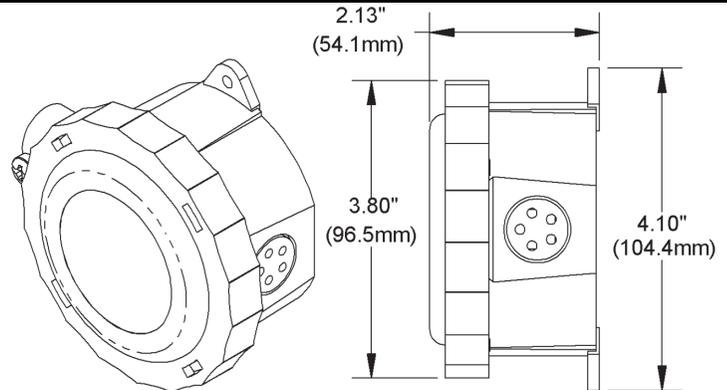


**Product Identification**

The Automated Logic Carbon Monoxide Sensor/Transmitter unit (Part # **NSB-420CO-3-ND-EUO-A**) is designed to provide continuous, reliable surveillance of surrounding air. This unit provides a 4 to 20 mA, variable current signal, which is proportional to the Carbon Monoxide concentration detected. Each Carbon Monoxide Sensor/Transmitter unit is factory calibrated, and is ready for field installation and operation. The housing is suitable for use in parking and service garages where the unit is not exposed to rain or direct sunlight.



**Figure 1:** CO Sensor with optional Conduit Fitting

**Mounting**

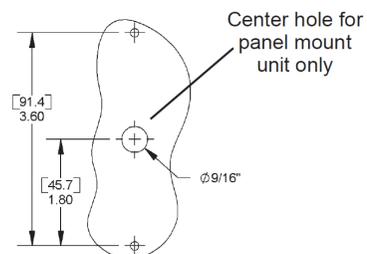
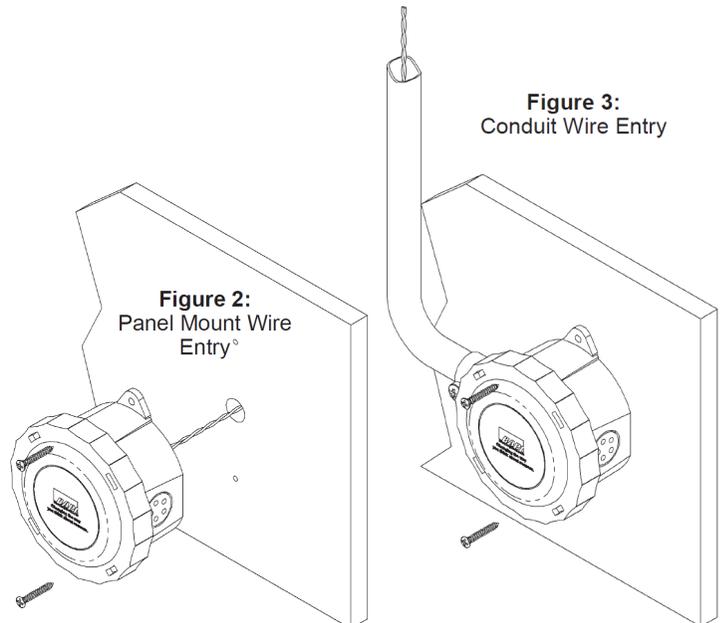
There are two mounting options; panel or conduit mount.

**Panel Mount**

Figure 2 shows the unit mounted on an electrical panel. Drill all the holes shown in Figure 4. Run the wires through the center hole. Using the outer two holes shown in Figure 4, attach the unit to the panel with the hardware provided.

**Conduit Mount**

Figure 3 shows the unit mounted to a wall with conduit. Using the outer two holes shown in Figure 4, attach the unit to a wall in the monitored space with the hardware provided. Attach conduit using a 1/2" conduit fitting.

