

PRIMUS V CONTROLLER



Operations & Safety Manual



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Document/Revision History

Release #	Date	Description of changes/Reference
1.0	Feb. 22 2023	Initial Release
2.0	Mar. 28 2023	Firmware Updates/Adding Flammability Rating
3.0	July 11, 2023	Updating Wiring Instructions

Warranty & Disclaimer Information

Due to Conspec Controls Inc.'s continuous effort to produce the highest quality monitoring equipment possible, products described in this manual are subject to change at any time without notice. While every effort has been made in preparing this manual to include all information pertinent to the installation, and maintenance, Conspec Controls Inc. assumes no responsibility for errors, omissions, or any loss due to said errors or omissions.

A gas monitoring system alone cannot prevent hazardous conditions from occurring. The reliability of a gas monitoring system, and the resultant safety level is dependent on, and the responsibility of the user. The user's responsibilities include, but are not limited to:

- Ensuring that the correct equipment is specified for conditions at the particular site
- Following recommended installation and wiring guidelines
- Meeting all applicable safety and electrical codes
- Scheduling regular calibrations and servicing
- Replacing inoperative or questionable parts or units

Warranty

Conspec Controls Inc. provides warranty service for one (1) year from the shipping date on all electronic and mechanical components. Warranty service is limited to defects in materials and workmanship on units which fail under normal use. Conspec will repair or replace any unit found to have failed due to defects in materials or workmanship. This warranty is voided if the unit has been misused, damaged due to incorrect wiring, or altered before return to the factory. Warranty claims that are denied will be billed at the standard rate. Expedited shipping is not covered under warranty.

No other warranty is authorized other than the above. Before returning a product for service, call Conspec Controls Inc. for a Return Authorization Number (RA#) at (800) 487-8450. Returned units should be packaged securely as damages incurred during shipping are not covered under warranty.

Warnings and Cautions

Throughout this document WARNING and CAUTION statements have been deliberately placed to highlight items critical to the protection of personnel and equipment.

WARNING – A warning highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in injury or death of personnel, or long-term physical hazards. Warnings are highlighted as shown below:



CAUTION – A caution highlights an essential operating or maintenance procedure, practice, etc. which if not strictly observed, could result in damage to, or destruction of equipment, or loss of functional effectiveness. Cautions are highlighted as shown below:

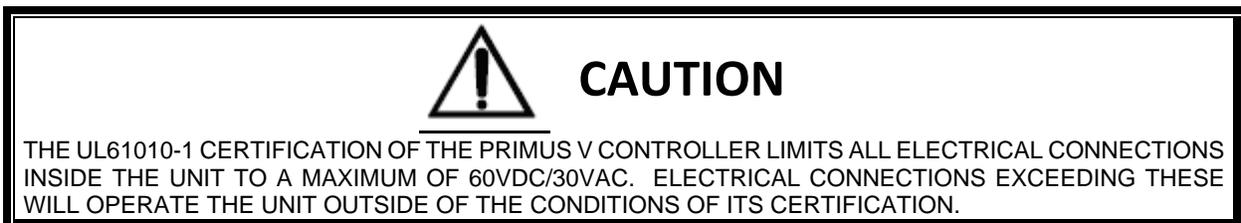


WARNINGS and CAUTIONS SHOULD NEVER BE DISREGARDED

The safety rules in this manual are not intended to replace any rules or regulations of any applicable local, state, or federal governing organizations. Always follow your local lockout and tagout procedure when maintaining any electrical equipment. The information in this manual is intended to be used in conjunction with other rules or regulations already in existence. It is important to read all of the safety information contained in this manual before installing or operating this monitor.

Primus V Controller System Overview

The Primus V Controller is a product which complements the Optio V gas monitor. The Primus V has the ability to gather and display real time data from Optio V units. This controller has optional 24Vac/24Vdc input power with a maximum power consumption of 2.5A at maximum load. There are six onboard relays that are freely programmable using Subcon logic. The Primus V has a user-friendly four button keypad used for menu navigation and a graphical LCD that displays detailed monitor information. Two local 4-20mA outputs, 12 remote modbus 4-20mA outputs, 1 local Strobe and Horn output port and three RS485 Modbus RTU Scan Ports that support a total of 96 multi-gas monitors. Each gas monitor has the ability to support six gas sensors enabling users to build a comprehensive gas detection network.



**Purpose:**

The Primus V Controller is a product to be used in an ordinary location to remotely monitor and manage connected multi-gas monitors. It is intended to connect to the Optio V monitor and can also be connected to a centralized control and automation systems. The Primus V is intended to be programmed using Subcon software, allowing users to design and create complex and custom networks. Users can configure the six onboard relays and local strobe and horn using built in logic on the Subcon software. It also gives the user the ability to configure the two local 4-20mA outputs as well up to twelve remote modbus 4-20mA outputs that can be utilized for fan control. All Primus V controllers will come with a preconfigured mode of operation.



Technical Specifications

Power Requirements

- 16-24 Vac, @ 50/60Hz
- 12-24 Vdc
- Max 2.5A @ 24Vac/Vdc at maximum load.

Environmental

- -20°C to 50°C (-4°F to 122°F)
- 0-95% RH non-condensing
- 6000 feet of cable distance
- For use in indoor environments with a pollution degree of 2
- Altitude < 2km or 6500 feet

Input/Output Capabilities

- 6 Relay Ports with Failsafe or Normal operation.
- 2 local 4-20mA outputs
- 12 remote modbus 4-20mA outputs
- 1 local Strobe and Horn Output port used for alarming
- 1 On board 85dB buzzer at 30 cm distance used for alarming

Communication Interfaces

- 3 Scan ports (Modbus RTU RS485)
- 1 RS-232 Subcon port
- 1 optional Ethernet COM card or POE
- 1 optional RS485 COM card

Passwords

- User: 123 (This password has limited access to system configurations)
- Admin: 321 (This password has more access to system configurations)

Network Capacity

- Up to 96 multi-gas monitors
- Each multi-gas monitor can have up to 6 sensors, 6 relays, 6 analog inputs and 2 local 4-20mA outputs

Configuration

- Easy to use Subcon Software completely configurable on a PC/laptop
- Local Menu Display via 128x64 Graphical LCD and 4 push buttons for basic settings

Menu & Display

- Password protected (User or Admin)
- Dimmable RGB backlight and Contrast
- Review screens shows additional diagnosis and Monitor Settings
- Intuitive menu navigation via LCD
- Real-time gas readings

Logic

- Ability to configure relays and output controls via drop down selections of different alarm logics using simple IF/ELSE logic

Enclosure

- Polycase
- 9.04 x 9.04 x 5.72 in



Installation and Wiring Instructions



WARNING

PRIOR TO INSTALLATION AND OPERATION OF THIS EQUIPMENT, READ AND DEVELOP AN UNDERSTANDING OF THE CONTENTS OF THIS MANUAL AND THE OPERATION MANUAL OF THE EQUIPMENT OR DEVICE TO WHICH THIS EQUIPMENT MAY WILL BE INTERFACED. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

TO AVOID POSSIBLE FIRE, SHOCK, OR DAMAGE TO THE PRODUCT, TURN OFF POWER SOURCE BEFORE INSTALLATION. BE SURE POWER IS OFF PRIOR TO PERFORMING ANY WIRING. IF YOU ARE UNSURE OR UNCOMFORTABLE WITH INSTALLATION, CONTACT A LICENSED ELECTRICIAN.

