

### INTRODUCTION

The horticulture sensor series uses a highly accurate and reliable dual channel, Non-Dispersive Infrared (NDIR) sensor to monitor CO<sub>2</sub>, a precision thermistor to monitor temperature and a thermoset polymer based capacitance sensor to measure humidity levels combined with state-of-the-art digital linearization and temperature compensated circuitry. An adjustable relay output is included.

### BEFORE INSTALLATION

Read these instructions carefully before installing and commissioning the horticulture sensor. Failure to follow these instructions may result in product damage. Do not use in an explosive or hazardous environment, with combustible or flammable gases, or as a safety or emergency stop device or in any other application where failure of the product could result in personal injury. Take electrostatic discharge

precautions during installation and do not exceed the device specifications, as listed. Use 22 AWG shielded wiring for all connections and do not locate the device wires in the same conduit with wiring used to supply inductive loads such as motors. Make all connections in accordance with national and local codes.

### MOUNTING

Remove the cover by using a standard or flat screwdriver to loosen the four screws as shown in Figure 1. As the screws are captive type, complete removal of the screw from the cover is not required. The horticulture sensor installs directly onto any wall or flat surface, or may hang from the ceiling via the wire through the cable gland on the top of the enclosure.

**For wall mounting**, select a suitable mounting area away from opening windows or any other disturbances. Mount the sensor directly to the wall using the four integrated mounting holes that are provided on each corner of the enclosure using a #10 size screw (not supplied). Ensure the cone on the bottom of the enclosure is pointing downwards. See Figure 2.

After the enclosure is securely mounted to the wall, feed the cable through the cable gland and tighten. See Figure 3.

