



Brüel & Kjær Vibro

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Instructions

VC-8000 for Hazardous Areas



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Instructions - **VC-8000 for Hazardous Areas**

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1 Important Safety Information

1.1 General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

- **USE ONLY AS SPECIFIED**
To avoid potential hazards, use this product only as specified. Only qualified personnel should perform installation and uninstallation procedures.
- **CONNECT AND DISCONNECT PROPERLY**
Do not connect or disconnect this product while it is connected to the live power source.
- **GROUND THE PRODUCT**
The housing of this product should be connected to earth ground. Before attempting to turn on the product, ensure its housing is properly grounded.
- **OBSERVE ALL TERMINAL RATINGS**
To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the individual sections of this manual for further ratings information before making connections to the product.
- **DO NOT OPERATE WITHOUT COVER**
If the product has a cover or covers, do not operate with cover(s) removed.
- **AVOID EXPOSURE TO CIRCUITRY**
Do not touch exposed electrical connections and components when power is present.
- **DO NOT OPERATE WITH SUSPECT FAILURES**
If you suspect there is damage to this product, have it inspected by qualified personnel.
- **DISCONNECTING METHOD**
 - a. a switch or circuit-breaker must be included in the installation
 - b. it must be suitably located and easily reached
 - c. it must be marked as the disconnecting device for the equipment.

1.2 Safety Terms and Symbols

Terms that appear in this manual requiring special attention include:

- **WARNING:**
Warning statements identify conditions or practices that could result in injury or loss of life.
- **CAUTION:**
Caution statements identify conditions or practices that could result in damage to the product, loss or corruption of data, or damage to the environment or other property.
- **NOTE:**
Notes identify material of special interest or importance to the user, not including cautions or warnings.

Symbols that may appear on the product and/or in this manual include:



HIGH VOLTAGE PRESENT



FUNCTIONAL GROUND



DANGER or CAUTION



NOTE



PROTECTIVE EARTH



2 Overview

This manual contains information on installing a VC-8000 Machinery Protection System (MPS) in a hazardous area. This manual supplements the 'VC-8000 Machine Protection System Instructions (S1079330)'.

2.1 Warnings

- THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY;
- **WARNING** -
EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- **AVERTISSEMENT** -
RISQUE D'EXPLOSION – LA SUBSTITUTION D'E COMPOSANTSP EUTR ENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2”;
- **WARNING** -
EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS”;
- **AVERTISSEMENT** -
RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON”;
- Warning – EXPLOSION HAZARD - Do not use USB connectors in hazardous area;
- **AVERTISSEMENT** –
RISQUE D'EXPLOSION – Ne pas utiliser les connecteurs USB en zone dangereuse;
- Warning – EXPLOSION HAZARD - Do not service when an explosive atmosphere is present;
- **AVERTISSEMENT** -
RISQUE D'EXPLOSION – Ne pas réparer en présence d'une atmosphère explosive;

2.2 Condition for safe use

- To be installed inside an IECEx certified tool secured IP54 enclosure that has a suitable service temperature range. The equipment must be mounted horizontally. Mounting of the equipment within a suitable enclosure will cause the internal ambient enclosure temperature to be higher than the maximum external enclosure ambient temperature. The equipment shall not form part of the external enclosure (panel mounted, for example). The maximum surface temperature measured according test conducted per Clause 26.5.1 IEC/EN/UL/CSA 60079-0 Standard was +109.43 °C. End user must verify that the enclosure in which this equipment is installed is suitably rated for service per this temperature. All cable entries into the enclosure shall be fitted with IECEx certified cable glands that have a minimum ingress protection of IP54. The cable glands shall have an operating temperature range equal to or greater than the ambient operating temperature.
- Maximum ambient temperature where the unit is installed shall not exceed +65 °C.
- Transient protection shall be provided on the supply to limit transients to max: 50.4 Vpk (140 % of the peak voltage).
- USB connectors are not for use in hazardous area and will be internal to installation in an IECEx certified IP54 enclosure.
- System chassis ground must follow section 3.4.1 of the '*VC-8000 for Hazardous Areas Instructions*'; Document: S1160865.
- Module hot-swapping is not allowed in hazardous locations.
- Any Ethernet connectors used shall be checked to ensure that the mechanical retaining clip is undamaged and provides a mechanically secured and retained connection.

2.3 Enclosure

When installing in hazardous areas, install the VC-8000 system in an enclosure or area protected to IP54 (splash protected).

The VC-8000 shall be installed in a suitably-certified enclosure which provides at least an ingress protection level of IP54, over the operating temperature range plus the applicable thermal rise and safety margins as described in clause 13 of IEC/EN 60079-15.



2.4 Power

The VC-8000 MPS must be powered by a 24-Vdc power by an isolated SELV supply which has been certified for use in a Zone 2/Division 2 location. The VC-8000 Vibration supplied power supplies meet this requirement.

In the event the external, 24 Vdc power supply does not clamp the output voltage to less than 140 % of the rated maximum voltage, the installer will fit a suitably-certified over-voltage protection device between the power supply and the VC-8000 MPS.

Maximum power consumed by the VC-8000 rack is 12.8W.

Maximum current drawn by the Rack (without sensors attached): 5.3A

Maximum power consumed by sensors connected to VC-8000: 2W/monitor

Maximum electrical ratings of the system (Rack including sensors) are as follows:

- Voltage: Continuous duty: 22- 30 VDC
Intermittent / Excursions to: 18-36 Vdc
- Current: 8.0 A
- Expected power budget of supply: 160 W



The external power supplies are powered from high voltages. Only qualified personnel should make connections to the power supply. Refer to instructions included with the power supply module.

2.5 Labeling

The VC-8000 MPS label located on the side of the rack lists the important hazardous area information required for approval according to the standards.

IECEX	ATEX	Canada	United States
Ex ec nC IIC 160°C (T3) Gc IECEX ETL 17.0045X	II 3 G Ex ec nC IIC 160°C (T3) Gc ITS15ATEX48339X	Ex ec nC IIC T3 Gc	Class I, Zone 2, AEx ec nC IIC T3 Gc
		Class I, Division 2, Groups A, B, C, D, T3C	Class I, Division 2, Groups A, B, C, D, T3C

Ambient Temperature:	-20 °C to +65 °C
Serial Number:	as appropriate
Year of Manufacturing:	as appropriate
Other Markings:	Other markings not related to the above listed approvals may be present

Warnings located on outside of main enclosure (separately supplied):

WARNING:

- EXPLOSION HAZARD – do not open unless area known to be non-hazardous
- THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY;
- **WARNING** - EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- **AVERTISSEMENT** - RISQUE D'EXPLOSION – LA SUBSTITUTION D'E COMPOSANTSP EUTR ENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2”;
- **WARNING** - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS”;
- **AVERTISSEMENT** - RISQUE D'EXPLOSION - AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DESIGNÉ NON”;
- Warning – EXPLOSION HAZARD - Do not use USB connectors in hazardous area;
- **AVERTISSEMENT** – RISQUE D'EXPLOSION – Ne pas utiliser les connecteurs USB en zone dangereuse;
- Warning – EXPLOSION HAZARD - Do not service when an explosive atmosphere is present;
- **AVERTISSEMENT** - RISQUE D'EXPLOSION – Ne pas réparer en présence d'une atmosphère explosive;



CAUTION

Although the system will continue to operate as long as supply voltages do not drop below 18 Vdc or rise above 36 Vdc, extended operation outside the range of 22-30 Vdc will shorten component life and may cause excessive heat dissipation inside of enclosures. Do not design the primary or secondary excitation systems to continuously supply voltages outside the range of 22 – 30 Vdc.

2.5.1 Grounding

Connect chassis ground wire to the rack at the RCM power connector chassis terminal. Follow electrical codes when selecting wire size, maximum wire length, and maximum earth ground resistance. When used in Zone 2 hazardous area applications, use a 4 mm² wire with crimp style lug to connect the chassis ground wire to earth ground.

2.5.2 USB Connector

USB connectors are not to be used in hazardous area and will be internal to installation in IECEx Ex e certified IP54 enclosure.

3 Installation

3.1 Installation Considerations

The intended use of this equipment is to connect to various sensors described within this document, record the received data and display it on a built in display or relay the recorded information to a suitable display module. This unit will also flag the user if set limits are reached of a particular sensor reading.

3.1.1 Permanent Connection Consideration

Permanently Connected Equipment installation considerations:

- a. a switch or circuit-breaker must be included in the installation;
- b. it must be suitably located and easily reached;
- c. it must be marked as the disconnecting device for the equipment.

3.1.2 Clearance

VC-8000 requires 4 inches of clearance between VC-8000 and any other components. This clearance is required for proper airflow for cooling the VC-8000 rack.

3.1.3 Environment

Install the VC-8000 system in an environment compatible with the system specifications. Refer to the VC-8000 system datasheets for environmental specifications. When installing in hazardous areas, install the VC-8000 system in an enclosure or area protected to IP54 (splash protected).

Environmental condition range:

Altitude: 2000 m
Temperature: -20 °C to +65 °C
Humidity: 80 % RH max
Pollution Degree: 2



3.2 Mounting Methods

3.2.1 Rack Mounting

The VC-8000 rack mounting option provides brackets for installation in an EIA 19 inch rack. Secure the rack using four 10/32 bolts and washers at the four locations shown in **Figure 3-1**.

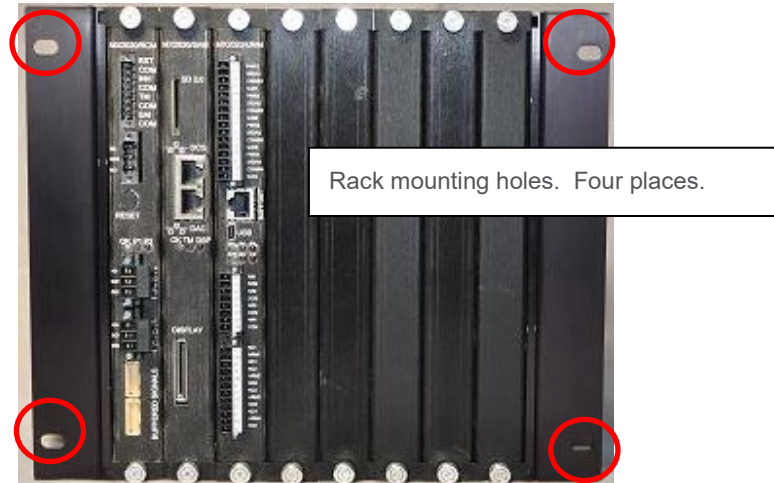


Figure 3-1) *Rack Mounting Holes*

3.2.2 Panel Mounting

Panel-mount the VC-8000 rack in a cutout according to **Figure 3-2: Mounting Holes and Cutout**.

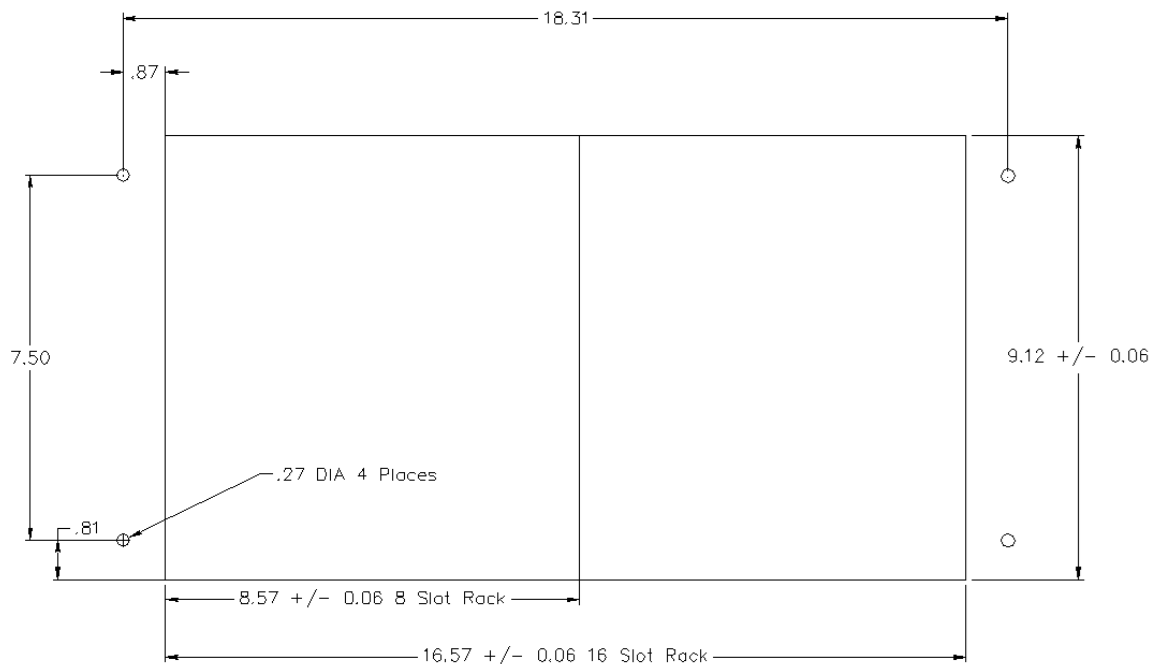


Figure 3-2) *Mounting Holes and Cutout*

The VC-8000 rack does not come with Panel Clamps.
Secure the rack using four 10/32 bolts through mounting holes at the locations shown.



3.2.3 Bulkhead Mounting

To bulkhead mount a VC-8000 rack, the mounting brackets are installed on the backside of the rack as shown.

