

Introduction

The CO2 transmitter uses Infrared Technology to monitor CO2 levels and outputs a linear 4-20 mA or 0-5/0-10 Vdc signal. Options include an LCD, a control relay and a resistive temperature sensor. Features include a back-lit LCD and user menu for easy installation.

Before Installation

Read these instructions carefully before installing and commissioning the CO2 transmitter. Failure to follow these instructions may result in product damage. Do not use in an explosive or hazardous environment, with combustible or flammable gases, 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 ratings.

Mounting

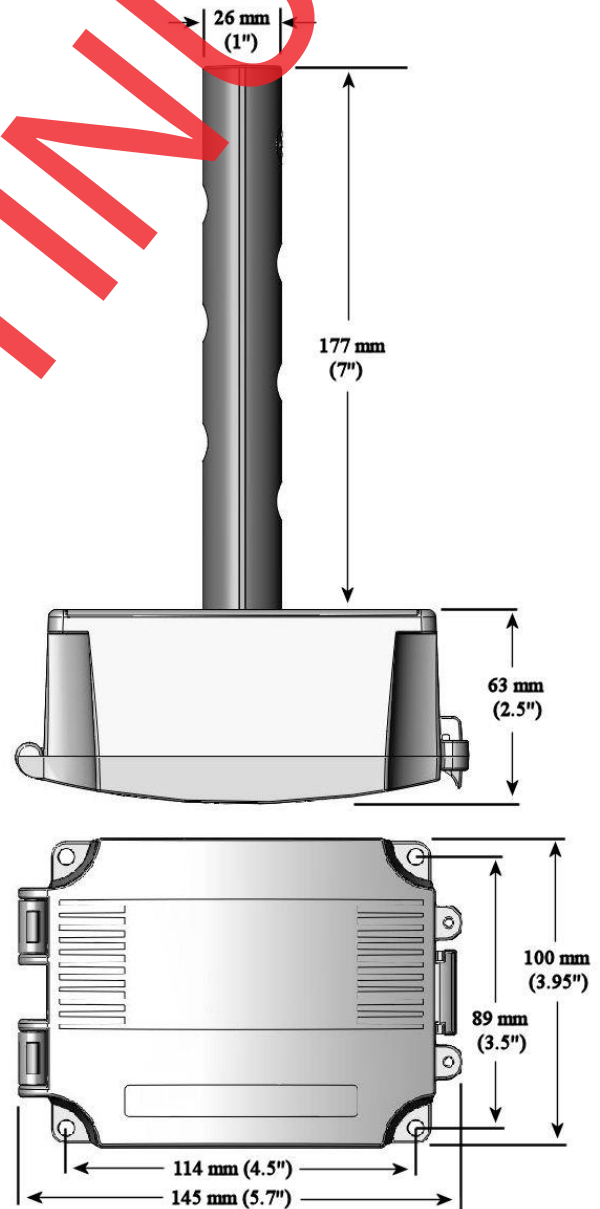
The CO2 duct type sensor installs on the outside of a return air duct with the sampling tube inserted into the duct. Use the included foam plug to prevent air from entering the enclosure through the conduit and causing an incorrect reading.

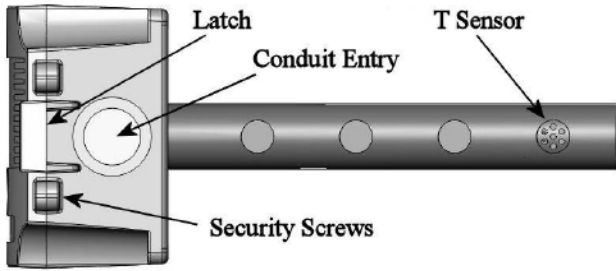
Mount the sensor in an easily accessible location in a straight section of duct at least five feet from corners and other items that may cause disturbances in the air flow. Avoid areas where the detector is exposed to vibrations or rapid temperature changes.

The duct CO2 transmitter principal of operation is based on the Venturi effect of the probe that extends into the HVAC duct. Air flowing through the duct is forced into the vent holes on one side of the probe, into the enclosure, over the CO2 sensor and then the air is drawn back out of the enclosure via the vent holes on the opposite side of the probe.