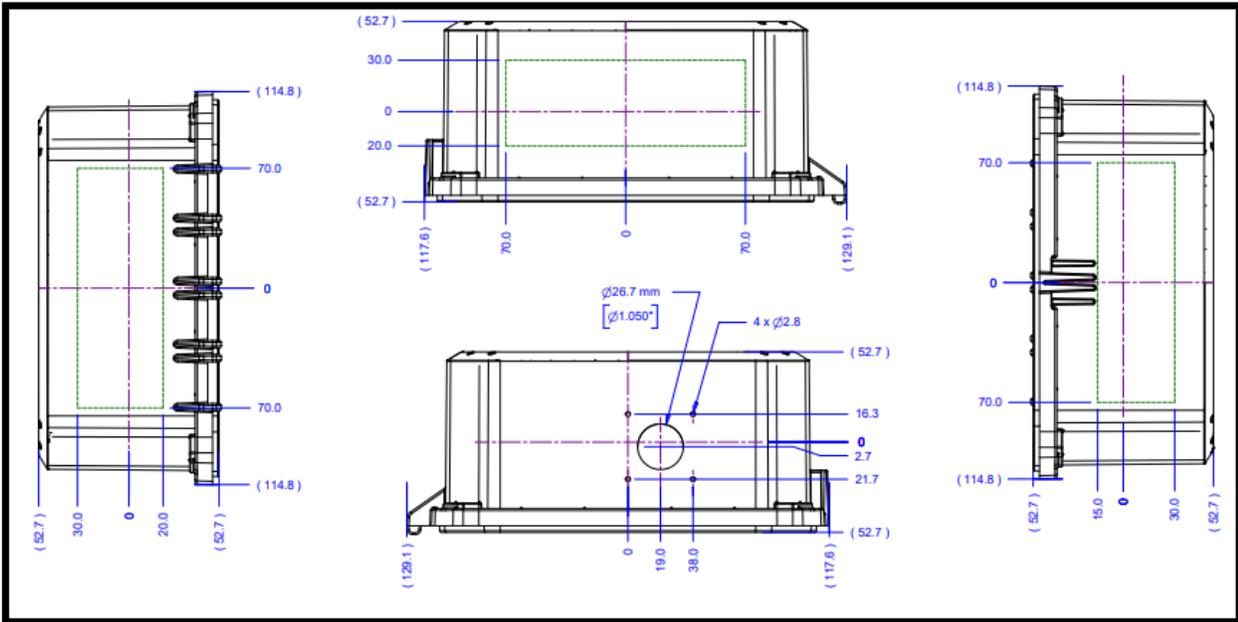
FOLLOW YOUR LOCAL LOCKOUT TAGOUT PROCEDURE BEFORE MAINTAINING ANY REMOTE CONTROLLED EQUIPMENT. ALWAYS REMOVE ALL ELECTRICAL POWER FROM ELECTRICAL EQUIPMENT BEFORE ATTEMPTING ANY INSTALLATION PROCEDURES. DEENERGIZE AND TAGOUT ALL SOURCES OF ELECTRICAL POWER BEFORE TOUCH-TESTING ANY EQUIPMENT. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

THE UNIT MUST BE WIRED TO THE CORRECT VOLTAGE AS REQUIRED BY THE ACTUAL LINE VOLTAGE AND SIGNALS MUST BE CONNECTED TO THE CORRECT TERMINALS. FAILURE TO FOLLOW THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH AND DAMAGE TO EQUIPMENT.

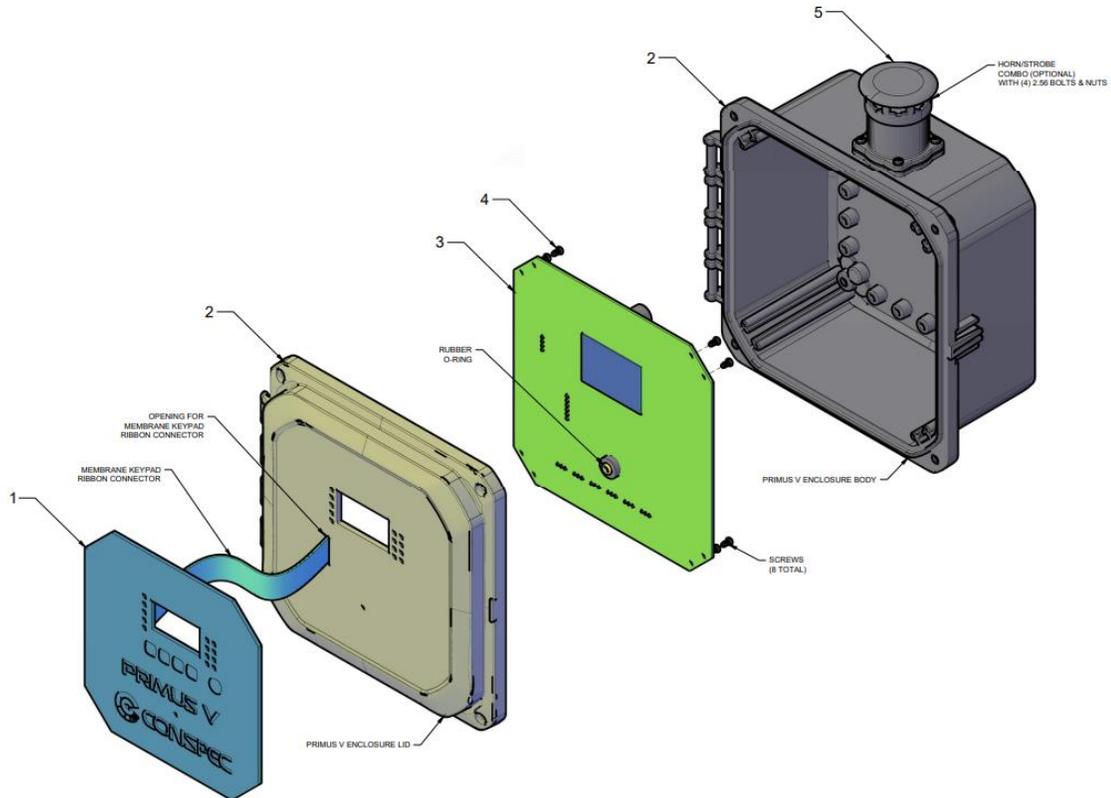
Mounting Location: To ensure Primus V functionality is consistent the following instructions shall be followed. Select a location to mount the monitor to best suit the needs of the room or facility. Avoid wet locations and locations where physical damage is possible to unit.

Mounting Instructions: The Primus V enclosure comes fully built with 4 mounting feet, for quick and easy installation. Mounting directly to the wall or uni-strut are common practices. Use steel or stainless steel 5/16" bolts, minimum length of 1" to ensure the panel is securely mounted to the desired medium.

The green dotted area in the block diagram below is the designated area where the user is allowed to drill holes for the purpose of making connections to any of the internal available ports on the PVC board. Appropriately sized cable glands are to be used to reduce opening size. Any unused holes must be properly closed off with blanking plugs of the appropriate size.