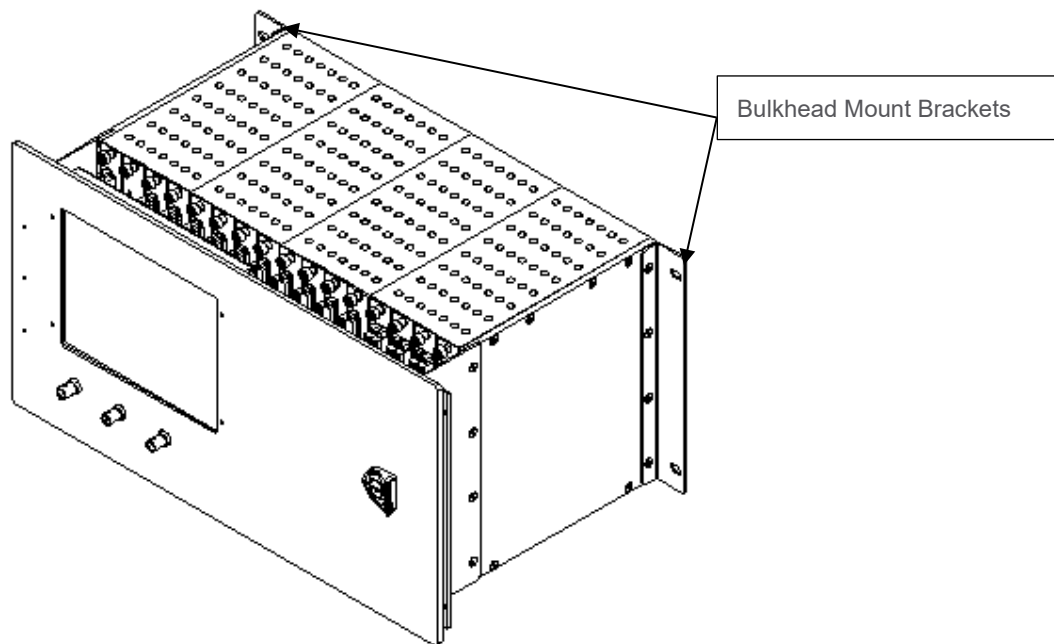


Figure 3-3) Bulkhead Mounting

The mounting hole pattern for bulkhead mounting is the same as for panel mounting. Refer to **Figure 3-2**.

3.2.4 Box Mounting

The VC-8000 system's small, front-loading design lends itself well to mounting in weatherproof or explosion proof boxes. Be sure to consider heat dissipation to ensure the box interior stays within the VC-8000 ambient temperature rating. If possible, keep the box out of direct sunlight. Refer to the module datasheets for power dissipation information in order to calculate heat rise inside the box. Provide ventilation air if required.

3.2.5 Mounting the Display Remotely

You can mount the VC-8000 door and display up to 3 meters (10 feet) from the VC-8000 rack using the remote display option. Anchor the display cable to a solid surface every 15 cm (6 inches).

3.2.6 Reverse Mounting

For applications requiring the system wiring to terminate at the rack back, you can move the display to the rack back and install in panels or 19 inch EIA racks following the instructions in 3.2.1 or 3.2.2. Reverse mounting requires a longer display cable to reach from the System Access Module to the display. Refer to the datasheet for display cable part numbers and ordering information.

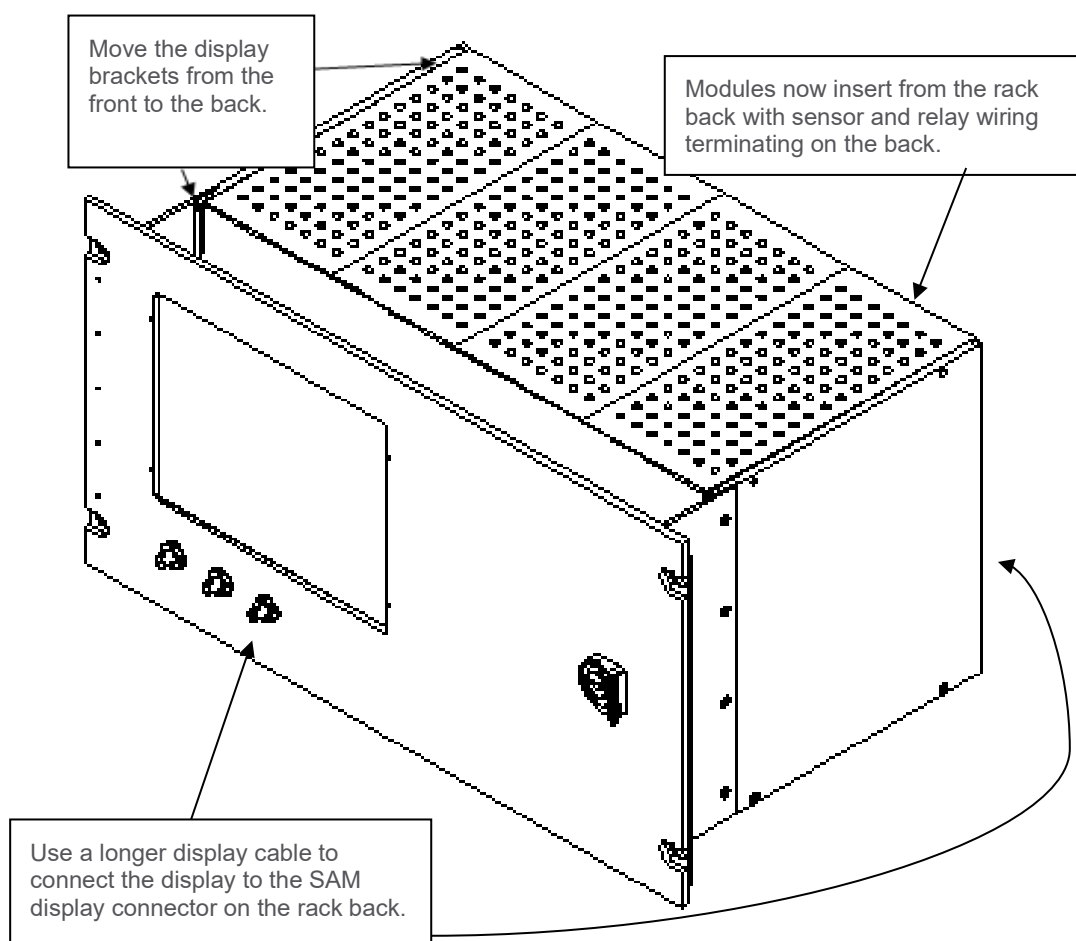


Figure 3-4) Reverse Mounting the Rack



3.3 General Wiring Considerations

All VC-8000 connectors are a pluggable type with flange locking screws. To remove the connectors, loosen the two flange screws on either side of the terminal contacts and pull the connector straight out.

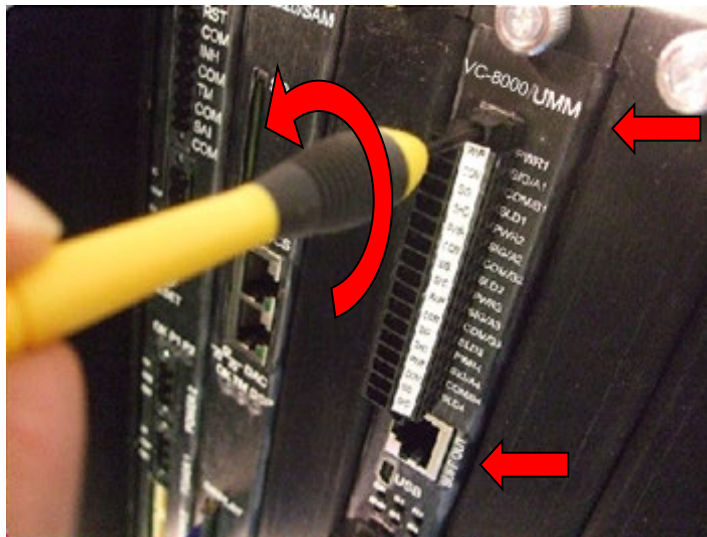


Figure 3-5) Loosen Connector Flange Screws

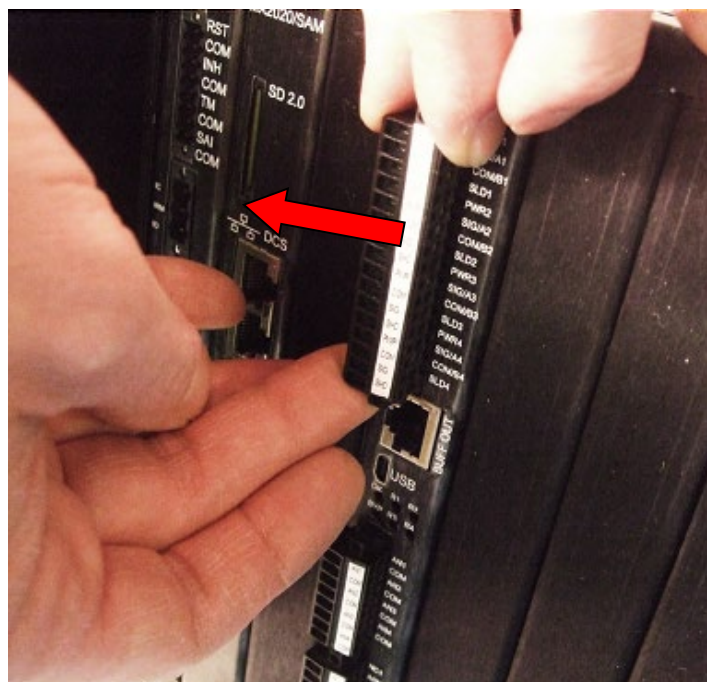
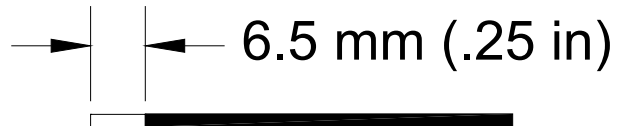
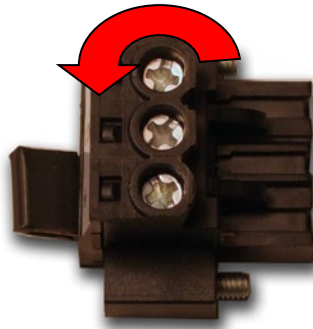


Figure 3-6) Pull Connector Plug Out

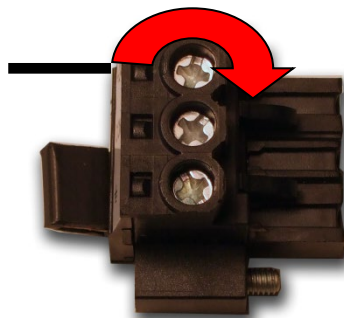
Strip wires to 6.5 mm (0.25 in).



Fully open the connector by turning the terminal screw counterclockwise.



Insert the wire and tighten the connector by turning the screw clockwise. Torque to 0.2 Nm.





3.4 Rack Connection Module Connections

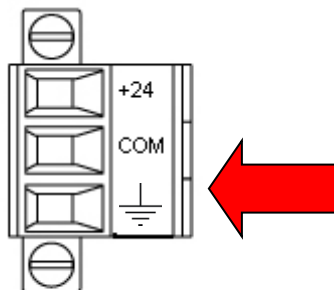
The Rack Connection Module (RCM) installs in the VC-8000 rack slot 1 (left).

The RCM provides connections for:

- System Chassis Ground
- Single Point System Common to Chassis Ground
- +24 V System Primary Power
- +24 V System Secondary Power
- Fault Relay
- Discrete Control Contacts
- Buffered Outputs


3.4.1 System Chassis Ground

Connect chassis ground wire to the rack at the RCM power connector chassis terminal. Follow electrical codes when selecting wire size, maximum wire length, and maximum earth ground resistance. When used in Zone 2 hazardous area applications, use a 4 mm² wire with crimp style lug to connect the chassis ground wire to earth ground.



The external power supplies are powered from high voltages. Only qualified personnel should make connections to the power supply. Refer to instructions included with the power supply module.

3.4.2 Single Point System Common to Chassis Connection

For normal installation, insert the jumper between COM and  as shown. This connects the internal system ground to the chassis. You can install the jumper at either the Power 1 or Power 2 plugs. Both work the same.

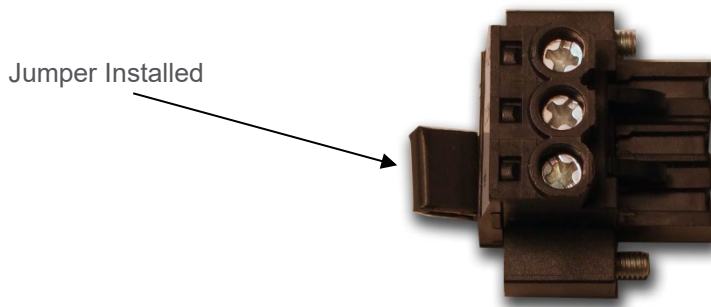


Figure 3-7) Chassis Jumper Installation

When using Zener safety barriers, or when the internal system ground is connected to another instrument ground, remove the jumper.

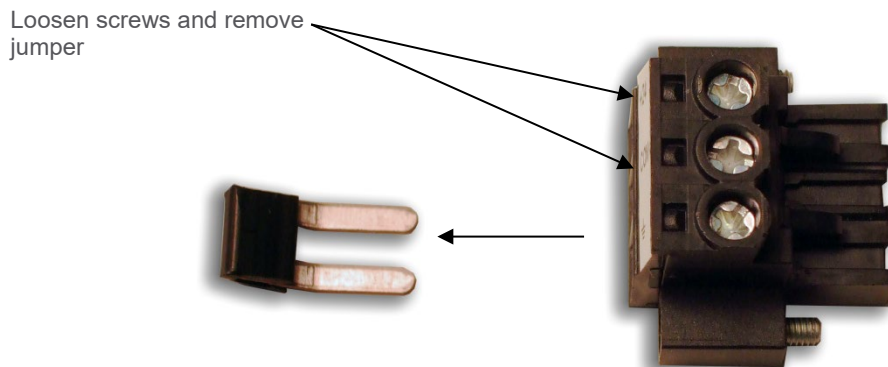


Figure 3-8) Chassis Jumper Removal



3.4.3 Power Wiring

Select the power wiring gauge to be large enough to keep the input supply voltage within the normal range of +22 Vdc to +30 Vdc. The amount of cable resistance allowed is determined by the maximum VC-8000 rack current draw and the nominal power supply.

Table 1 shows the maximum wire length for fully loaded racks when powered with a +24 Vdc power supply.

Table 1: Maximum Power Wire Length at +24 Vdc Input Power

Wire Size	16 slot rack	8 slot rack	4 slot rack
12 AWG	23 m (75 ft.)	61 m (200 ft.)	104 m (340 ft.)
14 AWG	18 m (50 ft.)	46 m (150 ft.)	76 m (250 ft.)
16 AWG	9 m (30 ft.)	24 m (80 ft.)	41 m (135 ft.)
18 AWG	6 m (20 ft.)	16 m (50 ft.)	26 m (85 ft.)
20 AWG	4 m (12 ft.)	9 m (30 ft.)	15 m (49 ft.)
22 AWG	2.5 m (8 ft.)	6.5 m (21 ft.)	11 m (36 ft.)

