Product Identification and Overview

- Electrochemical Sensor with Self-Test
- Optional %RH Measurement
- Field Selectable 0 to 5 or 0 to 10 VDC Outputs
- Certificate of Calibration Included with Sensors and Replacement Modules

BAPI's Carbon Monoxide Rough Service Sensor offers enhanced electrochemical sensing with outstanding accuracy at low concentrations. It features a ventilated BAPI-Box and is ideal for parking ramps, equipment rooms and warehouses.

The unit has a CO measurement range of 0 to 500 ppm. It includes optional %RH measurement. The CO and %RH outputs are field selectable for 0 to 5 or 0 to 10 VDC. The unit can be ordered with flying leads or a terminal strip.

CO Rough Service Sensors
(Right unit shown with %RH sensing)

Mounting

1. Mount the unit on a solid, non-vibrating surface 3 to 5 feet above floor level or as specified by local building codes. Do not mount near supply or return diffusers.

2. Mount in a horizontal orientation with the enclosure hinge at the top as shown in Fig 1. Mounting in other orientations increases the likelihood that water droplets will touch the sensor elements and damage the sensor.

3. Use the mounting template on the next page (or the enclosure itself) to to mark the pilot-hole locations. Use the 4 included #10 (M5) screws on the four mounting feet of the enclosure. A pilot-hole makes mounting easier.

4. Snug up the screws so that the foam backing is partially depressed but do not over-tighten or strip the screw threads. The foam is for insulation and vibration dampening.

