

INTRODUCTION

The horticulture sensor series uses a highly accurate and reliable dual channel, Non-Dispersive Infrared (NDIR) sensor to monitor CO₂, 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.

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 2. 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.

Figure 1

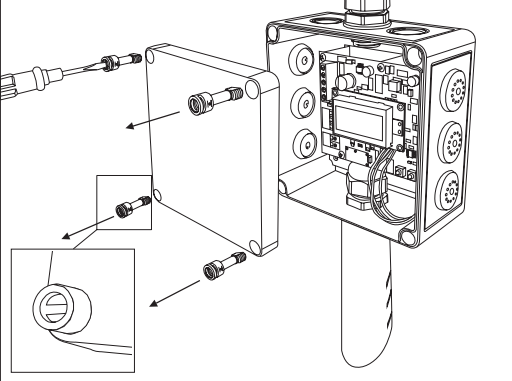


Figure 2

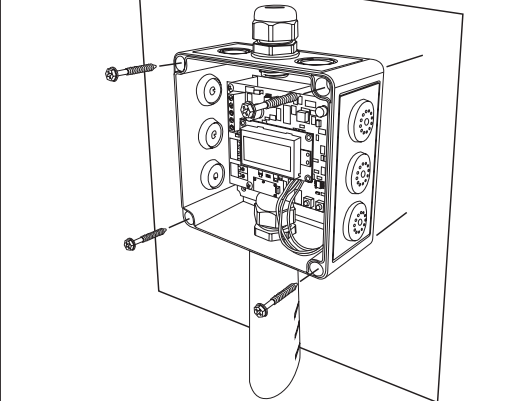


Figure 3

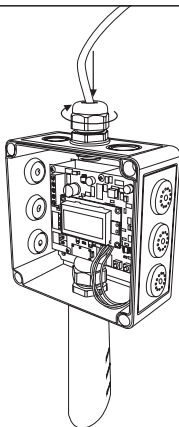
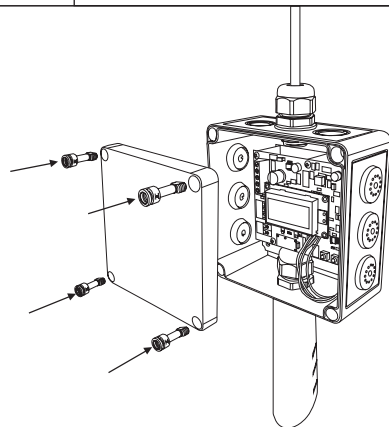


Figure 4



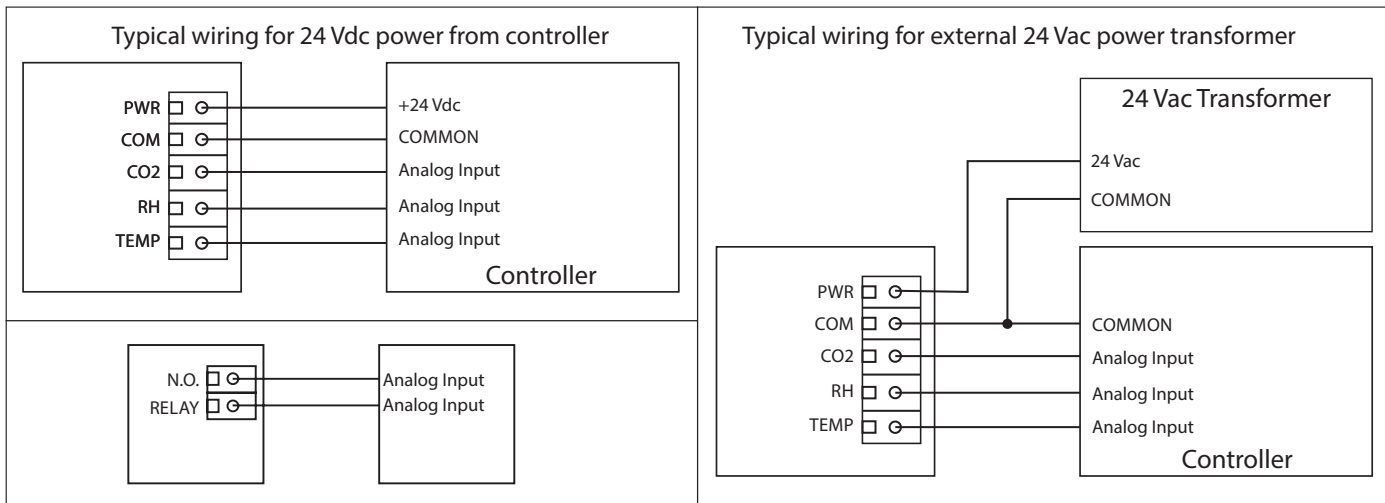
WIRING

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 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.