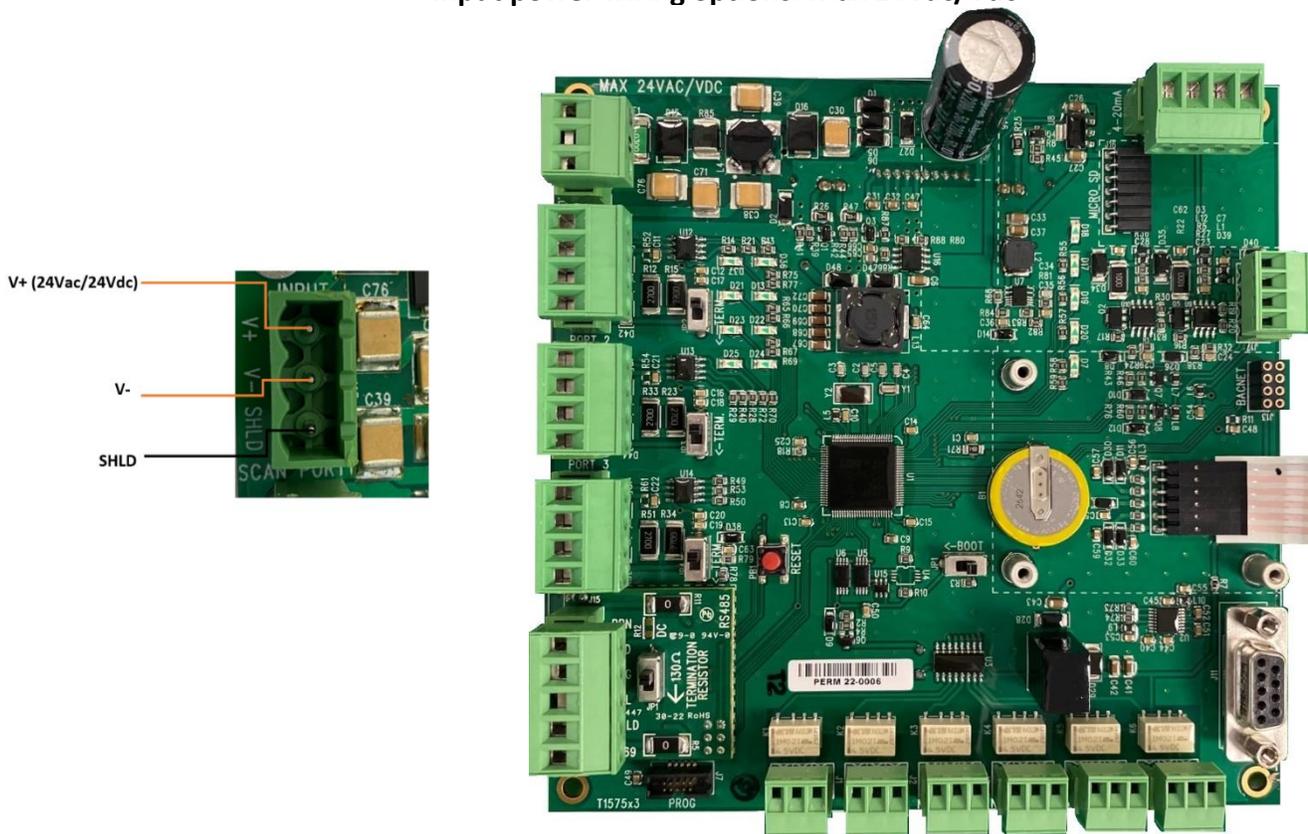


Mechanical Assembly:



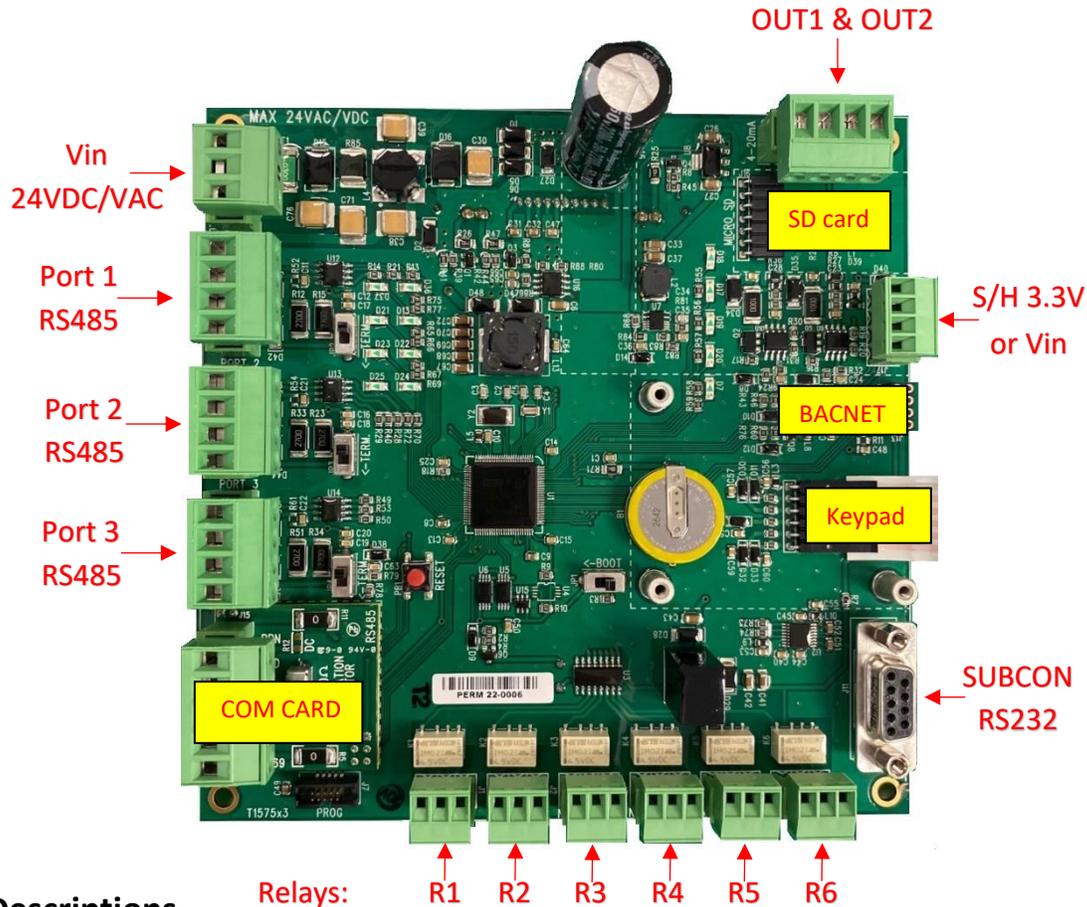
Wiring Instructions:

1. Read this manual before installation.
2. Please observe appropriate local and National Electrical Codes when wiring electrical devices.
3. Do not connect or disconnect wiring or perform circuit checks while the power is turned on.
4. The relay wiring, Modbus RTU RS485 wiring, 4-20mA wiring, Strobe and Horn wiring and the power wiring should be in separate metal conduits. All wiring coming to or from PVC unit must have flammability rating of at least VW-1. (including customer provided wiring)
5. Low voltage wires shall be wired with proper low voltage class wiring procedures.
6. All terminals shall be tightened to specific terminal torque 4.4 IN-LBS(0.5N·m), unless otherwise specified
7. Remove excess metal screws, metal filings, and wire clippings from inside of unit
8. Inspect to make sure no exposed wire has contact with any other wiring terminals
9. RC type suppressors are strongly recommended on all contactors
10. The power supply to the Primus V must have a master disconnect and should be fused.

Input power wiring options: Max 24Vac/Vdc

WARNING

FOR 24V CONNECTIONS: A UL REGISTERED CLASS 2 TRANSFORMER OR POWER SUPPLY MUST BE USED TO PROVIDE A MEANS FOR ISOLATING THE INCOMING POWER SUPPLY.

The Primus V controller is cable of handling multiple different Input and output types. Below is a field wiring for each option:



Relay Descriptions

Control Relay (Failsafe Operation)

When the gas concentration value reaches the user set point and the user configured program logic in Subcon is met, the relay coil selected will de-energize. This may be used to turn on a exhaust fan for the purpose of clearing an enclosed space. As an added safety feature after the gas value has dropped below the desired set point this relay will remain de-energized (fan remains on) for a user configured period of five minutes. This is to ensure complete removal of hazardous gases and prevents the relays from short cycling.