5. Place the provided #6 screws into the holes on each side of the lid latch to make the cover tamper resistant.
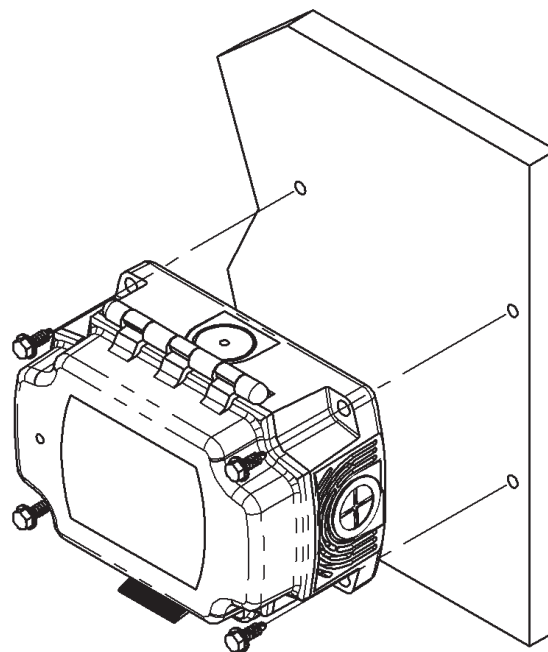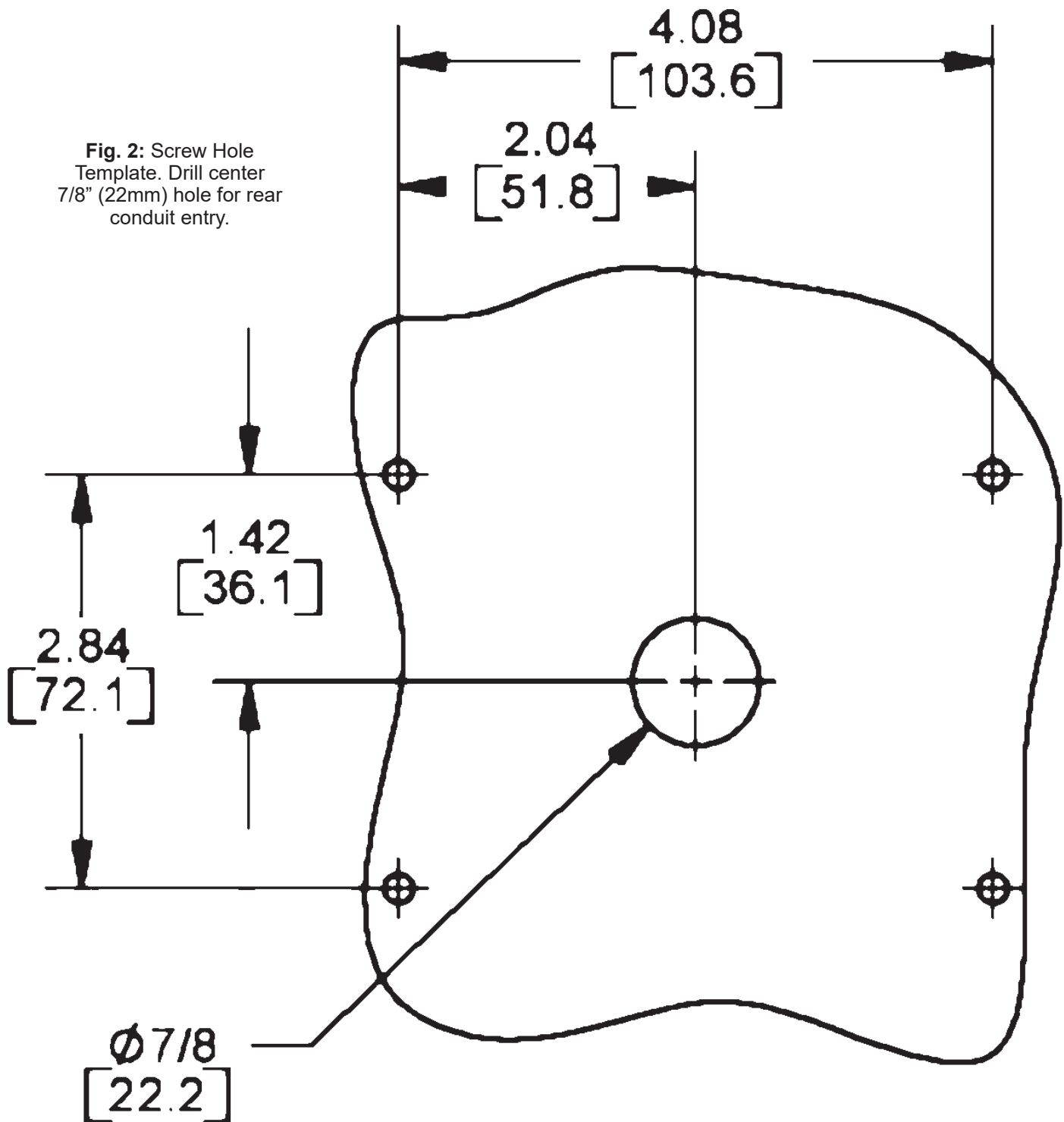

Fig. 1: Rough Service Unit mounting

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Mounting Template (Shown actual size)

Fig. 2: Screw Hole Template. Drill center 7/8" (22mm) hole for rear conduit entry.

4.08
[103.6]

2.04
[51.8]

1.42
[36.1]

2.84
[72.1]

Ø7/8
[22.2]

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Termination

BAPI recommends using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs. All wiring must comply with the National Electric Code (NEC) and local codes.

Do NOT run this device's wiring in the same conduit as AC power wiring of NEC class 1, NEC class 2, NEC class 3 or with wiring used to supply highly inductive loads such as motors, contactors and relays. BAPI's tests show that fluctuating and inaccurate signal levels are possible when AC power wiring is present in the same conduit as the signal lines. If you are experiencing any of these difficulties, please contact your BAPI representative.

