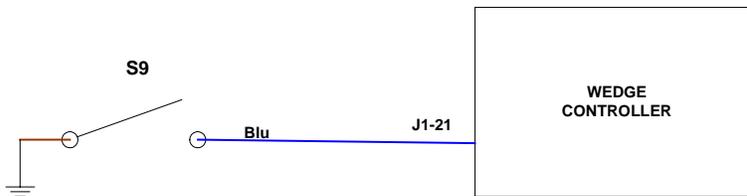
## Low Air End Oil Pressure

**Explanation:**

The WEDGE received a closed contact from pressure switch S9, located in the air end. This indicates a low oil pressure in the air end.

**Effect:**

Code 31 is a shutdown condition and will shutdown the machine. The cause of the low air end oil pressure must be repaired to continue machine operation.

**S9 Pressure Switch Circuit:****Circuit Description:**

Switch S9 is a 12 psi, normally open pressure switch. If the pressure falls below 12 psi, the switch will close, indicating to the WEDGE controller a low air end oil pressure.

**Component Location:**

S9 is located in the back of the air end.

## TROUBLESHOOTING STEPS

### Code 31

<b>Action</b>	<b>Result</b>
<b>Step1:</b> Check the air end oil pressure with a mechanical gauge.	If > 12 psi, replace S9  If not, there is a harness or WEDGE problem.

# COMPRESSOR CODE 32

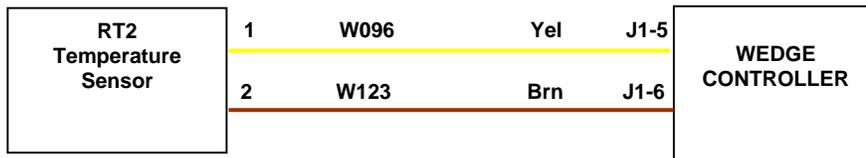
## RT2, Discharge Temperature Sensor Fault

**Explanation:**

The WEDGE has received an out of limits reading from the RT2 temperature sensor. This reading could be on the high or low end of the range. It is out of the normal range for temperature measurement.

**Effect:**

Code 32 is a shutdown condition and will shutdown the machine.

**RT2 Temperature Sensor Circuit:****Circuit Description:**

The thermistor temperature sensor connects to the WEDGE controller as shown in the schematic above. The temperature range of RT2 is -30 to 255 degrees F. The thermistor is a 10K ohm device.

**Component Location:**

RT2 thermistor is located in the airend discharge pipe.

## TROUBLESHOOTING STEPS

### Code 32

Action	Result
<b>Step1:</b> Substitute the thermistor simulator (I-R # 22073878) for RT2 Use the WEDGE service diagnostics to read the value for RT2 It should be approximately 32 degrees F.	Should read approx. 32 Deg F  If not, there is a harness or WEDGE problem.

# COMPRESSOR CODE 33

## PT1 Pressure Transducer Sensor Fault

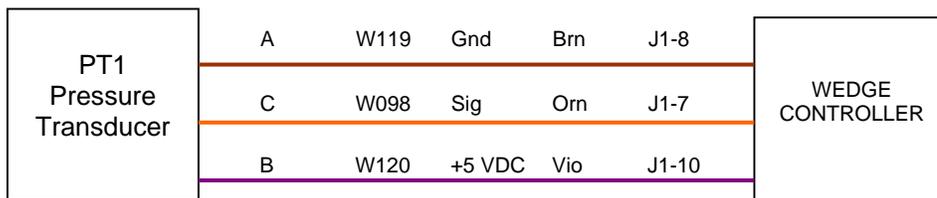
### Explanation:

The WEDGE has received an out of limits reading from the PT1 pressure transducer. This reading could be on the high or low end of the range. It is out of the normal range for pressure.

### Effect:

Code 33 is an ALERT condition and will not shutdown the machine. If the transducer is defective, the machine could shutdown due to an out of range pressure

### PT1 Pressure Transducer Circuit:



### Circuit Description:

The pressure transducer is a 3-wire device that connects to the WEDGE controller as shown in the schematic above. The violet wire (W120) is the 5 VDC excitation supply. This is spliced in the harness near the breakout for the harness branch that goes to the separator tank. The “sig” wire is the output signal that has a range of .45 to 4.5 volts DC. The pressure range of this transducer is 0 – 100 psig.

### Component Location:

PT1 pressure transducer is located in the top of the separator tank.

## TROUBLESHOOTING STEPS

### Code 33

<b>Action</b>	<b>Result</b>
<b>Step1:</b> Substitute the pressure transducer simulator (I-R # 22168868) for PT1. Use the WEDGE service diagnostics to read the value for PT1. It should be approximately 30 – 50 psi.	Should read 30 – 50 psi.  If not, there is a harness or WEDGE problem.

# COMPRESSOR CODE 34

## Separator Tank Pressure Greater Than 20 psi at Crank

**Explanation:**

The WEDGE has received a pressure from PT1 that is greater than 20 psi at the time of engine crank.

**Effect:**

Code 34 is a shutdown condition and will not allow the engine to crank. Once the separator tank bleeds down below 20 psi, engine crank will be allowed.

# COMPRESSOR CODE 35

## Machine Over Pressure Condition

**Explanation:**

The WEDGE has received a pressure from PT1 that is greater than 175 psi.

**Effect:**

Code 35 is a shutdown condition and will shutdown the machine. The separator tank high pressure has been exceeded.

## TROUBLESHOOTING STEPS

**Code 35**

Action	Result
Verify PT1 pressure transducer is reading correctly. The pressure simulator (PN 22168868) can be substituted for PT1. This will verify operation of harness and WEDGE controller. Using the simulator, PT1 on the WEDGE Diagnostics should read 30-50 psi.	

# COMPRESSOR CODE 36

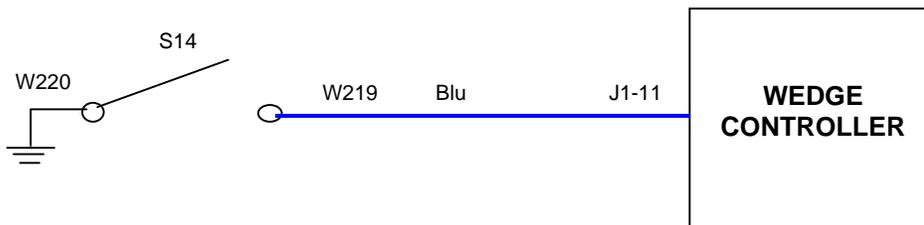
## Safety Valve Open

**Explanation:**

The WEDGE has received a switch closure from S14. This indicates the separator tank safety valve has opened.

**Effect:**

Code 36 is a shutdown condition and will shutdown the machine.

**S14 Pressure Switch Circuit:****Circuit Description:**

S14 is a normally open, 12 psi pressure switch. When the safety valve opens, S14's pressure is raised above 12 psi and the switch closes. This grounds the WEDGE input, indicating the safety valve has opened.

**Component Location:**

S14 is screwed into the outlet of the safety valve.

## TROUBLESHOOTING STEPS

### Code 36

<b>Action</b>	<b>Result</b>
Verify PT1 pressure transducer is reading correctly.	

# COMPRESSOR CODE 50

## Separator Tank Temperature

**Explanation:**

The WEDGE has received a separator tank temperature from RT1 that is greater than 247 degrees F.

**Effect:**

Code 50 is a shutdown condition and will shutdown the machine.

## TROUBLESHOOTING STEPS

### Code 50

Action	Result
<b>Step1:</b> Check for package air inlet restrictions.	
<b>Step 2:</b> Check for dirty or clogged coolers.	

# COMPRESSOR CODE 53

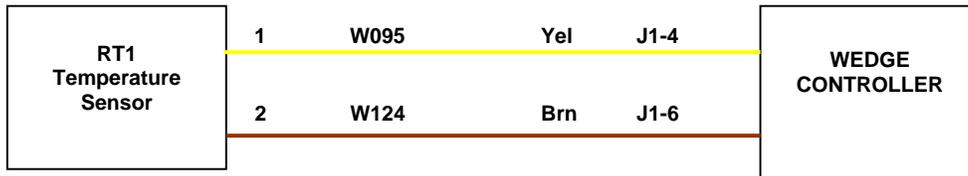
## RT1, Discharge Temperature Sensor Fault

**Explanation:**

The WEDGE has received an out of limits reading from the RT1 temperature sensor. This reading could be on the high or low end of the range. It is out of the normal range for temperature measurement.

**Effect:**

Code 53 is a shutdown condition and will shutdown the machine.

**RT1 Temperature Sensor Circuit:****Circuit Description:**

The thermistor temperature sensor connects to the WEDGE controller as shown in the schematic above. The temperature range of RT1 is -30 to 255 degrees F. The thermistor is a 10K ohm device.

**Component Location:**

RT1 thermistor is located in the side of the separator tank.

## TROUBLESHOOTING STEPS

### Code 53

Action	Result
<b>Step1:</b> Substitute the thermistor simulator (I-R # 22073878) for RT1 Use the WEDGE service diagnostics to read the value for RT1 It should be approximately 32 degrees F.	Should read approx. 32 Deg F  If not, there is a harness or WEDGE problem.

# COMPRESSOR CODE 54

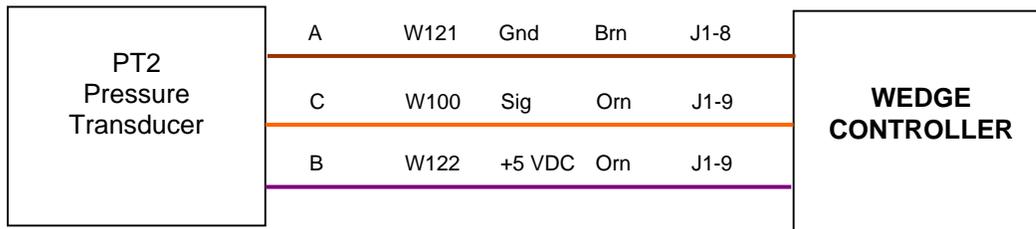
## PT2 Regulation System Sensor Fault

**Explanation:**

The WEDGE has received an out of limits reading from the PT2 pressure transducer. This reading could be on the high or low end of the range. It is out of the normal range for pressure.

**Effect:**

Code 54 is an ALERT condition and will not shutdown the machine.

**PT2 Pressure Transducer Circuit:****Circuit Description:**

The pressure transducer is a 3-wire device that connects to the WEDGE controller as shown in the schematic above. The violet wire (W122) is the 5 VDC excitation supply. This is spliced in the harness near the breakout for the harness branch that goes to the separator tank. The “sig” wire is the output signal that has a range of .45 to 4.5 volts DC. The pressure range of this transducer is 0 – 100 psig.

**Component Location:**

PT2 pressure transducer is located in the pneumatic circuit near the compressor inlet valve.

## TROUBLESHOOTING STEPS

### Code 54

<b>Action</b>	<b>Result</b>
<b>Step1:</b> Substitute the pressure transducer simulator (I-R # 22168868) for PT2. Use the WEDGE service diagnostics to read the value for PT2. It should be approximately 30 – 50 psi.	Should read 30 – 50 psi.  If not, there is a harness or WEDGE problem.

# COMPRESSOR CODE 55

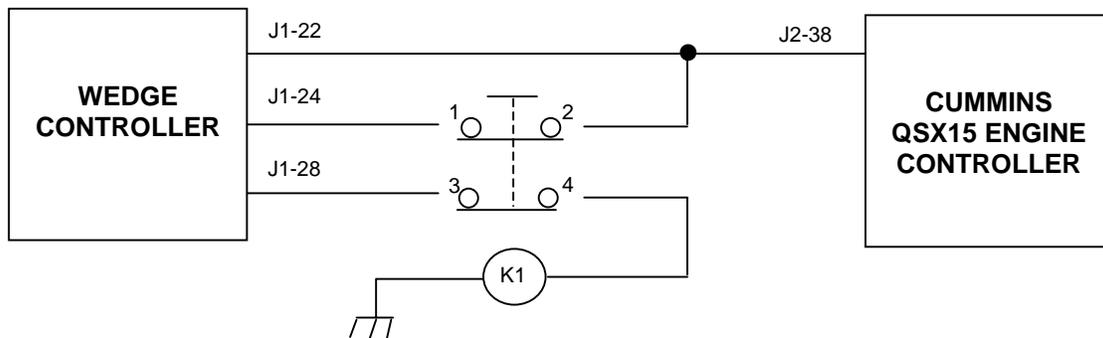
## Estop Button

**Explanation:**

The WEDGE has received an indication that the emergency stop button has been pressed.

**Effect:**

Code 55 is a shutdown condition and will shutdown the machine. If the machine is in the cranking mode when estop is pressed, the starter will be disengaged simultaneously with engine key switch signal turn off.

**Emergency Stop Button Circuit:**

### Circuit Description:

The estop button is in series with the engine key switch signal and the auxiliary start relay, K1. Pressing the button opens both of these circuits simultaneously. The WEDGE reads a sense input that is connected to the estop button to determine if the estop button is pressed.

### Component Location:

The estop button is located above the machine control panel on the front of the machine.

## TROUBLESHOOTING STEPS

### Code 55

<b>Action</b>	<b>Result</b>
<b>Step 1:</b> If the estop button is installed, determine if it is pressed.	Release the estop button to operate the machine.
<b>Step 2:</b> If the estop button is not installed, a jumper plug will be installed in the harness at the connection point for the estop button, P9.	Verify the jumper plug is functional
<b>Step 3:</b> Perform a continuity check of the harness wires from the WEDGE through the jumper plug to the engine connector.	

# COMPRESSOR CODE 56

## Minimum Pressure Not Met

**Explanation:**

The separator tank has not reached 50 psi within 20 seconds from time engine starts.

**Effect:**

Code 56 is an ALERT condition and will not halt machine operation.

## TROUBLESHOOTING STEPS

### Code 56

Action	Result
<b>Step1:</b> Check air piping system for restriction.	
<b>Step 2:</b> Verify engine speed has increased to 1800 rpm when Service Air switch is pressed.	

