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**INDUSTRIES** ™



CWL          CWE

CE *

*The CE mark indicates RoHS2 compliance.  Please refer to the  CE Declaration of Conformity for additional details.

| NOTICE |
| --- |
| • **This product is not intended for life or safety applications.**<br>• **Do not install this product in hazardous or classified locations.**<br>• **Read and understand the instructions before installing this product.**<br>• **Turn off all power supplying equipment before working on it.**<br>• **The installer is responsible for conformance to all applicable codes.** |

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

# CW Series

*Wall Mounted Environmental $CO_2$ Sensors*

## Product Overview

CW Series wall mount $CO_2$ sensors measure the levels of $CO_2$, RH (if equipped), and temperature (if equipped) of air inside a duct. The $CO_2$ sensor operates within accuracy specifications for an interval of five years and can be field calibrated. The temperature element is warranted to meet accuracy specifications for a period of five years. RH equipped models feature a replaceable HS Series humidity element that is warranted to meet accuracy specifications for a period of one year. To maintain accuracy, all vents must remain clear and free of dust, debris, etc.

## Product Identification

### *WALL DELUXE MODELS:*
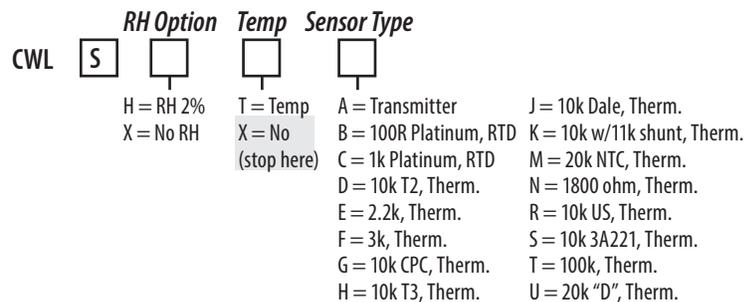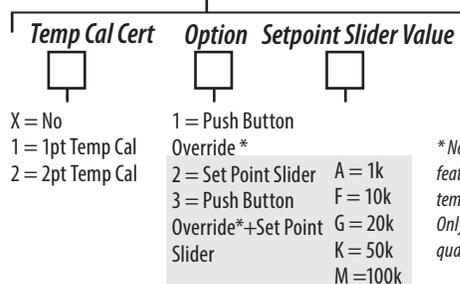
|  | *RH Option* | *Temp* | *Sensor Type* |
| --- | --- | --- | --- |
| CWL  S |  |  |  |

H = RH 2%       T = Temp       A = Transmitter          J = 10k Dale, Therm.
X = No RH       X = No         B = 100R Platinum, RTD   K = 10k w/11k shunt, Therm.
                (stop here)    C = 1k Platinum, RTD     M = 20k NTC, Therm.
                               D = 10k T2, Therm.       N = 1800 ohm, Therm.
                               E = 2.2k, Therm.         R = 10k US, Therm.
                               F = 3k, Therm.           S = 10k 3A221, Therm.
                               G = 10k CPC, Therm.      T = 100k, Therm.
                               H = 10k T3, Therm.       U = 20k "D", Therm.

**Options Available**

| *Temp Cal Cert* | *Option* | *Setpoint Slider Value* |
| --- | --- | --- |
|  |  |  |

X = No
1 = 1pt Temp Cal
2 = 2pt Temp Cal

1 = Push Button Override *
2 = Set Point Slider          A = 1k
3 = Push Button               F = 10k
Override*+Set Point           G = 20k
Slider                        K = 50k
                              M = 100k

*\* Note: the Pushbutton Override feature is not available with temperature transmitter models. Only resistive temperature models qualify for this feature.*

