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CD-Wxx-00-0 Series
Wall Mount CO_2 Transmitter

Application Requirements

IMPORTANT: The CD-Wxx-00-0 Series transmitters are intended to provide input to equipment under normal operating conditions. Where failure or malfunction of the transmitter could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of, or protect against, failure or malfunction of the transmitter must be incorporated into and maintained as part of the control system.

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Canadian Compliance Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Installation

Parts Included

- Wall Mount Carbon Dioxide (CO_2) Transmitter (includes base, PCB, and cover)
- Drywall Mounting Kit (includes two each No. 6-20 x 1-1/4 in. pan-head, self-tapping screws, spring clips, and spacers)

Mounting

The CO_2 transmitter is shipped ready for installation onto a standard wallbox or for surface mounting with the Drywall Spring Clip Mounting Kit (included).

IMPORTANT: Avoid touching or applying force to the components on the Printed Circuit Board (PCB). Handle the board by the edges only.

Location Considerations

This device mounts either to a U.S. wall box or directly to a wall surface:

Locate the device on an inside wall, free from drafts, and out of direct sunlight. The transmitter is shock and vibration resistant; however, be careful not to drop the unit or mount it where it could be exposed to excessive vibration. The following ambient operating conditions apply:

- Temperature: 23 to 113°F (-5 to 45°C)
- Humidity: 0 to 85% Relative Humidity (RH), non-condensing 85°F (29°C) maximum dew point

Surface Mounting

Use the following procedure to mount the CO_2 transmitter to a drywall surface:

1. Using a hole saw with a 1-3/8 in. blade, drill the center hole in the surface where the sensor will be mounted, then pull the wiring through the drilled hole.
2. Using only the drywall mounting holes indicated in Figure 1, mark the location of the two mounting holes and drill the 1/8 in. holes.

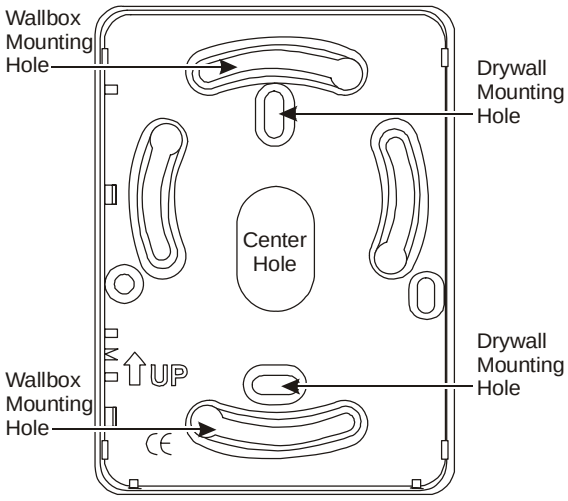

Figure 1: Transmitter Base

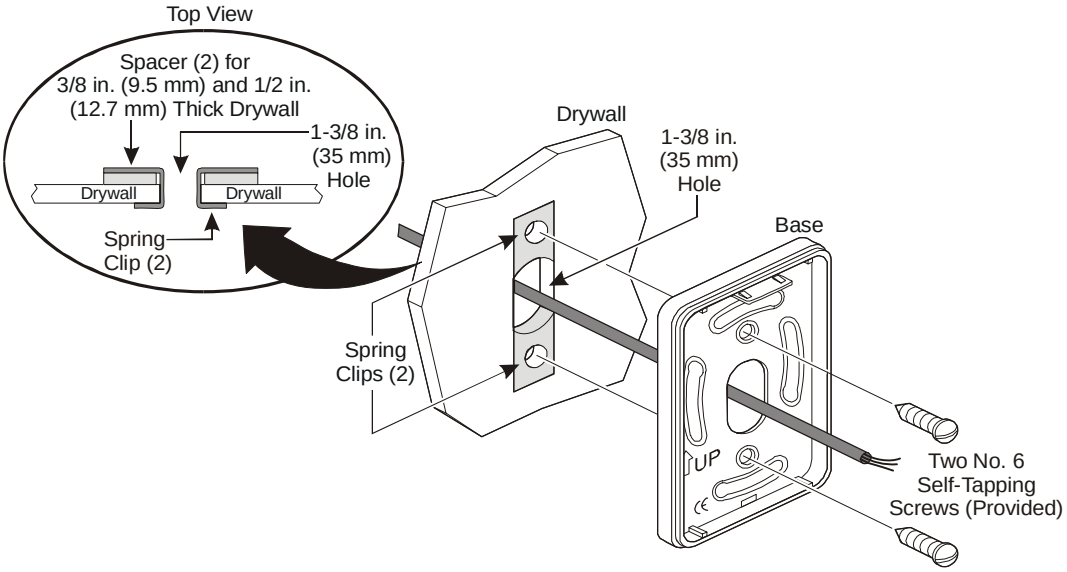

Figure 2: Surface Mounting to Drywall

3. Insert the spring clips as shown in Figure 2. (Use the spacers for 3/8 or 1/2 in. drywall.)

Note: Replacement spring clips, spacers, and screws can be ordered separately as the Drywall Mounting Kit (ACC-DWCLIP-0).

4. Pull the wiring through the base's center hole.
5. Center the two holes in the base over the drilled holes, and fasten the base to the drywall using the No. 6 screws provided (Figure 1 and Figure 2).

CAUTION: When mounting to drywall, use the specified holes (see Figure 2) with the provided spring clips. Other mounting may cause the screws to damage the PCB or cause a short circuit.