3.4.4 Fault Relay Wiring

The VC-8000 fault relay is a fault tolerant Single-Pole, Double-Throw (form C) relay. The fault relay activates whenever machine protection is compromised due to a detected failure. The fault relay labeling is in reference to the fault condition (i.e. when a fault occurs NC will be connected to ARM.). The fault relay is normally energized when the system is operating correctly and de-energizes to indicate a fault condition. Loss of rack power causes a fault indication. Connect to the fault relay using AWG 12 to 24 AWG wire (0.2 mm² to 4 mm²). Refer to the specifications for the fault relay current and voltage rating shown in the datasheet.



ELECTRICAL SHOCK HAZARD: High voltages may be present on relay wiring. Remove power before servicing relay connections

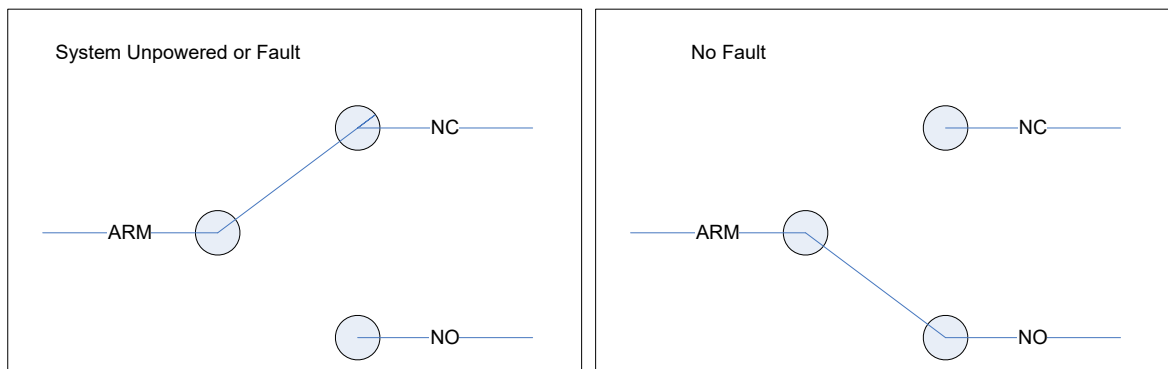
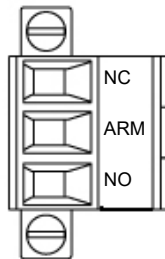
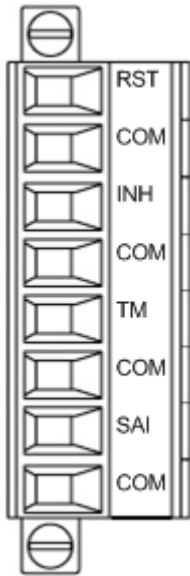


Figure 3-9) Fault Relay Operation



3.4.5 Discrete Control Input Wiring

The discrete input connector provides control signal inputs from external devices, dry contact relays, or switches. All discrete inputs are active low and are asserted when the input is pulled to common. The discrete inputs are 5V logic compatible and can be pulled low by logic gates.



CAUTION!

Connecting high voltage wetted relays to the discrete contacts can damage the module. Connect only dry contact relays or low voltage logic.

Figure 3-10) Discrete Contact Inputs

Connect to the discrete inputs using AWG 14 to AWG 28 wire as in the **Figure 3-11** example.

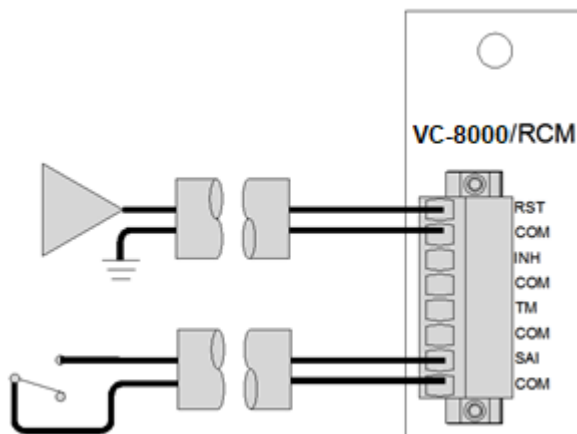


Figure 3-11) RCM Discrete Contact Wiring

3.4.6 Buffered Outputs Connectors

The buffered outputs connectors provide access to buffered analog signals from UMM modules installed in the rack. There are 56 dynamic signals and 4 COMMON signals are divided between two 30-pin connectors according to **Table 2** and **Table 3**.



NOTE:

The RCM buffered output port was designed for permanent connection to a patch panel or data acquisition system. Use the RJ45 connectors on the modules for temporary connections.

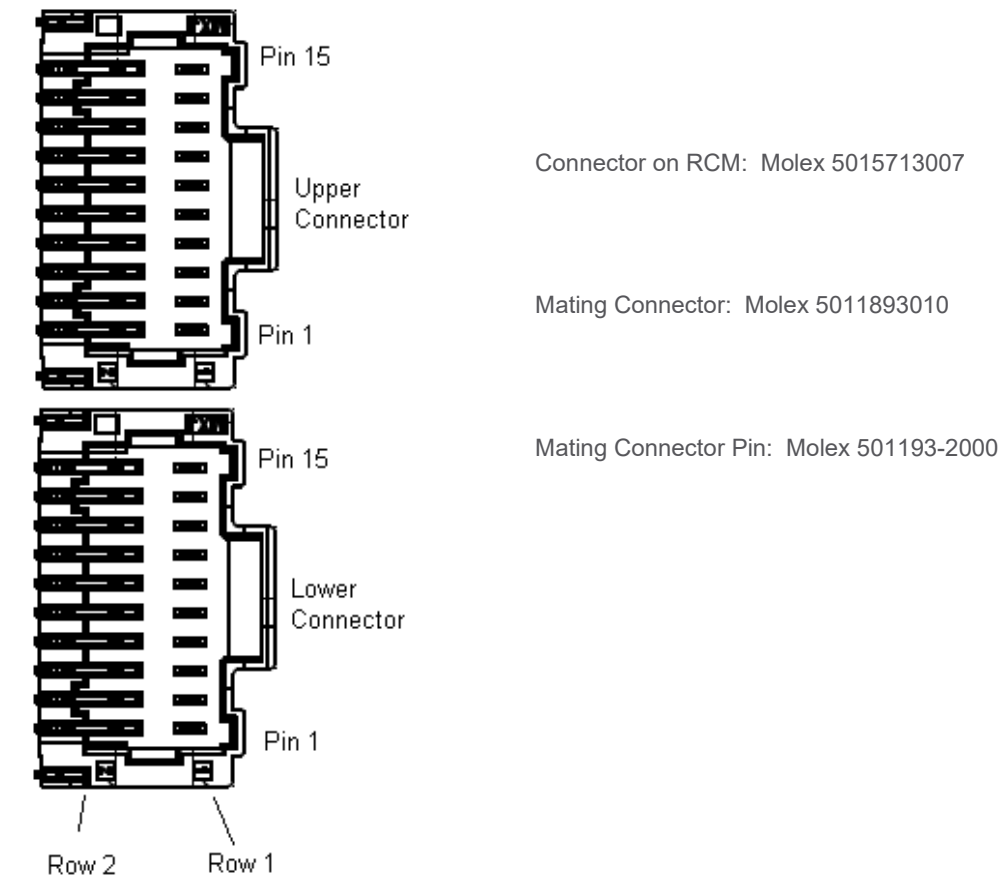


Figure 3-12) RCM Buffered Out Connectors



Table 2: Buffered Out Upper Connector

Upper Connector					
Row 1 Pin	Slot	Channel	Row 2 Pin	Slot	Channel
1	3	1	1	3	3
2	4	1	2	4	3
3	5	1	3	5	3
4	6	1	4	6	3
5	7	1	5	7	3
6	8	1	6	8	3
7	9	1	7	9	3
8	Common	Common	8	Common	Common
9	3	2	9	3	4
10	4	2	10	4	4
11	5	2	11	5	4
12	6	2	12	6	4
13	7	2	13	7	4
14	8	2	14	8	4
15	9	2	15	9	4

Table 3: Buffered Out Lower Connector

Lower Connector					
Row 1 Pin	Slot	Channel	Row 2 Pin	Slot	Channel
1	10	1	1	10	3
2	11	1	2	11	3
3	12	1	3	12	3
4	13	1	4	13	3
5	14	1	5	14	3
6	15	1	6	15	3
7	16	1	7	16	3
8	Common	Common	8	Common	Common
9	10	2	9	10	4
10	11	2	10	11	4
11	12	2	11	12	4
12	13	2	12	13	4
13	14	2	13	14	4
14	15	2	14	15	4
15	16	2	15	16	4

3.4.7 Switchable BNC connectors

VC-8000 racks purchased with the display option provide three switchable BNC connectors. Switchable BNC connectors allow you to quickly change the buffered out signals into a portable data collector or other test equipment without connecting or reconnecting BNC cables.

3.5 System Access Module Connections

The System Access Module (SAM) installs in the VC-8000 rack slot 2. A redundant SAM can install in rack slot 3.

The SAM provides connections for:

- SD Card Data Storage
- Ethernet Modbus/TCP connection to the controller
- Ethernet Data Acquisition computer connection
- Display connection
- Serial Modbus connection to the controller

3.5.1 SD Card Installation

The Dynamic Data option is required to activate the SD card functionality.



3.5.2 Modbus/TCP Ethernet Connection

The top port provides static data and statuses to a control system via 10/100baseT Ethernet using a standard CAT5 or CAT6 cable with an RJ45 connector.

The maximum length for twisted pair wiring without an interposing switch or hub is 100 m (328 ft).

Note: Ethernet connection to the VC-8000 Setup software is only available with the Remote Access functionality.

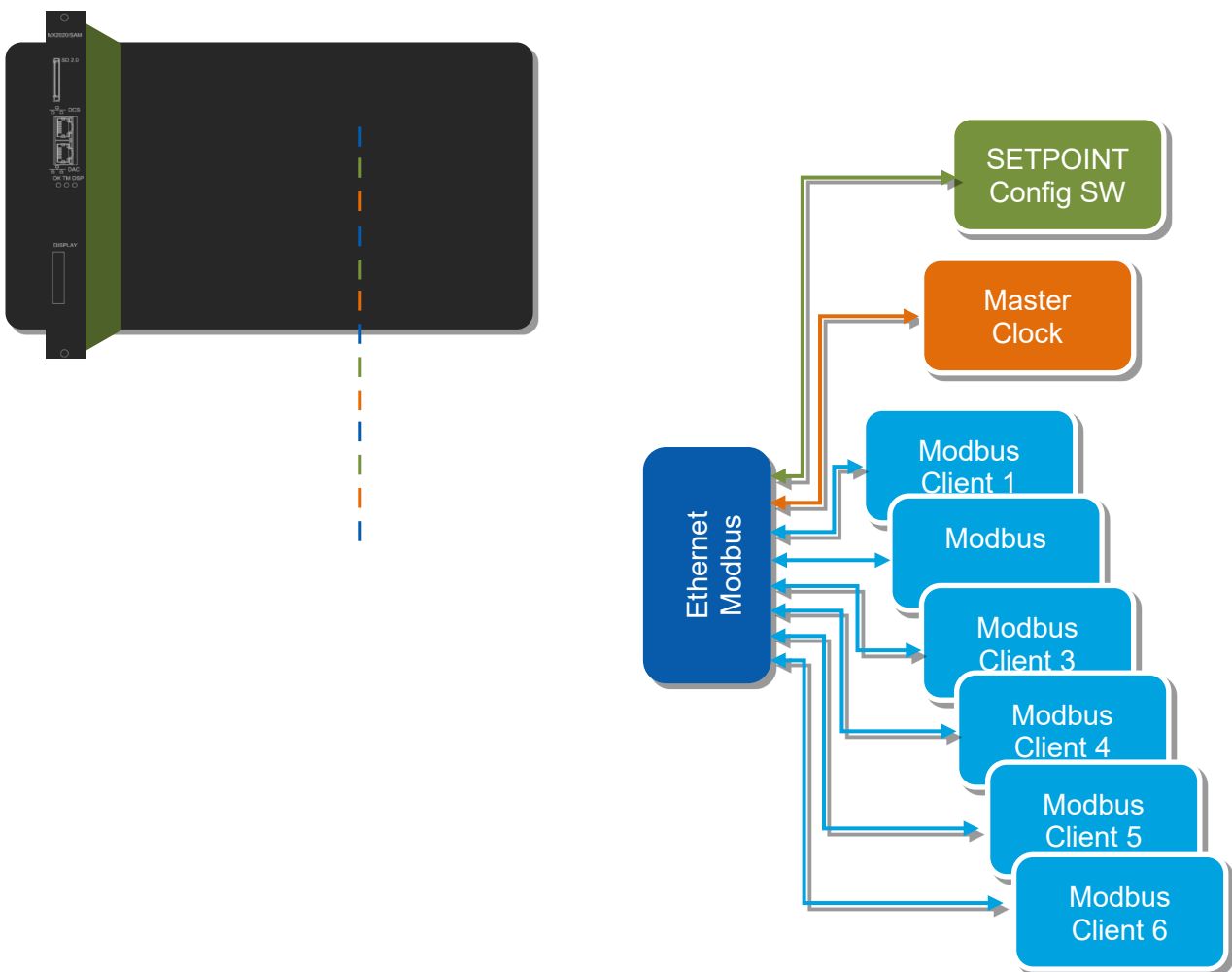


Figure 3-13) Connecting to Modbus

3.5.3 Serial Modbus Connection

When using a SAM with a serial Modbus connection as shown in **Figure 3-14**, wire the serial cables to the SAM as shown in this section.

RS-232, RS-422, or RS485 Point-to-Point

Wire point-to-point between the host controller or computer and the SAM using a custom cable or using adapter C106856.001.