# COMPRESSOR CODE 70

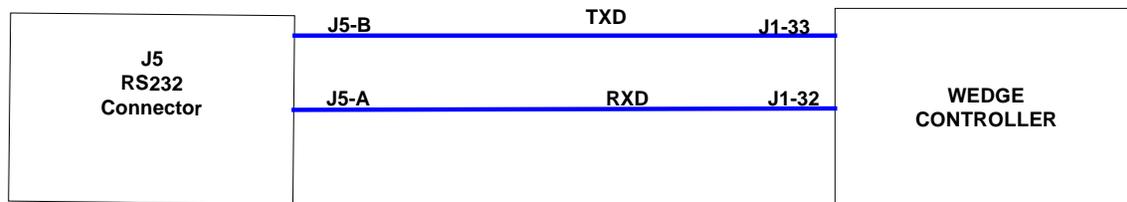
## Serial Communications

**Explanation:**

The WEDGE controller cannot communicate with an external computer over the RS232 serial link.

**Effect:**

This code can only occur when a laptop computer or PDA Service Tool is Connected to the WEDGE. The WEDGE may otherwise be functional and This event may not be mission disabling.

**RS232 Communications Circuit:****Circuit Description:**

The RS232 serial communications link is used for re-programming the WEDGE controller and is the communications port used with the PDA Service Tool. The J5 connector contains the RS232 port. It is normally located very close to the WEDGE. There are two signals associated with the RS232, TXD and RXD. TXD is the transmit signal and RXD is the received signal.

**Component Location:**

The J5 harness connector is located near the WEDGE controller.

## TROUBLESHOOTING STEPS

### Code 70

<b>Action</b>	<b>Result</b>
<b>Step1:</b> If the current RS232 device (laptop computer, etc.) will not communicate with the WEDGE, substitute another RS232 device. Note: The second device must have proper software loaded to communicate with the WEDGE.	If second device will not communicate with WEDGE, replace the WEDGE

# COMPRESSOR CODE 71

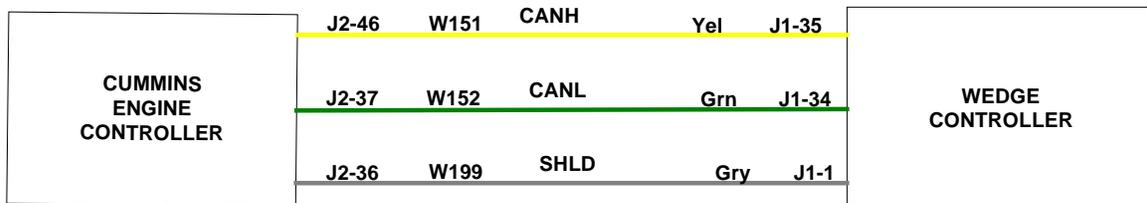
## CAN Communications

**Explanation:**

The WEDGE controller cannot communicate with the engine controller. The J1939 CAN (Controller Area Network) broadcast of engine parameters cannot be received.

**Effect:**

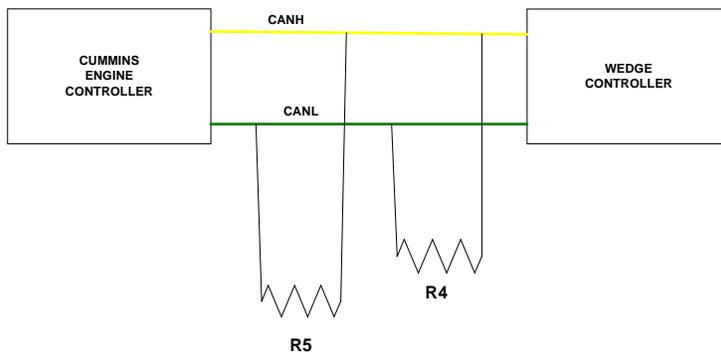
The WEDGE will not be able to display engine parameters using the diagnostic Display function. The compressor will continue to operate since Code 71 is an ALERT condition.

**CAN Communications Circuit:**

## Circuit Description:

The CANH, CANL and SHLD wires are a cable that is located in the main harness. CANH refers to CAN HI and CANL refers to CAN LO and SHLD is the shield of the CAN cable. This is the cable that carries the communications between the engine and WEDGE controller and any other devices that are connected to the CAN cable. This cable is also referred to as the CAN Network since it may have multiple devices connected to it.

The CAN network has two terminating resistors, one located near the engine controller and one near the WEDGE controller. The value of each of these resistors is 120 ohms. They are connected in parallel, as shown below, across the network. The resistors are mounted in a special Deutsch connector. One connector is tagged R4 and the other is tagged R5.



## Component Location:

The Cummins engine controller is located on the left side of the engine. Connector J2 is located on the left side of the controller and is the OEM connector. The machine harness (P2) plugs into the J2 connector.

The WEDGE controller is mounted to the machine control panel on the back side. Resistor R5 is stubbed out of the harness near the engine controller and resistor R4 is stubbed out of the harness near the WEDGE controller.

# TROUBLESHOOTING STEPS

## Code 71

Action	Result
<p><b>Step 1:</b></p> <p>Verify P1 harness connector pins 34, 35, and 1 are firmly seated into The connector at the WEDGE controller.</p>	
<p><b>Step 2:</b></p> <p>Verify P2 harness connector pins 37, 46, and 36 for Cummins engine are firmly seated into the connector at the engine electronic controller.</p>	
<p><b>Step 3:</b></p> <p>Setup the digital multimeter to read ohms. (Refer to the section in this manual on how to use the multimeter). Disconnect P1 harness connector from the WEDGE controller. If the engine is a Cummins, disconnect the P2 harness connector from the engine controller.</p> <p>Connect one of the multimeter test leads to P1-34 and the other test Lead to P1-35.</p>	<p>Meter should read approximately 60 ohms. If so, go to Step 5. If not, go to Step 4.</p>
<p><b>Step 4:</b></p> <p>If you did not get the results of Step 3, there is a problem with the wiring harness. This problem could be a defective splice, broken wire or defective wire connection at a pin. The CANH and CANL wires should be tested for continuity from P1 to P2. The resistor stub outs should be tested for continuity.</p>	<p>Make harness repairs as necessary.</p>
<p><b>Step 5:</b></p> <p>Setup the multimeter to read DC volts. (Refer to the section in this manual on how to use the multimeter). The harness should be connected to the engine controller and the WEDGE controller. Turn the machine power to the "ON" position, but do not start the engine. Using insulation piercing probes (I-R P/N 22216725), connect the red multimeter lead to P1-34 wire and connect the black multimeter lead to the battery negative post or one of the brown wires on the back of the control panel.</p>	

<p>Disconnect the test lead from P1-34 wire and connect to P1-35 wire.</p>	<p>Multimeter should read approximately 2.5 volts DC.</p> <p>Multimeter should read approximately 2.5 volts DC.</p> <p>If 2.5 volts cannot be read, replace WEDGE controller. If WEDGE controller is OK, harness should be checked as outlined in Step 4.</p>
--	---

# COMPRESSOR CODE 73

## Auto Start Stop Controller Communications Failure

**Explanation:**

The WEDGE has not been able to communicate with the Auto Start Stop controller for 17 seconds. A communications failure is determined.

**Effect:**

Code 73 is an ALERT condition and will not stop the machine. The Auto Start system may not function properly due to communications failure.

## TROUBLESHOOTING STEPS

### Code 73

Action	Result
<b>Step1:</b> If CAN communications is OK with the engine, check the CAN-power stub connection for the Auto Start module. If CAN with the engine is not working, check CAN wiring in harness.	
<b>Step 2:</b> Verify the Auto Start controller has power and ground.	
<b>Step 3:</b> Replace the Auto Start module.	

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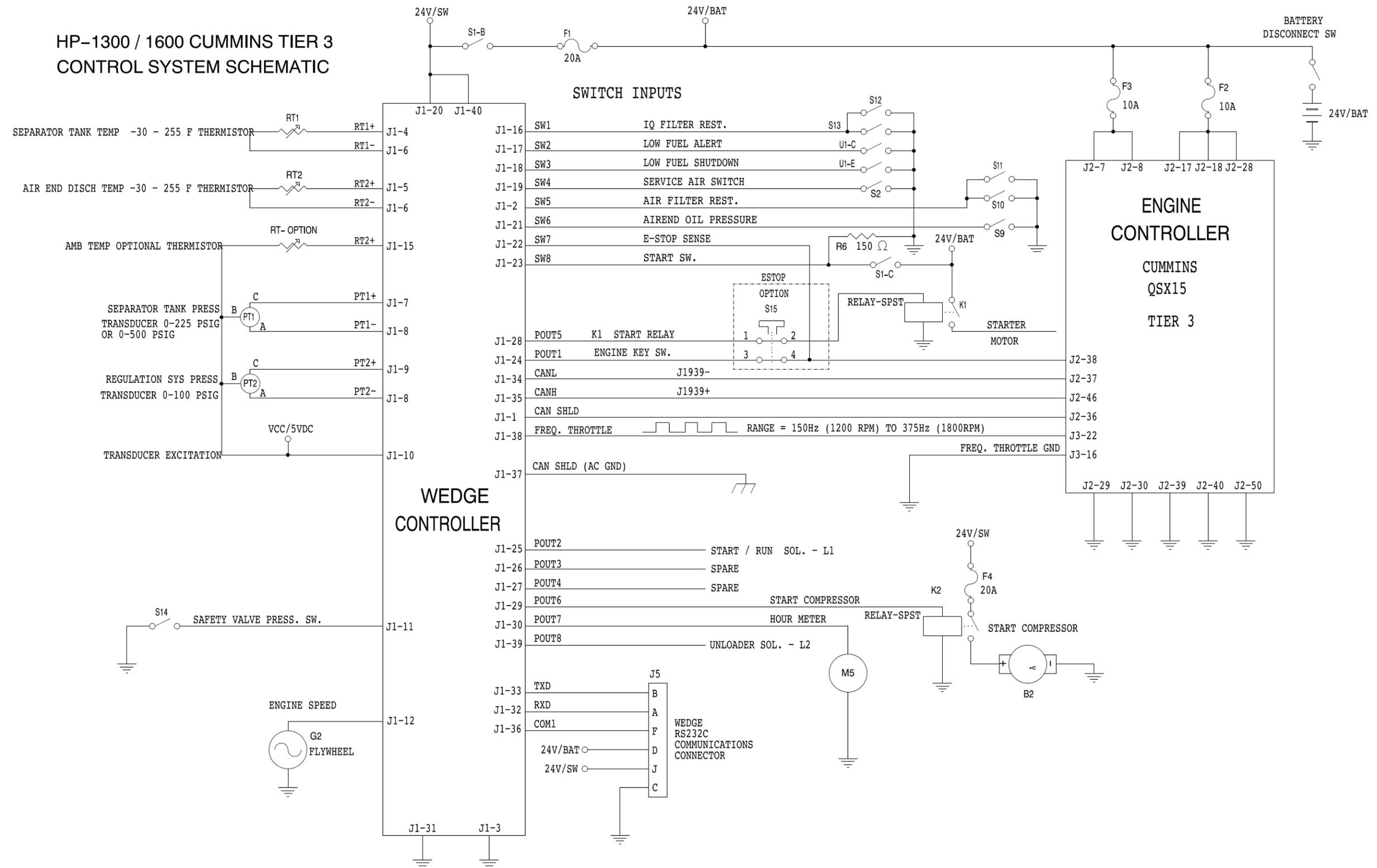
# **SECTION 5**

## **SYSTEM SCHEMATIC DIAGRAMS**



# Control System Wiring Diagram

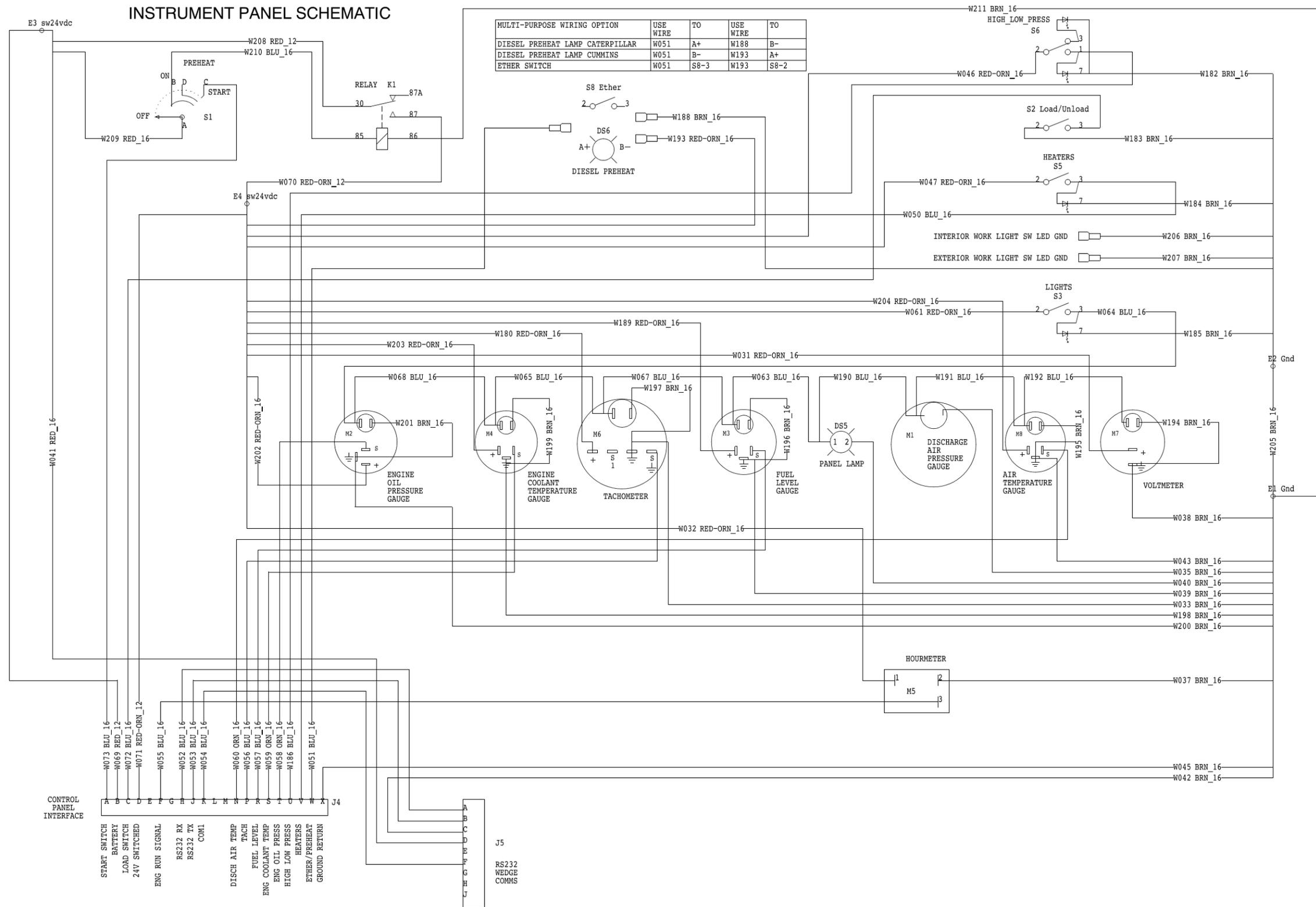
## HP-1300 / 1600 CUMMINS TIER 3 CONTROL SYSTEM SCHEMATIC