> **STOP** BAPI recommends wiring the product with power disconnected. Proper supply voltage, polarity and wiring connections are important to a successful installation. Not observing these recommendations may damage the product and void the warranty.
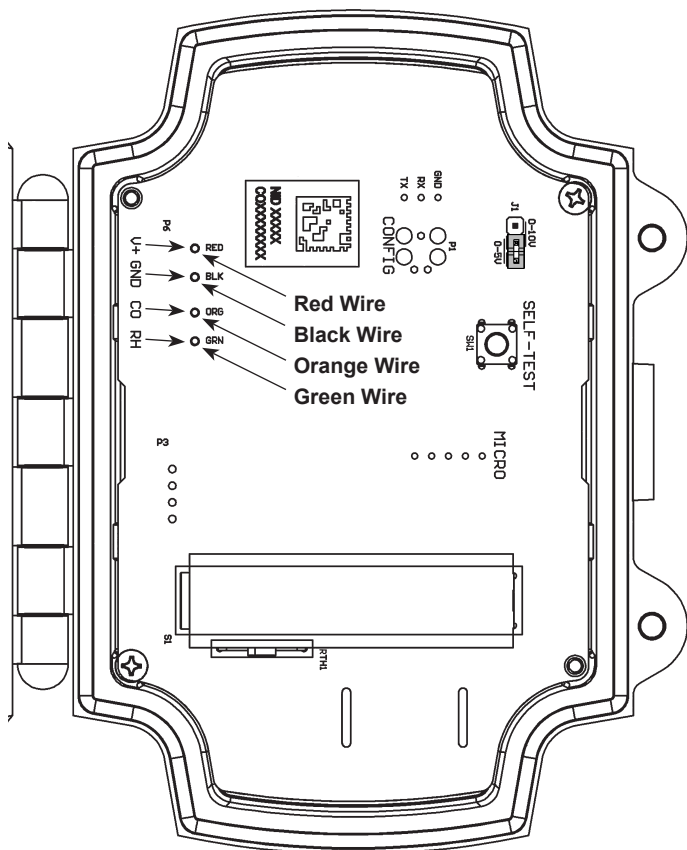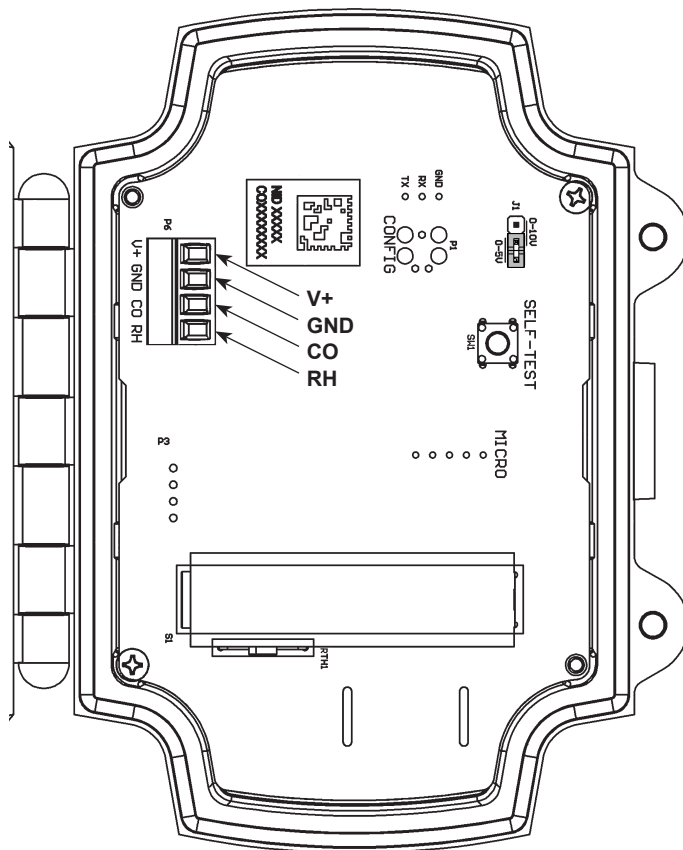
Fig. 3: Circuit Board with Flying Leads

Fig. 4: Circuit Board with Terminal Strip

WIRE TERMINATIONS

V+: 12.5 to 40 VDC, 10 mA Max or 12.5 to 28 VAC, 1.4 VA Max

GND: Ground for Power and Analog Output

CO: CO PPM Level, 0 to 5 or 0 to 10V Output

RH: %RH Level, 0 to 5 or 0 to 10V Output (if enabled)

Keeping the Enclosure Air Tight After Termination

For the sensor to work correctly, the wiring entrance must remain air tight. If the CO unit is mounted to a hollow wall and wired through its back, or wired with conduit, it is possible that a draft of clean air may fill the enclosure through the wiring opening. This draft may prevent the unit from measuring ambient Carbon Monoxide. BAPI recommends either a liquid-tight fitting or plugging the conduit at the enclosure.