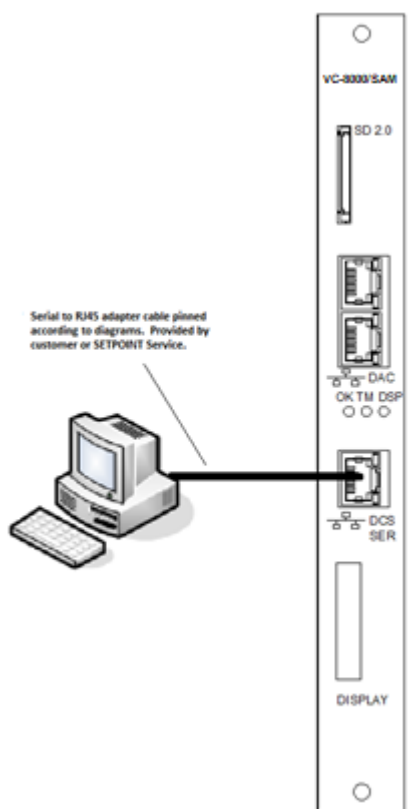


Figure 3-14) Serial Point to Point Connection



RS-485 Multi-drop

Figure 3-15 shows a multi-drop RS-485 network. You can use Adapter part number C106856.001 to convert between RJ45 and DB9M connectors. Depending on where to convert between cables, you can connect the network using Cat 5/6 cables with RJ45 connectors and adapter Ts, or use standard DSUB connector Ts.



NOTE!

The adapter should be a simple T with both ports connected in parallel and not a splitter which electrically combines signals from two ports and sends them down a single port.



NOTE!

Cat 5/6 cables have a characteristic impedance of 100 ohms vs. the 120 characteristic impedance of standard RS-485 cable. This will cause a small reflection. If your network length exceeds the length shown in Table 4, use RS-485 cable and terminate with 120 ohms.

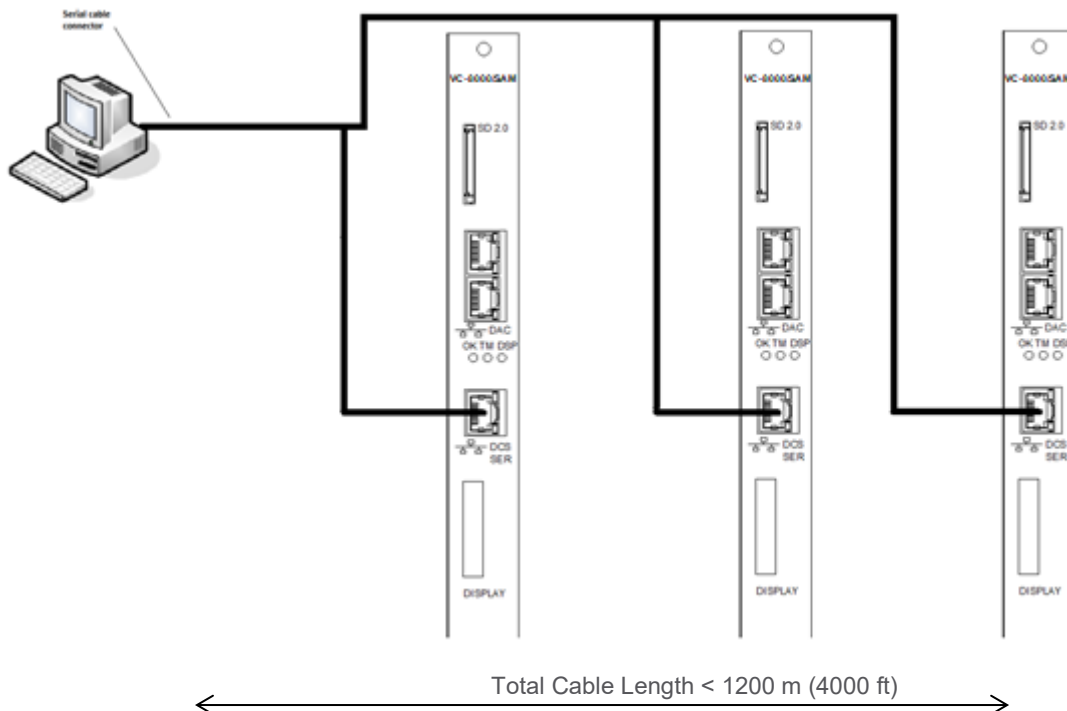


Figure 3-15) RS-485 Multi-drop Cabling

Maximum Racks on an RS-485 Network

You can place up to 64 VC-8000 racks on an RS-485 multi-drop network.

Fail Safe Biasing Resistors

VC-8000 does not require biasing resistors. The fail safe function is built in.

Termination for RS-485 Networks

Depending on the total network cable length, reliable RS-485 communication requires proper termination at each end of the network. If the cable length is short and the baud rate low, reflections are attenuated by the time the signal is read so termination is not required. However, if your cable length exceeds the length shown in **Table 4** for your baud rate, you will need to terminate your network as discussed in this section.

Table 4: Maximum Cable Length without Termination

Baud Rate (bits per second)	Maximum Cable Length without Termination
1200, 2400, 4800	Termination not required up to maximum allowable length of 1215 m (4000 ft).
9600	850 m (2800 ft)
19200	425 m (1400 ft)
38400	213 m (700 ft)
57600	143 m (470 ft)
115200	71 m (234 ft)

Terminate at both ends of the network as shown in **Figure 3-15**. Keep stubs between the main trunk and each rack as short as possible.

If required, place external 120 ohm termination resistors between RX- and RX+ and between TX- and TX+.

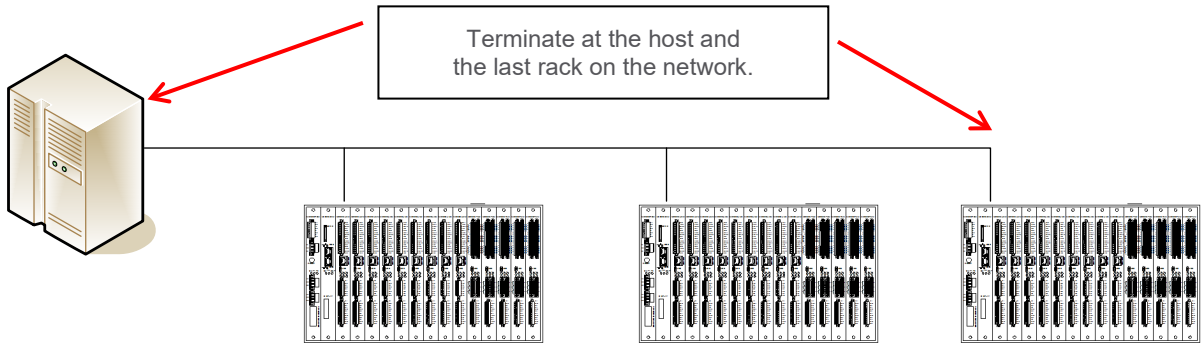


Figure 3-16) Terminating an RS-485 Network with Host on End

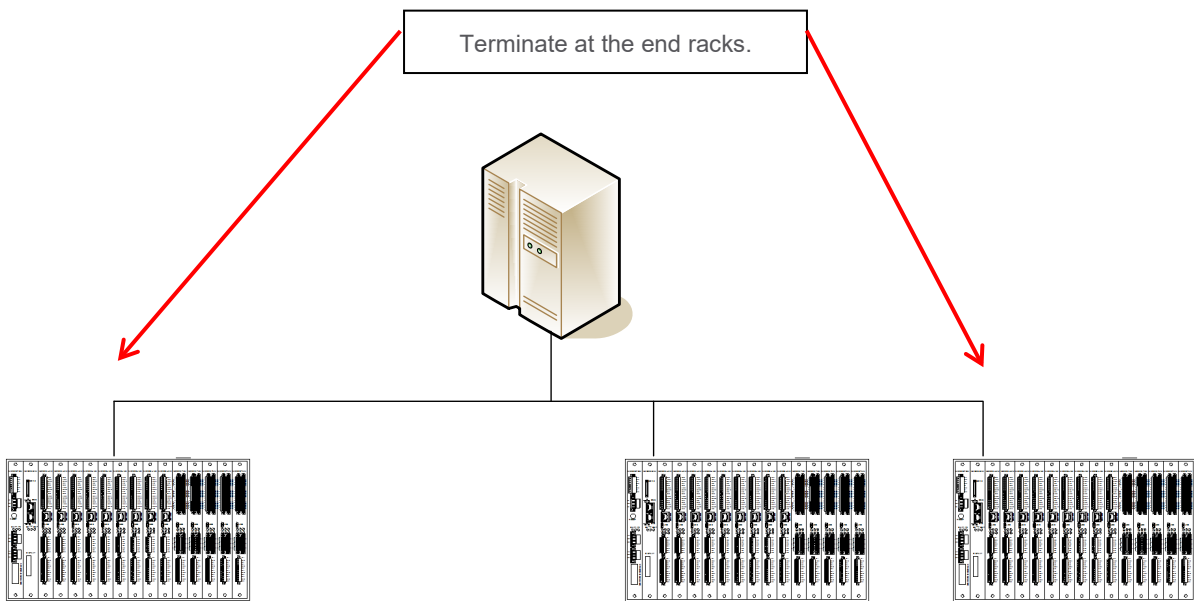


Figure 3-17) Terminating an RS-485 Network with Host not on End

Two-wire RS-485 Half Duplex networks

Externally connect the receive and transmit pairs together (RD+ to TD+, RD- to TD-) for half duplex RS-485 communication. When configuring the rack enable only RX termination for the last rack on the network (TX termination not enabled).

3.5.4 Ethernet Data Acquisition Computer (DAC) Connection

The lower Ethernet port provides dynamic data via 10/100/1000baseT Ethernet to a computer running the SETPOINT® Condition Monitoring Software. When connecting to a 1000baseT (gigabit) Ethernet network, use CAT6 cable. Slower networks can use CAT5 or CAT6 cable. The connector is a standard RJ45. Refer to 'SETPOINT® CMS Instructions (S1176125)' for information on using the CMS connection.

The maximum length for twisted pair wiring without an interposing switch or hub is 100 m (328 ft).

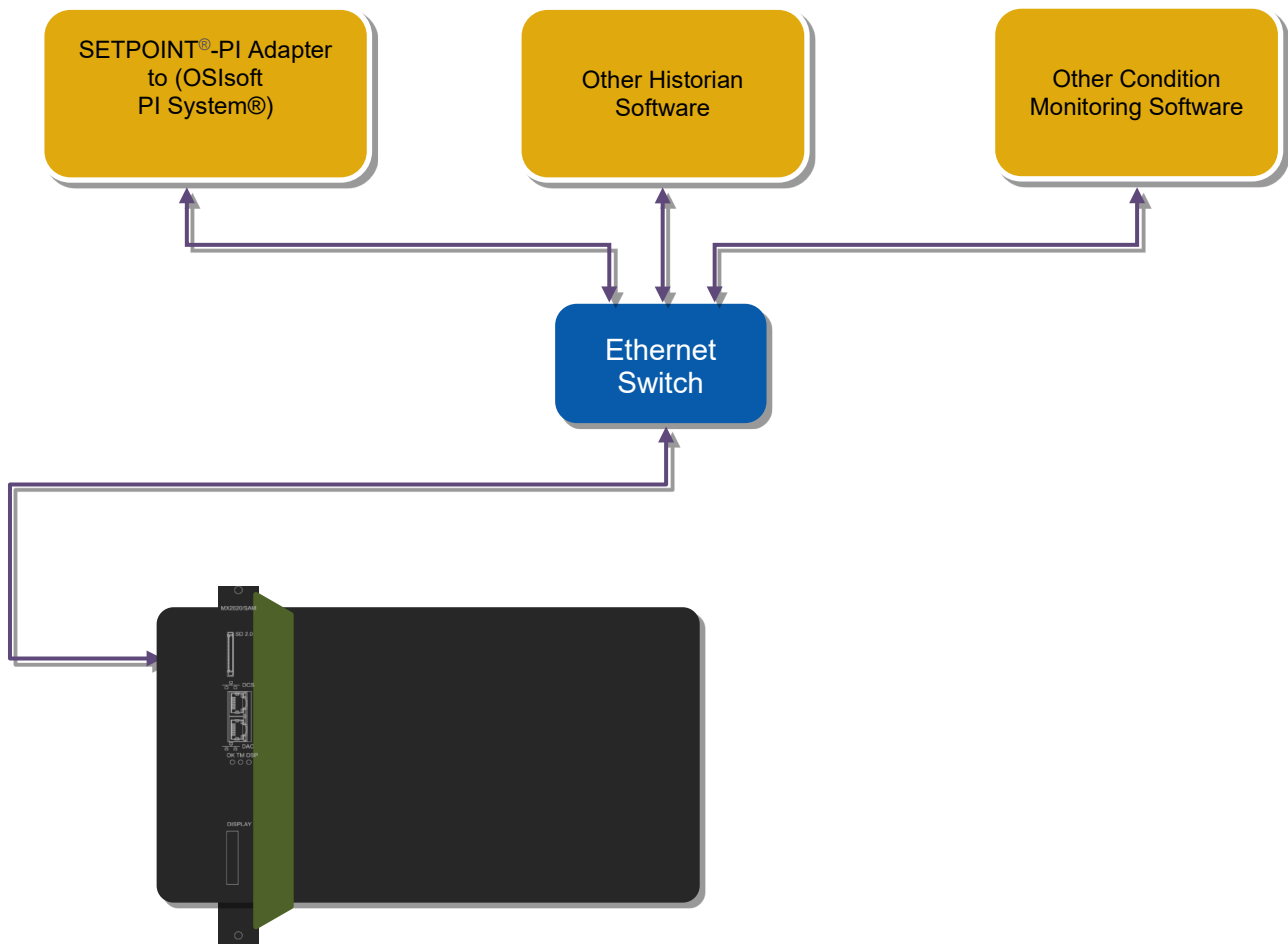


Figure 3-18) Connecting SETPOINT® CMS with a Switch



The dynamic data Ethernet port is MDIX compliant and can be connected directly to a computer using a straight through or crossover cable without an interposing hub or switch.