Figure 1

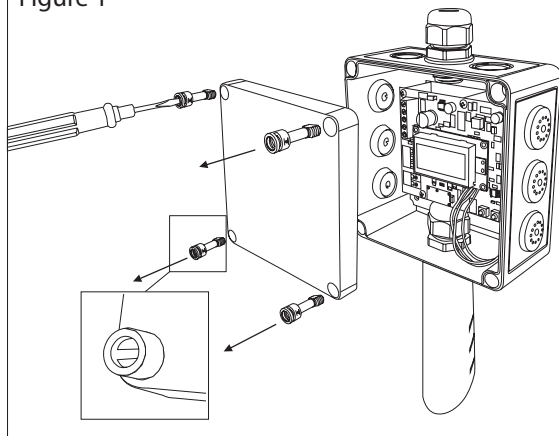
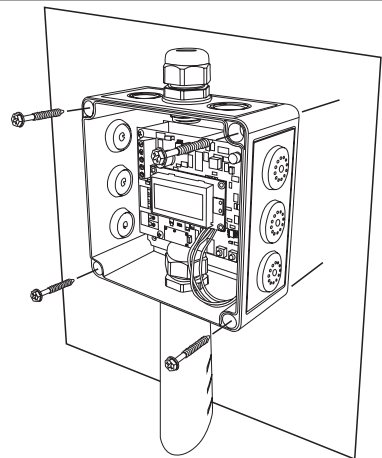
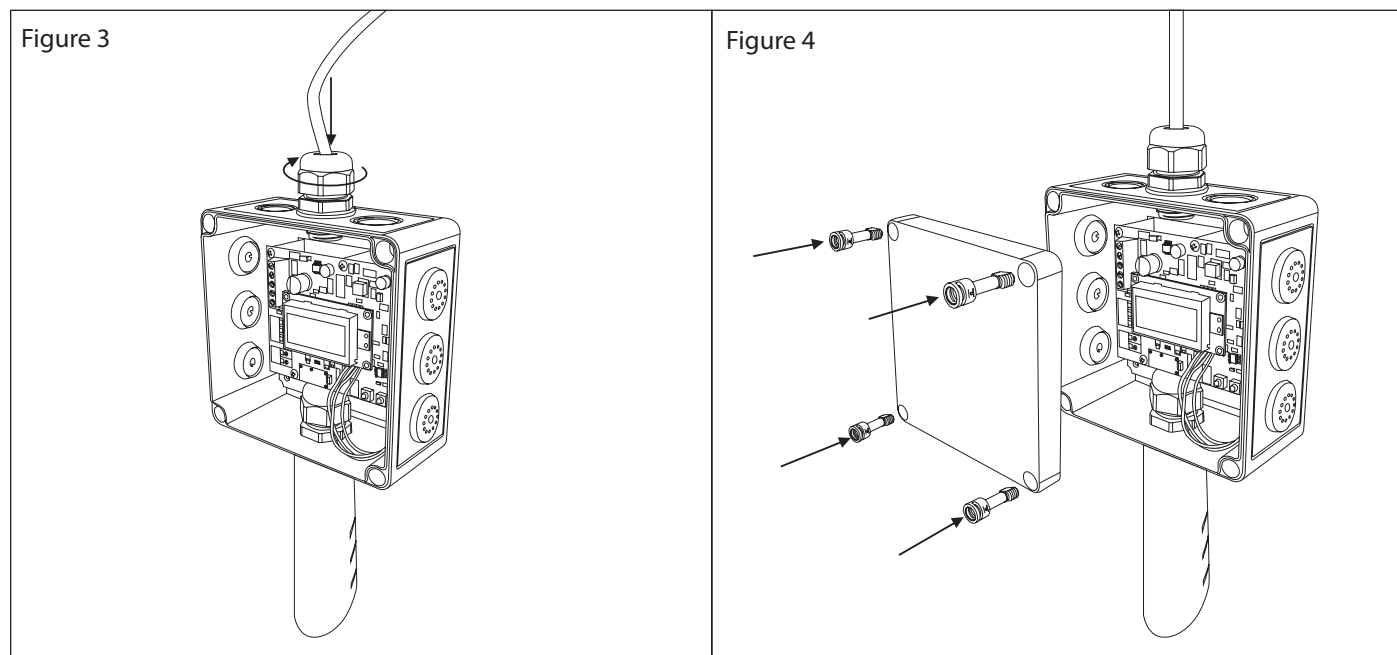


Figure 2



**For a hanging style** installation, feed the wire through the cable gland and tighten, allowing the enclosure to hang freely from the wire. See Figure 3.

Make wire connections as per the "Wiring" illustrations on Page 3. Once wiring and set up are complete, re-install cover and secure by tightening the four screws using a standard or flat screwdriver. See Figure 4.



## WIRING

- Deactivate the 24 Vac/dc power supply until all connections are made to the device to prevent electrical shock or equipment damage.
- Follow proper electrostatic discharge (ESD) handling procedures when installing the device or equipment damage may occur.
- Use 22 AWG wiring for all connections and do not locate the device wires in the same conduit with wiring used to supply inductive loads such as motors.
- Make all connections in accordance with national and local codes.

Connect the 24 Vac/dc power supply to the terminals labeled PWR +(power) and - (common) as shown in Figure 5. This device has a half-wave type power supply so use caution when wiring multiple devices so that the circuit ground point is the same on all devices and the controller. Use caution if 24 Vac power is used and one side of the transformer is earth-grounded. In general, the transformer should NOT be connected to earth ground when using devices with RS-485 network connections. The device is reverse voltage protected and will not operate if connected backwards. For End Of Line (EOL) device place termination resistor jumper in ON position, for all other devices, place jumper in OFF position. See Figure 6.