22742951\_071\_06/04\_A



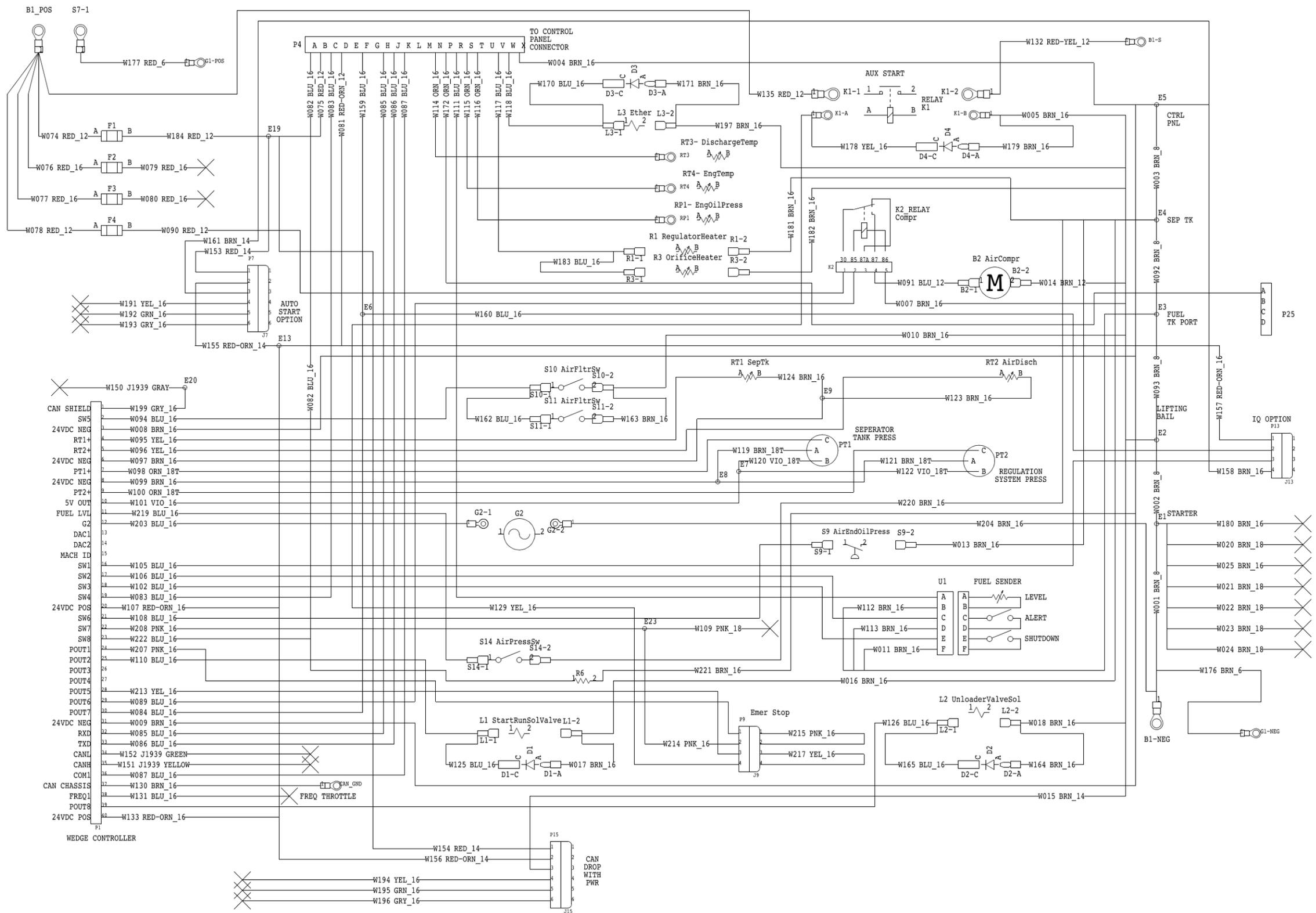
# Control System Wiring Diagram



22742951\_072\_06/04\_A



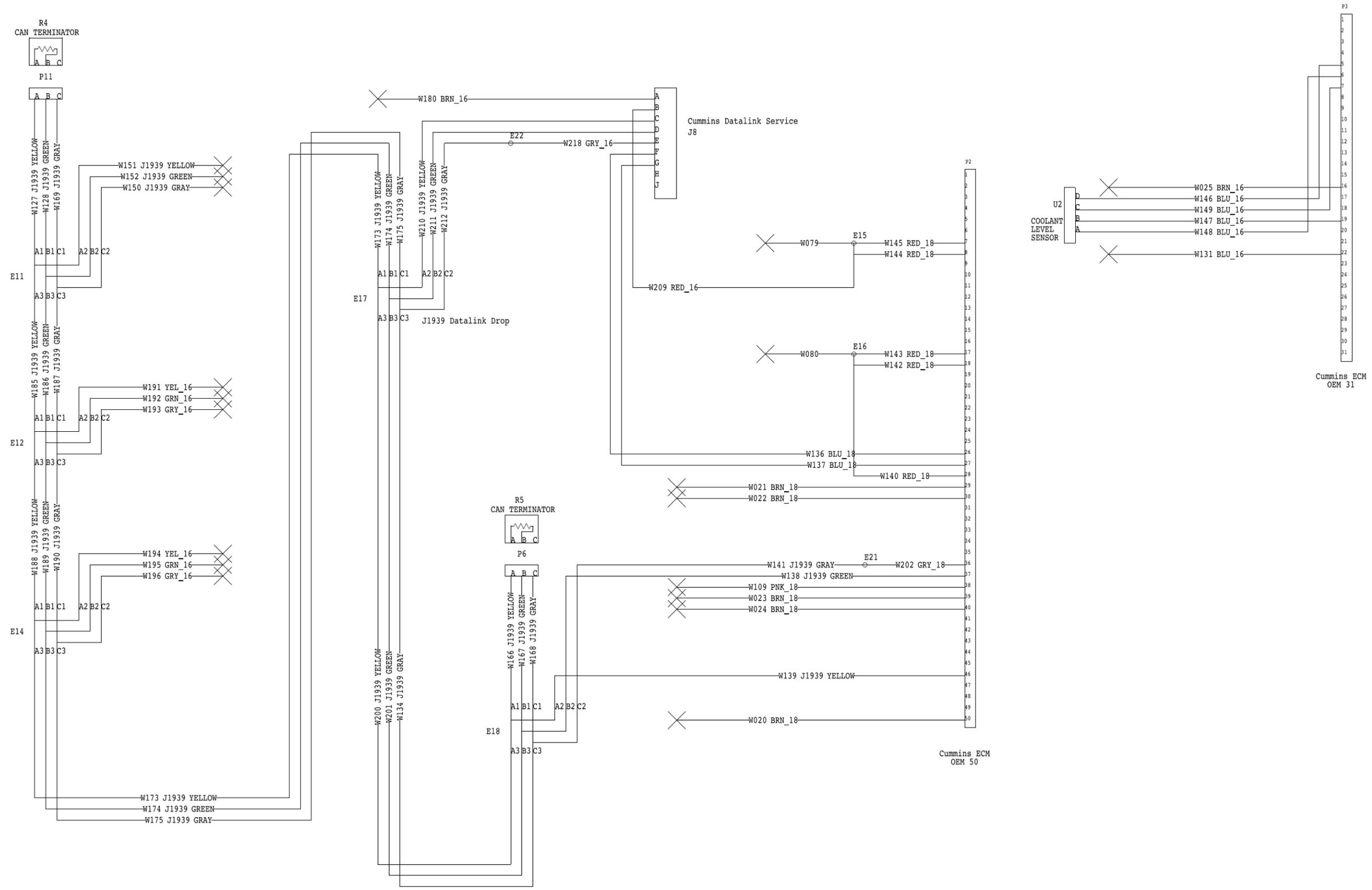
# Control System Wiring Diagram



22742951\_073\_06/04\_A



# Control System Wiring Diagram



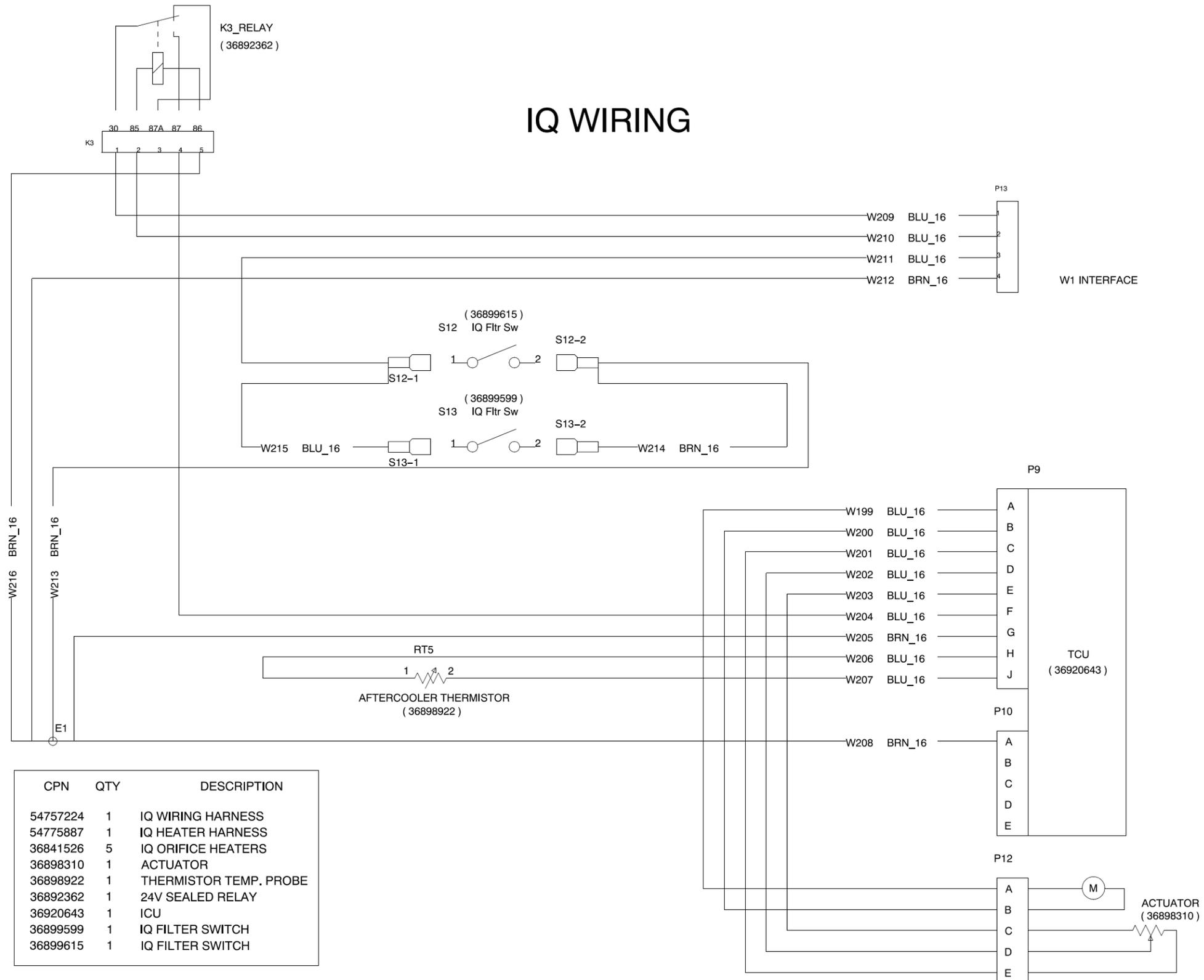
22742951\_074\_06/04\_A

22742951



# IQ Wiring Diagram

## IQ WIRING



CPN	QTY	DESCRIPTION
54757224	1	IQ WIRING HARNESS
54775887	1	IQ HEATER HARNESS
36841526	5	IQ ORIFICE HEATERS
36898310	1	ACTUATOR
36898922	1	THERMISTOR TEMP. PROBE
36892362	1	24V SEALED RELAY
36920643	1	ICU
36899599	1	IQ FILTER SWITCH
36899615	1	IQ FILTER SWITCH