Liquid-Tight Fitting
BAPI's Liquid-Tight Fitting (BA/LTF) allows wire cables of 0.1 to 0.3 inch (2.5 to 7.6mm) to outside diameter to enter the box. Tightening the collar onto the wire cable keeps the wiring entrance air tight.
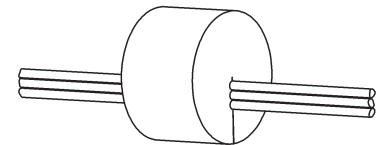
Conduit
Included with the sensor is a foam plug to seal the ½ inch (13mm) EMT. Place the wires into the plug as shown in Fig. 5 and then insert the plug into the conduit sealing the conduit.

Fig. 5:
Wires Through Foam Plug

Operation

POWER UP
On initial power up, the unit performs a self-test to ensure that the CO Sensor Module is not at the end of its life. This self-test typically takes about 45 seconds, and during this time, the green LED (visible on the face of the unit) will blink slowly. Under certain circumstances, the self-test may take up to 13 minutes. When the self-test is complete, the green LED will go to a steady "on" state and the unit will be fully operational.

SELF-TEST BUTTON
The unit automatically conducts a self-test daily to ensure that the CO Sensor Module is not at the end of its life, but the "Self-Test" button allows additional testing of the CO sensor if desired.

Push and hold the button for 2 seconds to put the unit into self-test mode. During the self-test, the green LED will begin to blink slowly. The self-test typically takes about 45 seconds, but under certain circumstances it may take up to 13 minutes. When the self-test is complete, the green LED will go to a steady "on" state, indicating that the CO Sensor Module is not at the end of its life. If the red LED (visible on the face of the unit) and green LED both blink slowly, this indicates that the CO Sensor Module is at end of life.

VOLTAGE OUTPUT JUMPER J1
Jumper switch J1 sets the analog output voltage for the CO and optional %RH to 0 to 5 or 0 to 10 VDC.
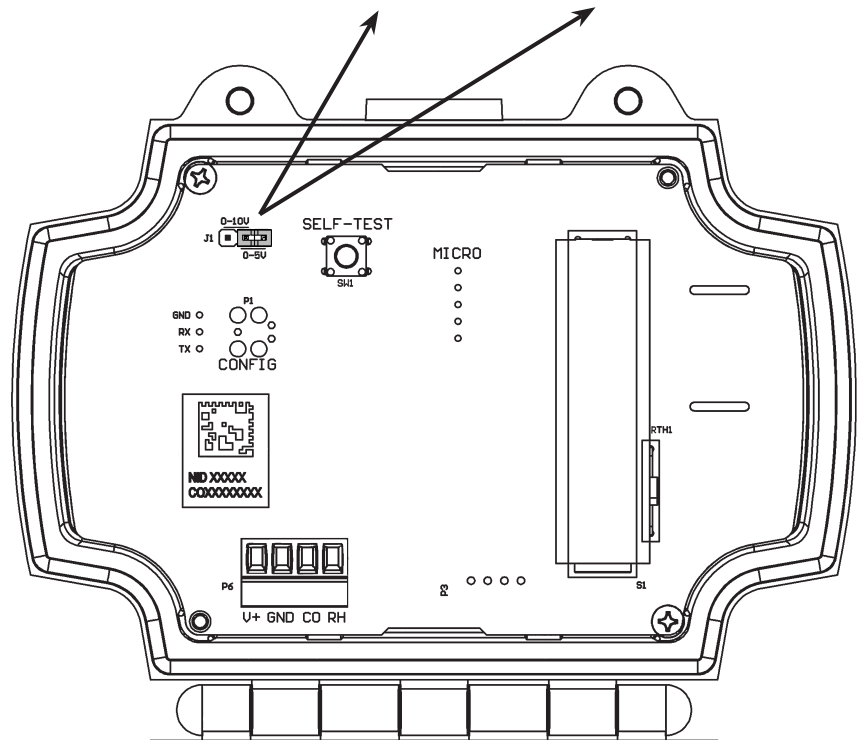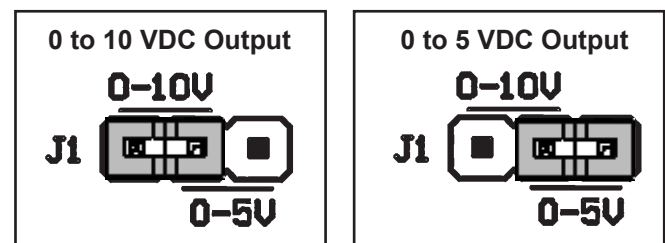
0 to 10 VDC Output