Figure 5

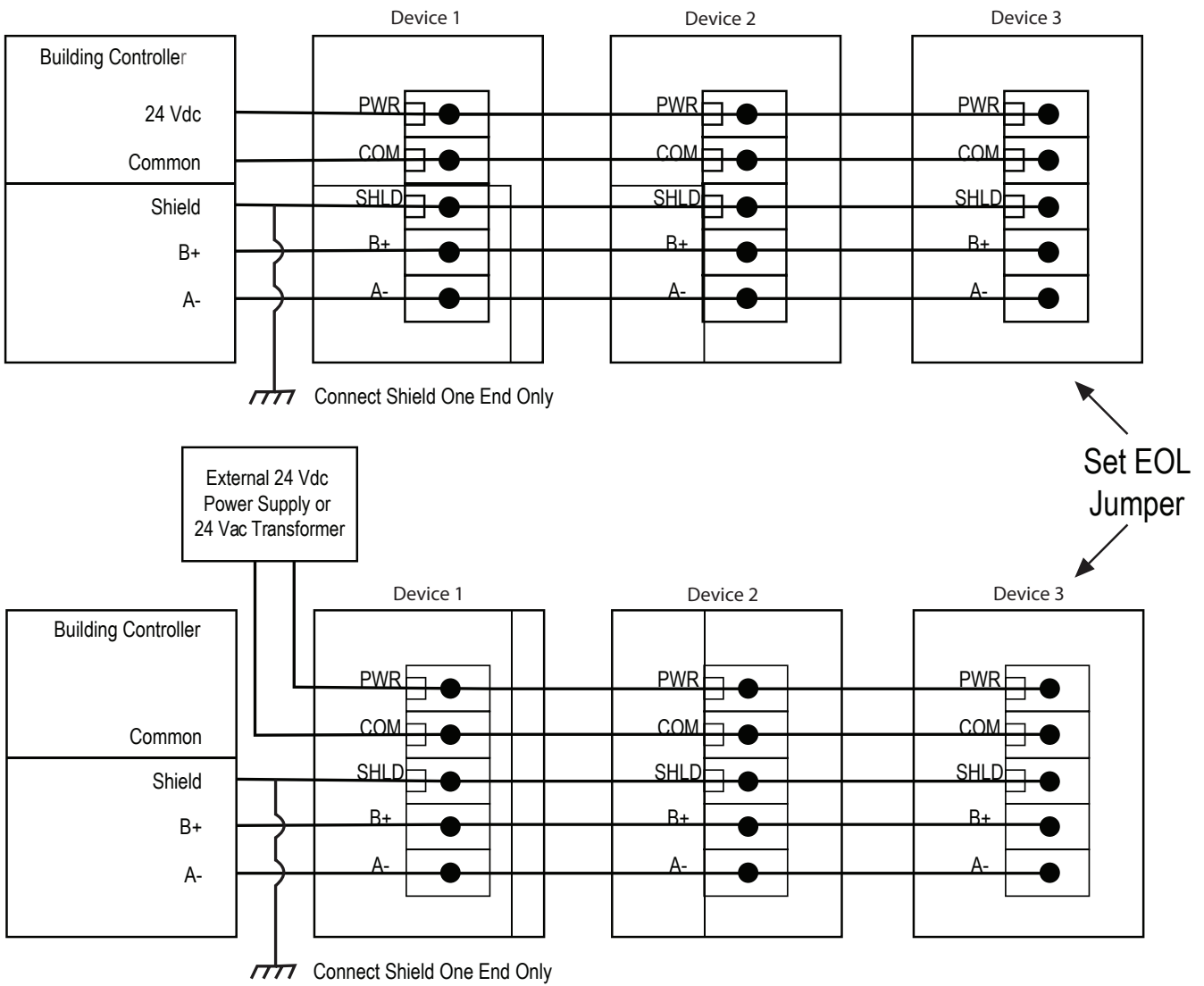
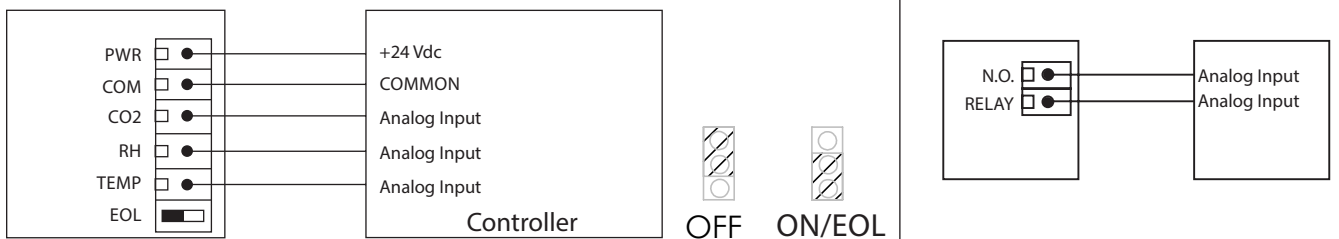