22742951\_074\_06/04\_A

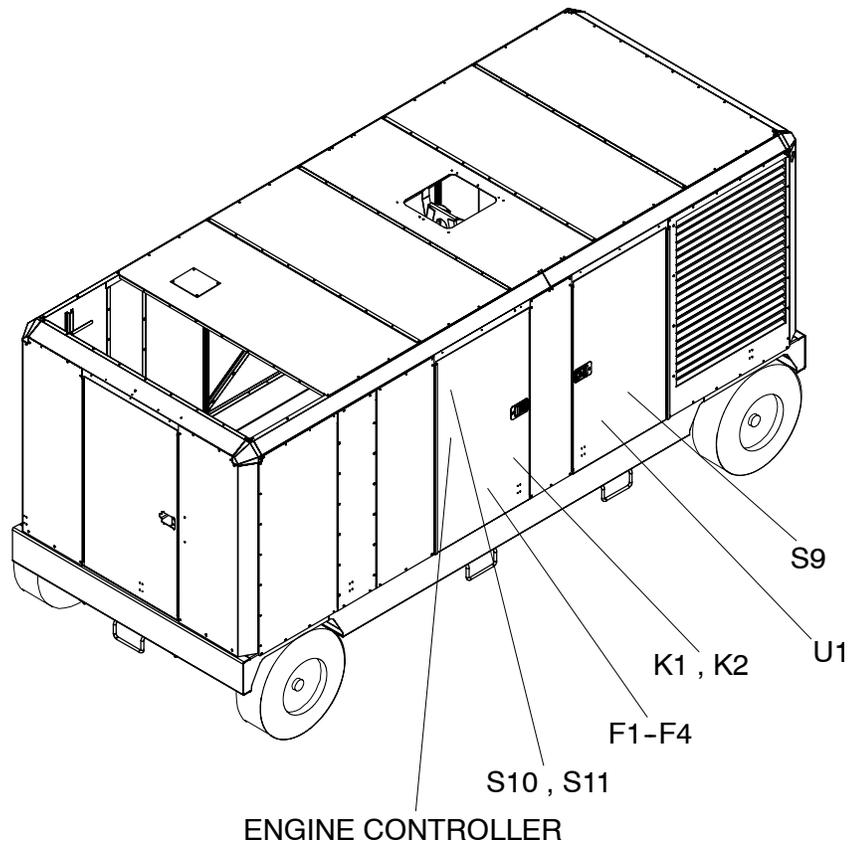
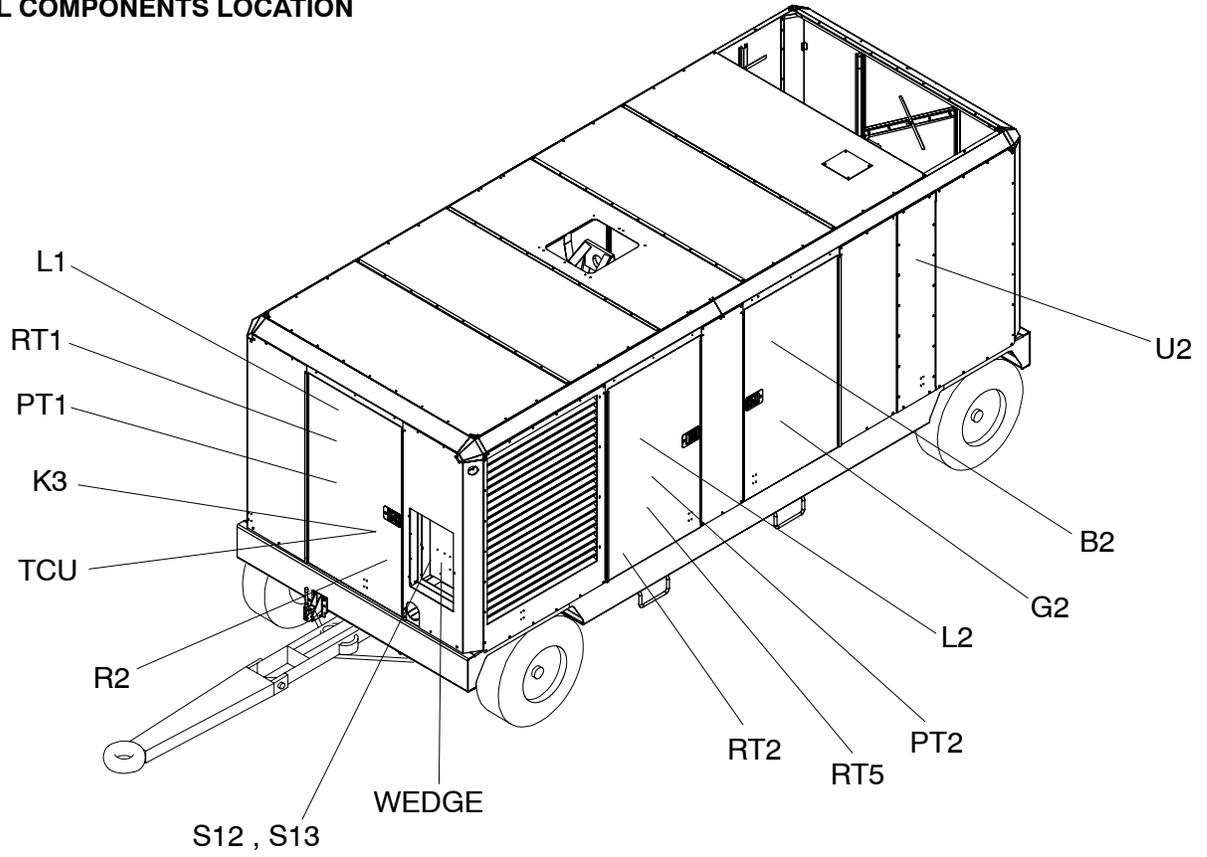


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## **SECTION 6**

# **ELECTRONIC COMPONENT LOCATION DRAWINGS**

**ELECTRICAL COMPONENTS LOCATION**



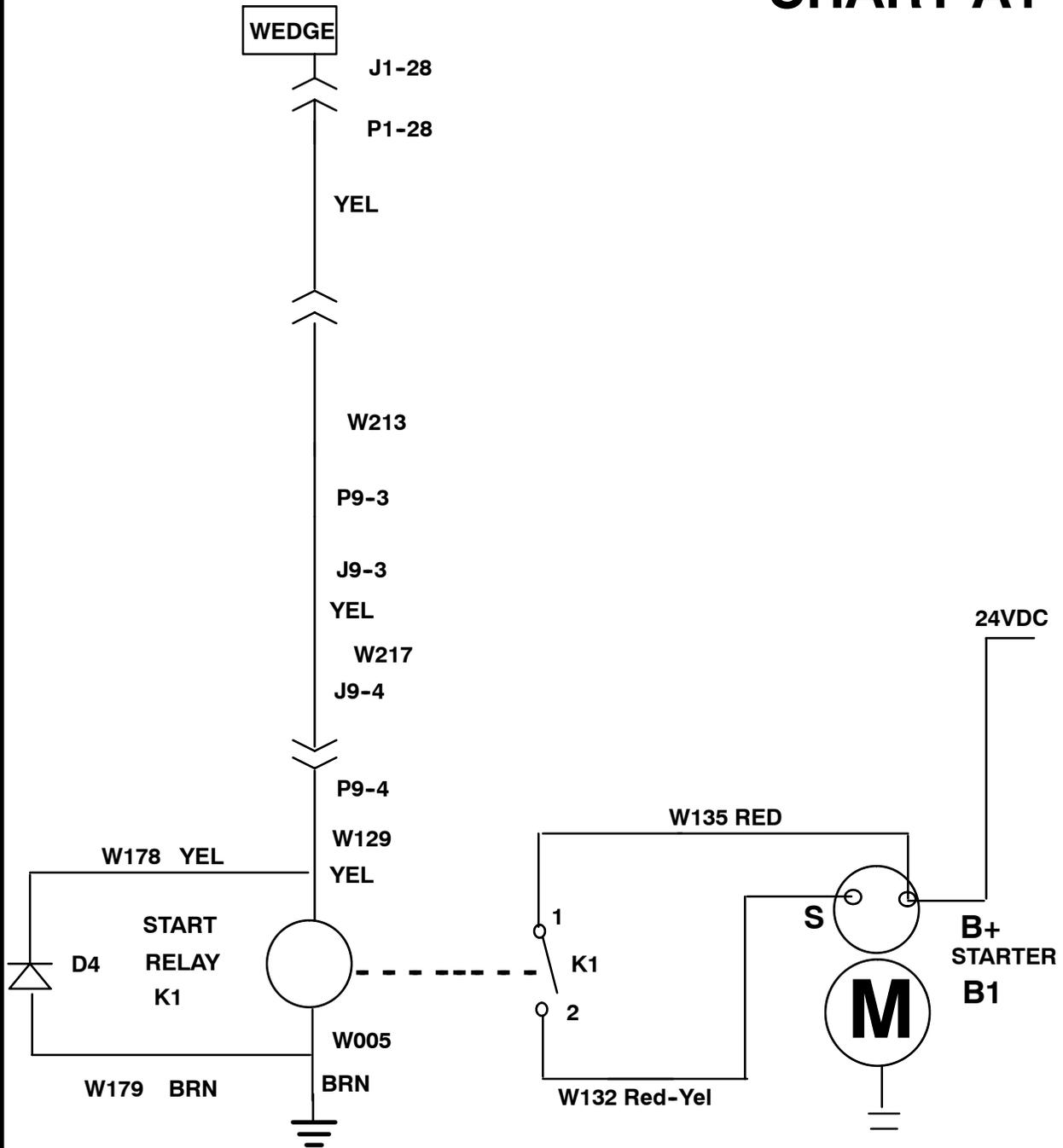
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## **SECTION 7**

# **INDIVIDUAL CIRCUIT DIAGRAMS**

# ENGINE START CIRCUIT

## CHART A1



V1.5

---

## **CIRCUIT DESCRIPTION**

**The WEDGE drives the engine starter through the auxiliary start relay, K1.**

**K1 is mounted on the lifting rail near the engine.**

**K1 has a single set of contacts that connect to the starter solenoid.**

**Diode D4 is for field suppression across K1's coil.**

**The control signal leaving the WEDGE on J1-28 passes through the W1 harness and through a jumper plug. The jumper plug is replaced with an ESTOP switch for ESA versions.**

## **CIRCUIT TROUBLESHOOTING**

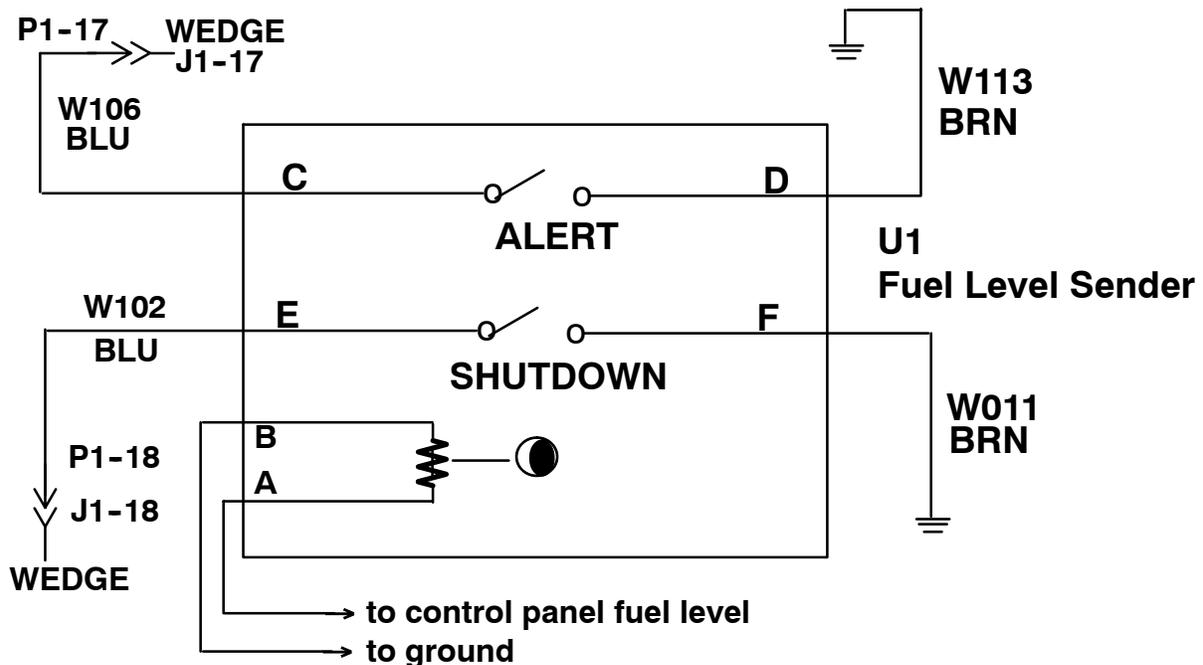
**If the starter will not engage during a crank cycle, check the voltage at the coil of K1 during the crank cycle. It should be 14-22VDC. If voltage is not at K1, check for voltage back through the ESTOP jumper and to the WEDGE.**

**If voltage is at K1 coil, verify voltage is sent to the starter solenoid by K1 contact.**

**Voltage available at the starter solenoid during a no-crank condition indicates a starter problem.**

# FUEL SENDER CIRCUIT

## CHART B1



### CIRCUIT DESCRIPTION

The fuel sender is a resistive device that provides a 10–180 ohm resistance to the fuel gauge indicating fuel level. It also contains two switches, one for low fuel level and another that will shutdown the machine when the fuel reaches this level. These two switch inputs connect to the WEDGE controller.

### CIRCUIT TROUBLESHOOTING

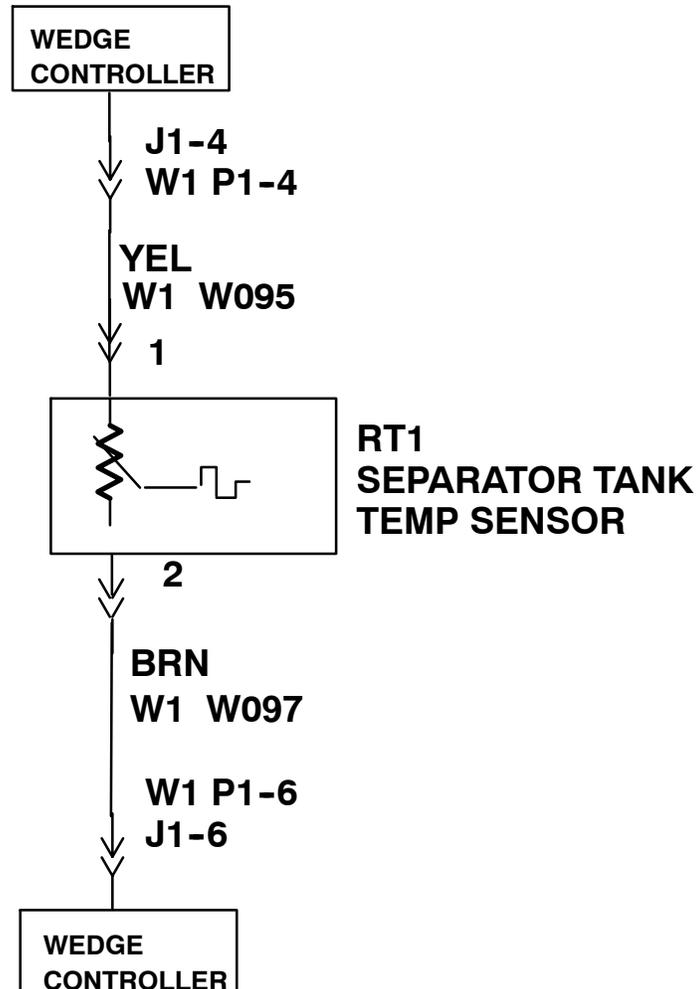
If the fuel reading appears incorrect, check the fuel level in the tanks to see if it corresponds with the gauge. If not, remove the fuel sender and disconnect the harness plug. Connect an ohmmeter across terminals A and B on the Packard Weather-Pack connector. Tilting the sender tube should produce resistance reading between 10 and 180 ohms. If not, replace the sender.