### *WALL ECONOMY MODELS:*

|  | *Sensor Type* |
| --- | --- |
| CWE  S |  |

B = 100R Platinum, RTD   K = 10k w/11k shunt, Therm.
C = 1k Platinum, RTD     M = 20k NTC, Therm.
D = 10k T2, Therm.       N = 1800 ohm, Therm.
E = 2.2k, Therm.         R = 10k US, Therm.
F = 3k, Therm.           S = 10k 3A221, Therm.
G = 10k CPC, Therm.      T = 100k, Therm.
H = 10k T3, Therm.       U = 20k "D", Therm.
J = 10k Dale, Therm.
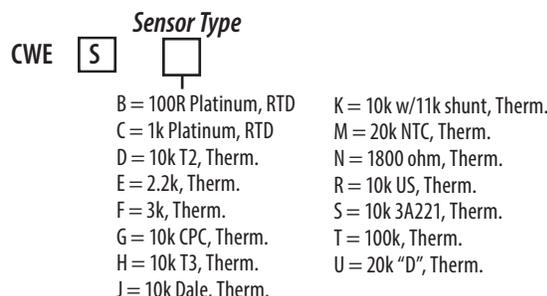
# Specifications

| | |
|---|---|
| **Input Voltage** | Class 2; 20 to 30 Vdc, 24 Vac |
| **Analog Output** | CWL: 4 to 20 mA (clipped and capped)/0-5 Vdc/0-10Vdc (selectable)<br>CWE: 4 to 20 mA (clipped and capped)/0-10Vdc (selectable) |
| **Sensor Current Draw** | 100 mA max. |
| **Operating Temperature Range** | No humidity option: 0 to 50 °C (32 to 122 °F)<br>With humidity option**: 10 to 35 °C (50 to 95 °F) |
| **Operating Humidity Range** | 0 to 95% (non-condensing) |
| **Housing Material** | High impact ABS plastic |
| *$CO_2$ TRANSMITTER* | |
| **Sensor Type** | Non-dispersive infrared (NDIR), diffusion sampling |
| **Output Range** | CWL: 0 to 2000 ppm or 0 to 5000 ppm, user selectable;<br>CWE: 0 to 2000 ppm |
| **Accuracy** | ±30 ppm ±2% of measured value* |
| **Repeatability** | ±20 ppm ±1% of measured value |
| **Response Time** | <60 seconds for 90% step change |
| *RH TRANSMITTER** | |
| **HS Sensor** | Digitally profiled thin-film capacitive (32-bit mathematics);<br>U.S. Patent 5,844,138 |
| **Accuracy** | ±2% from 10 to 80% RH @ 25°C; Multi-point calibration NIST |
| **Hysteresis** | 1.5% typical |
| **Linearity** | Included in Accuracy spec. |
| **Stability** | ±1% @ 20 °C (68 °F) annually for two years |
| **Output Range** | 0 to 100% RH |
| **Temperature Coefficient** | ±0.1% RH/°C above or below 25 °C (typical) |
| *TEMPERATURE (TRANSMITTER)** | |
| **Sensor Type** | Thermistor |
| **Accuracy** | ±0.5 °C (±1 °F) typical |
| **Resolution** | 0.1 °C (0.2 °F) |
| **Output Range** | 10 to 35 °C (50 to 95 °F) |
| *RELAY CONTACTS** | |
| **1 Form C (on models without setpoint slider option)** | 1 A@30 Vdc, resistive; 30 W max. |

*Specified accuracy with 24 Vdc supplied power with rising humidity. RTD/Thermistors in wall packages are not compensated for internal heating of product.*

*EMC Conformance: EN 61000-6-3:2007 Class B, EN 61000-6-1:2007*

*EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper SURGE PROTECTION (EN 61000-6-1:2007 specification requirements)*

*\* Measured at NTP*

*\*\* Not available on CWE*

*Note: Rough handling and transportation may cause a temporary reduction of $CO_2$ sensor accuracy. With time, the ABC function will tune the readings back to the correct accuracy range. The default tuning speed is limited to 30 ppm per week.*

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## Dimensions

FRONT VIEW

4.75"
(121 mm)

3.50"
(89 mm)

1.15"
(29 mm)
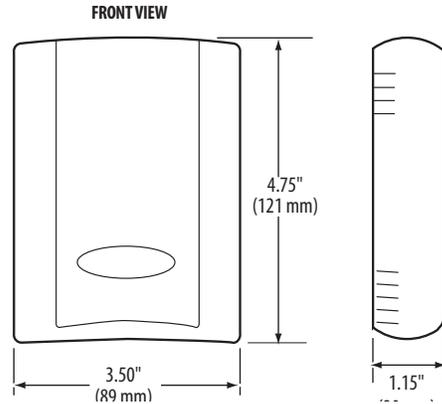
## Installation

1. Remove the cover by pressing the tab at at the top of the sensor while pulling outward from the top of the cover.

Observe precautions for handling static sensitive devices to avoid damage to the circuitry that is not covered under the factory warranty.

ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

2. Remove the backplate by unfastening the sensor from the bottom of the backplate and pivoting the sensor outward.

3. Punch out desired wire openings in the backplate.
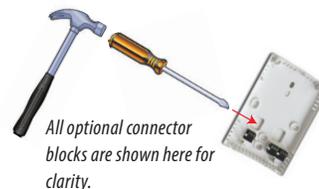
*All optional connector blocks are shown here for clarity.*

4. Position the sensor vertically on the wall, 4-1/2 feet above the floor. Locate away from windows, vents, and other sources of draft. If possible, do not mount on an external wall, as this might cause inaccurate temperature readings.
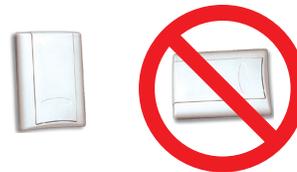
5. Mount the backplate onto the wall using the screws provided.

*Five screwholes available; use a minimum of two for secure mounting.*

*All optional connector blocks are shown here for clarity.*

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## Installation (cont.)

6.  Wire the backplate.

*CWL with RH and Temperature Transmitter Options*
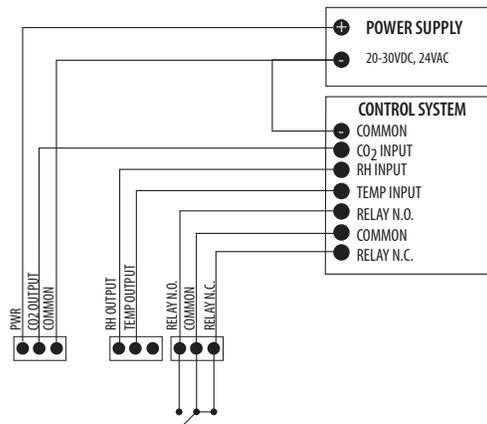


*CWL with RH, Thermistor/RTD, Pushbutton Override, and Setpoint Slider Options*
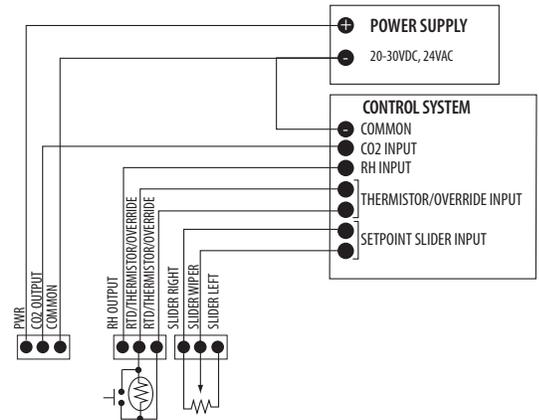


*CWE*
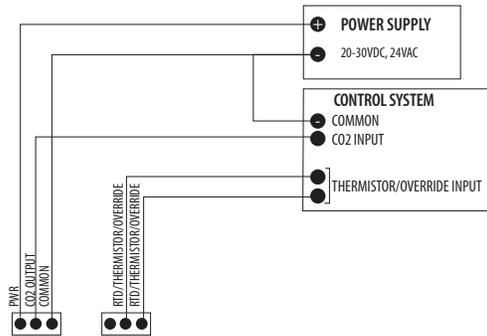


7.  Install the sensor onto the backplate.



8.  Use the switch to select voltage or current output. For CWL model, see Configuration section.
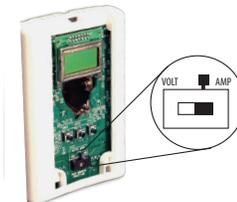


9.  When installation is complete, install the cover and snap into place.

# Installation (cont.)

10. Programmable override button



*Override button*

*Note: the Pushbutton Override feature is not available with temperature transmitter models. Only resistive temperature models qualify for this feature.*

11. Programmable setpoint slider



*Setpoint slider*

# ABC Calibration Algorithm

ABC (Automatic Baseline Calibration) is a patented self-calibration feature that automatically adjusts the $CO_2$ sensor to compensate for drift. When ABC is enabled, the sensor records the lowest reading within every 24-hour interval and compares these values over a running 7-day or 28-day period. If a statistically significant amount of drift is detected, the ABC applies an automatic correction factor. This enables the sensor to operate within specifications for the 5-year calibration interval.