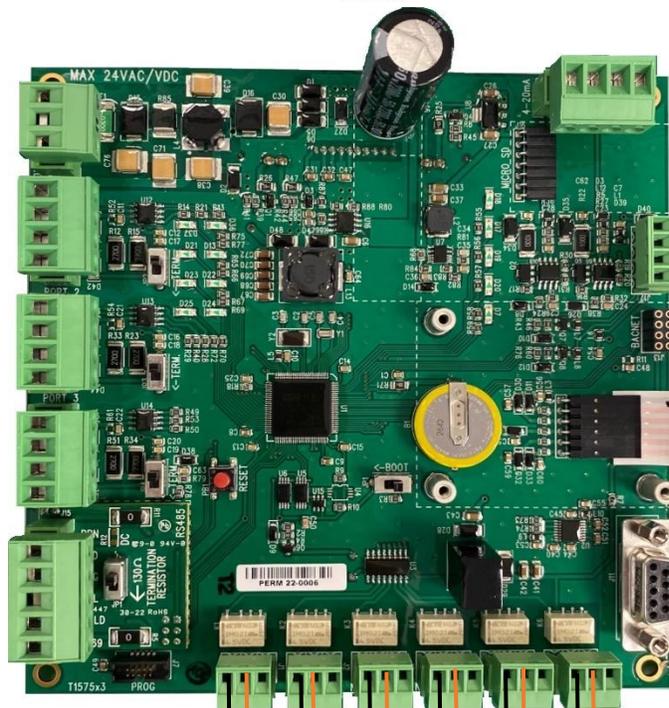
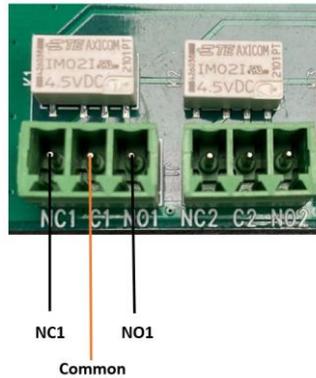
Alarm Relay (Normal Operation)

When the gas concentration value reaches the user set point and the user subcon program logic is met the relay coil selected will energize. It is used to activate audible and/or visual indicators at remote locations.

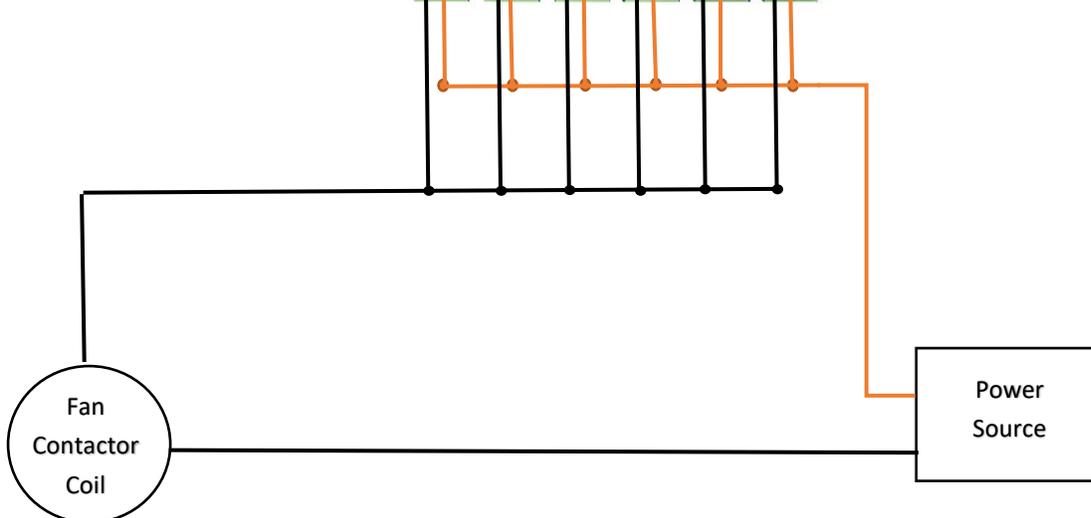
Trouble Relay (Failsafe Operation)

Relay coil will de-energize if the Primus V losses communication with the sensor/monitor or recognizes that it has drifted either above or below its capabilities.

System wiring using relay outputs

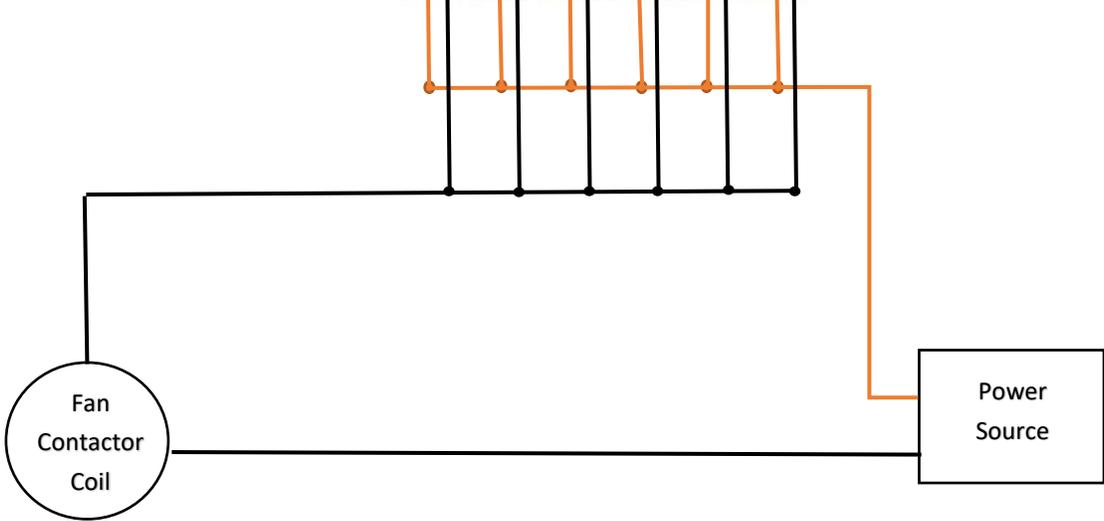


With this wiring configuration, the fan contactor coil below becomes energized during an alarm state or power failure. Due to the fail-safe operation of the on-board relays.