This is a 3-wire sourcing device. Connect the plus dc or the ac voltage hot side to the **POWER** terminal. The supply common is connected to the **COMMON** terminal. The device is reverse voltage protected and will not operate if connected backwards. It has a half-wave power supply so the supply common is the same as the signal common. Several devices may be connected to one power supply and the output signals all share the same common. Use caution when grounding the secondary of a transformer or when wiring multiple devices to ensure the ground point is the same on all devices and the controller.

The analog outputs are available on the **CO2**, **RH** and **T** terminals. The signal type can be ordered as either voltage or 4-20 mA active outputs. The voltage model is selectable for either 0-5 or 0-10 Vdc via the menu (the factory default is 0-5 Vdc). The current output operates in the active mode and does not require a loop power supply. This means that the signal current is generated by the transmitter and must not be connected to a powered input or device damage will result. Check the controller Analog Input to determine the proper connection before applying power. Both current and voltage signals are referenced to the **COMMON** terminal. The analog output signals are typically connected directly to the Building Automation System (B.A.S.) and used as control parameters.

An optional signal is the relay output available on the **N.O. RELAY** terminals. The relay output is completely isolated and has a Normally Open (N.O.) signal. This signal can be used to directly control an alarm or ventilation fan.



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, the relay setpoint, the CO2 measurement range, the RH measurement and the temperature range.

OUTPUT

The CO2 output is scaled so that 4-20 mA (or 0-5/0-10Vdc) equals 0 to Out_High as set in the Setup Menu. The factory default is 0-5,000 ppm. The Out_High can be changed in the Setup Menu and the output signal is scaled accordingly. The RH and temperature output operate similar to the CO2 output. RH is scaled 0-100 %RH and temperature defaults to 0 to 50°C but can be changed to 32 to 122°F or 0 to 32°C or 32 to 95°F using the Setup Menu.

OPERATION

The CO2, RH and Temperature signals are connected to the BAS analog inputs. The BAS reads the voltage or current signals and calculates actual values using correct scaling for the ranges and signal type. These values can be used to control ventilation devices or initiate alarms. All values are displayed locally on the LCD. The Setup Menu can be used to modify the displayed information. The display is factory set to display all three measurement values. The CO2 level will be displayed as 0 to 5000 ppm. The Setup Menu can be used to modify the displayed information. The installer can select to only display CO2, or to display CO2 and RH and temperature, or alternately CO2 and temperature. The device supports four temperature ranges that may also be selected in the menu.

The default is 0 to 50°C but may be changed to 32 to 122°F and the output signal will stay the same. Also, the temperature range may be changed to 0 to 35°C or 32 to 95°F and the output scaling will change to match the display

The relay can directly control a small fan or alarm by setting the trip value and hysteresis to appropriate values. The relay status is not indicated on the device LCD.

SETUP

1. Output High

Out High
5000 ppm

Default CO2 range is 0-5000 ppm. The output span can be changed from 2,000 to 20,000 ppm in increments of 500. Use <ROLL> to change the value.

Press <MENU> to save and advance.

2. Altitude Adjustment

Altitude
0 Ft

The default is 0 feet. Change by using <ROLL> from 0 to 5000 feet in 500 foot increments for CO2 local altitude correction.

Press <MENU> to save and advance.

3. Temperature Unit

Temp C/F
°C

The temperature scale defaults to Celcius (°C). Use <ROLL> to change to Fahrenheit (°F).

Press <MENU> to save and advance.

4. Temperature Range

T Range
0-50°C

Two temperature ranges are available for output scaling, 0 to 35°C (32 to 95°F) or 0 to 50°C (32 to 122°F). Change using <ROLL>. The available range will depend on the °C or °F menu selection.

Press <MENU> to save and advance.