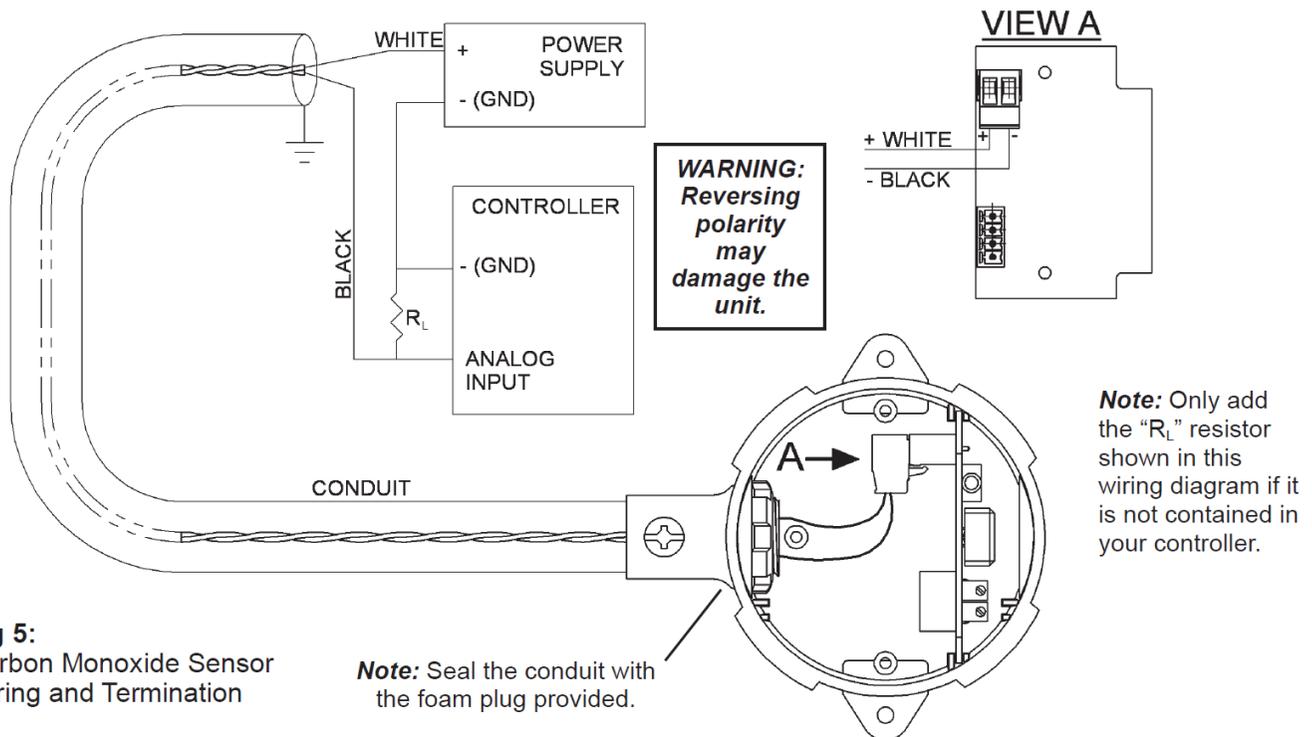


**Figure 4:**  
 Mounting Hole Pattern  
 Note: BAPI recommends using #8 screws that require 1/8" pilot holes

**Termination**

Automated Logic 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 Automated Logic representative



**Fig 5:**  
Carbon Monoxide Sensor  
Wiring and Termination

**Note:** Seal the conduit with the foam plug provided.

The Carbon Monoxide Sensor/Transmitter is a two-wire 4 to 20mA device.

Connect your twisted pair wires to the circuit card by gently removing the printed circuit board from the case. Connect your wires to the screw terminals as shown in View A of Figure 5. The connector on the board uses a rising block screw terminal to hold the wires. It is possible for the block to be in a partially up position allowing the wire to be inserted under the block. Be sure that the connector screws are turned fully counterclockwise before inserting the wire. To ensure that all wires are properly terminated, gently tug on the wire after terminating to make sure of a good connection. Seal the conduit with the foam plug provided.

At the controller end of the wire connect the plus (usually white) to 14 to 24 VDC. Connect the signal return wire (usually black) to a controller's analog input configured as a 4 to 20mA input. Be sure that the power supply's and controller's grounds are tied together.

**Table 1: Loop Length versus Wire Gauge**

Wire Gauge	22 AWG	20 AWG	18 AWG	16 AWG
14 VDC power supply	400 feet	700 feet	1000 feet	1500 feet
24 VDC power supply	10,000 feet	16,000 feet	> 20,000 feet	> 20,000 feet

Table 1 defines the maximum loop length for various wire gauges (out and back). The table is based on a 250-Ohm load resistor and 0.5 volt safety margin.

