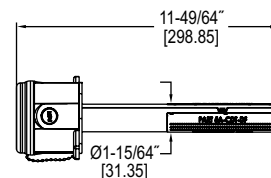
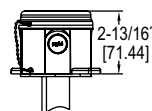
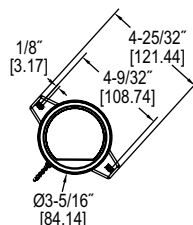




# Series CDT and CDTR Duct Mount Carbon Dioxide/ Temperature/Relative Humidity Transmitter

## Specifications - Installation and Operating Instructions



**Series CDT and CDTR Duct Mount Carbon Dioxide/ Temperature/Relative Humidity Transmitters** accurately monitor the CO<sub>2</sub> concentration and temperature in schools, office buildings, and other indoor environments to help achieve LEED® certification. A non-dispersive infrared (NDIR) sensor is used to automatically correct the measurement in both occupied and unoccupied buildings against aging effects. In order to achieve a higher level of accuracy, the Series CDT includes digital barometric pressure adjustment.

Universal outputs allow users to select the transmitter output to be 4-20 mA, 0-5 VDC or 0-10 VDC to work with virtually any building management controller. An optional relay with user adjustable set points can be used to control exhaust fans, open actuated windows or dampers, or signal a light or horn.

For configuration purposes, the Series CDT and CDTR can be ordered with the Model A-449 remote LCD display that can plug into the mini-connector port on the internal circuit board. Menu items that can be accessed include: engineering units, relay output set points, display configuration, transmitter output scaling, and ambient barometric pressure.

### Automated CO<sub>2</sub> Baseline Correction (ABC)

The Series CDT and CDTR CO<sub>2</sub> transmitters are maintenance free instruments with the ability to adjust the CO<sub>2</sub> calibration by using the on-board ABC logic for intermittently occupied spaces. The ABC algorithm accounts for long term drift by making small adjustments to its zero calibration point based on the lowest CO<sub>2</sub> readings it measures. CO<sub>2</sub> calibration adjustments are made every eight days by the ABC algorithm. For environments occupied 24 hours per day it is recommended to periodically expose the CO<sub>2</sub> sensor to outside ambient air.

### SPECIFICATIONS

**Sensor:** NDIR, 15 year life expectancy.

**Range:** CO<sub>2</sub>: 0 to 2000 or 0 to 5000 PPM (depending on model); RH: 0 to 100% (for units configured with humidity output); Temperature: 32 to 122°F (0 to 50°C).

**Accuracy\*:** ±40 PPM + 3% of reading (2000 PPM CO<sub>2</sub>); ±50 PPM + 5% of reading (5000 PPM CO<sub>2</sub>); RH: ±2% (for units configured with humidity output); Temperature: ±1°C @ 25°C.

**Response Time:** 2 min for 90% step change.

**Temperature Limits:** 32 to 122°F (0 to 50°C).

**Humidity Limits:** 0 to 85% RH (non-condensing).

**Power Requirements:** 16-35 VDC/19-28 VAC.

**Power Consumption:** Average: 2 watts; Peak: 3.75 watts.

**Output:** Current: 4-20 mA (max 500 Ω); Voltage: 0-5 VDC or 0-10 VDC (min 500 Ω); Relay: SPST NO 2A @ 30 VDC; RTD or thermistor per r-t curves (depending on model).

**Weight:** 5.6 oz (158.8 g).

**Agency Approvals:** CE.

\*The specified CO<sub>2</sub> accuracy is only guaranteed after three weeks of continuous operation in environments which are intermittently occupied.

### INSTALLATION



#### WARNING

Disconnect power supply before installation to prevent electrical shock and equipment damage.

Make sure all connections are in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

#### CAUTION

Use electrostatic discharge precautions (e.g., use of wrist straps) during installation and wiring to prevent equipment damage.

#### CAUTION

Avoid locations where severe shock or vibration, excessive moisture or corrosive fumes are present.

#### CAUTION

Do not exceed ratings of this device, permanent damage not covered by warranty may result.

#### NOTICE

Upon powering the transmitter, the firmware version will flash on the display. A warm up period of 30 minutes is required for the transmitter to adjust to the current CO<sub>2</sub> concentration.

#### NOTICE

Self calibration feature of the transmitter requires exposure to normal outdoor equivalent carbon dioxide level once every thirty days.

## MOUNTING

1. Cut hole into duct large enough to insert probe.
2. Attach housing ears to duct using the two self-tapping screws provided.
3. Knock out an opening in the housing and attach an electrical fitting to route electrical wiring. PG11 and PG16 knockouts are molded into the housing.