The two switches can be checked with the sender removed from the tank. Use an ohmmeter to verify switch operation. Tilting the sender tube back and forth should activate the switches.

# RT1 SEPARATOR TANK TEMPERATURE CIRCUIT

## CHART C1

Temp°C	Temp°F	Resistance (Ohms)
-20	-4	25,490
-10	14	18,088
-5	23	12,221
0	32	9,369
5	41	7,240
15	59	4,427
25	77	2,786
40	104	1460
60	140	668.7
70	158	467.2
90	194	241.0
100	212	177.5
105	221	153.1
110	230	132.8



### CIRCUIT DESCRIPTION

Separator tank temperature is read by RT1 thermistor. It is mounted in the side of the separator tank and connects to the W1 harness. The temperature range is -30 to 255°F.

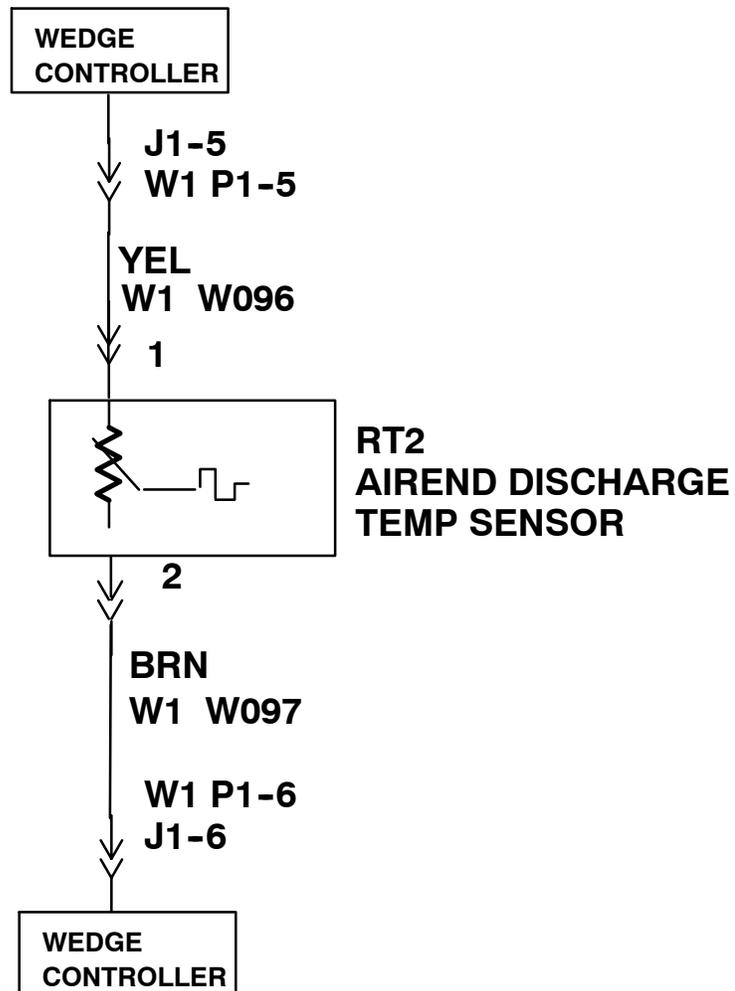
### CIRCUIT TROUBLESHOOTING

If the WEDGE Controller has an incorrect reading for the RT1 channel, disconnect the thermistor and install the Thermistor Simulator Plug (PN 22073878) into the harness connector. Read the channel again and it should read 32 degrees F  $\pm$  5 degrees (0C  $\pm$  3C). If the reading is correct, replace the thermistor. If not, disconnect the WEDGE Controller P1 connector. Connect an ohmmeter between pins P1-4 and P1-6. The ohmmeter should read 33.2K ohms  $\pm$  1%. If the reading is correct, replace the WEDGE Controller. If not, there is a problem with the W1 harness or the P1-4, P1-6 connector pins.

# RT2 AIREND DISCHARGE TEMP

## CHART D1

Temp°C	Temp°F	Resistance (Ohms)
-20	-4	25,490
-10	14	18,088
-5	23	12,221
0	32	9,369
5	41	7,240
15	59	4,427
25	77	2,786
40	104	1460
60	140	668.7
70	158	467.2
90	194	241.0
100	212	177.5
105	221	153.1
110	230	132.8



### CIRCUIT DESCRIPTION

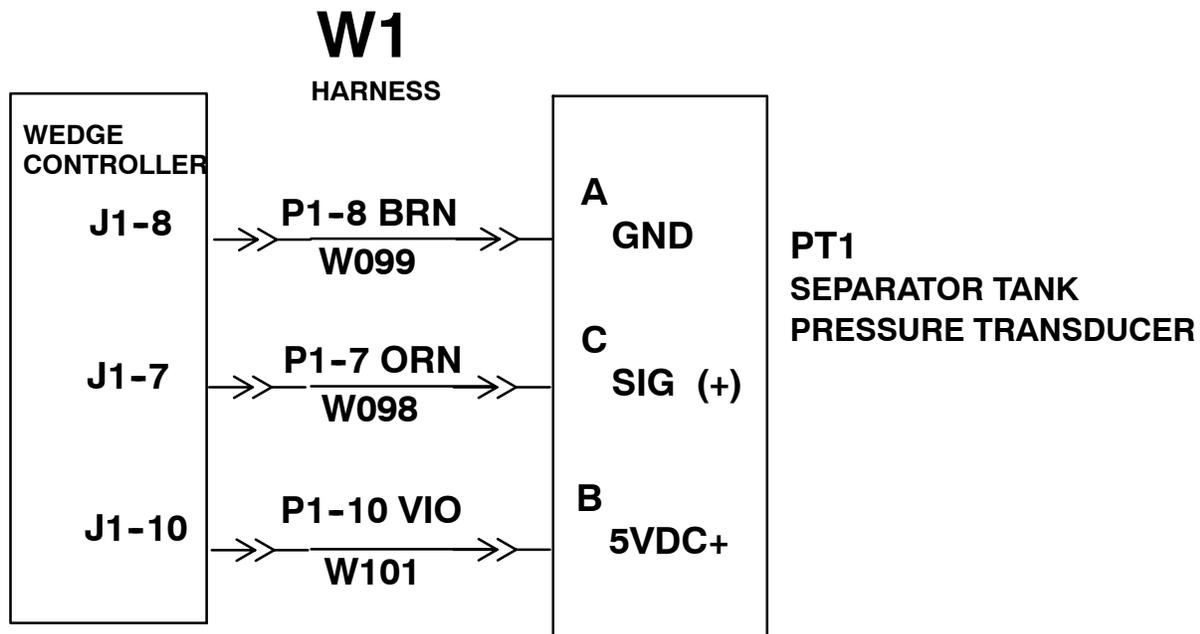
Airend discharge temperature is read by RT2 thermistor. It is mounted in the airend discharge piping and connects to the W1 harness. The temperature range is -30 to 255°F.

### CIRCUIT TROUBLESHOOTING

If the WEDGE Controller has an incorrect reading for the RT2 channel, disconnect the thermistor and install the Thermistor Simulator Plug (PN 22073878) into the harness connector. Read the channel again and it should read 32 degrees F  $\pm$  5 degrees (0C  $\pm$  3C). If the reading is correct, replace the thermistor. If not, disconnect the WEDGE Controller P1 connector. Connect an ohmmeter between pins P1-5 and P1-6. The ohmmeter should read 33.2K ohms  $\pm$  1%. If the reading is correct, replace the WEDGE Controller. If not, there is a problem with the W1 harness or the P1-5, P1-6 connector pins.

# PT1 SEPARATOR TANK PRESSURE CIRCUIT

## CHART E1



### CIRCUIT DESCRIPTION

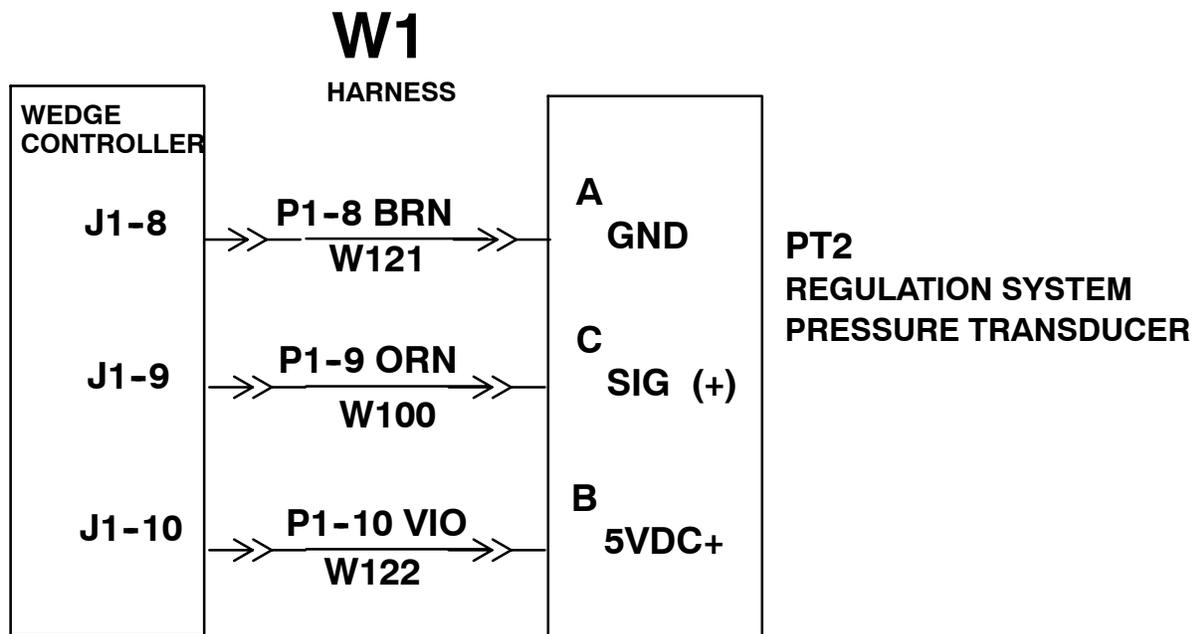
The WEDGE reads separator tank pressure from PT1. It is a gauge pressure transducer mounted on the separator tank. The WEDGE provides 5 VDC excitation voltage to pin B (+5) and pin A (GND). The pressure signal on pin C connects to the WEDGE input. The signal range is .45 to 4.5 volts. The transducer range is 0 to 225 psig.

### CIRCUIT TROUBLESHOOTING

To check the operation of PT1, connect a known correct gage in parallel with it. Compare readings and if PT1 does not track the test gage, replace it. This test should be performed from idle to loaded engine speeds. The test gauge used should be at least 1% accuracy to match the accuracy of PT1.

# PT2 REGULATION SYSTEM PRESSURE CIRCUIT

## CHART F1



### CIRCUIT DESCRIPTION

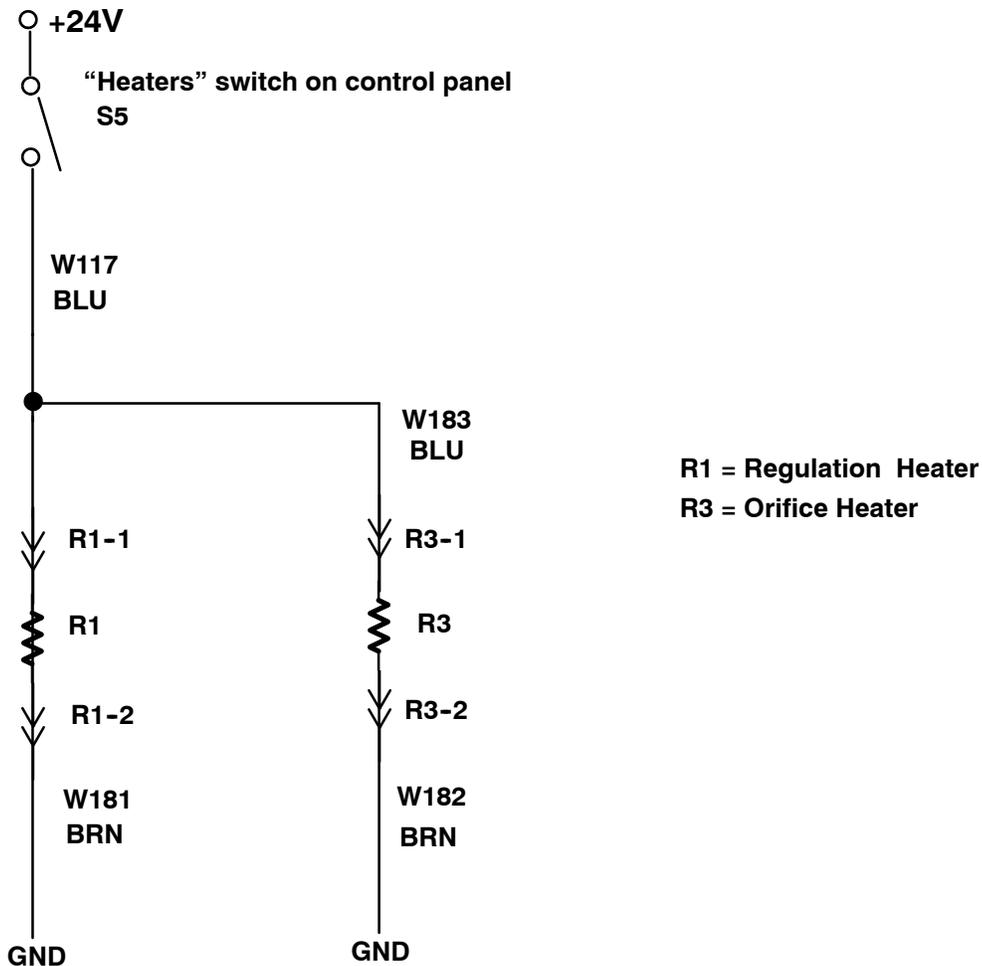
The WEDGE reads regulation system pressure from PT2. It is a gauge pressure transducer mounted near the inlet unloader. The WEDGE controller provides 5 VDC excitation voltage to pin B (+5) and pin A (GND). The pressure signal on pin C connects to the WEDGE input. The signal range is .45 to 4.5 volts. The transducer range is 0 to 100 psig.