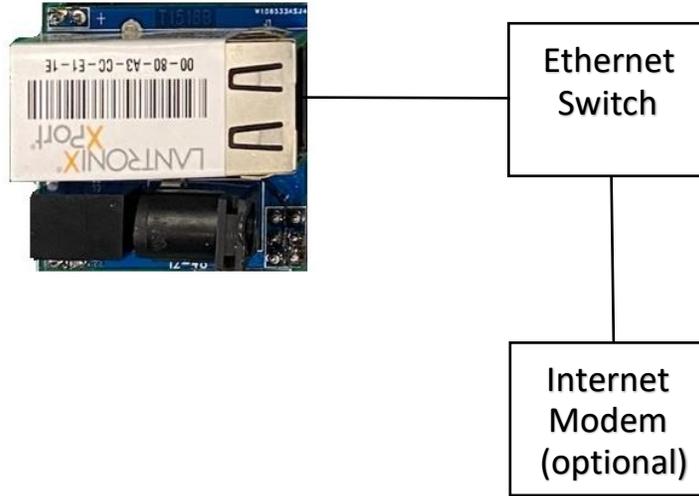




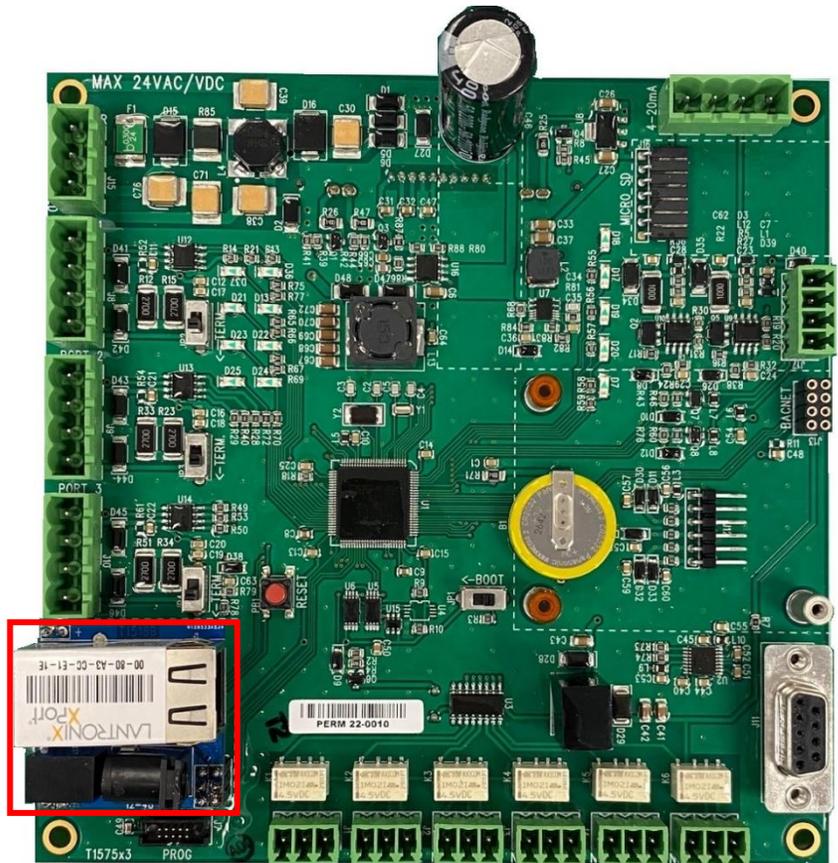
With this wiring configuration, the fan contactor coil below becomes de-energized during an alarm state or power failure and is energized under normal operation.



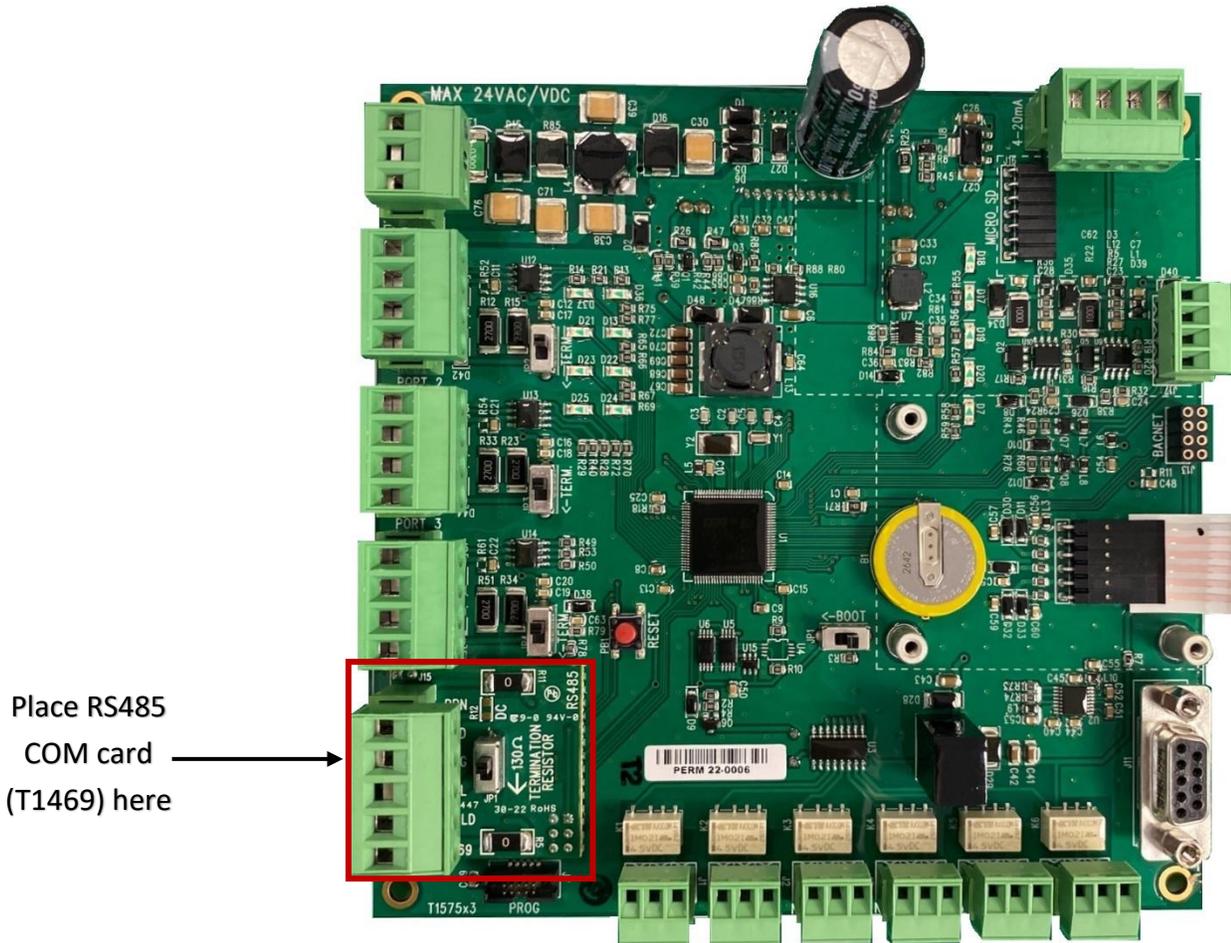
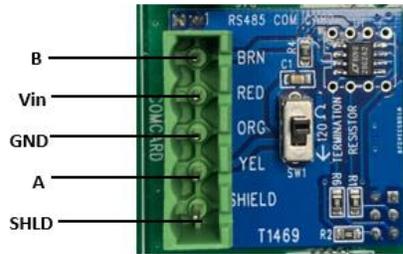
System wiring using Ethernet/POE COM card



Place Ethernet/POE Com Card (T1517)