Figure 6



## USER MENU

The User Menu has several items as shown below. To enter the menu, press and release the <MENU> key while in normal operation. This will enter the User Menu step 1, pressing the <MENU> key a second time advances to step 2. Each press of the <MENU> key saves the selection and advances the menu item. The <ROLL> key is used to make changes to program variables by scrolling through the available options.

## START-UP

On start-up, the LCD will indicate the software version number, the output signal type.

Version / 1.00

Modbus / Addr 01 or BACnet® / MAC 03

BaudRate / 9600 BaudRate / 9600

## OPERATION – GO3B BACnet® MODEL

In normal operation the device reads the CO2, RH, and temperature sensors and updates the object values accordingly. The LCD displays the sensor values as determined by the display mode object.

The setpoint scale can be configured via the menu. Various options are available such as temperature ranges in °C or °F, %RH values or ppm values. See the Setup Menu section for more details. Changing the scale in the menu will affect the BACnet® object and the LCD display of the setpoint values.

## OPERATION – GO3M MODBUS MODEL

In normal operation the device reads the CO2, RH, and temperature sensors and updates the register values accordingly. The setpoint units may be changed as described in the menu section.

## SETUP

**Press and release the <MENU> key to enter the SETUP menu**

### Address Setup

#### 1. For Modbus device only

**Modbus  
Addr 01**

Use <ROLL> to select a unique slave address from 1-255. The default Modbus slave address is 1. Hold <ROLL> for 1 second to increment quickly.

#### For BACnet® device only

**BACnet  
MAC 01**

Use <ROLL> to select a unique slave address from 0-127. The default BACnet® slave address is 1. Hold <ROLL> for 1 second to increment quickly.

Press <MENU> to save and advance.

#### 2. BaudRate

**BaudRate  
9600**

Use <ROLL> to select a BaudRate of 9600, 19200, 38400, 57600, 76800, or 115200. The default Modbus BaudRate is 9600.

Press <MENU> to save and advance.

### Modbus Device Only

#### 3. Parity

**Modbus  
Parity N**

Use <ROLL> to select a parity value of N (none), O (odd), or E (even). The factory default Modbus parity bit is N (none).

Press <MENU> to save and advance.

#### 4. Stop Bits

**ModBus  
Stop 1**

Use <ROLL> to toggle the stop bits between 1 and 2. The Modbus stop bits is 1.

Press <MENU> to save and advance.

## Modbus Device Only (continued)

### 5. CRC Value

ModBus  
CRC A001

Use <ROLL> to set the CRC value to A001 (CRC-16 reverse), 1021 (CITT), 8005 (CRC-16), 8408 (CITT reverse). The default CRC polynomial is 0xA001.

Press <MENU> to save and advance.

### 6. Delay

ModBus  
Del MIN

Use <ROLL> to change the value from MIN (minimum) to 50, 100, 150, 200, 250, 300, or 350ms. The factory default slave response delay is minimum (minimum delay means just more than 3.5 character time delays, 4ms for 9600 baud rate, for example).

Press <MENU> to save and advance.