### CIRCUIT TROUBLESHOOTING

To check the operation of PT2, connect a known correct gauge in parallel with it. Compare readings, and if PT2 does not track the test gauge, replace it. This test should be performed from idle to loaded engine speeds. The test gauge used should be of at least 1% accuracy to match the accuracy of PT2.

# DC HEATER CIRCUIT

## CHART G1

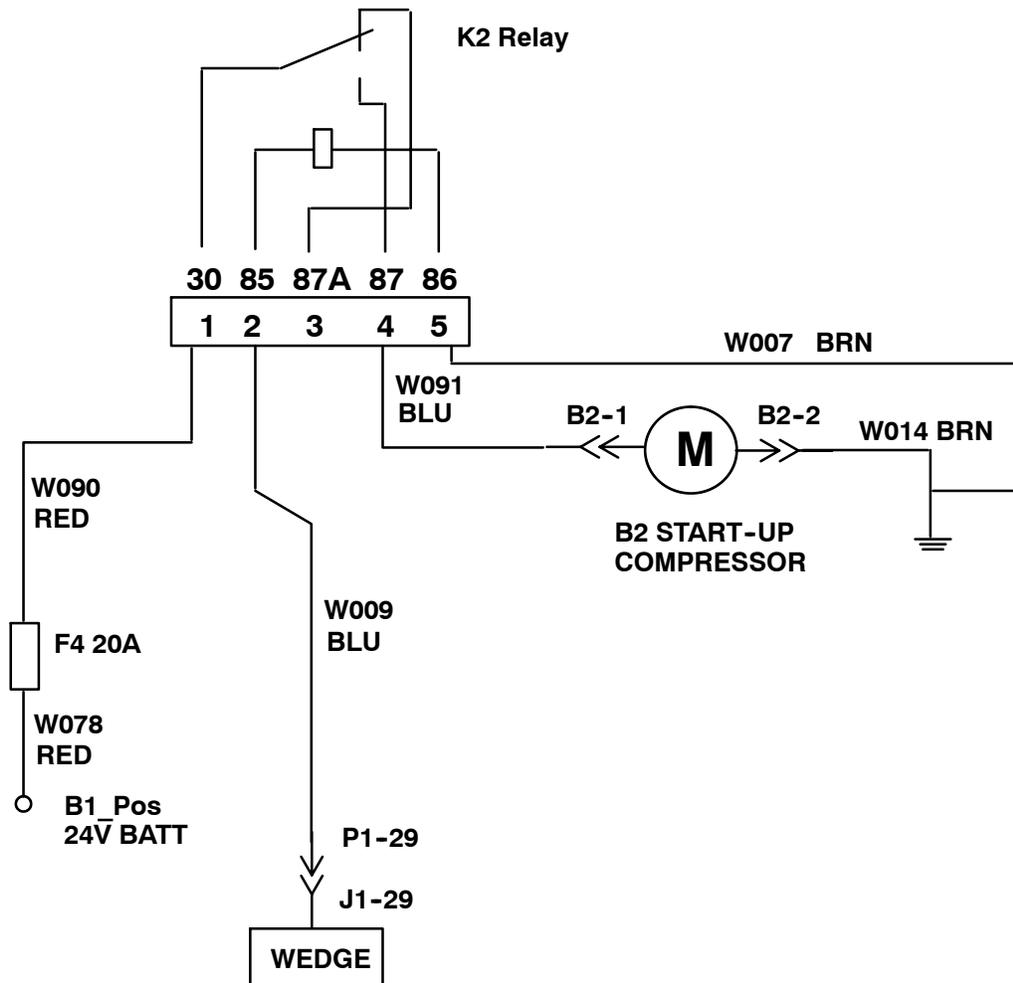


### CIRCUIT DESCRIPTION

A DC heater system is provided to prevent the orifices from freezing in cold temperatures. It is turned on by control panel switch, S5. Fuse F1, a 20 amp fuse, supplies power to the heaters.

# B2 STARTUP AIR COMPRESSOR

## CHART H1



### CIRCUIT DESCRIPTION

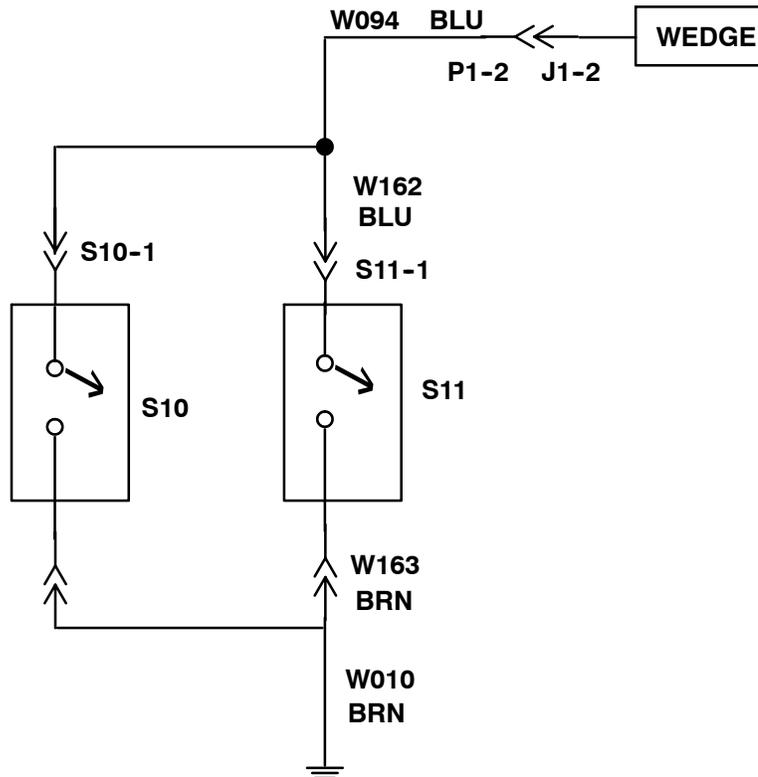
The WEDGE connects to the startup compressor through relay K2. The startup compressor is activated at engine crank to provide air to close the inlet valve to the aircend. The circuit is protected by a 20 amp fuse, F4. The K2 relay is activated by one of the high side driver outputs on the WEDGE controller, through P1-29.

### CIRCUIT TROUBLESHOOTING

The start compressor activate signal is turned on at engine crank for 10 seconds. At all other times it is off. First ensure the fuse F4 is not blown. Then verify the control signal from the WEDGE to the K2 relay is activated at engine crank. This can be measured at P1-29 at the WEDGE or at pin 2 (85) on K2 relay.

# S10, S11 AIR FILTER SWITCHES

## CHART I1



### CIRCUIT DESCRIPTION

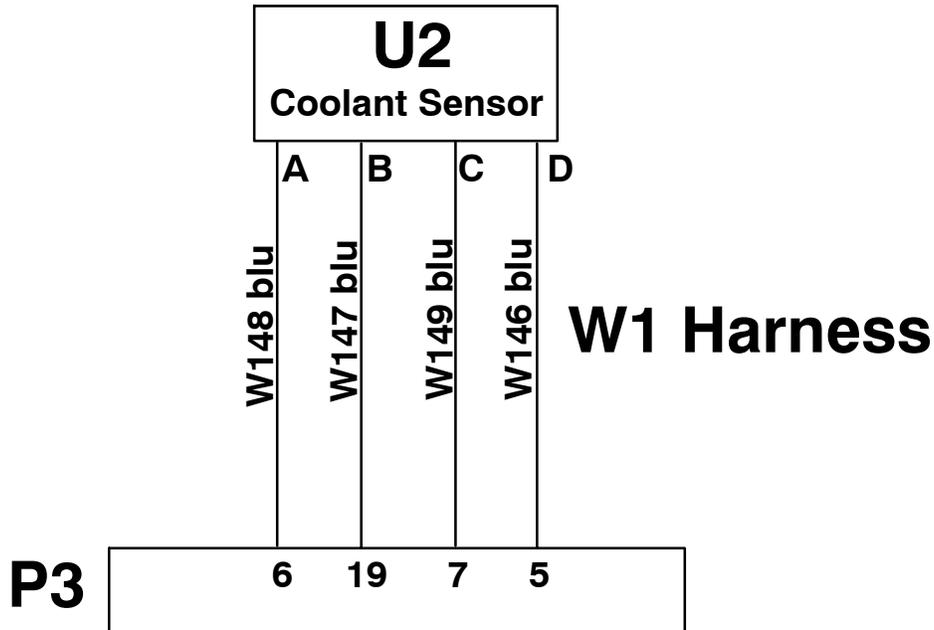
The WEDGE reads the air filter switches, S10 and S11. S10 is connected to the compressor air filter and S11 is connected to the engine air filter. These are normally open switches and close when the air filter restriction reaches 20 inches of water. The switches provide a ground connection to an opto coupler input on the WEDGE controller.

### CIRCUIT TROUBLESHOOTING

To verify the circuit operation, another type of switch can be substituted for the filter switch, or a wire jumper can be used to activate the circuit. Disconnect S10 and S11 and install the test switch or jumper. Closing the test switch or installing the jumper should activate the circuit, and the "Air Filter" alarm light on the control panel should light. Forcing the alarm lamp to turn on and off will verify proper circuit operation.

# U2 ENGINE COOLANT LEVEL SENSOR

## CHART K1



### CIRCUIT DESCRIPTION

The engine coolant level sensor is a capacitive probe mounted in the radiator top tank. The probe connects to the engine controller. The probe has two complementary outputs (when one is on, the other is off). The sensor is powered by a 5VDC supply from the engine controller. The sensor connects to the engine controller at the J3 connector, near the engine controller.

### CIRCUIT TROUBLESHOOTING

If the probe fails shorted, it can pull down the 5VDC supply and cause other sensors to not function properly. Generally, a engine fault code of 187 indicates a 5VDC power supply problem. If a sensor problem is suspected, check to see if engine fault codes have been set.

The probe can be tested, using a container of water. Pin C connects to +5VDC, Pin B to ground. Pins A and D are the two outputs. Using a container of water, they should operate as follows:

Pin	Out Of Water	In Water
A	5.0V	0V
D	0V	5.0 V

---

# **SECTION 8**

## **ELECTRICAL CONNECTOR INFORMATION**

## CONNECTOR PARTS INFORMATION

The following is a list of the connector parts used with the harnesses and devices on the HP1600/1300 machine. Most connectors consist of 1 to 4 items per side (harness or device). The devices can be located on the schematics and then referenced to this list. A connector repair kit, Part No. 54749635 containing terminals and housings, is available for repairs.

PART	Manufacturer	Part No.
<b>RT1, RT2</b>		
Plug, 2 Way	Packard	22869515
TPA, 2 Way	Packard	22969523
Seal, Cable	Packard	54750567
Contact, Female	Packard	22869531
<b>PT1,PT2</b>		
Plug, 3 Way	Packard	22869499
TPA, 3 Way	Packard	22869754
Seal, Cable	Packard	22869762
Contact, Female; 18AWG	Packard	22869507
<b>U1, Fuel Level</b>		
Plug, 6 Way	Packard	22869416
Seal, Cable	Packard	54750567
Contact, Female	Packard	54750526
<b>P1, Wedge Controller</b>		
Plug, 40 Way	Deutsch	22868939
Socket, 16 AWG, Tin Stamp	Deutsch	22869044
Socket, 16 AWG, Gold Stamp	Deutsch	22869069
Socket, 14 AWG, Tin Stamp	Deutsch	22868947
<b>P4, Control Panel</b>		
Plug, 21 Way	Deutsch	22868962
Backshell	Deutsch	22870034
Seal Cavity, 12-16 AWG	Deutsch	22868954
Socket, 12 AWG, Tin Stamp	Deutsch	54699525
Socket, 16 AWG, Tin Stamp	Deutsch	22869044
<b>U2, Coolant Level Sensor</b>		
Plug, 4 Way	Packard	54750658
TPA, 4 Way	Packard	22869473
Seal, Cable	Packard	54750682
Plug, Sealing	Packard	22869465
Contact, Female	Packard	54750674

<b>PART</b>	<b>Manufacturer</b>	<b>Part No.</b>
<b>P2, Cummins ECM</b>		
Plug, 50 Way	Deutsch	22869580
Seal, Cavity, Size 20	Deutsch	22870018
Socket, Size 20	Deutsch	54699608
Back Shell, 50 Way	Deutsch	22870018
<b>P3, ECM</b>		
Plug, 31 Way	Deutsch	22871867
Back Shell	Deutsch	22870034
Socket, 16 AWG, Tin Stamp	Deutsch	22869044
Seal, Cavity 12-16 AWG	Deutsch	22868954
<b>K2, Relay Compressor</b>		
Connector, Relay, 4 Way	Packard	22869440
Terminal, Female 12-10 AWG	Packard	22869432
Terminal, Female 16-14 AWG	Packard	22869424
<b>P25</b>		
Connector, 4 Way	Packard	22880918
TPA, 4 Way	Packard	22870083
Seal, Cavity	Packard	22869465
Contact	Packard	54750674
<b>P7, Auto Start Option; P15, Can Drop W/PWR</b>		
Plug, 6 Way	Deutsch	22868988
Wedge Lock, 6 Way	Deutsch	22868996
Socket, Size 14, Tin Stamp	Deutsch	22868947
Socket, Size 16, Gold Stamp	Deutsch	22969069
Socket, Size 16, Tin Stamp	Deutsch	22869044
<b>P13, IQ Option; P9, Emergency Stop Option</b>		
Plug, 4 Way	Deutsch	22869002
Wedge Lock, 3 Way	Deutsch	22869028
Socket, Size 16, Tin Stamp	Deutsch	22869044
Socket, Size 16, Gold Stamp	Deutsch	22869069
<b>P6, P11; Can Buss</b>		
Plug, 3 Way	Deutsch	22869150
Wedge Lock, 3 Way	Deutsch	22870000
Socket, Size 16, Gold Stamp	Deutsch	22869069
<b>R4, R5; Can Terminator</b>		
Resistor Plug Assembly	Deutsch	54750633
<b>J8 Data Link Service</b>		
Receptacle, 9 Way	Deutsch	22869994
Cap, Dust, w/Lanyard	Deutsch	22869085
Pin, Size 16, Gold Stamp	Deutsch	22869093