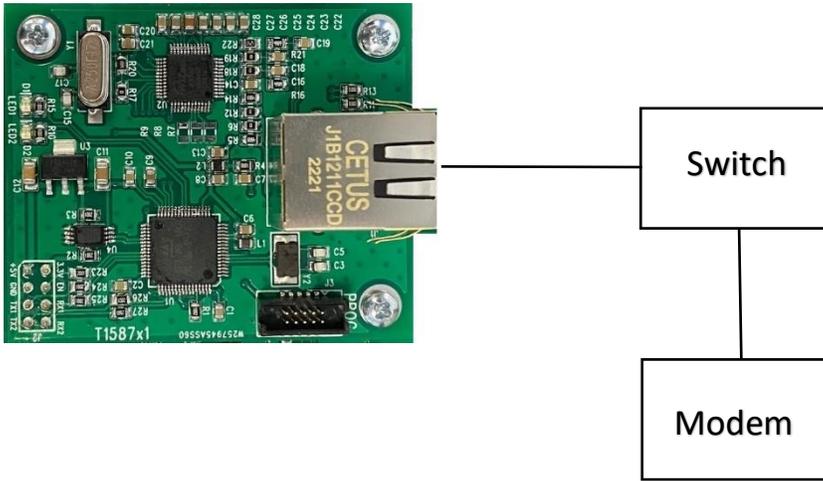


System wiring for RS485 COM card



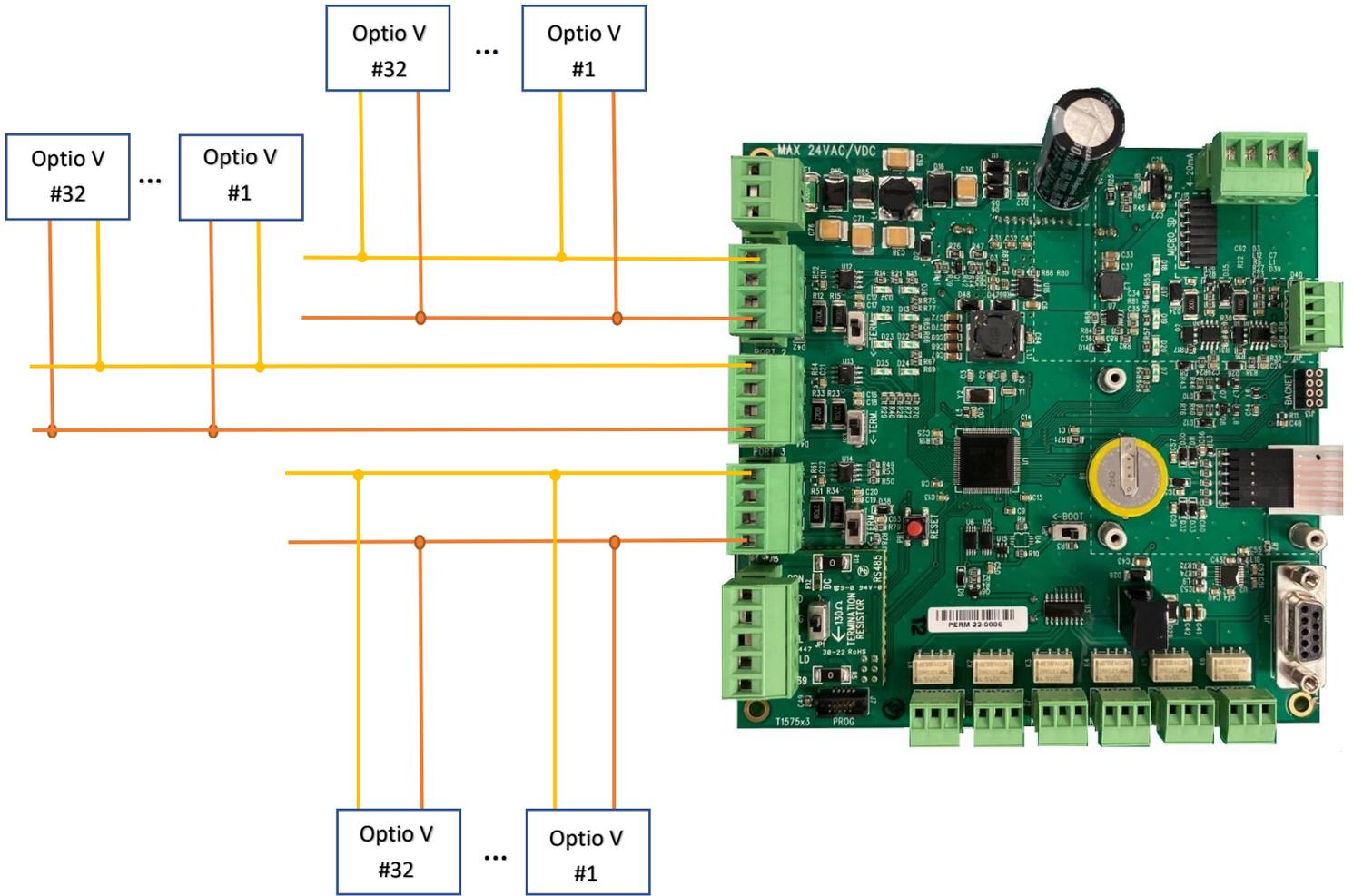
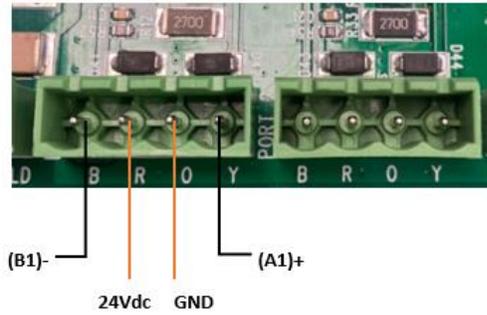
Place RS485
COM card
(T1469) here

System wiring using BACNET Tophat

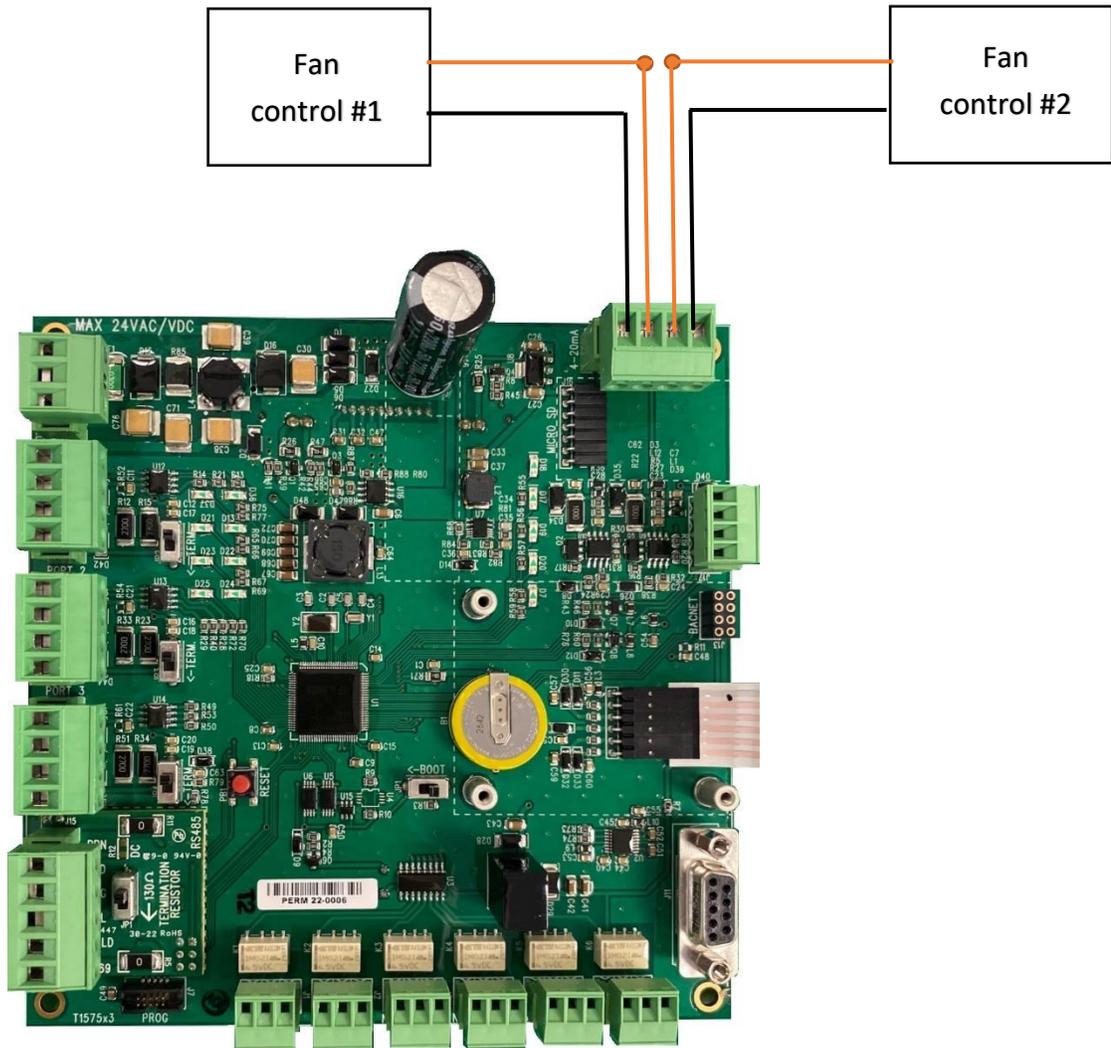
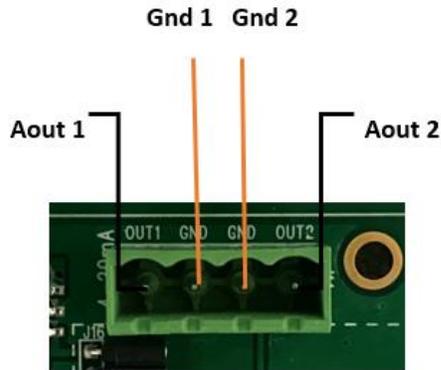


Place BACNET Tophat card (T1587) here.