Drill or punch a 1-1/8" or 1-1/4" hole in the duct at the preferred location and insert the probe into the hole to mark the enclosure mounting holes. Remove the unit and drill the four mounting holes. Clean all drilled holes of debris before mounting the device. Mount the enclosure to the duct with four sheet metal screws such that the duct air flow is parallel with the vent holes in the probe (i.e.: air flows directly into the probe holes). To prevent air leaks, ensure the gasket is compressed around the probe between the device enclosure and the air duct.

Open the cover by releasing the latch and connect the device according to the wiring instructions. After wiring and setup are complete, close and latch the cover. Secure it with two self-tapping screws in the holes provided.





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.

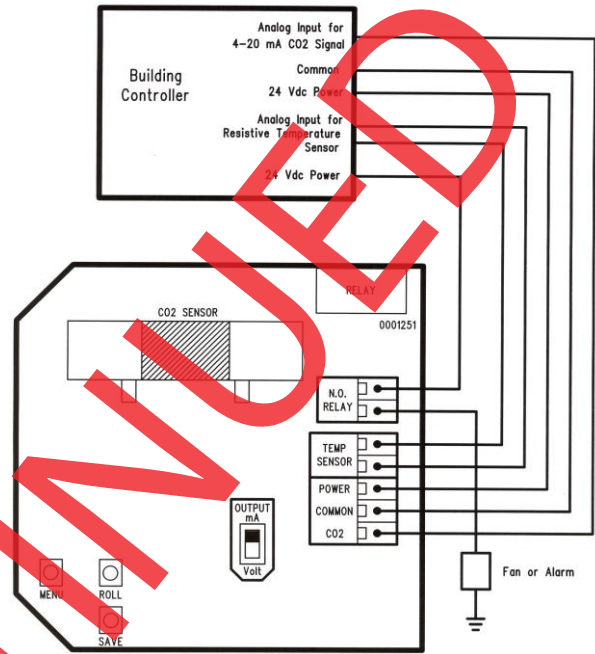
This is a 3-wire sourcing device. Connect the plus dc or the ac voltage hot side to the **POWER** terminal. The supply common is connected to the **COMMON** terminal. The device is reverse voltage protected and will not operate if connected backwards. It has a half-wave power supply so the supply common 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 output is available on the **CO2** terminal. This signal is switch selectable for either voltage or 4-20 mA active output. In voltage mode the output 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 signal is typically connected directly to the Building Automation System (B.A.S.) and used as a control parameter or for logging purposes.

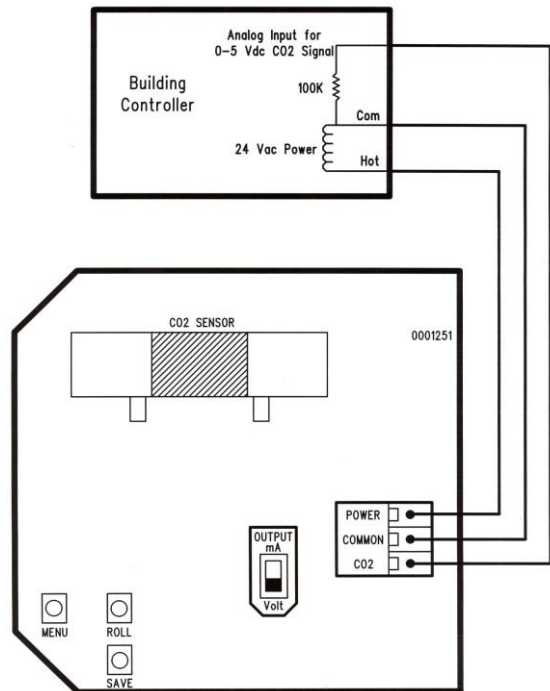
An optional signal is the relay output available on the **N.O. RELAY** terminals. The relay output is completely isolated and has a Normally Open (NO) signal. This signal can be used to directly control an alarm or ventilation fan. The two-wire resistive temperature sensor output signal can be ordered with various RTDs and thermistors to suit

all control applications and is available on the **TEMP SENSOR** terminals.

Typical 4-20 mA wiring with 24 Vdc and all options



Typical 0-5 Vdc wiring with 24 Vac for CO2 only



Start-up

Verify the device is properly wired and connections are tight. Ensure the V/I switch is set for the correct signal type. Apply power and the LCD will indicate the software version number, the output signal type, the relay setpoint (if installed), the CO₂ measurement range and then the sensor will begin reading the CO₂ level, output the correct analog signal and display the value on the LCD.