ON POSITION. Recommended Setting. Use the ON setting for applications where the building is unoccupied within a 24-hour timeframe.

LOW POSITION. Use the LOW setting for buildings occupied 24 hours a day.

OFF POSITION. Not Recommended.

NOTE: After changing the ABC settings, power cycle the unit for changes to take effect.

To set the ABC mode for CWL models, refer to the Configuration section of this document.

To set the ABC mode for CWE models, position the ABC jumper as shown:
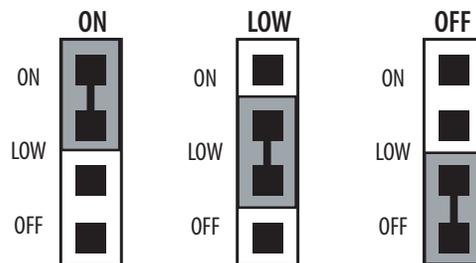
# Output Scaling

### $CO_2$ - Carbon Dioxide Sensor

Output scaling: 0 to 2000 ppm

| | $CO_2$ PPM | 0 to 5 V Output | 0 to 10 V Output | mA Output |
|---|---|---|---|---|
| Outside | 30 to 500 | 0.75 to 1.25 | 1.5 to 2.5 | 6.4 to 8 |
| Over Ventilated | Under 600 | Under 1.5 | Under 3 | Under 8.8 |
| Ideal Ventilation | 600 to 900 | 1.5 to 2.25 | 3 to 4.5 | 8.8 to 11.2 |
| Under Ventilated | Over 900 | Over 2.25 | Over 4.5 | Over 11.2 |

### RH - Relative Humidity Sensor

Output scaling: 0 to 100%

### T - Temperature Transmitter

Output scaling:  10° to 35°C (50° to 95°F)

To determine temperature from output reading:

1.  Compute Total Span from Temperature Range:
    Maximum range - Minimum range = Total span
    ex. 10° to 35°C range:  35 - 10 = 25 Total span

2.  Compute Output % of Span from Reading:
    (Reading - Minimum Output) / (Maximum output - Minimum output)
    ex. 11.10 mA reading on 4-20 mA output: (11.10-4) / (20-4) = 7.10 / 16 = 0.444 = 44.4%
    ex. 4.44v reading on 0-10 V output: (4.44-0) / (10-0) = 4.44 / 10 = 0.444 = 44.4%

3.  Compute Temperature:
    (Total span x Output % of Span) + Minimum range
    ex. 44.4% Output, Total Span = 45, range = 50/95: (0.444 x 45) + 50 = 20 + 50 = 70°

Example outputs for selected temperatures:

| Temperature | 4 to 20 mA | 0 to 10 V | 0 to 5 V |
|---|---|---|---|
| 65 | 9.33 mA | 3.33 V | 1.67 V |
| 70 | 11.10 mA | 4.44 V | 2.22 V |
| 75 | 12.89 mA | 5.56 V | 2.78 V |

# Configuration - CWL Only

## RUN MODE:

| P | P | M | | 1 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|
| C | O | 2 | | | | | |

*CO$_2$ ONLY MODEL*
*\*INDICATES RELAY STATUS*

| P | P | M | | 1 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|
| % | R | H | | 5 | 0 | . | 0 |

*CO$_2$/RH COMBO MODEL*

| P | P | M | | 1 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|
| º | F | | | 7 | 0 | . | 0 |

*CO$_2$/T COMBO MODEL*

| P | P | M | | 1 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|
| X | X | X | | X | X | . | X |