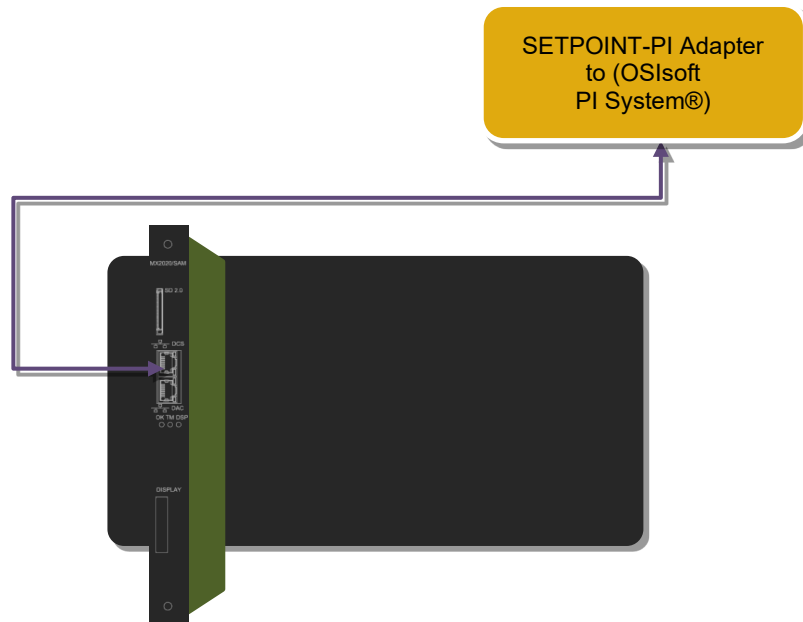


Figure 3-19) Connecting SETPOINT® CMS Directly

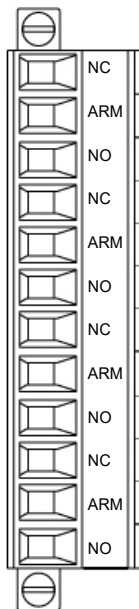
3.6 Monitor Module Connections

This section describes installation of the UMM and TMM monitor modules including:

- Relay Wiring
- Analog 4 to 20 mA output wiring
- UMM sensor wiring
- TMM sensor wiring

3.6.1 Connecting to Relays

UMM and TMM relay connectors support wire gauges between 16 AWG and 28 AWG.



ELECTRICAL SHOCK HAZARD:

High voltages may be present on relay wiring. Remove power before servicing relay connections



APPLICATION ALERT:

The De-Energize to Trip (Normally Energized) relay setting will cause a trip on loss of power, configuration change or firmware download. Externally disconnect relays or bypass when making system changes.

Relay labeling NC (normally closed), NO (normally open), and ARM (armature) refer to the relay contacts in the de-energized state. Refer to **Figure 3-20** for relay contact operation for de-energized to trip and energized to trip operation.

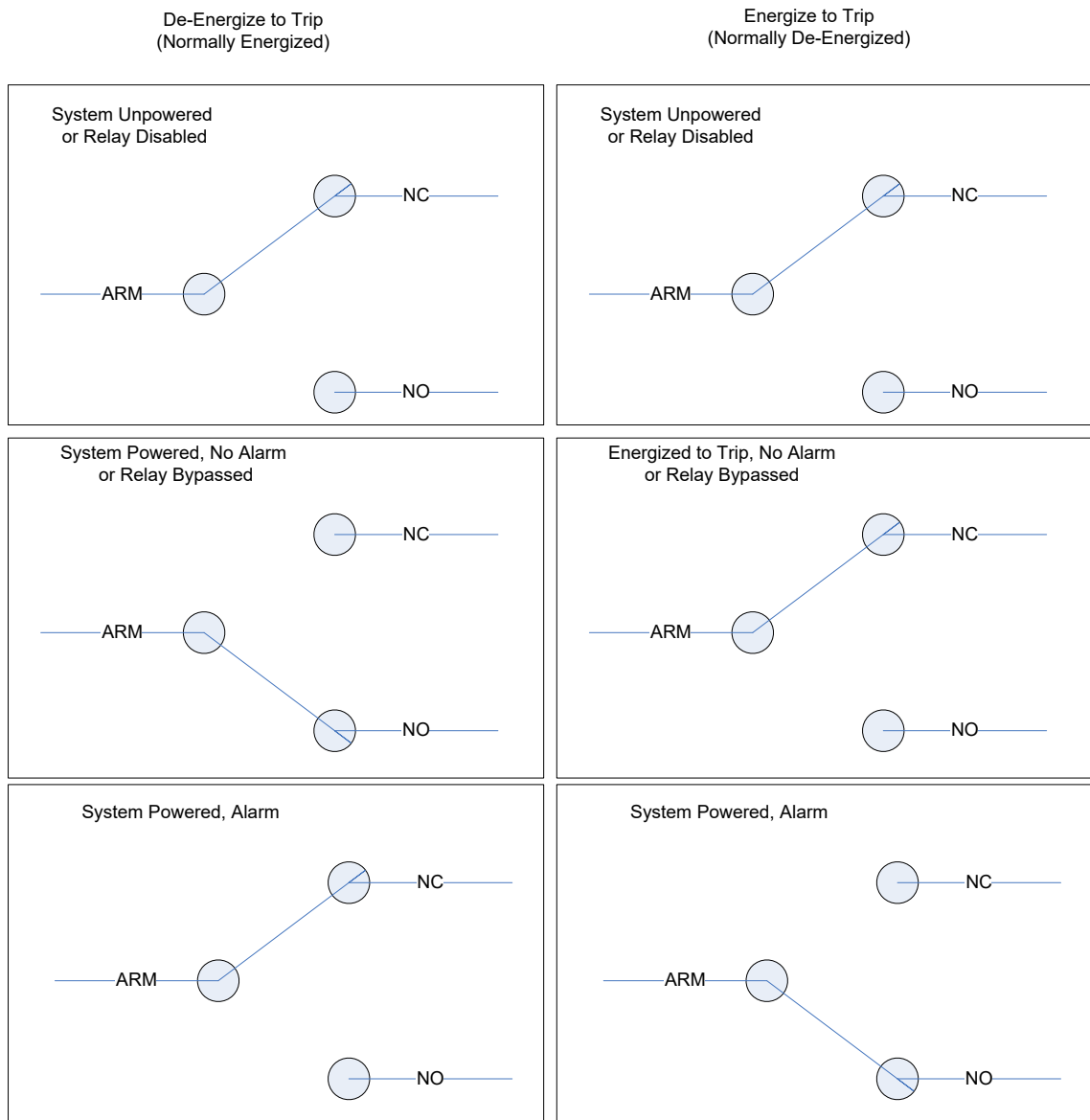


Figure 3-20) Relay Wiring

Connecting the Analog Outputs

The monitor modules provide 4 to 20 mA outputs proportional to the configured variable measurement. 4 mA corresponds to the configured bottom-scale, 20 mA corresponds to the configured full-scale. The 4 to 20 mA is self-powered (sourcing) and requires no external power source.

Shielded wire is recommended to reduce electrical noise. Terminate shielding at the receiving device.

In the event of a sensor fault, the 4 to 20 mA output will drop to 2 mA or to a programmed clamp value depending on configuration. An output between 20 mA and 24 mA indicates an over-range condition.

3.6.2 Universal Monitoring Module (UMM) Sensor Wiring

This section describes installation of the Universal Monitoring Module including field wiring for:

- -24 V, 3-wire Proximity Transducers
- -24 V, 3-wire Acceleration Transducers
- +24 V, 2-wire IEPE Accelerometers
- +24 V, 2-wire IEPE Velocity Sensors
- Moving coil velocity sensors
- -24 V, 3-wire Proximity type speed sensors
- 2-wire loop powered process variable transmitters
- Externally powered process variable transmitters
- Discrete inputs
- Aeroderivative Interface Modules

Wiring 3-Wire Proximity Transducers

Connect standard, -24 V powered Proximity transducers as shown below:

3 WIRE PROXIMITY

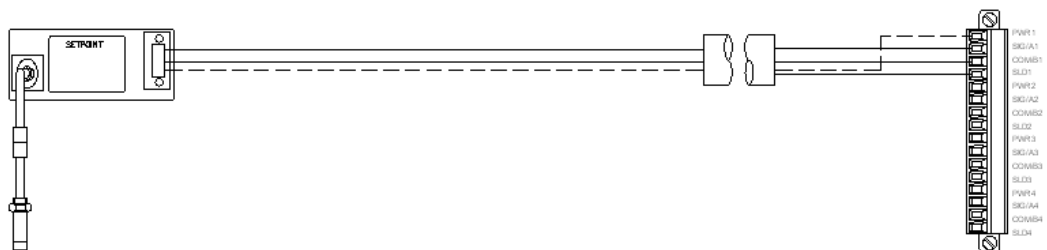


Figure 3-21) -24 V, Proximity Sensor Wiring



Wiring 3-Wire Accelerometers

Connect 3-wire, voltage mode accelerometers as shown below:

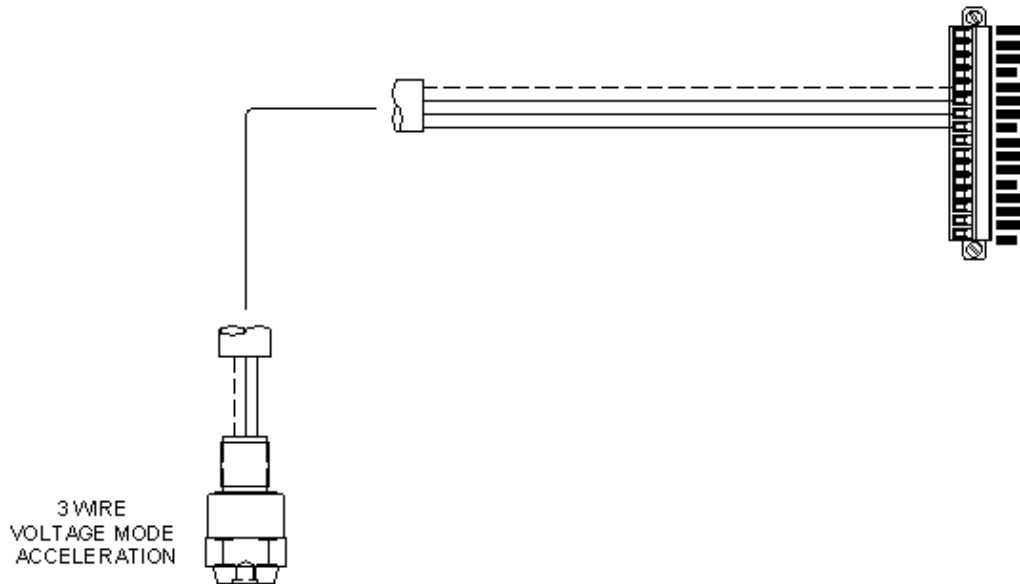


Figure 3-22) -24 V, 3-wire Accelerometer Wiring

Wiring IEPE Transducers

The UMM provides +24 Vdc at 3 mA constant current to power typical IEPE 2-wire sensors. Connect the transducer “A” wire to the UMM Sig/A wire and the transducer “B” wire to the UMM COM/B terminal as shown in **Figure 3-23** IEPE Transducer Wiring

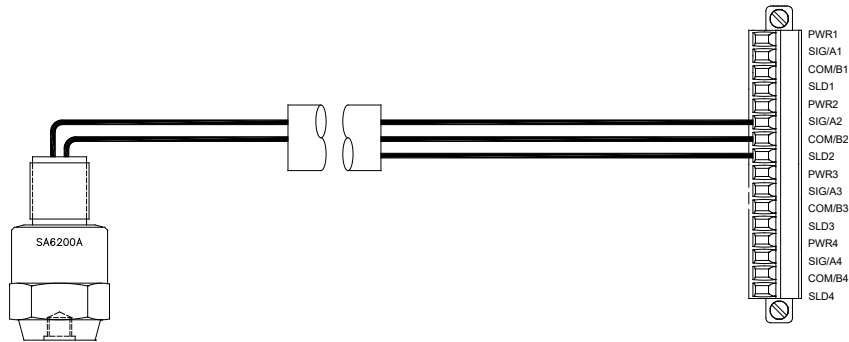


Figure 3-23) IEPE Transducer Wiring



NOTE:

Sensors designed for negative voltage operation, such as the Bently Nevada Velomitor, typically have the A terminal connected to COM and the B terminal connected to a -24V constant current source. These sensors can be wired to +24 constant current using the same wiring as for positive voltage sensors shown above, however the sensor noise shielding may be impaired.



Wiring Moving Coil Velocity Sensors

Connect moving coil transducers between the UMM SIG/A and COM/B terminals as shown below. When the sensor is properly connected, the bias is 0 Volts. If the transducer is disconnected, the input will change to -6 V and the UMM will set the channel as faulted.

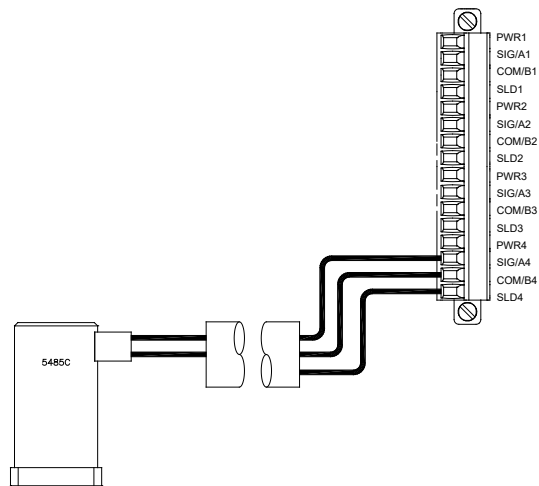


Figure 3-24) Moving Coil Velocity Sensor Wiring

Wiring Proximity Transducer Speed Sensors

Connect speed sensors to Channel 4 on any UMM module. If the speed sensors are shared between multiple modules, use UMM modules mounted in slots 4 through 9 according to **Table 5**.

Table 5: Phase Trigger Channels

Phase Trigger	Slot, Channel
1	Slot 4, Channel 4
2	Slot 5, Channel 4
3	Slot 6, Channel 4
4	Slot 7, Channel 4
5	Slot 8, Channel 4
6	Slot 9, Channel 4

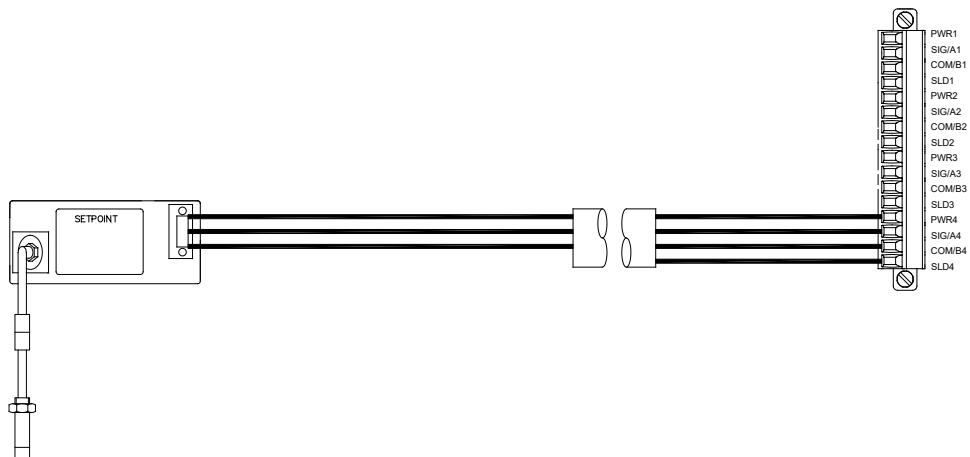


Figure 3-25) Phase Trigger Wiring



Wiring to Discrete Inputs

The VC-8000 UMM supports discrete inputs from external +3.3 V logic devices, +5 V logic devices, or from a dry contact relay closure. **Figure 3-26** shows how to wire logic devices and dry contact relays to the UMM inputs.