Output

The CO₂ output is scaled such that 4-20 mA (or 0-5/0-10 Vdc) equals 0 to Out_High. Depending on the model, the factory default is either 0-2000 ppm or 0-20,000 ppm. Out_High can be changed in the Setup Menu and the output is scaled accordingly. If using voltage output type, the default is 0-5 Vdc (0-10 can be selected in the menu).

Operation

The output signal is available on the CO₂ terminal and is connected to the BAS analog input which reads the signal and calculates the CO₂ ppm value using correct scaling for the range and signal type. This CO₂ value is used to control output ventilation devices or initiate alarms. The CO₂ value is also displayed locally on the optional LCD.

If a relay is installed it can control a small fan or alarm by setting the trip value and hysteresis to appropriate values.

If a temperature sensor is installed it will be wired to an analog input of the BAS that is set for the specific resistance type. This could be a 10 K Ω thermistor, a 1000 ohm RTD or other sensor values. The BAS reads the resistance signal and converts it to a temperature value.

Calibration

Calibration with gas requires a field calibration kit with pressure regulator, necessary tubing and appropriate bottles of CO₂ gas. Note that the procedure depends on the device model. The standard model requires only a single point 1000 ppm calibration to meet specified accuracy due to the Automatic Calibration mode and other technology incorporated into the CDD4A model.

The CDD4B dual channel sensor with extended range requires a 3-point calibration with 0, 1000 and 20,000 ppm gas (in order).

0 PPM Calibration (For the CDD4B model only)

Turn the regulator knob off and attach it to the Nitrogen gas bottle and hand tighten. Remove the cover of the unit to be calibrated to expose the gas sensor chamber. The tubing from the gas bottle can be connected to either port on the chamber after the 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. 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 until the CO₂ stabilizes.

Enter the Setup menu and use the <MENU> key to advance to **Calibrat 0 PPM**. Press and hold the <SAVE> 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 the ppm value and **Cal Done**. Press <SAVE> to resume normal operation and shut the gas off.

1000 PPM Calibration (For all CDD models)

Connect the 1000 ppm CO₂ gas bottle and apply the gas as before. The CO₂ reading on the LCD will begin to approach 1000 ppm. Wait 1 to 2 minutes until the CO₂ reading stabilizes.

Enter the Setup menu and use the <MENU> key to advance to **Calibrat 1000 PPM**. Press and hold the <SAVE> 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 the ppm value and **Cal Done**. Press the <SAVE> key to return to normal operation and shut the gas off.

20,000 PPM Calibration (For the CDD4B model only)

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 until the CO₂ reading stabilizes.

Enter the Setup menu and use the <MENU> key to advance to **Calibrat 20,000 PPM**. Press and hold the <SAVE> 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 the ppm value and **Cal Done**. Press <SAVE> to resume normal operation and shut the gas off.

Disconnect the tubing and replace the cap on the sensor chamber as calibration is complete.

Setup Menu

The menu has several items shown below. Some items change depending on the hardware configuration and the CO₂ sensor. To enter the menu, press and release the <MENU> key while in normal operation. This will enter the SETUP menu step 1, pressing <MENU> a second time advances to step 2. Each press of <MENU> advances the menu. No values are saved or changed by using <MENU>. The <ROLL> key is used to make changes to program variables by scrolling through the available options. When a value is changed, use the <SAVE> key to save it to memory and advance to the next menu item.

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

If the 2000 ppm CO₂ sensor is installed (CDD4A model)

1. Out High 2000 ppm The default range is 0-2000 ppm. The span can be changed from 1000 to 7500 ppm in increments of 500. Use the <ROLL> key to change the value and <SAVE> to save. The factory default is 2000 ppm.

If the 20,000 ppm CO₂ sensor is installed (CDD4B model)

1. Out High 20000ppm The default range is 0-20,000 ppm. The span can be changed from 2000 to 20,000 ppm in increments of 500. Use the <ROLL> key to change the value and <SAVE> to save. The factory default is 20,000 ppm.

<MENU>

2. Altitude 0 Ft The default is 0 feet. Change by using the <ROLL> key from 0 to 5000 feet in 500 ft increments. Change for CO₂ local altitude correction and press <SAVE> to save a change.