## WIRING

Use maximum 18 AWG wire for wiring to terminals. Refer to Figure 4 for wiring information.

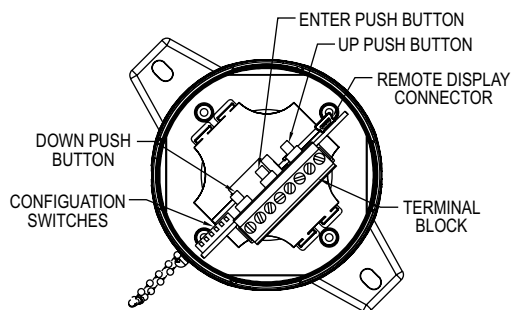


Figure 1: Diagram of circuit board

## Selection of Current and Voltage Outputs

Prior to wiring, verify that the current/voltage configuration switches (positions 1 and 2) are set to the desired output type. Refer to Figure 1 to locate the configuration switches. See Figure 2 for diagram of the current/voltage selection switches. For voltage output selection, the output can be 0-10 VDC, 0-5 VDC, 2-10 VDC or 1-5 VDC. See Figure 3 for the type of voltage output selection switches (positions 3 and 4).

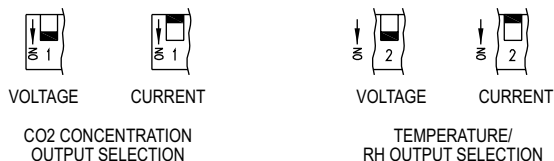


Figure 2: Current/voltage output Selection jumper (PJ1 And PJ2)

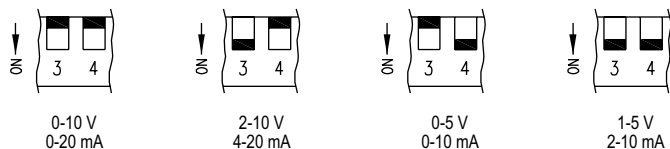


Figure 3: Output range selection jumper

## Current/Voltage Outputs

The transmitter may be wired for current or voltage output for both carbon dioxide and temperature. The transmitter can be powered with either 16-35 VDC or 19-28 VAC. Wire the transmitter according to Figure 4.

### NOTICE

Optional relay can be used as either a dry contact or low voltage switched circuit up to 2 A at 30 VDC.

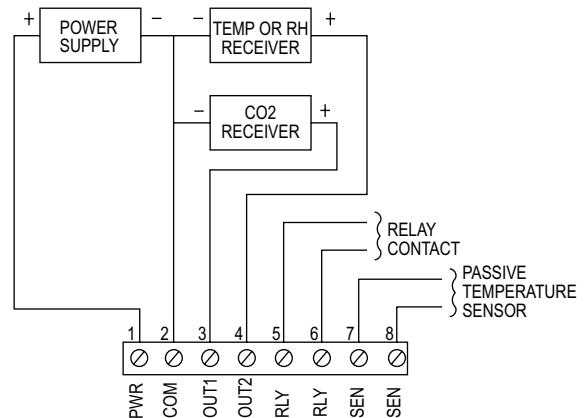


Figure 4: Active output wiring diagram

## Thermistor and RTD Outputs

Thermistor and RTD passive outputs are located on terminals 7 and 8 and do not require any power. Passive temperature outputs are not polarity sensitive.

## ACCESSING MENU PARAMETERS

- Step 1: To enter the menu structure, press "Up" and "Down" simultaneously for 5 seconds (display will show RON parameter).
- Step 2: Press "Up" or "Down" to cycle between menu items.
- Step 3: Press "Enter" to edit the value for the displayed menu item (SET will appear on display).
- Step 4: Press "Up" or "Down" to adjust the value of the menu item.
- Step 5: Press "Enter" to save the changes (SET will disappear).
- Step 6: Repeat Steps 2 through 5 for each of the parameters.
- Step 7: To exit the menu at any time, press and hold "Down" and "Up" simultaneously for 5 seconds or wait 10 seconds without pushing any buttons.