*CO$_2$/RH/T COMBO MODEL*
*TOGGLE %RH AND DEGREES*

*\*NOTE: This product is factory calibrated. The typical CO$_2$ sensor calibration interval is 5 years, depending on specific site installation factors. As of the date of this document, compliance with ANSI/ASHRAE 62-2001 requires minimum on-site accuracy verification intervals of 6 months or per the building operation and maintenance manual. Verify accuracy using a comparison to a known reference or the CO$_2$ gas calibration kit available from Veris Industries as AA01.*

*WARNING: CO$_2$ sensor calibration requires gas calibration kit. Performing calibration without gas kit or at an incorrect gas flow rate will cause erroneous readings.*

## CONFIGURATION MODE:

*PRESS ENTER FOR CONFIGURATION MODE.*
*PRESS PLUS OR MINUS TO CHANGE SETTING.*

| S | E | T | P | O | I | N | T |
|---|---|---|---|---|---|---|---|
| C | O | 2 | | | 8 | 0 | 0 |

*RANGE 500 TO 1500*
*50 PPM INCREMENT*

| D | E | A | D | B | A | N | D |
|---|---|---|---|---|---|---|---|
| C | O | 2 | | | 1 | 0 | 0 |

*RANGE 10 TO 500*
*5 PPM INCREMENT*

| R | A | N | G | E | | | |
|---|---|---|---|---|---|---|---|
| C | O | 2 | | X | X | X | |

*OPTIONS ARE 2000 OR 5000*

| A | B | C | | M | O | D | E |
|---|---|---|---|---|---|---|---|
| – | | X | X | X | | | + |

*OPTIONS ARE ON, LOW, OFF*
*SEE PREVIOUS PAGE FOR EXPLANATION*

| U | N | I | T | S | | | |
|---|---|---|---|---|---|---|---|
| – | | | º | X | | | + |

*(TEMP MODELS ONLY)*
*OPTIONS ARE °F or °C*

| | O | U | T | P | U | T | |
|---|---|---|---|---|---|---|---|
| – | 0 | – | 1 | 0 | V | | + |

*(VOLTAGE MODE ONLY)*
*OPTIONS: 0 to 10 V OR 0 to 5 V*
*DEFAULT IS 0 to 10 V*

| | O | U | T | P | U | T | |
|---|---|---|---|---|---|---|---|
| | 4 | – | 2 | 0 | m | A | |

*(mA MODE ONLY)*

## CALIBRATION MODE*:

*PUSH AND HOLD PLUS AND MINUS FOR 5 SECONDS TO ENTER MODE. PRESS ARROW TO CHANGE OPTION. PUSH ENTER FOR NEXT SELECTION.*

| | S | E | R | I | A | L | |
|---|---|---|---|---|---|---|---|
| X | X | X | X | X | X | X | X |

*DISPLAYS SERIAL NUMBER*

| | | X | X | X | | | |
|---|---|---|---|---|---|---|---|
| | X | X | X | X | | | |

*DISPLAYS MODEL NUMBER*

| O | F | F | S | E | T | | |
|---|---|---|---|---|---|---|---|
| º | C | | | | X | . | X |

*RANGE IS -5 TO 5 °C, 0.1 °C INCREMENT*
*(CO$_2$/temp combo models)*

| O | F | F | S | E | T | | |
|---|---|---|---|---|---|---|---|
| % | R | H | | X | X | . | X |

*RANGE -10 TO 10%, 0.1% INCREMENT*
*(CO$_2$/temp combo models)*

| C | O | 2 | | C | A | L | ? |
|---|---|---|---|---|---|---|---|
| – | | | X | X | | | + |

*OPTIONS ARE YES, NO*

| C | A | L | | G | A | S | ? |
|---|---|---|---|---|---|---|---|
| – | | | X | X | X | | + |

*OPTIONS ARE NONE, 0, 400*

| W | O | R | K | I | N | G | |
|---|---|---|---|---|---|---|---|
| | * | | | 5 | : | 0 | 0 |

*Unit will automatically return to run mode when calibration is complete.*

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# Calibration Process

### CWL Models:

1. Remove cover and connect gas cylinder hose to the plastic port located on sensing module. Note: only connect one sensor to the calibration gas cylinder at a time.