0 to 5 VDC Output

Fig. 6: Circuit Board Components
(shown with optional Terminal Strip)

Status LEDs

The green and red Status LEDs are visible through the clear cover of the unit and indicate various sensor conditions as listed below.

| Green LED	Red LED	Status
Solid	Off	Power is applied and there are no fault conditions.
Blinking Slow	Off	Running a self-test.
Off	Blinking Fast	The unit had detected an output ground fault of either the CO or %RH sensors.
Off	Blinking Slow	CO alarm condition (CO PPM level is above 300 ppm)
Blinking Slow	Blinking Slow	The CO sensor is at the end of life or either the CO or %RH sensor has been disconnected (reconnect the sensor and cycle power to clear the alert). Either condition sends the CO analog output to its max value until power is cycled.

Green LED   **Red LED**
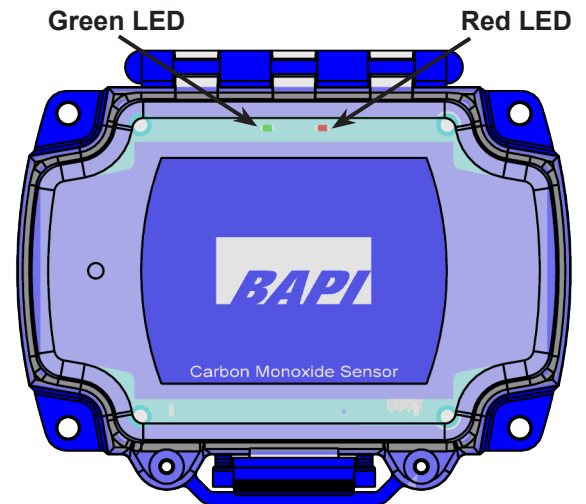
Fig. 7: Status LED Location

Maintenance

The unit should be vacuumed clean once a year or more, depending on the rate of accumulation of any dust or dirt. To avoid sensor damage, the unit MUST NOT be submerged in any liquids. Hosing or splashing of the unit with any liquids must also be avoided and may void the warranty.

Specifications

Power:
12.5 to 40 VDC, 10 mA Max or 12.5 to 28 VAC, 1.4 VA Max

CO Measurement Range: 0 to 500 ppm

CO Sensor Accuracy:
<200ppm = ±3% FS, 32 to 122°F (0 to 50°C)
201 to 500 ppm = ±5% FS, 50 to 122°F (10 to 50°C)