## Calibration

### 7.

Calibrat  
0 PPM

This item is used for 0 ppm gas calibration and is explained in the *Calibration* section.

Press <MENU> to save and advance.

### 8.

Calibrat  
1000 PPM

This item is used for 1000 ppm gas calibration and is explained in the *Calibration* section.

Press <MENU> to save and advance.

### 9.

Calibrat  
20000 PPM

This item is used for 20,000 ppm gas calibration and is explained in the *Calibration* section.

Press <MENU> to save and advance.

## 10. Backlight

BackLite  
Auto

Use <ROLL> to enable, disable, or set to auto the LCD backlight. When enabled the LCD backlight is always on, when disabled it never lights and if it is set to Auto it lights for a period of 30 seconds whenever a key is pressed. The factory default is Auto.

Press <MENU> to save and advance.

## 11. Exit

Menu  
Exit

Press <MENU> or <ROLL> to edit the menu and return to normal operation.

## CALIBRATION

CO2 calibration with gas requires a field calibration kit with pressure regulator, necessary tubing and appropriate bottles of CO2 gas. The 0-20000 ppm dual-channel sensor with extended range requires a 3-point calibration with 0, 1000 and 20,000 ppm gas (in order).

### 0 PPM CALIBRATION

Turn the regulator knob off and attach it to the Nitrogen gas bottle and hand tighten. Open the cover of the unit to be calibrated to expose the circuit board. Remove the circuit board using the screws as shown in Figure 3 for calibration to expose the gas sensor on the back side of the circuit board.

The tubing from the gas bottle can be connected to either port on the chamber after the protective plastic cap is removed. Gently remove one cap and connect the tubing, note that strong shock or vibration can affect calibration. Ensure the device has been operating normally for at least five minutes before applying gas. See Figure 4.

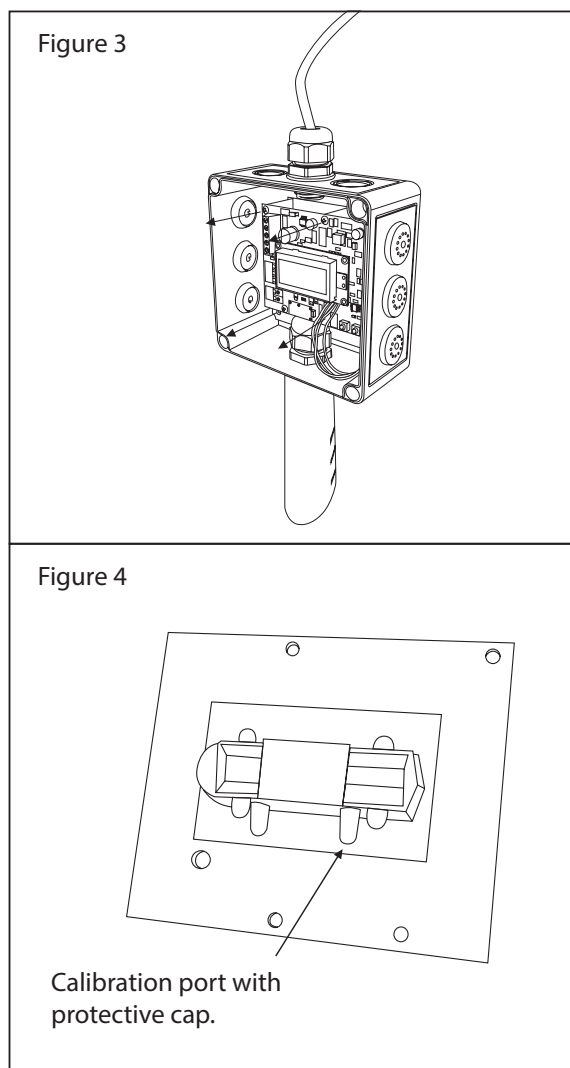
Turn the valve knob on the regulator to start the gas flow. The regulator will restrict the flow rate to the specified 100 ml/min. After a brief period the gas will flow into the chamber. Wait 1 to 2 minutes while the CO2 stabilizes. Enter the Setup menu and use the ROLL key to advance to Calibrat 0 PPM. Press and hold the key for 2 seconds and the display will change to Waiting Calibrat then to Waiting 5 minute to indicate that the process of setting the internal calibration is taking place. This takes about 5 minutes while the LCD counts down. Do not disturb the unit or the gas flow. When complete the unit will display Calibrat Done. Press the MENU key to return to normal operation and shut the gas off.