800 PPM
70.0 °F

*Connect hose here*

2. Start flowing nitrogen gas (0 ppm $CO_2$). Use a flow rate of 0.3 to 0.5 liter/minute.

**Regulator Valve**
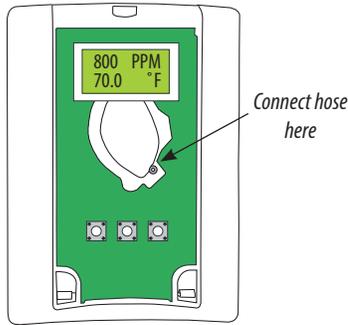
**NITROGEN GAS**
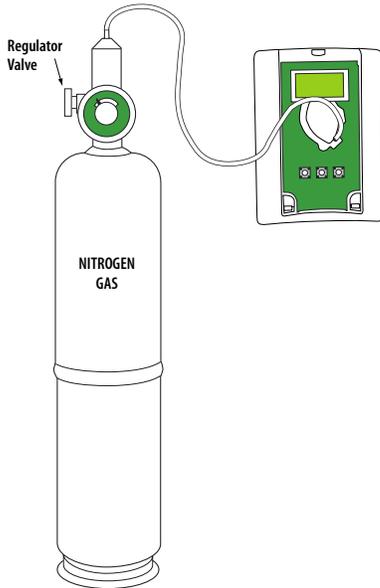
3. Calibrate for 5 min. Unit will return to working display when finished.

800 PPM
70.0 °F
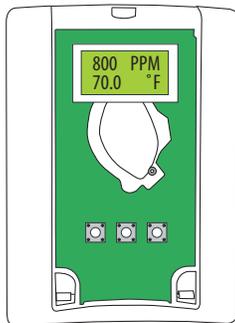
4. When unit returns to working display, remove hose from calibration port and enter Calibration mode as described in the Installation section.

### CWE Models:

1. Remove cover and connect gas cylinder hose to the plastic port located on sensing module. Note: only connect one sensor to the calibration gas cylinder at a time.

*LED indicator*

*Connect hose here*

2. Start flowing nitrogen gas (0 ppm $CO_2$). Use a flow rate of 0.3 to 0.5 liter/minute.

**Regulator Valve**
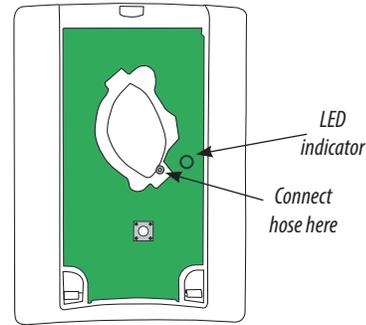
**NITROGEN GAS**
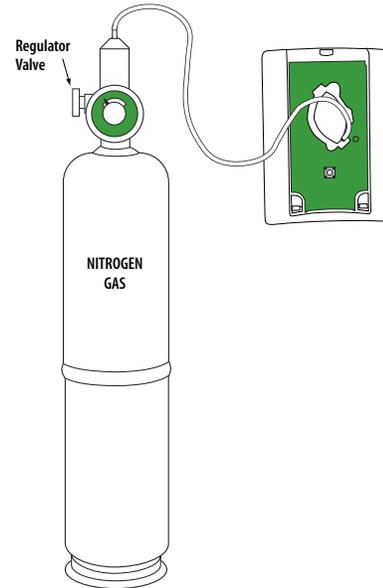
3. Push and hold down calibration button until the LED illuminates.

*LED indicator*

*Connect hose here*

*Calibration button*
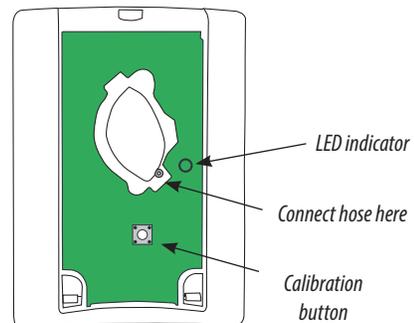
4. Continue flowing gas through the sensor until the LED is off. Estimated calibration time is 5 minutes. Remove hose from calibration port when complete.

*For more complete calibration instructions using the AA01 Calibration Kit, see the AA01 Installation Guide.*