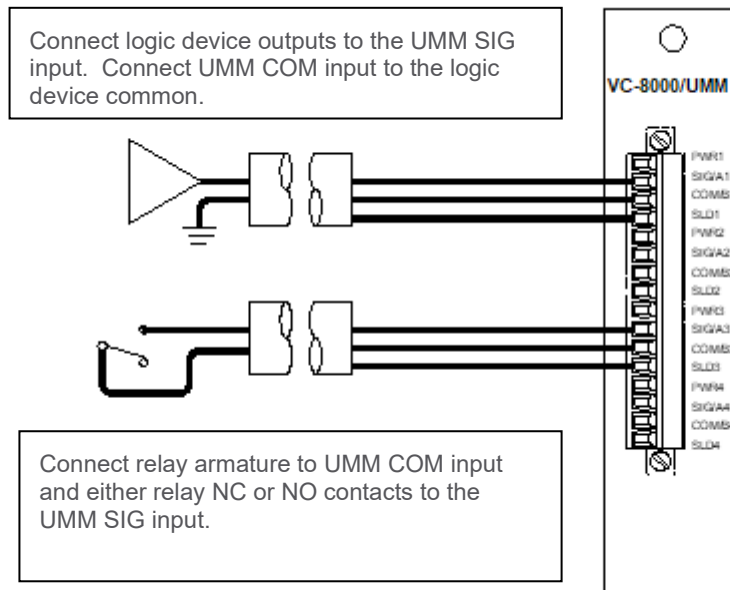


Figure 3-26) Wiring Discrete Inputs

Wiring to Aeroderivative Interface Module

Connect Aeroderivative module as indicated below. Wire the 86517 according to **Figure 3-27** and the 86497 according to **Figure 3-28**. You can also connect the +Accel (ACC) signal to a separate UMM channel SIG input for monitoring the acceleration if desired.

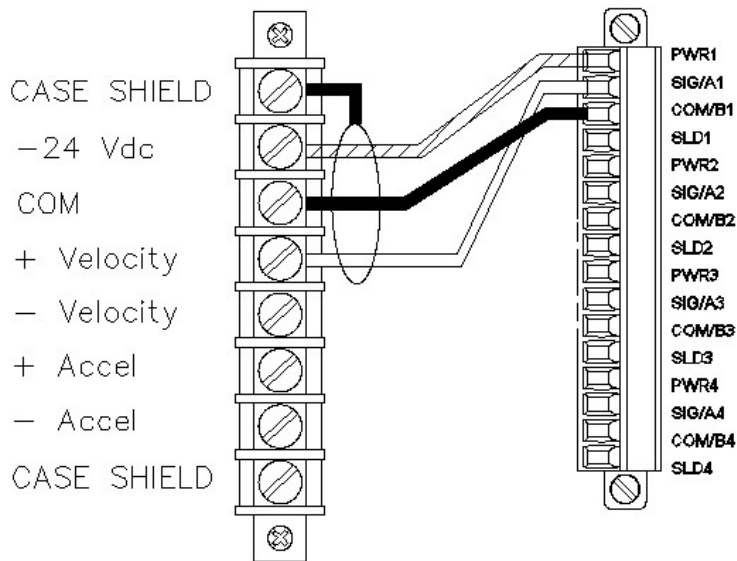


Figure 3-27) Bently Nevada 86517 Interface Module Wiring

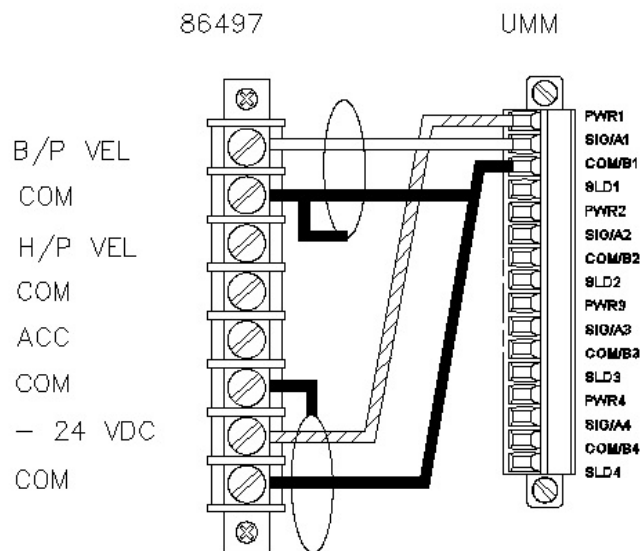


Figure 3-28) Bently Nevada 86497 Interface Module Wiring



Magnetic Pickup Sensor Wiring

Connect the sensor as indicated below

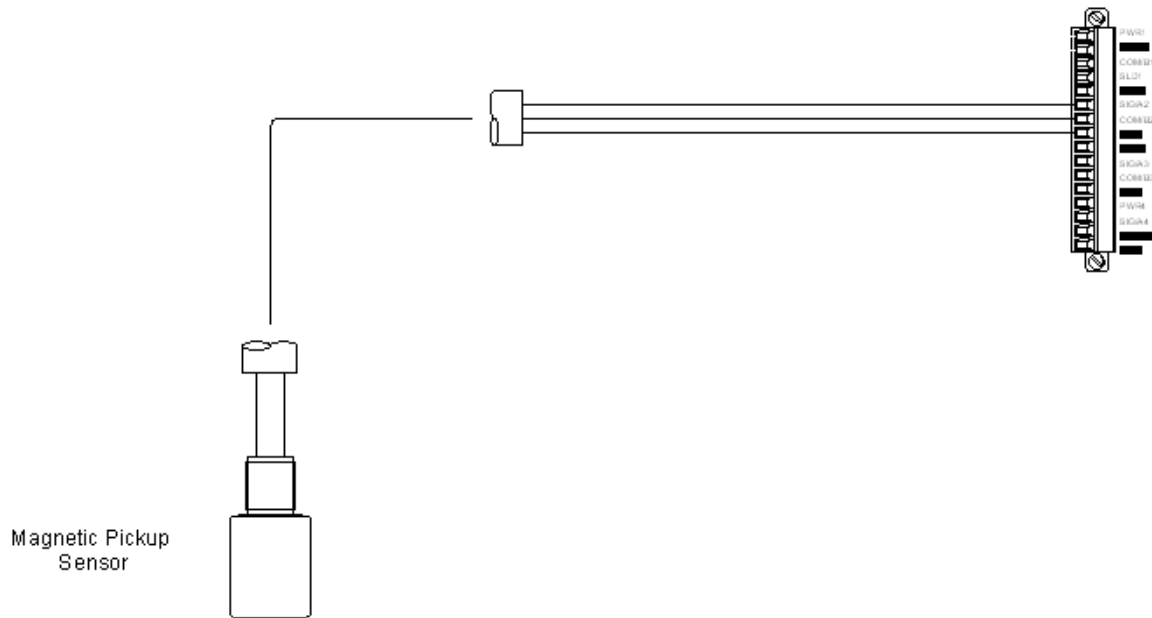


Figure 3-29) Magnetic Pickup Wiring

Wiring 4 to 20 mA Transmitters

You can use the UMM to monitor 4 to 20 mA transmitter inputs. The UMM provides higher sampling rates, faster alarming, and buffered outputs not provided by the TMM.

Two-wire, Loop-Powered Transmitters

Connect 4 to 20 mA 2-wire, loop-powered transmitters as shown in **Figure 3-30**. The UMM provides -24Vdc power sufficient to power the transmitter. The 4 to 20 mA current signal passes through a 249 ohm sense resistor to create a -1.0 V to -5.0 V analog signal that is inverted and gained to create a -1 V to -20 V signal available at the UMM buffered outputs.

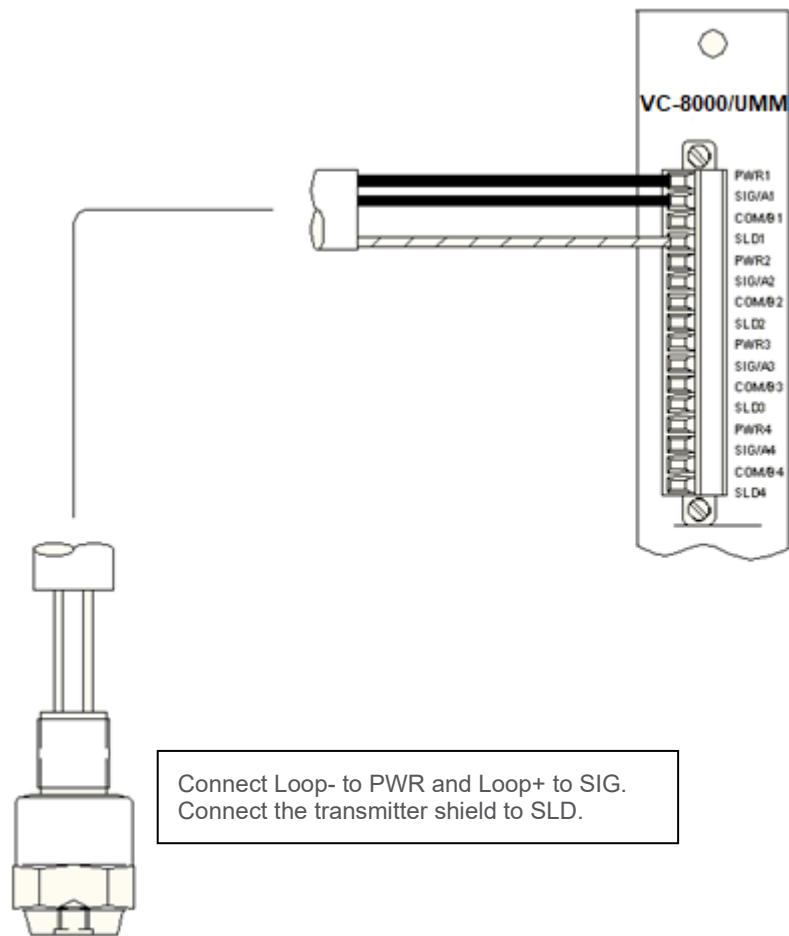


Figure 3-30) UMM two wire Transmitter Wiring



Externally Powered Transmitters

You can use externally powered 4 to 20 mA, 0 V to +5 V, +1 V to +5V, and 0 V to -10V when wired as shown in **Figure 3-31** with the transmitter loop+ connected to SIG and loop- connected to COM.

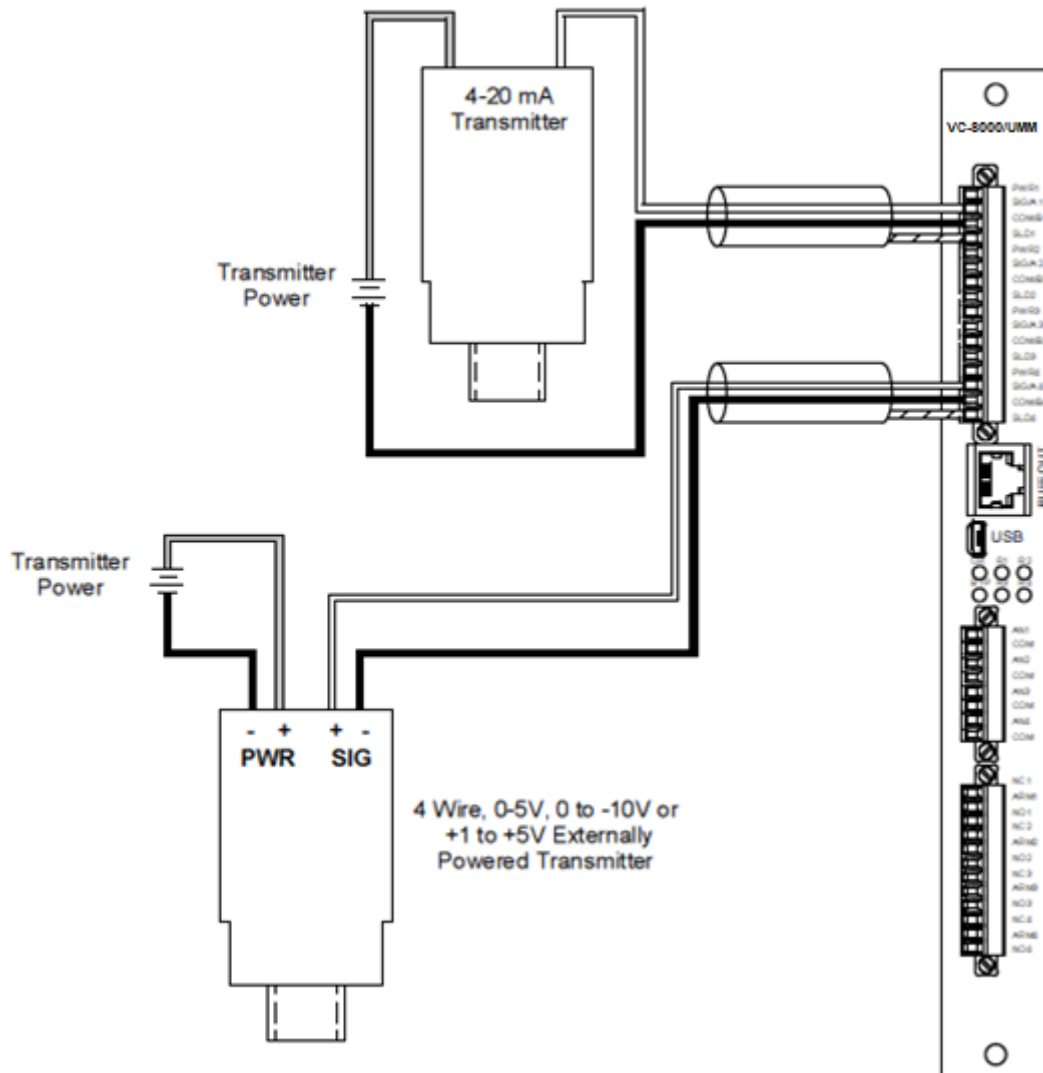


Figure 3-31) Externally Powered Transmitter Wiring

Wiring the IT6810 Impact Transmitter

The UMM supports impact measurements similar to the IT6810 Impact Transmitter. Using the UMM provides additional features such as buffered outputs, Modbus output, and alarming not available on the transmitter. You can reuse existing IT6810 Impact Transmitters with the UMM following the wiring described in this section.