Optional %RH Sensor Accuracy:
±2%RH (20 to 80%) @ 25°C, Fully Compensated

Response Time: <80 seconds from 10 to 90% of range

Sensor Element Life: 7 Years Typical

Field Selectable Outputs 0 to 5 or 0 to 10 VDC

Field Wiring: Flying Leads (22 AWG) or Terminal Strip

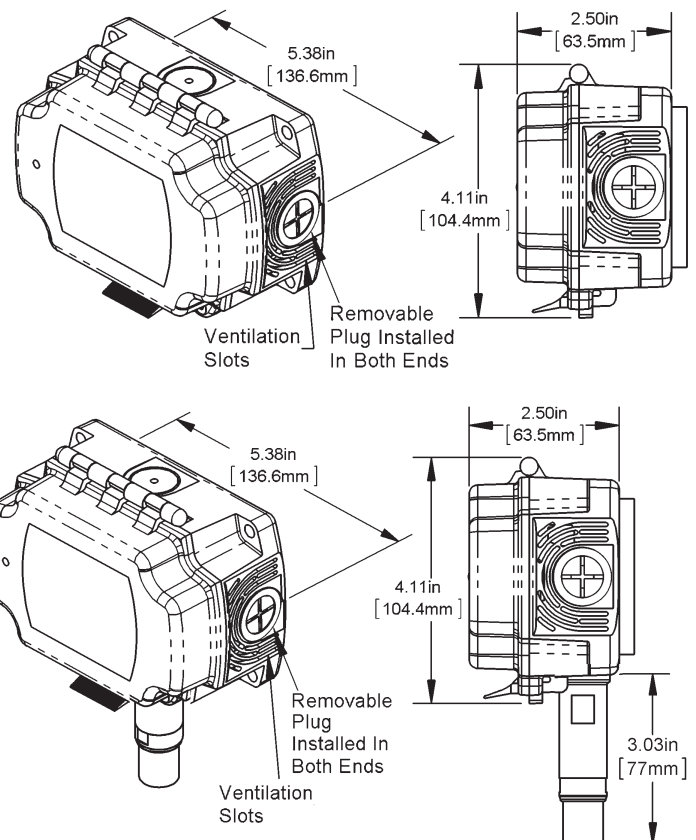**Environmental Operation Range**
Continuous:
32 to 122°F (0 to 50°C)
5 to 95%RH Noncondensing

Intermittent:
-40 to 131°F (-40 to 55°C)
5 to 95%RH Noncondensing

Agency: RoHS

5.38in [136.6mm]
2.50in [63.5mm]
4.11in [104.4mm]
Removable Plug Installed In Both Ends
Ventilation Slots

5.38in [136.6mm]
2.50in [63.5mm]
4.11in [104.4mm]
3.03in [77mm]
Removable Plug Installed In Both Ends
Ventilation Slots

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Diagnostics

POSSIBLE PROBLEMS:

POSSIBLE SOLUTIONS:

General troubleshooting

- Determine that the input is set up correctly in the controller's and building automation software.

- Check wiring for proper termination.

- Check for corrosion at either the controller or the sensor. Clean off the corrosion, re-strip the interconnecting wire and reapply the connection. In extreme cases, replace the controller, interconnecting wire and/or sensor.

- Check that the wiring is good between the CO unit and the controller. To do this, label the wires at both ends and then disconnect the wires from the controller and the sensor. With the interconnecting wires separated at both ends, use a multimeter to measure the resistance from wire-to-wire. The meter should read either greater than 10 Meg-ohms, open or OL depending on the style of meter. Now connect the wires together at one end and measure the resistance from wire-to-wire with a multimeter at the other end. The meter should read less than 10 ohms for 22 gauge or larger wire and runs of 250 feet (76m) or less. The resistance may be slightly higher for smaller wires or longer runs. If either test fails, replace the wire.

Unit does not operate

- Cycle power.

- Disconnect the power wires from the power source and check for proper power at the source as specified in the Termination section on page 3. If the voltage is outside the specifications, troubleshoot the power source. Reconnect power wires to the source when finished.

- Disconnect the power wires at the sensor and verify that the power is the same at the sensor as at the power source. If the voltage is different at the sensor from the source, troubleshoot the wiring. Reconnect power wires to sensor when finished.

- Measure the power at the sensor with the power wires connected to the power source and to the sensor. If the voltage is outside the limits specified on page 3, but within the limits when the wires are disconnected to the sensor, call your BAPI representative.

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