5. Temperature Offset

T Offset
0°C

This item allows calibration of the temperature sensor. Use <ROLL> to add and offset to the temperature signal and display. -1 subtracts 1 degree from the temperature and +1 adds 1 degree to the temperature. The range is -10 to +10°F or -5 to +5°C. Resolution is 1°F or 0.5°C. Units depend on the previous C/F setting and resets to 0° if C/F is changed.

Press <MENU> to save and advance.

6. Relative Humidity Sensor

H Offset
0 %RH

This item allows calibration of the RH sensor. Use <ROLL> to add an offset to the RH signal and display. -1 subtracts 1 %RH and +1 adds 1 %RH. The range is -10 to +10 %RH.

Press <MENU> to save and advance.

7. Relay Setpoint

Relay SP
1000 ppm

The relay trip setpoint default is 1000 ppm. Use <ROLL> to change from 500 to 15,000 in 100 ppm increments.

Press <MENU> to save and advance.

8. Relay Hysteresis

Relay Hy
50 ppm

The relay hysteresis default is 50 ppm. Use <ROLL> to change from 25 to 500 in 25 ppm increments.

Press <MENU> to save and advance.

9. Relay Delay

**Relay
On Delay**

The relay on delay time default is 15 seconds. Use <ROLL> to change from 0 to 255 seconds in 1 second increments.

Press <MENU> to save and advance.

10. Relay Testing

Relay
Test OFF

Use <ROLL> to toggle the relay ON or OFF for testing purposes.

Press <MENU> to save and advance.

11. Voltage Output

Out Type
0-5 Vdc

The default output type is 0-5 Vdc. USE <ROLL> to change to 0-10 Vdc if necessary.

Press <MENU> to save and advance.

12. Gas Calibration

Calibrat
0 PPM

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

13. Gas Calibration

Calibrat
1000 PPM

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

14. Gas Calibration

Calibrat
20000 PPM

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

15. 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 time period (30 seconds) whenever a key is pressed. The factory default is Auto.

Press <MENU> to save and advance.

16. Exit

Menu
Exit

Press <MENU> or <ROLL> to exit 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.

Figure 3

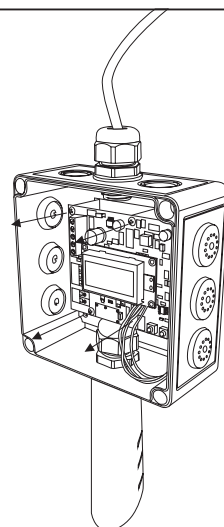
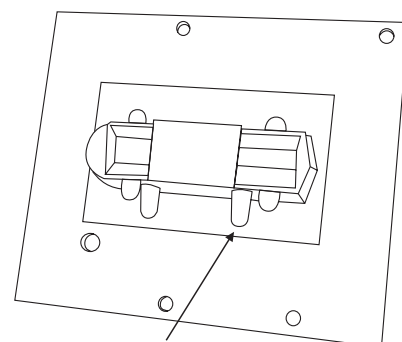


Figure 4



Calibration port with protective cap.

SPECIFICATIONS

General Specifications

Power Supply	20-28 Vac/dc (non-isolated half-wave rectified)
Consumption	120 mA max @ 24 Vdc, 212 mA max @ 24 Vac (mA models) 79 mA max @ 24 Vdc, 129 mA max @ 24 Vac (voltage models)
Output Signals	4-20 mA active (sourcing) or 0-5 Vdc or 0-10 Vdc
Output Drive Capability	550 ohms maximum for current output, 5000 ohms minimum for voltage output
Output Resolution	10 bit PWM
Input Voltage Effect	Negligible over specified operating range
Protection Circuitry	Reverse voltage protected, overvoltage protected
LCD Resolution	1 ppm CO ₂
LCD Size	35 mm W x 15 mm H (1.4" W x 0.6" H) alpha-numeric 2 line x 8 characters
LCD Backlight	Enable or disable via keypad
Wiring Connections	Screw terminal block (14 to 22 AWG)
Enclosure	Wall mount enclosure, 130 mm W x 130 mm H x 75mm D (5.12" x 5.12" x 2.95")

CO₂ 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 keypad
Response Time	< 2 minutes for 90% step change typical
Warm-up Time	< 2 minutes

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

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 keypad
Relay Hysteresis	Programmable 25 to 500 ppm via keypad

DIMENSIONS