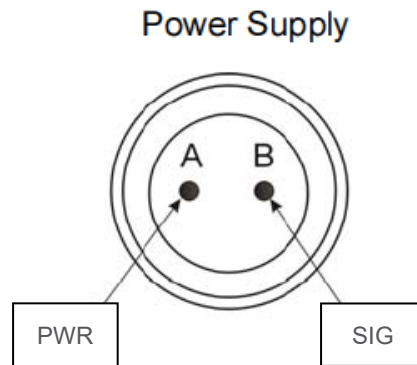


Figure 3-32) Impact Transmitter Wiring

Wire the IT6810 with the A terminal connected to the -24V PWR output from the UMM and the B terminal connected to Sig. When wired with reverse polarity (A = -24V, B = 0) the IT6810 enters adjustment mode. In this mode, the IT6810 outputs the dynamic signal along with a periodic pulse at the window period. The amplitude of this pulse is equal to the IT6810 threshold setting. The UMM will count this pulse resulting in a reading of “1” each window. You can use this count to verify that the transducer is working and increase your alarm limits by 1. If this is not desirable, adjust the IT6810 threshold to minimum so the UMM will not count this pulse. Refer to the IT6810 Manual for instructions on lowering the threshold.



3.6.3 Temperature Monitoring Module (TMM) Sensor Wiring

The TMM includes 5 connections per channel input (A, B, C, D, Shield) and can accept any combination of 2, 3, and 4-wire RTDs or thermocouples.



NOTE!

Some RTD manufacturers (e.g. Minco) have color codes other than IEC 751/ASTM. Be sure to verify wiring with the information provided with the RTD.

Connecting RTDs

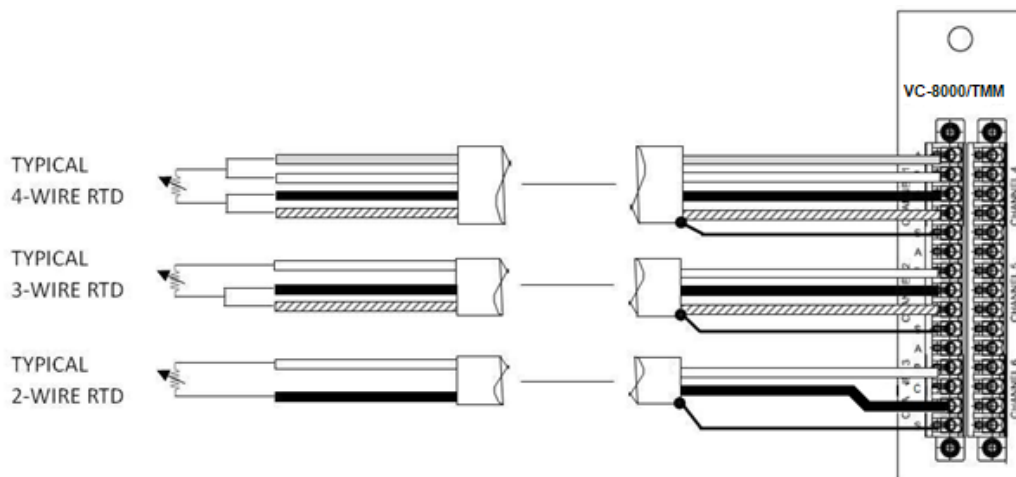


Figure 3-33) RTD Wiring

Table 6: RTD Wiring Table

TMM RTD wiring using IEC 751/ASTM Color Codes					
	VC-8000 TMM Terminal				
RTD	A	B	C	D	Shield
2-wire	NC	White	NC	Red	Shield
3-wire	NC	White	Red	Red	Shield
4-wire	White	White	Red	Red	Shield

The TMM compensates for the RTD wiring resistance. However, differences in resistance between the legs of 3-wire RTDs, or temperature drift of the 2-wire RTD extension wires will introduce errors. VC-8000 Vibration recommends a maximum of 25 ohms of field wiring resistance.

Connecting Thermocouples

Thermocouple common lines are electrically isolated from the VC-8000 system allowing connection to grounded tip thermocouples on a machine at ground potential different from the VC-8000 system. All thermocouple inputs are on the same common plane so grounded tip thermocouples should be at the same ground potential.

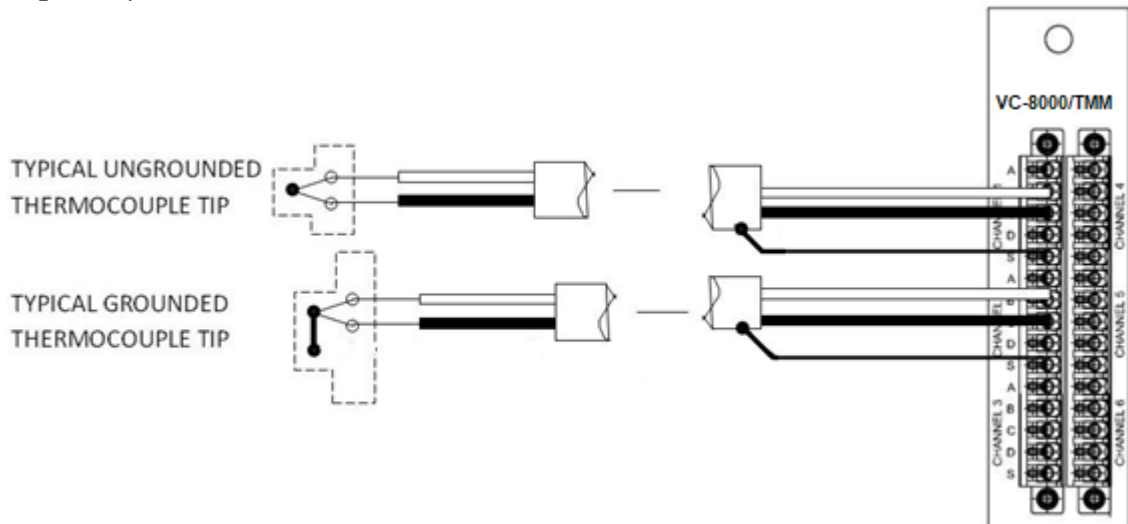


Figure 3-34) Thermocouple Wiring

Table 7 - Thermocouple Color Coding

	ANSI/ASTM E-230 Color Coding		IEC 584-3 Color Coding	
	B Terminal (+)	C Terminal (-)	B Terminal (+)	C Terminal (-)
J	White	Red	Black	White
K	Yellow	Red	Green	White
T	Blue	Red	Brown	White
E	Violet	Red	Violet	White



Connecting 4 to 20 mA Transmitters

The TMM supports process variable 4 to 20 mA transmitter measurements from externally powered transmitters connected through a 68 ohm resistor. The resistor converts the current into a voltage range suitable for TMM measurement.



APPLICATION ALERT:

Do not connect TMM PV channels as listeners in loops connected to another device. This will cause errors in the readings.

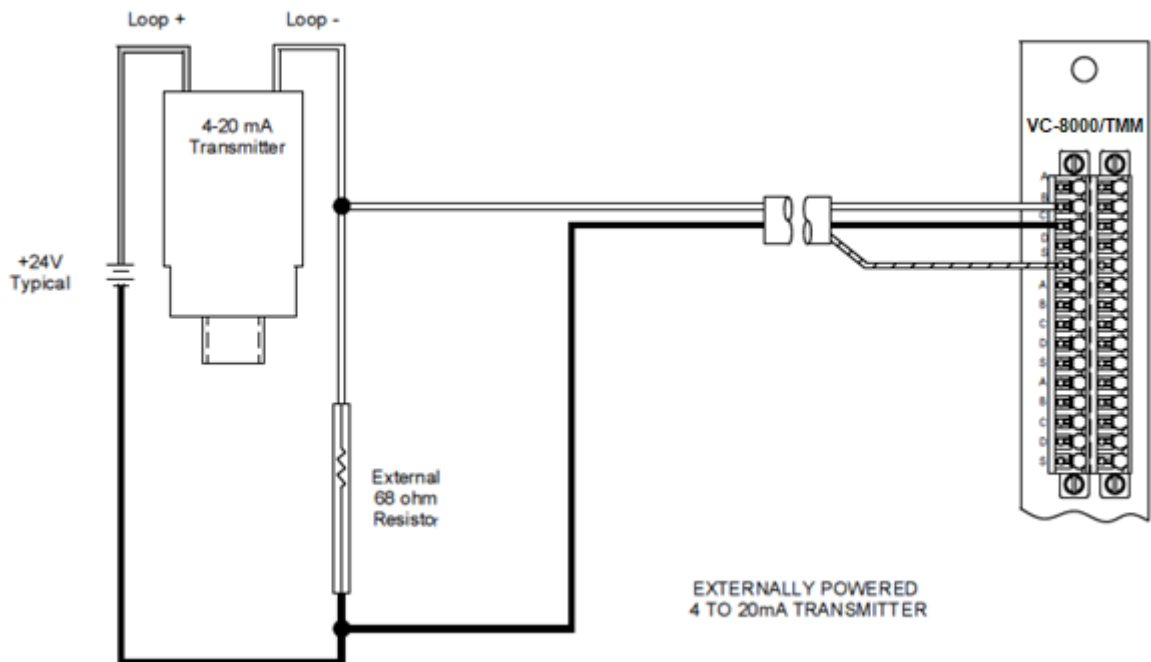


Figure 3-35) TMM Process Variable Transmitter Wiring

4 Standards

4.1.1 Standards for Zones

IECEX	ATEX	Canada (Zones)	United States (Zones)
IEC 60079-0:2011	EN 60079-0:2012	CAN/CSA 60079-0:2011	ANSI/UL 60079-0:2013
IEC 60079-15:2010	EN 60079-15:2010	CAN/CSA 60079-15:2012	ANSI/UL 60079-15:2013

(The requirements of the equivalent ATEX, IECEX and CAN/CSA and UL standards are similar; therefore, any references in the following report can be regarded as referring to either format unless stated otherwise.)

4.1.2 Standards for Divisions

Canada (Divisions)

C22.2 No 61010-1-12, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use. Part 1: General Requirements.

C22.2 No 213 – M1987 (R2013), Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations.

United States (Divisions)

UL 61010-1 Issued 2012, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use. Part 1: General Requirements.



5 Maintenance

This section describes typical procedures for performing VC-8000 system maintenance including:

- Inserting a Removing Modules
- Upgrading Firmware

5.1 Inserting and Removing Modules

Follow the procedures below when adding, removing, or replacing VC-8000 Modules. You may remove VC-8000 Modules while the system is powered (Hot Swap). While hot swapping modules does not damage modules, removing and inserting modules into a live system will cause the module statuses to become invalid and the Fault relay to activate. Depending on the voting logic, this can cause an alarm relay trip.



IMPORTANT:

VC-8000 Modules can be damaged by electrostatic shock when removed from the rack. Take appropriate precautions such as grounding straps when removing or handling VC-8000 modules.



IMPORTANT:

Modules removed from the system cause loss of machine protection. Depending on relay voting logic, loss of protection can cause relays to activate. Bypass relays before removing modules.



IMPORTANT:

Removing and inserting cables and modules can cause sparking that can ignite hazardous gases. Verify the area is safe before performing maintenance.

Modules inserted into a live rack will begin protection functions as soon as the module boots up and the filters settle. When hot inserting modules into a rack make sure the module configuration is correct before insertion or else inhibit rack alarming until the module is correctly configured.

To remove a module:

1. If necessary, remove field wiring connectors (refer to section 3.3).
2. Fully loosen the two captive screws located at the top and bottom of the module. The captive screws are spring-loaded and will spring out when fully disengaged.



Figure 5-1) Loosen Captive Screws

3. Grasp the captive screw large knurled knobs and pull the module from the rack.

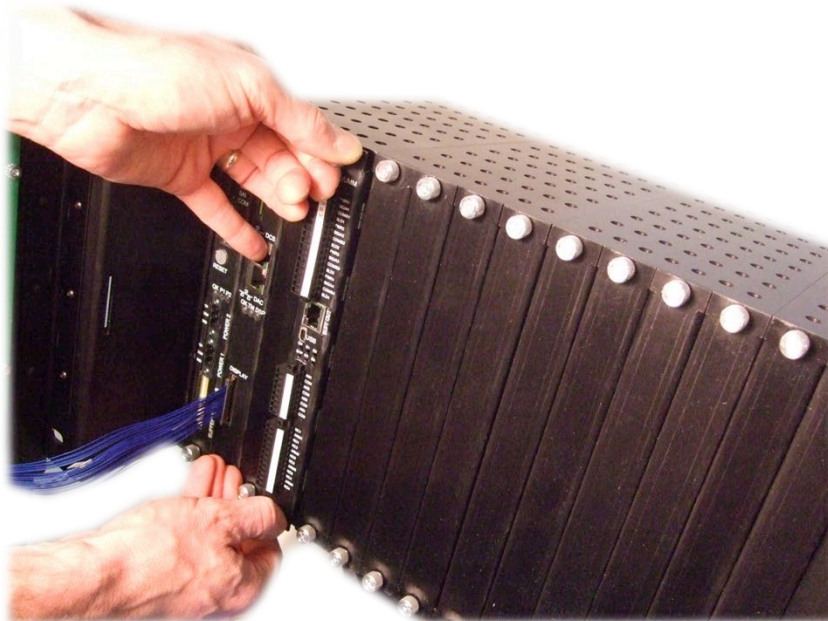


Figure 5-2) Removing a Module



To install a module:

1. Align the card edges with the card guide slots on the left.
2. Slowly push the card in until the connector alignment pins engage.
3. Firmly push the module to seat the connector pins.
4. Tighten the captive screws finger tight.
5. Use a screwdriver to tighten an additional 1/8 turn.