### 1000 PPM CALIBRATION

Connect the 1000 ppm CO2 gas bottle and apply the gas as described above. The CO2 reading on the LCD will begin to approach 1000 ppm. Wait 1 to 2 minutes while the CO2 reading stabilizes. Enter the Setup menu and use the ROLL key to advance to Calibrat 1000 PPM. Press and hold the key for 2 seconds and the display will change to Waiting Calibrat then to Waiting 5 minute to indicate that the device is calibrating. Again, this process takes about 5 minutes. When calibration is complete the unit will display Calibrat Done. Press the MENU key to return to normal operation and shut the gas off.

### 20,000 PPM CALIBRATION

Connect the 20,000 ppm CO2 and apply the gas as before. The LCD will begin to approach 20,000 ppm. Wait 1 to 2 minutes while the CO2 reading stabilizes. Enter the Setup menu and use the ROLL key to advance to Calibrat 20,000 PPM. Press and hold the key for 2 seconds and the display will change to Waiting Calibrat then to Waiting 5 minute. Again, wait 5 minute and when calibration is complete the unit will display Calibrat Done. Press the MENU key to return to normal operation and shut the gas off. Disconnect the tubing and replace the cap on the calibration port as calibration is complete.



## SPECIFICATIONS

### General Specifications

Power Supply .....	20-28 Vac/dc (non-isolated half-wave rectified)
Consumption .....	73 mA max @ 24 Vdc, 124 mA max @ 24 Vac with all options
Protection Circuitry.....	Reverse voltage protected, overvoltage protected
Operating Conditions .....	0 to 50°C (32 to 122°F), 0 to 95 %RH non-condensing
Wiring Connections .....	Screw terminal block (14 to 22 AWG)
Sensor Coverage Area.....	100 m <sup>2</sup> (1000 ft <sup>2</sup> ) typical
Enclosure .....	Wall mount enclosure, 130 mm W x 130 mm H x 75mm D (5.12" x 5.12" x 2.95")

### CO<sub>2</sub> Signal

Measurement Type .....	Dual Channel Non-Dispersive Infrared (NDIR), diffusion sampling
Measurement Range .....	0-20,000 ppm
Standard Accuracy .....	75 ppm or 10% of reading (whichever is higher)
Temperature Dependence...	0.2 %FS per °C
Stability .....	< 5 %FS over life of sensor (15 years typical)
Pressure Dependence.....	0.13 % of reading per mm Hg
Altitude Correction .....	Programmable from 0-5000 ft via Modbus or BACnet®
Response Time.....	< 2 minutes for 90% step change typical
Warm-up Time .....	< 2 minutes

### Interface

Hardware .....	2-wire RS-485
Software.....	Native Modbus MS/TP protocol, Native BACnet® MS/TP protocol
Baud Rate .....	Locally set to 9600, 19200, 38400, 57600, 76800, or 115200
Slave Address Range .....	Locally set to Modbus – 1-255 (factory default is 1), BACnet® – 1-127 (factory default is 1)

### LCD Display

Resolution .....	1 ppm CO <sub>2</sub> , 1 %RH, 0.1°C (0.1°F)
Size.....	35 mm W x 15 mm H (1.4" W x 0.6" H) alpha-numeric 2 line x 8 characters
Backlight.....	Enable or disable via keypad