<b>J9</b>		
Receptacle, 4 Way	Deutsch	22869036
Wedge Lock, 4 Way, Pin	Deutsch	22880876
Pin, Size 16, Gold Stamp	Deutsch	22869093
<b>F1, F4; Fuse Connectors</b>		
Connector, 2 Way; Fuse	Packard	22871677
Cover, Fuse	Packard	22861735
Terminal, Female; 12-10 AWG	Packard	22869432
<b>F2, F3; Fuse Connectors</b>		
Connector, 2 Way; Fuse	Packard	22871685
Cover, Fuse	Packard	22871735
Terminal, Female; 12-10 AWG	Packard	22868432
<b>D1-D4; Diodes</b>		
Diode, Molded M/F	Portable Power	35376169
Connector, Over Mold; M/F	Portable Power	36882694
Shur RCPT .180 dia.	AMP	22869606
Shur Plug .180 dia.	AMP	22869598
<b>M2, M3, M4, M7, M8 Control Panel</b>		
Housing, Connector; 3 Way	Siemens VDO	22972089
Pin, Connector, 14-18 AWG	AMP	22872097
<b>S1-Key Switch</b>		
Plug, 4 Way	Packard	22871966
TPA, 4 Way	Packard	22971974
Terminal, Female	Packard	22871982
<b>J5, Wedge Comms</b>		
Terminal, Male, 16 AWG	Deutsch	22880405
Seal, Cavity 12-16 AWG	Deutsch	22868954
Receptacle, sq. Flange 9 Way	Deutsch	22871875
Cap, Dust w/Lanyard	Deutsch	22869085
<b>J4, Control Panel Interface</b>		
Connector, Receptacle, 21 pin	Deutsch	22880439
Seal, Cavity 12-16 AWG	Deutsch	22868954
Terminal, Male 16 AWG	Deutsch	22880405
Terminal, Male 12 AWG		22880413
<b>K4, Relay - Control Panel</b>		
Connector, Relay, 4 Way	Packard	22869440
Terminal, Female 16-14 AWG	Packard	22869424
Terminal, Female 12-10 AWG	Packard	22869432

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## Removal Tool Usage

TERMINAL P/N	Manufacturer	Removal Tool P/N
54699525	Deutsch	54699624
22869044	Deutsch	54699632
22869069	Deutsch	54699632
22868947	Deutsch	54699624
22869093	Deutsch	54699632
22880405	Deutsch	54699632
22880413	Deutsch	54699624
54699608	Deutsch	54699640
22880710	Deutsch	54699624
22869531	Packard	54749643
22869507	Packard	54749643
54750526	Packard	54749643
54750674	Packard	54749643
22869044	Packard	54749643
22869432	Packard	54749643
22869424	Packard	54749643
22871982	Packard	54749643

<p><b>Deutsch DT Series Connector</b> (Note the orange wedgelock)</p>	
<p><b>Packard Metri Pack Series Connector</b> (Note the green wire seals and blue Terminal Position Assurance Connection)</p>	
<p><b>Deutsch HD Series Connector</b></p>	
<p><b>Deutsch DRC Series Connector</b></p> <p>It is very important that connectors be properly assembled. Use of the correct pin crimp tool is required to ensure high quality terminations. The manufacturer's instructions must be followed as to selection and use of crimp tools. Improper crimps not only provide unreliable connections but can damage the connector housing.</p> <p>Troubleshooting Harnesses - For extensive harness troubleshooting, a detailed schematic will be required. Splice location details can be very useful since problems do occur at splices.</p> <p>The proper test adapters are recommended for harness troubleshooting. Some examples of these are shown in Section 2 concerning multimeters. Use of these adapters will prevent harness damage during testing.</p> <p>The first item to perform during harness troubleshooting is a physical inspection of the harness for damage. Look for cut or frayed conductors, melted insulation and conductors pulled from connectors.</p> <p>The next item to check is connector pin seating. Ensure the connector pins in the circuit under test are properly seated in the connector housing. A tug on the wire should confirm this.</p> <p>If the harness is not physically damaged and all connector pins are seated, perform a continuity check of the circuit conductors. The ohmmeter function of the multimeter can be used for this test.</p>	 <p>Check to ensure there are not any ground faults or conductor shorts to ground.</p> <p>Finally, measure the signals on the circuit under test. Start at the point of origin of the signal and verify at as many points along the harness as possible, ending at the termination point.</p>

### Use of Harness Tools

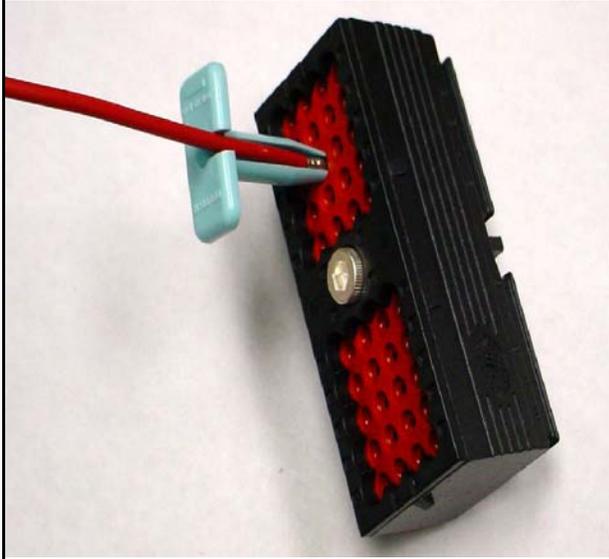
These pictures describe the proper methods of use of harness tools.

Proper removal tool usage is shown in the above picture. The removal tools are color coded as to wire size. The Table below lists the colors and wire sizes.

#### Removal

<b>Tool Color</b>	<b>Wire Size</b>	<b>P/N</b>
Red	20-24	54699640
Blue	16-18	54699632
Yellow	12-15	54699624
Green	8-10	54699616

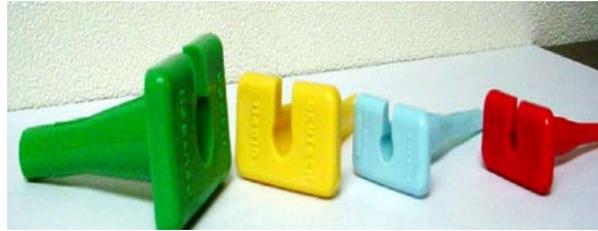
The wire is placed into the slot on the removal tool and the tool is slid along the wire inserted into the back of the connector. Gently pull on the wire as the tool is pushed into the connector. The pin should release from the connector. To insert a pin, push it into the connector until it locks.



### Removal Tools

This picture shows the various removal tools for the Deutsch connectors.

The following two pages will show how the Deutsch crimp tools are to be used. One is used for machined contacts and the other for stamped and formed contacts.



## ASSEMBLY INSTRUCTIONS



1. Cycle the hand tool to the open position.



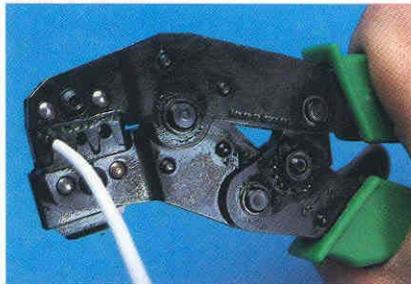
2. While pressing upward on the locator spring, insert the contact with the tails upward completely into the locator.



3. When correctly positioned, the contact should be located beyond flush with the edge of the hand tool and positioned on the concave polished split level crimp areas.



4. Partially (usually the first click) cycle the hand tool assuring that the upward thrusting tails of the contact has started engaging with the top jaw of the tool. (There is a slight tendency for the contact to roll out of vertical alignment.)



5. Insert the prestripped wire into the crimp area of the contact and completely cycle the tool.

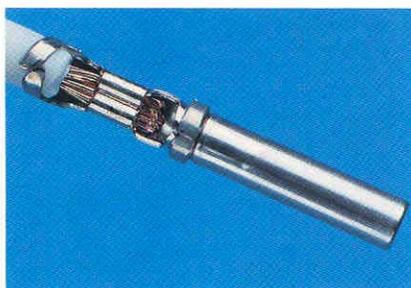
**Recommended strip length**  
 $.175 \pm .025$ .



6. While pressing upward on the locator spring withdraw the crimped termination.



7. The result will be a perfect termination.

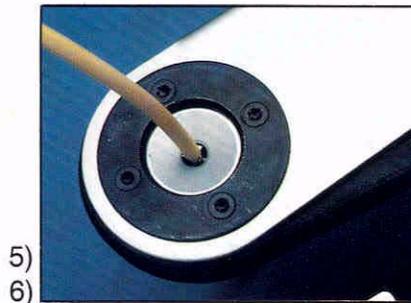
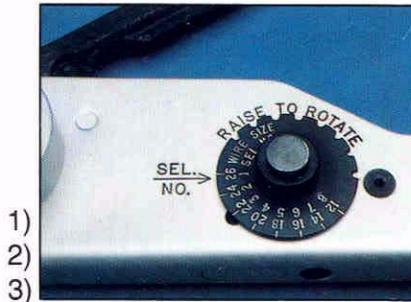


8. Note that there are no unterminated wire strands, and that some strand ends can be seen at the forward edge of the crimp. Also note the insulation is gripped by the smaller secondary crimp. Distortion is at a minimum.

## Crimping Procedure (HDT-48-00)

- 1) Strip (see recommended strip lengths) insulation from wire.
- 2) Raise selector knob and rotate until arrow is aligned with wire size to be crimped.
- 3) Loosen lock nut, turn adjusting screw in until it stops.
- 4) Insert contact, turn adjusting screw counter clockwise out until contact is flush with indenter cover. Tighten lock nut.
- 5) Insert wire in contact, contact must be centered between indicators, close handles until handle contacts the stop.
- 6) Release handles and remove crimped contact.
- 7) Inspect terminal to insure that all strands are in crimp barrel.

**NOTE:** Tool must be readjusted for each type/size of contact.



## Wire Termination

### Do's and Don'ts

#### Do's

- ✓ Check strip lengths.
- ✓ Protect wire strands.
- ✓ Gauge the crimp indenters.
- ✓ Check crimp selector for correct wire size settings.
- ✓ Check air pressure on semi- and automatic crimp equipment.
- ✓ Tensile pull test.
- ✓ Specify Deutsch manufactured terminals.
- ✓ Check crimp locations.

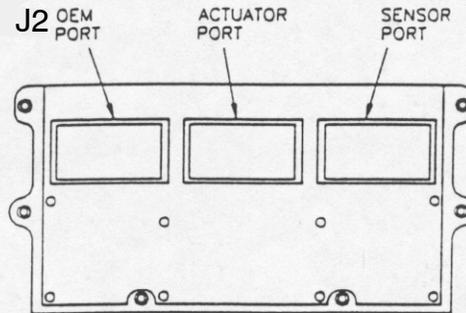
#### Don'ts

- ✓ Add solder.
- ✓ Apply heat.
- ✓ Leave exposed conductor wire strands.
- ✓ Overcrimp.
- ✓ Rely on T-Dim measurements only.
- ✓ Use "Field-Maintenance" crimp tools for volume production.
- ✓ Buy bogus terminals.

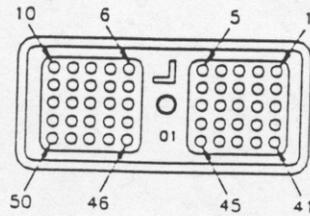


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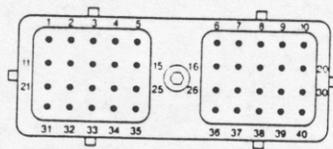
Engine electronic controller connector (J2) location:



**OEM port connector (P2) pinout viewed from connector mating face (opposite wire side)**



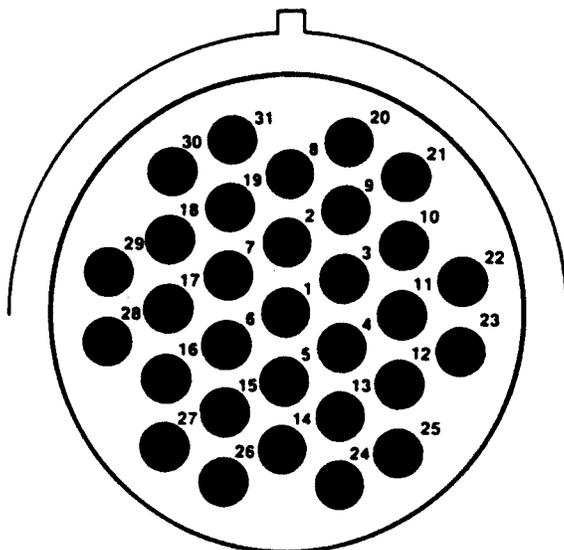
**WEDGE connector (P1) pinout from connector back side (wire side)**



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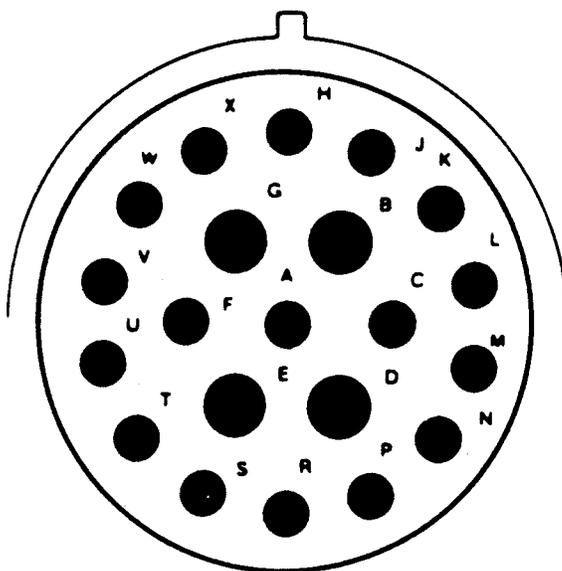
Circular Connector P3, located under the engine controller ECM

**VIEW FROM WIRE ENTRY SIDE**



Circular Connector P4, located in the back of the control panel box

**VIEW FROM WIRE ENTRY SIDE**

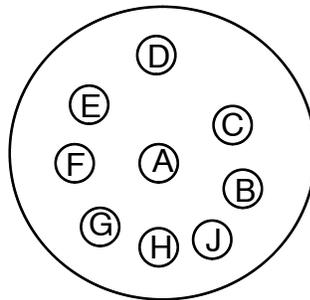


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Circular connectors J5 and J8 pinout. J5 is located on the back of the control panel and J8 is located near the engine controller.