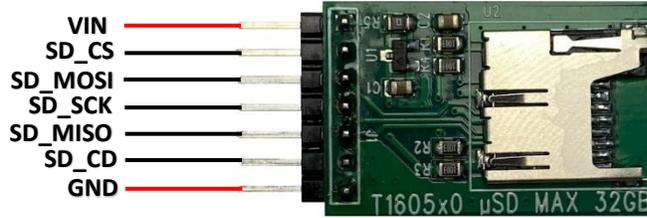
System wiring using Modbus RTU RS485 communication



System wiring for 4-20mA Output

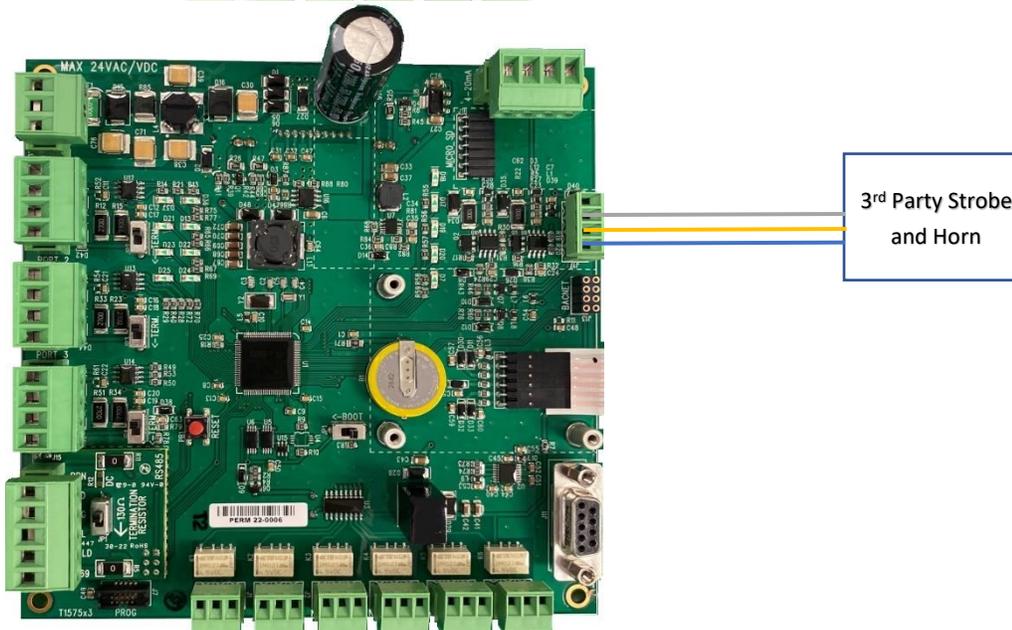
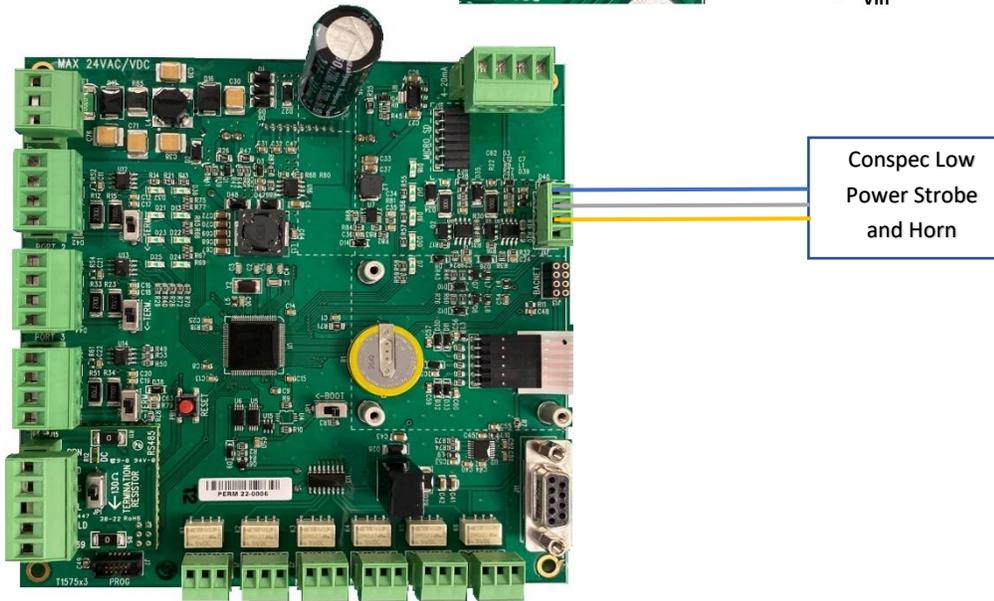
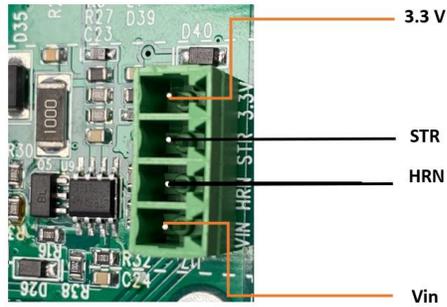


System wiring for SD card



Place optional SD Card (T1605) here.

System wiring for Strobe and Horn



Note: Value of Vin is dependent on the Input Power. If user applies 24Vdc to V+ the value of Vin will be approximately 23Vdc. If user applies 24Vac to V+ the value of Vin will be approximately 38Vdc. To avoid damaging 3rd Party Strobe and Horn Verify Vin Value before making connections.



Factory Default Settings

Relay Settings:

Relay 1 : Open

Drive: Standard (NO)

Silence: Disabled

Rly Off:T = 0

Relay 2: Open

Drive: Standard (NO)

Silence: Disabled

Rly Off: T = 0

Relay 3: Open

Drive: Standard (NO)

Silence: Disabled

Rly Off: T=0

Relay 4 : Open

Drive: Standard (NO)

Silence: Disabled

Rly Off:T = 0

Relay 5: Open

Drive: Standard (NO)

Silence: Disabled

Rly Off: T = 0

Relay 6: Open

Drive: Standard (NO)

Silence: Disabled

Rly Off: T=0

Note: These relay settings can be configured via SUBCON. See SUBCON manual UM1115 for more information.

4-20mA Calibration

The first screen will ask for a password entry:



The default admin password is “321”. (It is recommended that only users with admin rights have access to this password). Once the password has been entered successfully, select the “ 4-20mA Cal” tab. From there the user will choose either channel 1 or 2 depending upon what 4-20mA output is being calibrated. After selecting the channel, select either the 4 mA or 20 mA calibration and verify the output using a multimeter. Use the four push buttons to change the value. If the calibration is successful and passes all the internal checks, a window will be displayed indicating the calibration was successful. The user needs to press enter to save the calibration.