### Temperature Signal

Sensing Element .....	10K thermistor, ±0.2°C (±0.4°F)
Range.....	0 to 35°C (32 to 95°F) or 0 to 50°C (32 to 122°F) selectable via keypad
Resolution .....	0.1°C

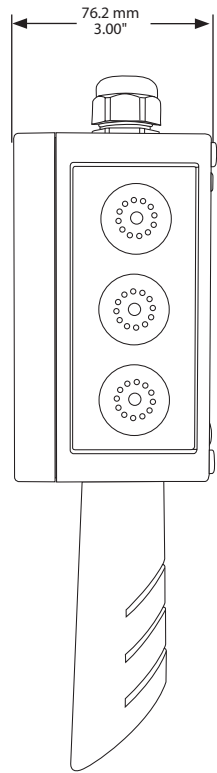
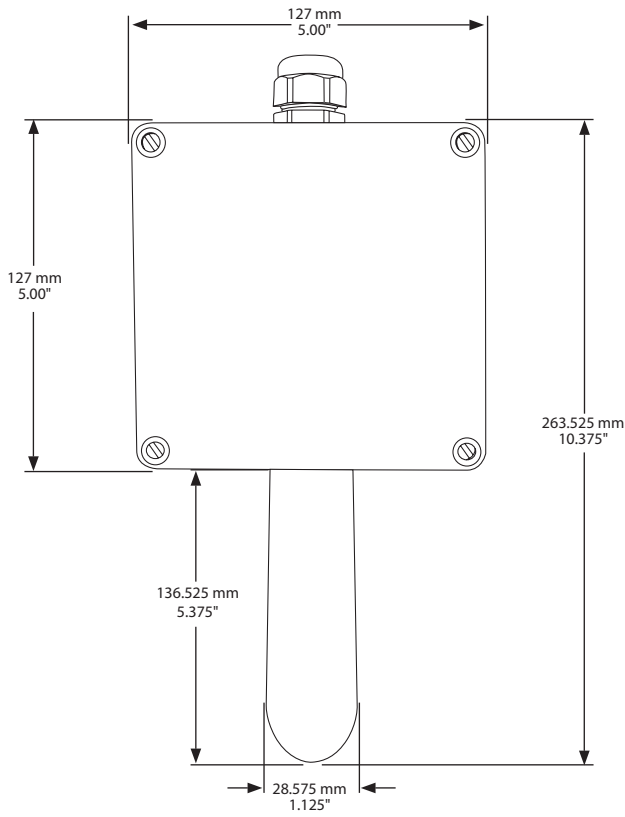
### RH Signal

Sensor .....	Thermoset polymer based capacitive
Accuracy .....	±2 %RH
Range.....	0 to 100 %RH, non- condensing
Resolution .....	2 %RH
Hysteresis .....	±3 %RH
Response Time .....	15 seconds typical
Stability .....	±1.2 %RH typical @ 50 %RH in 5 years

### Optional Relay Output

Contact Ratings.....	Form A contact (N.O.), 2 Amps @ 140 Vac, 2 Amps @ 30 Vdc
Relay Trip Point.....	Programmable 500 to 15000 ppm via BACnet® or Modbus
Relay Hysteresis.....	Programmable 25 to 500 ppm via BACnet® or Modbus

# DIMENSIONS



## NETWORK SETUP GUIDE

The network setup guide describes the implementation of the BACnet® for Modbus protocol. It is intended to assist control system programmers who may need to add support to their systems to communicate with this device.

BACnet® and Modbus setup guide downloads are available online.



### BACnet® PROTOCOL

<http://downloads.greystoneenergy.com/Website%20Documents/GO3/SG-GO3BACnet-01-01.pdf>



### MODBUS PROTOCOL

<http://downloads.greystoneenergy.com/Website%20Documents/GO3/SG-GO3Modbus-01-01.pdf>