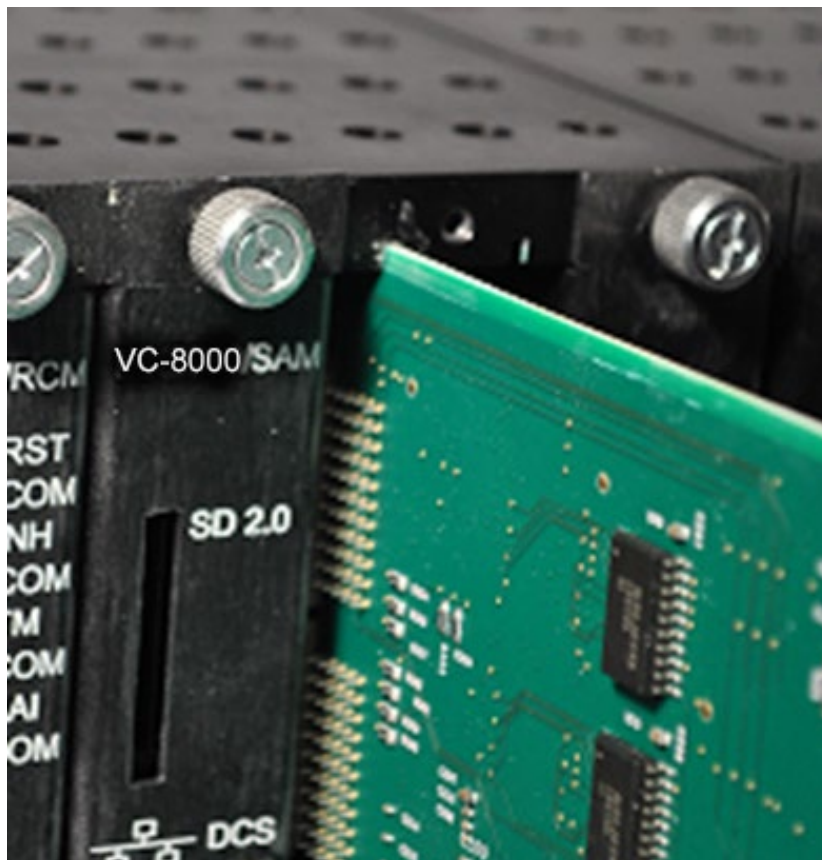


Figure 5-3) Module Installation

5.2 Removing or Installing the Door

Follow these steps to install or remove the rack front door. There are two hinge versions. Racks shipped before June 2014 use a spring loaded door hinge. Racks shipped after June 2014 have a pin hinge. Remove the display cable before removing the door.

5.2.1 Removing or Installing the Display Cable

Unplug the display cable at the SAM. The display connectors have retention locks. Gently squeeze the two latches in toward the connector body and pull the connector straight out.



Figure 5-4) *Display Connector Retention Locks*



When inserting the display cable at the display board, be sure the cable connector gold contacts are facing up as shown in **Figure 5-5**.

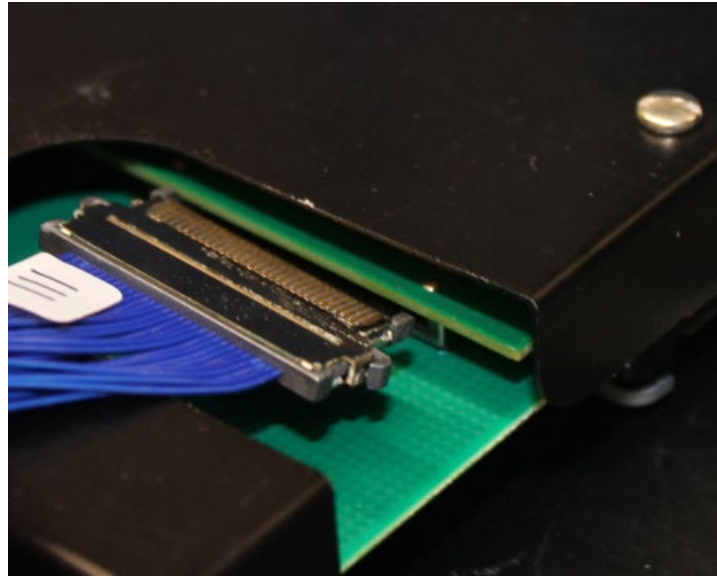


Figure 5-5) *Inserting the Display Cable at the Display*

When inserting the display cable at the SAM, make sure the connector gold contacts face to the left (towards the RCM) as shown in **Figure 5-6**.

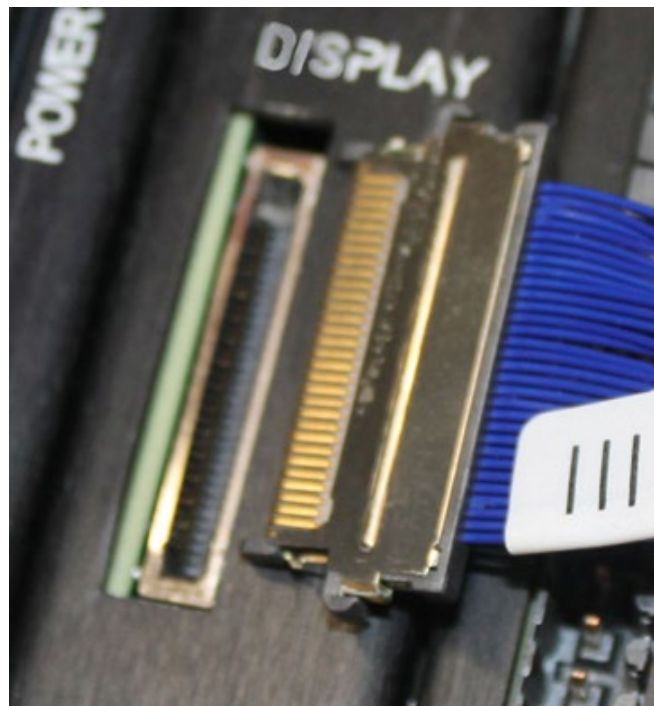


Figure 5-6) *Inserting the Display Cable at the SAM*

5.2.2 Removing or Installing the Spring Loaded Door Hinge

Squeeze the two hinge levers inward to retract the hinge pins.

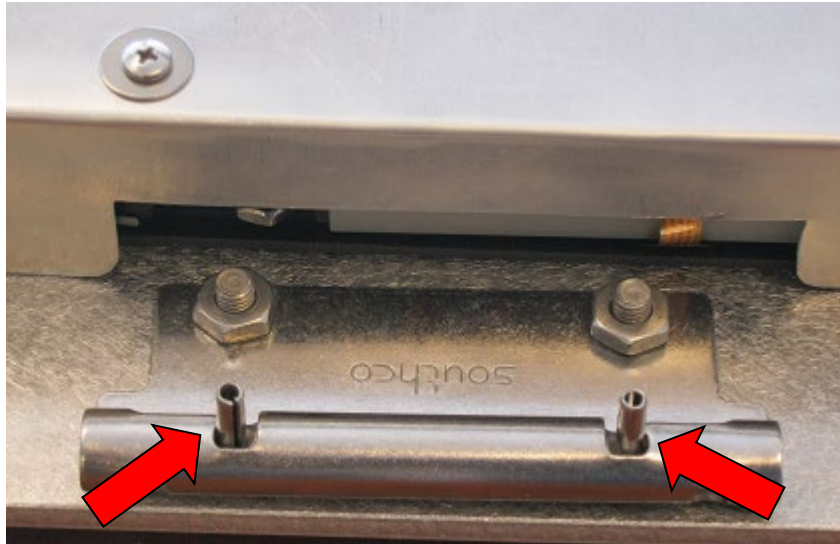


Figure 5-7) Door Hinge Open



Figure 5-8) Door Hinge Locked

To install, insert the hinge into the brackets and release the hinge levers so that the pins engage into the brackets.

At the SAM, with the display connector pins facing toward the left of the rack (toward the RCM), align the display connector and gently press in until the locks click. VC-8000 Vibration recommends that you leave the cable connected to the display.



5.2.3 Removing or Installing the Pin Door Hinge

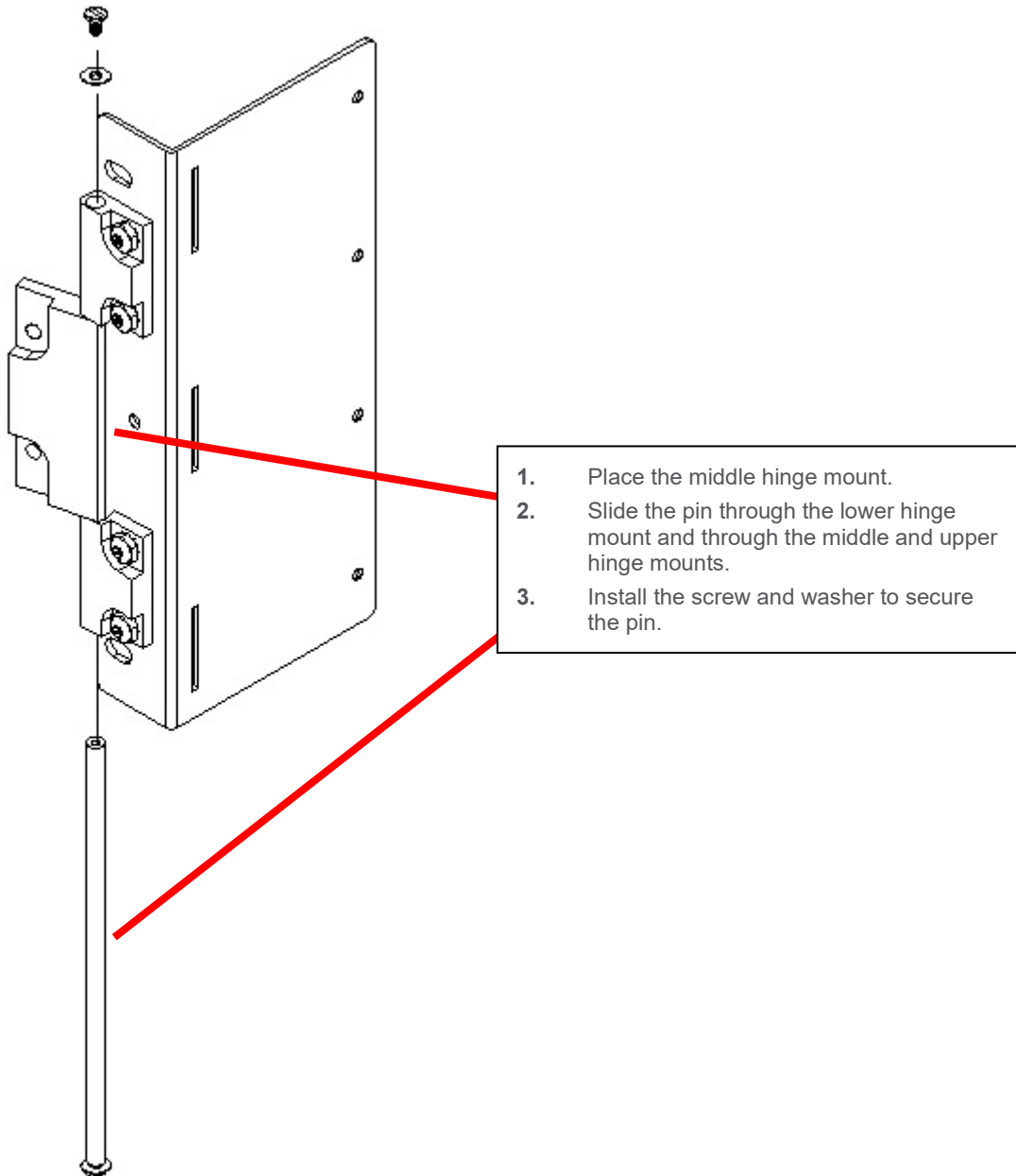


Figure 5-9) *Installing the Pin Door Hinge*

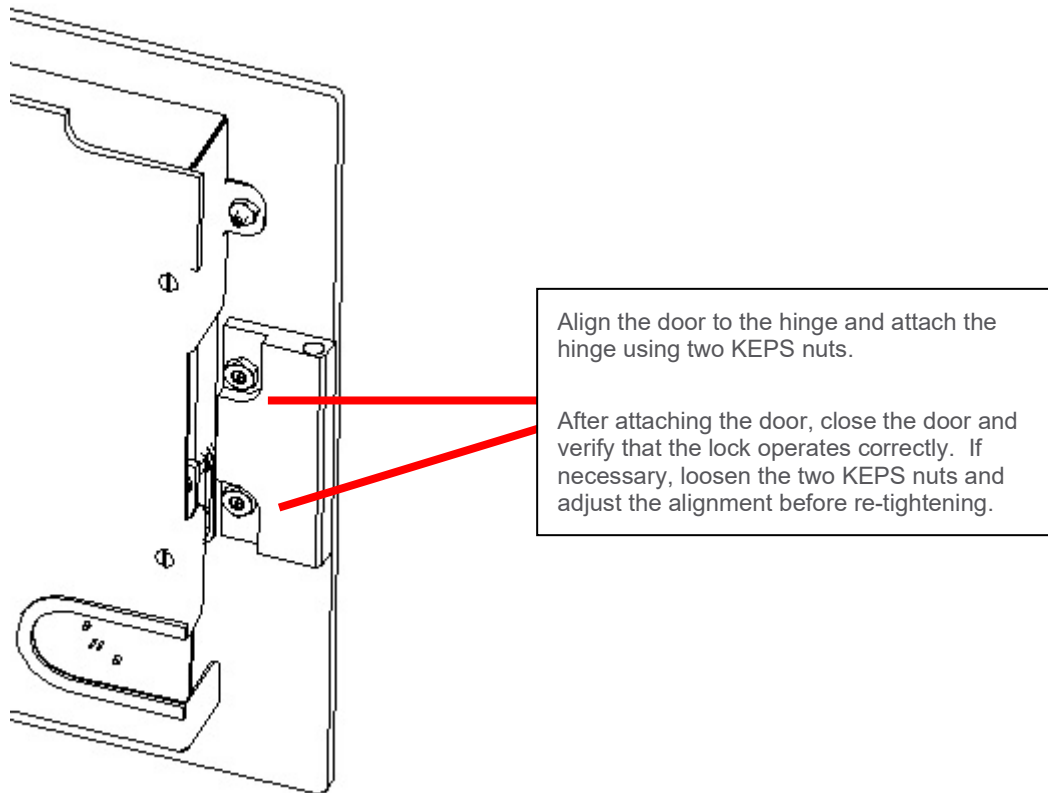


Figure 5-10) Attaching the Door

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