<MENU>

This item is omitted if the 20,000 ppm dual-channel sensor is installed

3. Auto Cal ON Automatic Cal Mode default is ON to correct CO₂ sensor drift to better than ± 10 ppm per year. Change with the <ROLL> key and save using <SAVE>. ON is recommended for applications where the CO₂ level will be close to normal (400 ppm) at least once per day. If a building is occupied 24 hours and the CO₂ level is fairly constant then this should be set to OFF.

Items 4, 5 and 6 are only available if the Relay Option is installed, otherwise the menu skips directly to step 7.

4. Relay SP 1000 ppm The relay trip setpoint default is 1000 ppm. It can be changed from 500 to 5000 in 100 ppm increments for the 2000 ppm CO₂ sensor or 500 to 15,000 for the 20,000 ppm sensor. Save changes by using the <SAVE> key.

<MENU>

5. Relay Hy 50 ppm The relay hysteresis default is 50 ppm. This can be changed from 25 to 200 in 25 ppm increments for the 2000 ppm sensor or 25 to 500 ppm for the 20,000 ppm sensor. Use <SAVE> to save any change.

<MENU>

6. Relay Test OFF Use the <ROLL> key to toggle the relay ON or OFF for testing purposes. Press either <SAVE> or <MENU> to turn the relay off and advance to the next item.

<MENU>

7. Out Type 0-5 Vdc For voltage, the factory default output type is 0-5 Vdc. Use the <ROLL> key to change the value to 0-10 Vdc if necessary. Press the <SAVE> key to save. If the switch is set to mA, then 4-20 mA is displayed.

<MENU>

8. Output Test OFF Use the <ROLL> key to toggle the output OFF (normal operation), MIN (minimum output) or MAX (maximum output) for testing purposes. Press either <SAVE> or <MENU> to set it back to OFF and advance to the next item.

<MENU>

This item is omitted if the 2000 ppm sensor is installed

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

<MENU>

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

<MENU>

This item is omitted if the 2000 ppm sensor is installed

11. Calibrat 20000 PPM This item is used for 20,000 ppm gas calibration and is explained in the *Calibration* section.

<MENU>

12. BackLite Enable Use the <ROLL> key to enable or disable the LCD backlight. When enabled the backlight is always on, when disabled it never lights. Press the <SAVE> key to save the setting. The factory default is Enable.

<MENU>

13. Menu Exit Press <SAVE> to exit the menu and return to normal operation or <MENU> to repeat the menu.

General Specifications

- Power Supply 20 – 28 Vac/dc (non-isolated half-wave rectified)
- Consumption 100 mA max @ 24 Vdc, 185 ma max @ 24 Vac (with all options)
- Output Signals 4-20 mA active (sourcing), 0-5 Vdc or 0-10 Vdc (field selectable)
- Output Drive Capability 550 ohms maximum for current output, 5 Kohm min for voltage output
- Output Resolution 10 bit PWM
- Input Voltage Effect Negligible over specified operating range
- Protection Circuitry Reverse voltage protected, overvoltage protected
- Operating Conditions 0-50 °C (32-122 °F), 0-95 %RH non-condensing
- Wiring Connections Screw terminal block (14 to 22 AWG)
- Enclosure 5.7”w x 3.95”h x 2.5”d (145 x 100 x 63 mm)
- Duct Probe 7” (177 mm) long x 1” (25.4 mm) diameter

CO2 Signal

- Measurement Type Non-Dispersive Infrared (NDIR), diffusion sampling
- Measurement Range 0-2000 ppm (CDD4A) or 0-20,000 ppm (CDD4B), programmable span
- Standard Accuracy ± 30 ppm + 3% of reading (CDD4A with Auto Cal)
± 75 ppm or 10% of reading (whichever is greater) (CDD4B with dual-channel sensor)
- Temperature Dependence 0.2 %FS per °C
- Stability < 2 %FS over life of sensor (15 years typical) (CDD4A)
< 5 %FS or <10% reading annual (CDD4B)
- Pressure Dependence 0.135 % 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

LCD Display

Resolution 1 ppm CO2
Size 1.4" w x 0.6" h (35 x 15 mm) alpha-numeric 2 line x 8 characters
Backlight Enable or disable via keypad

Optional Temperature Signal

Sensing Element Various RTDs and thermistors available as 2-wire resistance output

Optional Relay Output

Contact Ratings Form A contact (N.O.), 2 Amps @ 140 Vac, 2 Amps @ 30 Vdc
Relay Trip Point Programmable via keypad
Relay Hysteresis Programmable via keypad