**Operation**

The Carbon Monoxide Sensor/Transmitter is factory calibrated for carbon monoxide. The unit should not require re-calibration when first installed and powered up, but a test for correct operation is recommended after a stabilization period of 30 minutes. Ideally, after the stabilization period, the unit should be sending a signal of approximately 4 mA to the controller. However, many facilities may have small amounts of carbon monoxide in the air at all times so an output of 1 or 2 ppm would not be uncommon.

Although the electrochemical sensors are very selective, there are some interference gases, which can also cause a response from the sensor. See table 2.

**Table 2: Typical Cross-Sensitivities:**

Gas	Test Gas Used (ppm)	CO Concentration Equivalent (ppm)	Cross Sensitivity %
Carbon monoxide	100	100	100
Hydrogen sulfide	10	0	0
Hydrogen	500	200	40
Methane	5000	0	0
Carbon dioxide	5000	0	0
Sulfur dioxide	25	0	0
Nitric oxide	30	0	0
Nitrogen dioxide	30	<10	<30
Ammonia	100	0	0
Ethyl Acetate	200	0	0
Iso-Butane	2500	0	0

The output is linear from 4 to 20mA for a 0 to 100 ppm carbon monoxide concentration. The concentration in parts per million is:

- CO concentration in ppm =  $100 * ((\text{Current output} - 4\text{mA}) / 16)$  for 0 to 100ppm units
- CO concentration in ppm =  $300 * ((\text{Current output} - 4\text{mA}) / 16)$  for 0 to 300ppm units

**Calibration**

Every Carbon Monoxide Sensor/Transmitter is factory calibrated. Each unit is ready for operation after installation and a 30-minute stabilization time.

Calibration is required as a part of regular maintenance. Automated Logic recommends calibrating the unit a minimum of twice a year, 4 times a year is preferable. Contact your Automated Logic representative for more details.

**Maintenance**

The Carbon Monoxide Sensor/Transmitter unit should be brushed or wiped 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.

The sensor element in the unit has a life typically over 4 years. When the sensor reaches the end of its useful life one may find its signal greatly reduced or unstable, and that is when a replacement is required.

To replace the sensor it is recommended to send the sensor/transmitter unit back to the factory for a new sensor and factory calibration of the complete unit.

**Diagnostics****Possible Problems**

General troubleshooting

**Possible Solutions**

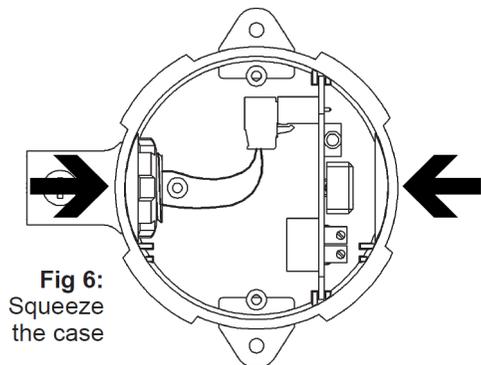
- Verify the input is set up correctly in the controller's and building automation software.
- Check wiring for proper termination
- Check for corrosion at either the controller or the sensor. Clean off the corrosion, re-strip the interconnecting wire and reapply the connection. In extreme cases, replace the controller, interconnecting wire and/or sensor.
- Label the terminals that the interconnecting wires are connected to at the sensor end
- and the controller end. Disconnect the interconnecting wires from the controller and the sensor. With the interconnecting wires separated at both ends measure the resistance from wire-to-wire with a multimeter. The meter should read greater than 10 Meg-ohms, open or OL depending on the meter you have. Short the interconnecting wires together at one end. Go to the other end and measure the resistance from wire-to-wire with a multimeter. The meter should read less than 10 ohms (22 gauge or larger, 250 feet or less). If either test fails, replace the wire.

Unit does not operate

- Check power for proper polarity. Connecting power with the polarity reversed may damage the unit.
- Disconnect the power wires at the controller. Measure controller output for 15 to 24 VDC, if the voltage is outside the limits trouble shoot controller. Reconnect power wires to controller when finished. If the measured voltage is above 32 VDC, you may have damaged the unit so contact your BAPI representative.
- Disconnect the power wires at the sensor. Measure the wires for the same voltage as at controller. If the voltage is different from that measured at the controller troubleshoot wire. Reconnect power wires to sensor when finished.
- Measure the power at the sensor with the power connected for 14 to 24 VDC. If the voltage is outside the limits, call your BAPI representative.
- Gently squeeze case as shown in Figure 6.

Printed circuit board stuck in case

Gently squeeze case as shown in Figure 6.



**Fig 6:**  
Squeeze  
the case