The pinout on these connectors is the same, however, they are keyed differently.

## View from front side – non wire side



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## **SECTION 9**

# **ELECTRICAL PARTS LIST**

## ELECTRICAL PARTS LIST

Ref Designator	Description	Part Number
	IQ Wiring Harness	54757224
U2	Coolant Level Switch	54474572
	Battery Disconnect Switch	36896975
PT1	0-225 psi pressure transducer	54496973
PT2	0-100 psi Pressure Transducer	36920825
K2	Relay, 24VDC SPDT	36892362
G2	Mag Speed Sensor	36785319
RT1,RT2	Thermistor Temperature Sensor	36898922
L1	Start / Run Solenoid Valve	36842300
L2	Unloader Solenoid Valve	36842318
S10, S11	Air Filter Switch	36847838
RP1	Engine Oil Press Sender	36870608
RT3, RT4	Temperature Sender	36841138
S9	Airend Oil Press Switch	36757581
S14	Safety Valve Press Switch	36757581
B2	Startup Compressor	36850691
K1	Auxiliary Start Relay	35577873
R3	Control Orifice Heater	36841526
R1	Regulator Heater	36864677
U1	Fuel Level Sender	(Wagon) 54672803 (High Speed) 54672811
D1-D4	Diode	35376169
	WEDGE Controller	22173579
W1	Chassis Harness	22614416
	W1 Control Panel Harness	22817829
	Negative Battery Cable	54765367
	Positive Battery Cable	54765375
	Positive Jumper Cable	54765383
	Battery Jumper	35128982
F2, F3	10 Amp ATC Fuse	22071591
F1, F4	20 Amp Fuse	36792083
	IQ Heater Harness	54775887
	IQ Orifice Heaters	36841526
	Actuator	36898310
RT5	Thermistor Temperature Sensor	36898922
K3	Relay, 24VDC SPDT	36892362
TCU	Controller	36920643
S12	Filter Switch	36899615
S13	Filter Switch	36899599

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## **SECTION 10**

# **ALERTS AND SHUTDOWNS LIST**

# ALERT/SHUTDOWN CONDITIONS

Version 2.07

## ALERT SHUTDOWN

	CODE	LIGHT (BLINKS)	Machine ID	CODE	LIGHT (STEADY)	DELAY (sec)	Machine ID
Engine Speed < Min. RPM				1	CPRSR Malf	30	All <sup>3</sup>
Engine Speed > Max. RPM				2	CPRSR Malf	30	All <sup>4</sup>
Engine Crank Time Exceeded				3	CPRSR Malf	0	All <sup>1</sup>
Engine Oil Temperature > 252 deg. F	5	CPRSR Malf.	0-6				
Intake Manifold Temperature > 180 deg. F	6	CPRSR Malf.	0-7				
Water In Fuel	8	CPRSR Malf.	5,6				
Engine Not Responding to Throttle Cmd.	10	CPRSR Malf.	All				
Too Many Start Attempts during Autostart				11	CPRSR Malf	0	All
Engine Shuts Itself Down: reason unknown				29	CPRSR Malf	0	All
Low AE Oil Pressure				31	CPRSR Malf	20	0,2,5
Disch. Temp (RT2) Sensor Fault				32	CPRSR Malf	10	All
Separator Tank (PT1) Sensor Fault	33	CPRSR Malf.	All				
Separator Tank Pressure >20 PSI during start attempt (Engine will not crank)				34	CPRSR Malf	0	0-10
Machine Over Pressure				35	CPRSR Malf	1	0-6
Safety Valve Open				36	CPRSR Malf	2	0-6
Sep. Tank Temp > 247 degrees F				50	CPRSR Malf	3	All
Machine ID Not Valid				51	CPRSR Malf	0	All
Sep. Tank Temp. (Rt1) Sensor Fault				53	CPRSR Malf	10	All
Reg. System Pressure (PT2) Sensor Fault	54	CPRSR Malf.	All				
Estop Button Pushed	55	CPRSR Malf.	0-6	55	CPRSR Malf	3	0-6
Minimum Pressure Not Met	56	CPRSR Malf.	All				
Serial Comm. Problem	70	CPRSR Malf.	All				
CAN Bus Problem	71	CPRSR Malf.	All				
Auto Start/Stop Module Failure - No Comm for 17 seconds	73	CPRSR Malf.	All				
<b>Dedicated Lights:</b>							
Low Fuel Level		Fuel Level	0-6		Fuel Level	3	All
Air Filter Restriction		Soiled Filter	All <sup>6</sup>				
Low Battery Voltage		Battery Charging Condition	All				
Engine Oil Pressure < 18 PSI		Low Engine Oil Pressure	All				
Low Coolant Level		Engine Coolant Level	0,1,5, 6 <sup>5</sup>				
Engine Coolant Temp > = 220 deg F.		High Engine Temp	All				
Engine Coolant Temp > = 230 deg F.					High Engine Temp	10	All
IQ Filter Restriction					IQ Filter Restriction	3	0-6 <sup>2</sup>
High Discharge Temp. (RT2 > 247 deg. F)					High Comp. Temp.	3	All

CAN Derived Data =

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**Notes:**

**1) Max. crank time 0-6 = 15 sec; 7,8 = 30 sec.**

**2) IQ equipped machines**

**3) ID 0-6 = 800 RPM; 7,8 = 900**

**4) ID 0-6 = 1900 RPM; 7,8 = 2500**

**5) Via fault code 235**

**6) ID 7,8 Option**

**Machine ID:**

**0 = Viking HP CU**

**1 = Viking XHP CU**

**2 = EMU LP CAT**

**3 = EMU HP CAT**

**4 = Viking XHP CAT**

**5 = EMU LP CU**

**6 = EMU HP CU**

**7 = Zenith P425**

**8 = WW600**

**9 = C15 CAT 150 psi**

**10 = Triton CU**

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## FAULT CODES FOR QSX15 CUMMINS ENGINE

<b>Fault Code</b>	<b>Description</b>
111	Engine Control Module - Critical Internal Failure
115	Engine Speed/Position Sensor Circuit - Lost both signals from Magnetic Pickup Sensor
121	Engine Speed/Position Sensor Circuit - Lost One of Two Signals From the Magnetic Pickup Sensor
122	Intake Manifold Pressure Sensor #1 Circuit - Shorted High
123	Intake Manifold Pressure Sensor #1 Circuit - Shorted Low
135	Engine Oil Pressure Sensor Circuit - Shorted High
141	Engine Oil Pressure Sensor Circuit - Shorted Low
143	Engine Oil Pressure Low - Warning
144	Engine Coolant Temperature Sensor Circuit - Shorted High
145	Engine Coolant Temperature Sensor Circuit - Shorted Low
147	Frequency throttle signal low (see note 1)
151	Engine Coolant Temperature High - Critical
153	Intake Manifold Temperature Sensor #1 Circuit - shorted High
154	Intake Manifold Temperature Sensor #1 Circuit - Shorted Low
155	Intake Manifold Temperature #1 High - Critical
187	Sensor Supply Voltage #2 Circuit - Shorted Low
212	Engine Oil Temperature Sensor Circuit - Shorted High
213	Engine Oil Temperature Sensor Circuit - Shorted Low
214	Engine Oil Temperature High - Critical
221	Ambient Air Pressure Sensor Circuit - Shorted High
222	Ambient Air Pressure Sensor Circuit - Shorted Low
223	Engine Oil Burn Valve Solenoid Circuit - Shorted Low
227	Sensor Supply Voltage #2 Circuit - Shorted High

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234	Engine Speed High - Critical
235	Engine Coolant Level Low - Critical
241	Vehicle Speed Sensor Circuit - Data Incorrect
245	Fan Clutch Circuit - Shorted Low
254	Fuel Shutoff Valve Circuit - Shorted Low
255	Fuel Shutoff Valve Circuit - Shorted High
259	Fuel Shutoff Valve - Stuck Open
284	Engine Speed/Position Sensor #1 (Crankshaft) Supply Voltage Circuit - Shorted Low
285	SAE J1939 Multiplexing PGN Timeout Error
286	SAE J1939 Multiplexing Configuration Error
287	SAE J1939 Multiplexing Remote Throttle Error
295	Ambient Air Pressure Sensor Circuit - Data Incorrect
299	Engine Shutdown Commanded By J1939
311	Injector Solenoid Valve Cylinder #1 Circuit - Grounded Circuit
312	Injector Solenoid Valve Cylinder #5 Circuit - Grounded Circuit
313	Injector Solenoid Valve Cylinder #3 Circuit - Grounded Circuit
314	Injector Solenoid Valve Cylinder #6 Circuit - Grounded Circuit
315	Injector Solenoid Valve Cylinder #2 Circuit - Grounded Circuit
319	Real Time Clock - Power Interrupt
341	Engine Control Module - Data Lost
343	Engine Control Module - Warning Internal Hardware Failure
346	Engine Control Module - Warning Software Error
352	Sensor Supply Voltage #1 Circuit - Shorted Low
378	Fueling Actuator #1 Circuit - Open Circuit
379	Fueling Actuator #1 Circuit - Grounded Circuit
386	Sensor Supply Voltage #1 Circuit - Shorted High
394	Timing Actuator #1 Circuit - Open Circuit

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395	Timing Actuator #1 Circuit - Grounded Circuit
396	Fueling Actuator #2 Circuit - Open Circuit
397	Fueling Actuator #2 Circuit - Grounded Circuit
398	Timing Actuator #2 Circuit - Open Circuit
399	Timing Actuator #2 Circuit - Grounded Circuit
415	Engine Oil Pressure Low - Critical
418	Water In Fuel Indicator High - Maintenance
422	Engine Coolant Level Sensor Circuit - Data Incorrect
426	SAE J1939 Datalink - Cannot Transmit
428	Water In Fuel Sensor Circuit - Shorted High
429	Water In Fuel Sensor Circuit - Shorted Low
433	Intake Manifold Pressure Sensor Circuit - Data Incorrect
434	Power Lost Without Ignition Off
435	Engine Oil Pressure Sensor Circuit - Data Incorrect
441	Battery #1 Voltage Low - Warning
442	Battery #1 Voltage High - Warning
449	Fuel Pressure High - Warning
451	Injector Metering Rail #1 Pressure Sensor Circuit - Shorted High
452	Injector Metering rail#1 Pressure Sensor Circuit - Shorted low
466	Turbocharger #1 Wastegate Control Circuit - Data Incorrect
482	Fuel Pressure Low - Warning
483	Injector Metering Rail #2 Pressure Sensor Circuit - Shorted High
484	Injector Metering Rail #2 Pressure Sensor Circuit - Shorted Low
485	Injector Metering Rail #2 Pressure High - Warning
486	Injector Metering Rail #2 Pressure Low - Warning
496	Engine Speed/Position Sensor #2 (Camshaft) Supply Voltage
546	Fuel Delivery Pressure Sensor Circuit - Shorted High

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547	Fuel Delivery Pressure Sensor Circuit - Shorted Low
553	Injector Metering Rail #1 Pressure High - Warning
581	Fuel Supply Pump Inlet Pressure Sensor Circuit - Shorted High
582	Fuel Supply Pump Inlet Pressure Sensor Circuit - Shorted Low
583	Fuel Supply Pump Inlet Pressure Low - Warning Level
595	Turbocharger #1 Speed High - Warning Level
596	Electrical Charging System Voltage High - Warning Level
597	Electrical Charging System Voltage Low - Warning Level
598	Electrical Charging System Voltage Low - Critical Level
611	Engine Hot Shutdown
753	Engine Speed/Position #2 Cam Sync Error
755	Injector Metering Rail #1 Pressure Malfunction
758	Injector Metering Rail #2 Pressure Malfunction
951	Cylinder Power Imbalance Between Cylinders

Notes:

1. Code 147 will be logged each time the compressor controller stops the engine. This is an operational fault and does not indicate any engine fault.

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# SECTION 11

## RECOMMENDED SPARE PARTS

<b>Quantity</b>	<b>Description</b>	<b>Part Number</b>
1	WEDGE Controller	22173579
2	Thermistor Temperature Sensor	36898922
3	0-100 psig Pres Transducer	36920825
3	0-225 psig Pres Transducer	54496773

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# **SECTION 12**

## **Software Information**

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## **Software Updates**

Software updates are available on a website for downloading. The website will always contain the latest software revisions for all applications of Utility Equipment products. Software files will be available for the Virtual Technician I (PDA based service tool), and Virtual Technician II PC based service tool.

The website address is: [WWW.iembedded.com](http://WWW.iembedded.com)

## **Service Manuals**

The website has Electrical/Electronics service manuals for all equipment requiring this manual. They are stored in .PDF format and can be viewed or downloaded as needed.

## **Service Bulletins**

Service Bulletins will be posted at the site as needed. These will describe any actions that need to be taken involving hardware or software.





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