## Menu Descriptions

|            |   |            |  |
|------------|---|------------|--|
| <b>MAX</b> | Maximum CO <sub>2</sub> value<br>Displays the highest CO <sub>2</sub> concentration value observed by the sensor since the last power cycle or reset.<br>Reset the MAX CO <sub>2</sub> concentration by pressing and holding the ENTER button for 1 second.   | <b>TOL</b> | Temperature low output range (CDT with active temperature only)<br>Sets the temperature for the lowest output (4 mA or 0 VDC).<br><br>Low limit: 32.0°F / 0.0°C<br>Factory setting: 32.0°F / 0.0°C<br>High limit: 122.0°F / 50.0°C   |
| <b>RON</b> | Relay on set point<br>Sets the CO <sub>2</sub> concentration which the optional relay is energized.<br><br>Low limit: 0 PPM<br>Factory setting: 1000 PPM<br>High limit: 2000/5000 PPM (depending on model)  | <b>TOH</b> | Temperature high output range (CDT with active temperature only)<br>Sets the temperature for the highest output (20 mA, 5 VDC or 10 VDC). When TOH is set above TOL, the transmitter is direct acting and the output will increase with an increase in temperature. When TOH is below TOL, the transmitter is reverse acting and the output will increase with a decrease in temperature.<br><br>Low limit: 32.0°F / 0.0°C<br>Factory setting: 122.0°F / 50.0°C<br>High limit: 122.0°F / 50.0°C        |
| <b>ROF</b> | Relay off set point<br>Sets the CO <sub>2</sub> concentration which the optional relay is de-energized. Setting value lower than RON provides direct action for detecting high concentrations of CO <sub>2</sub> . Setting value higher than RON provides indirect action for detecting low concentrations of CO <sub>2</sub> . "Up" or "Down" on the LCD display will be lit to indicate when the relay is energized.<br><br>Low limit: 0 PPM<br>Factory setting: 950 PPM<br>High limit: 2000/5000 PPM (depending on model)            | <b>HOL</b> | Humidity low output range (CDTR only)<br>Sets the temperature for the lowest output (4 mA or 0 VDC).<br><br>Low limit: 0.0%<br>Factory setting: 0.0%<br>High limit: 100.0%   |
| <b>DSP</b> | Display configuration<br>Determines the LCD display configuration during normal operation. The LCD display can indicate the CO <sub>2</sub> concentration, temperature, relative humidity (CDTR only) and CO <sub>2</sub> concentration combined with temperature or relative humidity (CDTR only).<br><br>CH CO <sub>2</sub> concentration and relative humidity (CDTR only)<br>CT CO <sub>2</sub> concentration and temperature<br>C CO <sub>2</sub> concentration only<br>T Temperature only<br>H Relative humidity only (CDTR only) | <b>HOH</b> | Humidity high output range (CDTR only)<br>Sets the temperature for the highest output (20 mA, 5 VDC or 10 VDC). When HOH is set above HOL, the transmitter is direct acting and the output will increase with an increase in temperature. When HOH is below HOL, the transmitter is reverse acting and the output will increase with a decrease in temperature.<br><br>Low limit: 0.0%<br>Factory setting: 100.0%<br>High limit: 100.0%  |
| <b>UNI</b> | Units selection<br>Temperature and barometric pressure measurements can be displayed in US engineering units or SI engineering units. The factory default is to display US engineering units.<br><br>US units °F for temperature and in Hg for barometric pressure<br>SI units °C for temperature and hPa for barometric pressure   | <b>BAR</b> | Barometric pressure<br>Sets the typical barometric pressure for the location where the transmitter is mounted. The factory setting is for standard pressure at sea level. Adjusting the barometric pressure gives a more accurate measurement, especially at higher elevations. Refer to the elevation charts in Figure 6 for typical barometric pressures at a given elevation.<br><br>Low limit: 20.0 in Hg / 600 hPa<br>Factory setting: 29.9 in Hg / 1013 hPa<br>High limit: 32.0 in Hg / 1100 hPa |
| <b>OFT</b> | Temperature offset<br>Allows the user to add an offset to the measured temperature.<br><br>Range: ±5°C in 0.5°C increments (±9°F in 1°F increments)<br>Factory Default: 0°C   | <b>ABC</b> | Automated baseline correction<br>Enables/disables the Automated Baseline Correction algorithm for disabling in locations that experience elevated levels of CO <sub>2</sub> due to constant occupancy of the area. Select "ON" to enable ABC and select "OFF" to disable ABC.<br><br>Factory Default: ON   |
| <b>OFH</b> | Humidity offset (CDTR only)<br>Allows the user to add an offset to the measured relative humidity.<br><br>Range: ±10% in 1% increments<br>Factory Default: 0% RH  | <b>RST</b> | Reset to factory defaults<br>Resets all menu settings to their default value, and clears zero and span. YES - Press and hold - button for several seconds to reset settings<br>NO - Press button to exit this menu item without resetting  |
| <b>COL</b> | CO <sub>2</sub> low output range<br>Sets the CO <sub>2</sub> concentration for the lowest output (4 mA or 0 VDC).<br><br>Low limit: 0 PPM<br>Factory setting: 0 PPM<br>High limit: 2000/5000 PPM (depending on model)   |            |  |
| <b>COH</b> | CO <sub>2</sub> high output range<br>Sets the CO <sub>2</sub> concentration for the highest output (20 mA, 5 VDC or 10 VDC). When COH is set above COL, the transmitter is direct acting and the output will increase with an increase in CO <sub>2</sub> level. When COH is below COL, the transmitter is reverse acting and the output will increase with a decrease in CO <sub>2</sub> level.<br><br>Low limit: 0 PPM<br>Factory setting: 2000/5000 PPM (depending on model)<br>High limit: 2000/5000 PPM (depending on model)       |            |  |

## MAINTENANCE/REPAIR

Upon final installation of the Series CDT/CDTR, no routine maintenance is required. The Series CDT/CDTR is not field serviceable and should be returned if repair is needed. Field repair should not be attempted and may void warranty.



This symbol indicates waste electrical products should not be disposed of with household waste. Please recycle where facilities exist. Check with your Local Authority or retailer for recycling advice.

## WARRANTY/RETURN

Refer to "Terms and Conditions of Sales" in our catalog and on our website. Contact customer service to receive a Return Material Authorization number before shipping the product back for repair. Be sure to include a brief description of the problem plus any additional application notes.

| US Customary Units |       | SI Units |      |
|--------------------|-------|----------|------|
| ft                 | in Hg | m        | hPa  |
| 0                  | 29.92 | 0        | 1013 |
| 400                | 29.50 | 100      | 1002 |
| 800                | 29.10 | 200      | 990  |
| 1200               | 28.69 | 300      | 979  |
| 1600               | 28.29 | 400      | 968  |
| 2000               | 27.90 | 500      | 957  |
| 2400               | 27.51 | 600      | 946  |
| 2800               | 27.13 | 700      | 935  |
| 3200               | 26.76 | 800      | 924  |
| 3600               | 26.39 | 900      | 914  |
| 4000               | 26.02 | 1000     | 904  |
| 4400               | 25.66 | 1100     | 893  |
| 4800               | 25.30 | 1200     | 883  |
| 5200               | 24.95 | 1300     | 873  |
| 5600               | 24.60 | 1400     | 863  |
| 6000               | 24.26 | 1500     | 853  |
| 6400               | 23.93 | 1600     | 844  |
| 6800               | 23.60 | 1700     | 834  |
| 7200               | 23.27 | 1800     | 824  |
| 7600               | 22.94 | 1900     | 815  |
| 8000               | 22.63 | 2000     | 806  |
| 8400               | 22.31 | 2100     | 797  |
| 8800               | 22.00 | 2200     | 787  |
| 9200               | 21.70 | 2300     | 779  |
| 9600               | 21.40 | 2400     | 770  |
| 10000              | 21.40 | 2500     | 761  |

Figure 5: Elevation chart

## RESISTANCE VS TEMPERATURE TABLE

| Temperature |       | Resistance Curves (in Ohms) |           |           |        |        |            |
|-------------|-------|-----------------------------|-----------|-----------|--------|--------|------------|
| °C          | °F    | A                           | B         | C         | D      | E      | F          |
| -55         | -67.0 | 607800.00                   | 963849.00 | 289154.70 | 78.32  | 783.2  | 2394000.00 |
| -50         | -58.0 | 441200.00                   | 670166.00 | 201049.80 | 80.31  | 803.1  | 1646200.00 |
| -45         | -49.0 | 323600.00                   | 471985.00 | 141595.50 | 82.29  | 822.9  | 1145800.00 |
| -40         | -40.0 | 239700.00                   | 336479.00 | 100943.70 | 84.27  | 842.7  | 806800.00  |
| -35         | -31.0 | 179200.00                   | 242681.00 | 72804.30  | 86.25  | 862.5  | 574400.00  |
| -30         | -22.0 | 135200.00                   | 176974.00 | 53092.20  | 88.22  | 882.2  | 413400.00  |
| -25         | -13.0 | 102900.00                   | 130421.00 | 39126.30  | 90.19  | 901.9  | 300400.00  |
| -20         | -4.0  | 78910.00                    | 97081.00  | 29124.30  | 92.16  | 921.6  | 220600.00  |
| -15         | 5.0   | 61020.00                    | 72957.00  | 21887.10  | 94.12  | 941.2  | 163500.00  |
| -10         | 14.0  | 47540.00                    | 55329.00  | 16598.70  | 96.09  | 960.9  | 122280.00  |
| -5          | 23.0  | 37310.00                    | 42327.00  | 12698.10  | 98.04  | 980.4  | 92240.00   |
| 0           | 32.0  | 29490.00                    | 32650.00  | 9795.00   | 100.00 | 1000.0 | 70160.00   |
| 5           | 41.0  | 23460.00                    | 25392.00  | 7617.60   | 101.95 | 1019.5 | 53780.00   |
| 10          | 50.0  | 18780.00                    | 19901.00  | 5970.30   | 103.90 | 1039.0 | 41560.00   |
| 15          | 59.0  | 15130.00                    | 15712.00  | 4713.60   | 105.85 | 1058.5 | 32340.00   |
| 20          | 68.0  | 12260.00                    | 12493.00  | 3747.90   | 107.79 | 1077.9 | 25360.00   |
| 25          | 77.0  | 10000.00                    | 10000.00  | 3000.00   | 109.74 | 1097.4 | 20000.00   |
| 30          | 86.0  | 8194.00                     | 8057.00   | 2417.10   | 111.67 | 1116.7 | 15892.00   |
| 35          | 95.0  | 6752.00                     | 6531.00   | 1959.30   | 113.61 | 1136.1 | 12704.00   |
| 40          | 104.0 | 5592.00                     | 5326.00   | 1597.80   | 115.54 | 1155.4 | 10216.00   |
| 45          | 113.0 | 4655.00                     | 4368.00   | 1310.40   | 117.47 | 1174.7 | 8264.00    |
| 50          | 122.0 | 3893.00                     | 3602.00   | 1080.60   | 119.40 | 1194.0 | 6722.00    |
| 55          | 131.0 | 3271.00                     | 2986.00   | 895.80    | 121.32 | 1213.2 | 5498.00    |
| 60          | 140.0 | 2760.00                     | 2488.00   | 746.40    | 123.24 | 1232.4 | 4520.00    |
| 65          | 149.0 | 2339.00                     | 2083.00   | 624.90    | 125.16 | 1251.6 | 3734.00    |
| 70          | 158.0 | 1990.00                     | 1752.00   | 525.60    | 127.08 | 1270.8 | 3100.00    |
| 75          | 167.0 | 1700.00                     | 1480.00   | 444.00    | 128.99 | 1289.9 | 2586.00    |
| 80          | 176.0 | 1458.00                     | 1255.00   | 376.50    | 130.90 | 1309.0 | 2166.00    |
| 85          | 185.0 | 1255.00                     | 1070.00   | 321.00    | 132.80 | 1328.0 | 1822.60    |
| 90          | 194.0 | 1084.00                     | 915.50    | 274.65    | 134.71 | 1347.1 | 1540.00    |
| 95          | 203.0 | 939.30                      | 786.60    | 235.98    | 136.61 | 1366.1 | 1306.40    |
| 100         | 212.0 | 816.80                      | 678.60    | 203.58    | 138.51 | 1385.1 | 1112.60    |
| 105         | 221.0 | 712.60                      | 587.60    | 176.28    | 140.40 | 1404.0 | 951.00     |
| 110         | 230.0 | 623.60                      | 510.60    | 153.18    | 142.29 | 1422.9 | 815.80     |
| 115         | 239.0 | 547.30                      | 445.30    | 133.59    | 144.18 | 1441.8 | 702.20     |
| 120         | 248.0 | 481.80                      | 389.60    | 116.88    | 146.07 | 1460.7 | 606.40     |
| 125         | 257.0 | 425.30                      | 341.90    | 102.57    | 147.95 | 1479.5 | 525.60     |
| 130         | 266.0 | 376.40                      | 301.00    | 90.30     | 149.83 | 1498.3 | N/A        |
| 135         | 275.0 | 334.00                      | 265.80    | 79.74     | 151.71 | 1517.1 | N/A        |
| 140         | 284.0 | 297.20                      | 235.30    | 70.59     | 153.58 | 1535.8 | N/A        |
| 145         | 293.0 | 265.10                      | 208.90    | 62.67     | 155.46 | 1554.6 | N/A        |
| 150         | 302.0 | 237.00                      | 186.10    | 55.83     | 157.33 | 1573.3 | N/A        |

Figure 6: Resistance vs temperature

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