Serial Setup

The first screen will ask for a password entry:



The default admin password is “321”. Once the password has been entered successfully, select the  “Serial Setup” tab, this option allows the user to change the serial communication configurations. First the user must select which serial port to configure.

- a. **RS232**
- b. **Port 1 RS485**
- c. **Port 2 RS485**
- d. **Port 3 RS485**
- e. **Com Card**

After selecting which serial port, the user will go through the following screens:

- a. **Enable/Disable:** Enable or disable the selected port. A disabled port will not be scanned.
- b. **Set Mode:** Set selected port as main or scan. (Main=Subcon, Scan=Monitors/Device)
- c. **Parity Bit:** The parity bit, EVEN/ODD/NONE.
- d. **Stop Bits:** The number of stop bits, 1 or 2.
- e. **Baud Rate:** The baud rate of the device, 4800/9600/19200/38400/57600
- f. **Set Retries:** 0-10. Immediate retries per cycle.
- g. **Set Rescans:** 0-10. Number of cycles.
- h. **Set Timeout:** 50 – 5000 ms.
- i. **Set Gap Time:** minimum depends on selected baud rate.

If using Modbus communication, please contact Conspec Controls for full register map 1-800-487-8450

PVC Setup

The default admin password is “321”. (It is recommended that only users with admin rights have access to this password). Once the password has been entered successfully, select the  PVC Setup”. The PVC Setup allows the user to make the following changes relating to the Primus V Controller.

- a. **Local Auto Alarm:** Will auto alarm if any scanned device is in alarm 1-4 (Enable/Disable).
- b. **Pause PVC Scan:** Pauses scanning and logic. Max: 240 mins (4 hours). 0 = Resume
- c. **Change PVC Adrs:** Change PVC Modbus address
- d. **Pause PVC Logic:** Pauses logic only, scan continues. Max: 240 mins (4 hours). 0 = Resume
- e. **Log Value Change:** Enable/Disable datalogging of value changes.
- f. **Device Select:** Select device to configure.
 - i. **Scan Setup:** “IN SCAN” or “OFFSCAN”
 - ii. **Remove Device:** Remove device from scan table, if not used in any logic.
 - iii. **Change MB Adrs:** Change Modbus address of device in scan. Must also change MB address on the actual device.
- g. **Add Device:** Add a new device to scan table.

Device Setup

The default user password is “321” (Recommended for any personnel that does not have admin rights). Once the password has been entered successfully, select the  Device Setup” From there the user can access and change the following information.

- a. **Set Alarm SIL Time:** Alarm Silence Timer when  button is pressed.
- b. **Set Backlight Brightness:** 0-100%.
- c. **Set USER Password:** Change user password.
- d. **Set ADMN Password:** Change admin password.
- e. **Set Time/Date:** Set time and/or date.
- f. **Reset Logger:** User can erase logged events.

Main Screen/Review Screens

Main Screen:

Once the warmup timer clears, the display will show the “Main Screen”:

100	1	2	CO	3	4	PPM
101			CH4	3		PPM
103			O2	19.7	5	%
104		OFF	CO	CFAIL		PPM
105		-----	CO	-OFFSCAN-6		
A75		DUE				
SR=0.77s, 7		A100=0.59ms, 8		5 9		

1. **Address:** Modbus address of the monitor
2. **Status:** Indicates status of the device, which are listed in the following table:

P1-3 N1-3	Working normally
DUE	Calibration Due
SFL	Sensor Fail Low
AL1	Alarm 1
AL2	Alarm 2
AL3	Alarm 3
AL4	Alarm 4
SFH	Sensor Fail High
CAL	Device in Calibration
REC	Warmup Time Recovery
CFL	Communication Fail
---	Device is OFFSCAN

3. **Sensor:** Gas/Sensor Name
4. **Value:** Gas/Sensor Reading
5. **Units:** Gas/Sensor Units
6. **Offscan:** Device is OFFSCAN
7. **Scan Rate (SR):** Time for full scan
8. **Address Scanned:** Device currently scanned
9. **Screen Shuffle Timer:** Countdown time to next page



Review Screens:

The review screens can be accessed by pressing the “ESC button”. You are able to navigate through each screen using the Left and Right Push buttons. There are 9 review screens and these include:

1. **Firmware Information** – Displays the Firmware Version and the current Date.
2. **Port Information** – Displays each ports serial communication information.
3. **Logic State** – Displays the status of the program logic.
4. **Device Review** – Displays information about devices in the scan table.
5. **Hardware Monitor** – Displays the power source, Voltage and Reset flags.
6. **Relays Review** – Displays state and driver info for PVC relays.
7. **4-20mA Review** – Displays address and value of 4-20mA output.
8. **Comfail Review** – Displays addresses of up to 20 devices in COMFAIL.
9. **Logged Events** – Displays total events, number of logs waiting to be saved and time till next save.

Maintenance and Repairs

This Microcontroller requires evaluation once/twice a year to ensure accuracy. The Primus V controller should be visually and operationally inspected by following the below steps:

Visual inspection of exterior of the panel

- Ensure no cracks/holes or damaged components
- Verify mounting is secure
- No displayed faults on the display or status LEDs

Visual inspection of interior of panel

- Verify no physical damage occurred to any internal components or wires
- No signs of water ingress
- No signs of corrosion
- No loose wires
- All plugs are gully seated

Operational Inspection:

- Check functionality of all keypad buttons
- Force an alarm event on at least one monitor from each zone to ensure proper operation of outputs and all connected components

Modifying this equipment without consulting the factory could result in unsafe operation and/or unsafe atmospheric conditions. Modifying this equipment will void any warranty authorized by Conspec Controls Inc.

Cleaning

Only a damp cloth and mild detergents may be used to clean the monitor. Do not use any strong chemicals or acids. Be sure the buzzer and strobe and horn do not become blocked by liquids.

Service/Repairs

Any Primus V controller found to be defective or questionable should be returned to Conspec Controls for evaluation and repair. Monitors must be repaired by Conspec Controls or their representatives. Conspec requires any returned equipment to first be issued a Return Authorization Number (R.A.#) by calling Conspec at (800) 487-8450 Mon.-Fri. 8am-5pm ET. Conspec also offers on-site Repair and Start-up service for Conspec Gas Detection Equipment.

Replacement Parts

Damaged or questionable parts should be replaced immediately upon detection. Damaged or inoperative parts could contribute to hazardous and/or unsafe conditions. Any consumable parts should be replaced if the reliability is questionable or within the part's specific expected life. Consumable parts include any filters, pump motors, sensors... etc.

Questions / Technical Support..... (800) 487-8450 Mon-Fri 8am-5pm Est
Conspec Sales..... (800) 487-8450 Mon-Fri 8am-5pm Est
Fax(724) 489-9772
E-mailsales.usa@conspec-controls.com
Web site www.conspec-controls.com

Please contact Conspec for an accurate timeframe of how often the monitors and sensors require calibration. Failure to adhere to a strict calibration schedule can result in improper readings and monitor malfunction. Spare parts can be stored under conditions that fall within the limits of the operation specifications. Please note, time frames for storing replacement sensor cells should be followed based on the manufacturer specifications.

Certifications

Nemko UL listing to UL 61010-1 and CSA22.2 No 61010-1 pending



Replacement Parts and Manufacturer Part Numbers

Primus V Controller (Main board): T1575

Ethernet COM card: T1517

Strobe and Horn: T1481

Bacnet Tophat card: T1587

SD Adapter: T1605

RS485 COM card (Non I.S.): T1469

Wiring Schematic:

