Series CDT and CDTR Wall Mount Carbon Dioxide and Temperature Transmitters accurately monitor the CO₂ concentration and temperature in schools, office buildings, and other indoor environments to help achieve LEED® certification. Additionally, the Series CDTR also measures ambient relative humidity. For increased sensor life, a single-beam dual-wavelength non-dispersive infrared (NDIR) sensor is used to automatically correct the measurement in both occupied and unoccupied buildings against aging effects. The single-beam dual-wavelength sensor technology provides the highest level of accuracy compared to Automatic Baseline Correction methods, which can unintentionally shift the calibration based on CO₂ levels and barometric pressure conditions. In order to achieve a higher level of accuracy, the Series CDT includes digital barometric pressure adjustment and the ability to field-calibrate the sensor.

Universal outputs allow users to select the transmitter output to be 4 to 20 mA, 0 to 5 VDC, or 0 to 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 applications that require visual indication, the Series CDT and CDTR can be ordered with an integral LCD display, Model A-449 or Model A-449A remote LCD display that can plug into the mini-connector port on the side of the transmitter. Both the CDT and CDTR can be configured to display temperature only, CO₂ only, or CO₂ and temperature together. The Series CDTR can also display relative humidity or CO₂ and relative humidity together. Push buttons are standard on the transmitters for access to the menu structure, but the transmitter can be ordered without the buttons. To prevent tampering, the action of the buttons can be locked out using an internal dip switch selection. Menu items that can be accessed include: engineering units, relay output set points, display configuration, transmitter output scaling, ambient barometric pressure and field calibration of the transmitter.

Single-beam dual-wavelength sensor advantages:
- Automatically corrects for aging effects in occupied and unoccupied buildings*
  - Perfect for hospitals and manufacturing plants that are occupied 24 hours per day
- Measures actual unfiltered light intensity directly
  - Eliminates error from incorrect assumptions of gas concentration in theoretical logic assumption methods
- For buildings occupied 24 hours per day, it is recommended that calibration be verified every 6 to 12 months depending on application.

**Specifications - Installation and Operating Instructions**

**Series CD and CDTR**

**European**

**North American**

**SPECIFICATIONS**
- **Sensor:** Single beam, dual-wavelength NDIR.
- **Range:**
  - CO₂: 0 to 2000 or 0 to 5000 ppm (depending on model);
  - Temperature: 32 to 122°F (0 to 50°C).
- **Accuracy:**
  - CO₂: ±40 ppm ±3% of reading;
  - RH: ±2% (10 to 90% RH);
  - Temperature: ±1°C @ 25°C.
- **Temperature Dependence:** ±8 ppm/°C at 1100 ppm.
- **Non-Linearity:** 16 ppm.
- **Pressure Dependence:** 0.13% of reading per mm of Hg.
- **Response Time:** 2 min for 99% step change.
- **Temperature Limits:** 32 to 122°F (0 to 50°C).
- **Humidity Limits:** 10 to 95% RH (non-condensing).
- **Power Requirements:** 16 to 35 VDC or 19 to 28 VAC.
- **Power Consumption:** Average: 2 w; Peak: 3.75 w.
- **Output:**
  - Current: 4 to 20 mA (max. 500 Ω);
  - Voltage: 0 to 5 VDC or 0 to 10 VDC (min. 500 Ω);
  - Relay: SPST NO rated 2A @ 30 VDC;
  - RTD or thermistor per r-t curves on page 4 (depending on model).
- **Agency Approvals:** CE.
- **Weight:** 4.4 oz (125 g).

**INSTALLATION**

**CAUTION** 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.

**NOTICE**
- Use electrostatic discharge precautions (e.g., use of wrist straps) during installation and wiring to prevent equipment damage.
- Avoid locations where severe shock or vibration, excessive moisture or corrosive fumes are present.
- Do not exceed ratings of this device, permanent damage not covered by warranty may result.
- 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 CO₂ concentration.
- Self calibration feature of the transmitter requires exposure to normal outdoor equivalent carbon dioxide level once every thirty days.

LEED® is a registered trademark of the U.S. Green Building Council.
MOUNTING
1. Push tab on top and bottom of cover and lift cover from back plate (See Figure 1).
2. Select the mounting location, away from diffusers, lights or any external influences.
3. Mount transmitter on a vertical surface to a standard electrical box using the two #6 M2C type screws provided.
4. Pull wires through sub base hole and make necessary connections.
5. Reattach cover to base plate.

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

DIp SWITCH SETTINGS
To access the DIP SWITCH, remove the cover of the unit as shown in Figure 2. The DIP SWITCH is located on the back of the circuit board.

DIP Switch Position 1: CO₂ Output Selection
ON: Output set to voltage output
OFF: Output set to current output

DIP Switch Position 2: Temperature (CDT models) / Humidity (CDTR models) Output Selection
ON: Output set to voltage output
OFF: Output set to current output

DIP Switch Positions 3 & 4: Current or Voltage Output Range Selection

<table>
<thead>
<tr>
<th>Output Range</th>
<th>DIP Switch 3 Position</th>
<th>DIP Switch 4 Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 10 V</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>4 to 20 mA</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>0 to 10 V</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>0 to 20 mA</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>0 to 5 V</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>0 to 10 mA</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>1 to 5 V</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>2 to 10 mA</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

DIP Switch Position 5: Menu Access
ON: Menu Disabled
OFF: Menu Enabled

Current / Voltage Outputs
On the Series CDT, the transmitter may be wired for current or voltage output for both carbon dioxide and temperature. On the Series CDTR, the transmitter may be wired for current or voltage output for both carbon dioxide and humidity. The transmitter can be powered with either 16 to 35 VDC or 19 to 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.

Remote Display
For models that are ordered without an integral LCD display, remote display Model A-449 can be used to display the temperature, humidity, and carbon dioxide. The mini USB plug of the remote display plugs into the receptor on the side of the housing. After a short warm up time, the display will begin to show the current temperature and carbon dioxide measurements unless configured by the user to show humidity and carbon dioxide, only temperature, only humidity, or only carbon dioxide.

EDITING MENU PARAMETERS
Before any adjustment can be made to the transmitter, the Menu Lockout Dip Switch must be set to the “On” position (See Figure 3)

ACCESSING MENU PARAMETERS
Step 1: To enter the menu structure, press Up button and Down button simultaneously for 5 seconds (display will show RON parameter).

Step 2: Press Up button or Down button 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 button or Down button to adjust the value of the menu item.

Step 5: Press Enter button 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 Up button and Down button simultaneously for 5 seconds or wait 10 seconds without pushing any buttons.
Menu Descriptions

RON Relay on set point
Sets the CO₂ concentration which the optional relay is energized.

- Low limit: 0 PPM
- Factory setting: 1000 PPM
- High limit: 2000/5000 PPM (depending on model)

ROf Relay off set point
Sets the CO₂ concentration which the optional relay is de-energized. Setting value lower than RON provides direct action for detecting high concentrations of CO₂. Setting value higher than RON provides indirect action for detecting low concentrations of CO₂. Up button and Down button on the LCD display will be lit to indicate when the relay is energized.

- Low limit: 0 PPM
- Factory setting: 950 PPM
- High limit: 2000/5000 PPM (depending on model)

DSP Display configuration
Determines the LCD display configuration during normal operation. The LCD display can indicate the CO₂ concentration, temperature, relative humidity (Series CDTR only) and CO₂ concentration combined with temperature or relative humidity (Series CDTR only).

- CH CO₂ concentration and relative humidity (Series CDTR only)
- CT CO₂ concentration and temperature
- TH Temperature and relative humidity (Series CDTR only)
- C CO₂ concentration only
- T Temperature only
- H Relative humidity only (Series CDTR only)

UNI Units selection
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.

- US units °F for temperature and in Hg for barometric pressure
- SI units °C for temperature and hPa for barometric pressure

COL CO₂ low output range
Sets the CO₂ concentration for the lowest output (4 mA or 0 VDC).

- Low limit: 0 PPM
- Factory setting: 0 PPM
- High limit: 2000/5000 PPM (depending on model)

COH CO₂ high output range
Sets the CO₂ 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 CO₂ level. When COH is below COL, the transmitter is reverse acting and the output will increase with a decrease in CO₂ level.

- Low limit: 0 PPM
- Factory setting: 2000/5000 PPM (depending on model)
- High limit: 2000/5000 PPM (depending on model)

TOL Temperature low output range (Series CDT with active temperature only)
Sets the temperature for the lowest output (4 mA or 0 VDC).

- Low limit: 32.0°F / 0.0°C
- Factory setting: 32.0°F / 0.0°C
- High limit: 122.0°F / 50.0°C

TOH Temperature high output range (Series CDT with active temperature only)
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.

- Low limit: 32.0°F / 0.0°C
- Factory setting: 122.0°F / 50.0°C
- High limit: 122.0°F / 50.0°C

HOL Humidity low output range (Series CDTR only)
Sets the humidity for the lowest output (4 mA or 0 VDC).

- Low limit: 0.0%
- Factory setting: 0.0%
- High limit: 100.0%

HOH Humidity high output range (Series CDTR only)
Sets the humidity 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 humidity. When HOH is below HOL the transmitter is reverse acting and the output will increase with a decrease in humidity.

- Low limit: 0.0%
- Factory setting: 100.0%
- High limit: 100.0%

BAR Barometric pressure
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 9 for typical barometric pressures at a given elevation.

- Low limit: 20.0 in Hg / 600 hPa
- Factory setting: 29.9 in Hg / 1013 hPa
- High limit: 32.0 in Hg / 1100 hPa

CAL Calibration
Calibrates the carbon dioxide sensor to a known gas value. Read calibration instructions before using this feature. Hold Enter button for 5 seconds.

CALIBRATING SENSOR
Step 1: Remove the cover as shown in Figure 1.
Step 2: Remove one of the gas nipple covers on the CO2 sensor and attach tubing from the gas pressure regulator to the nipple (See Figure 6).
Step 3: Attach the terminal block accessory to the circuit board so that the power wires line up with terminals 1 and 2. Plug in the power supply to power up the transmitter.
Step 4: Hold housing so that the sensor is in the vertical plane as shown in Figure 6.
Step 5: Follow the steps in the accessing parameter section to access the calibration parameter (CAL).
Step 6: Press the Enter button.
Step 7: Flow zero reference gas at 0.3 SLPM for 5 minutes.
Step 8: Press and hold the Down button for 3 seconds.
Step 9: Flow the full scale reference gas at 0.3 SLPM for 5 minutes.
Step 10: Press and hold the Up button for 3 seconds.
Step 11: Exit the parameter menu.
Step 12: Disconnect the power supply from the power source and remove the terminal block from the circuit board.
Step 13: Remove tubing from sensor and re-attach the gas nipple cover to the sensor.
Step 14: Re-attach the cover to the back plate.

Figure 6: Calibration
MAINTENANCE/REPAIR

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

WARRANTY/RETURN

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

<table>
<thead>
<tr>
<th>Series</th>
<th>CDT</th>
<th>Configuration</th>
<th>CO Output</th>
<th>Temperature Output</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>2</td>
<td>North American Wall Mount</td>
<td>0</td>
<td>None</td>
<td>-LCD LCD display (wall only)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>European Wall Mount</td>
<td>4</td>
<td>4 to 20 mA / 0 to (5 or 10) VDC</td>
<td>-RLY Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 KΩ NTC thermistor type III</td>
<td>-NBC No buttons (wall only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 KΩ NTC thermistor type II</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 KΩ NTC thermistor</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pt100Ω RTD</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>20 KΩ NTC thermistor</td>
<td></td>
</tr>
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</table>

Figure 7: Series CDT Model Chart

<table>
<thead>
<tr>
<th>Series</th>
<th>CDTR</th>
<th>Configuration</th>
<th>CO Output</th>
<th>Temperature Output</th>
<th>Options</th>
</tr>
</thead>
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<tr>
<td>Range</td>
<td>2</td>
<td>North American Wall Mount</td>
<td>4</td>
<td>4 to 20 mA / 0 to (5 or 10) VDC</td>
<td>-LCD LCD display (wall only)</td>
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<tr>
<td></td>
<td>5</td>
<td>European Wall Mount</td>
<td></td>
<td></td>
<td>-RLY Relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-NBC No buttons (wall only)</td>
</tr>
</tbody>
</table>

Figure 8: Series CDTR Model Chart

RESISTANCE VS TEMPERATURE TABLE

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Resistance in Ohms</th>
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</thead>
<tbody>
<tr>
<td>-55</td>
<td>0</td>
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<tr>
<td>-50</td>
<td>9.916</td>
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<tr>
<td>-45</td>
<td>9.987</td>
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<tr>
<td>-40</td>
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<td>-35</td>
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<td>10.478</td>
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<tr>
<td>-25</td>
<td>10.604</td>
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<td>-15</td>
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</tr>
<tr>
<td>150</td>
<td>10.737</td>
</tr>
</tbody>
</table>

Figure 10: Resistance vs Temperature

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