IMPORTANT: To prevent drywall damage, do not overtighten the screws.

6. To install the PCB into the base, refer to Figure 3 and:
   - align the PCB over the latch pins on the base.
   - press down on the board until it snaps into place and is secured by the latches.
7. Proceed to the *Wiring* section.

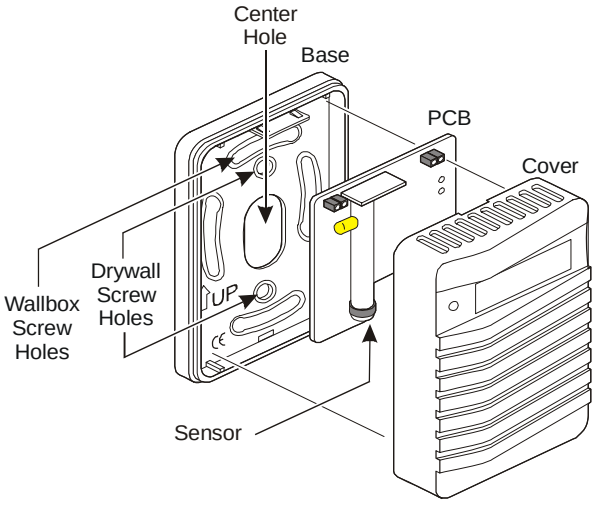

Figure 3: Mounting the Transmitter

Wallbox Mounting

To mount the transmitter to a standard wallbox, refer to Figure 4 and proceed as follows:

1. Pull the wiring through the wallbox and the transmitter's base.
2. Rotate the base so the arrow points up.
3. Fasten the base to the wallbox with two No. 6-32 screws (not provided) using the curved wallbox mounting holes shown in Figure 1 and Figure 4.

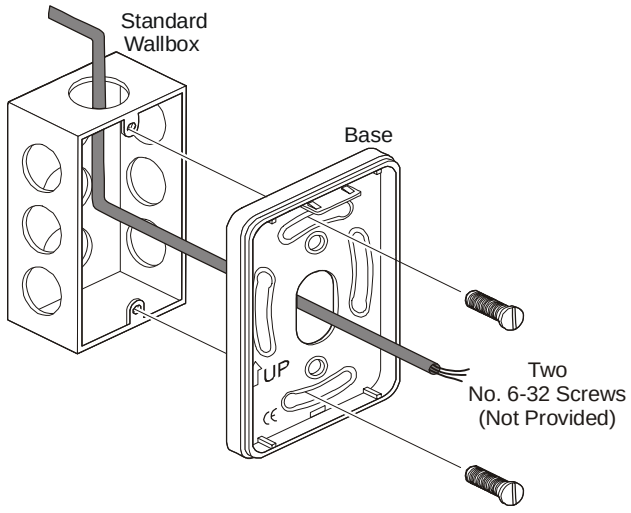

Figure 4: Mounting to a Wallbox

4. To install the PCB into the base, refer to Figure 3 and:
   - align the PCB over the latch pins on the base.
   - press down on the board until it snaps into place and is secured by the latches.
5. Proceed to the *Wiring* section.

Wiring

Power Supply Requirements

The transmitter requires a 24 VAC/VDC, Class 2 power supply maintaining voltages of 18 to 30 VDC or 20 to 30 VAC. Although the power input includes a halfwave rectifier, to avoid current peaks, use a DC supply (current consumption: peak 170 mA, average 85 mA).

24 VAC Power Supply Connections

When more than one transmitter is connected to one 24 VAC transformer a common loop is formed at the controller and the risk of a short circuit increases.

All commons must be at the same potential.

Note: To avoid a short circuit, isolate the 24V power supply by providing a separate transformer for each transmitter as shown in Figure 5.

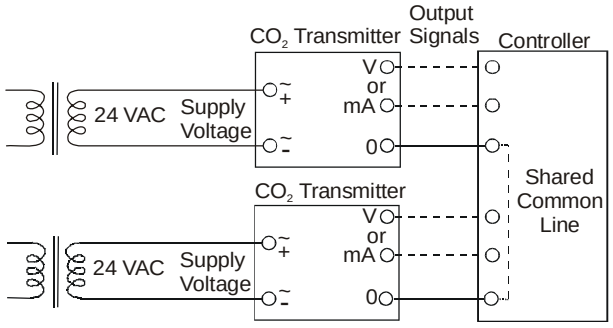

Figure 5: Connecting Separate AC Supplies (Recommended)

If several transmitters share one transformer, the phase (~) must always be the same at each transmitter to maintain polarity. A shared common line at the controller (see Figure 6) may cause a short circuit.

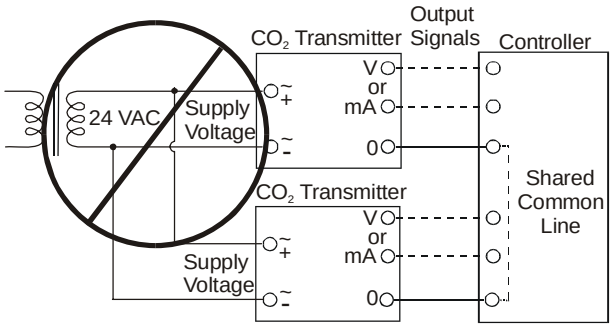

Figure 6: Connecting One AC Supply to Several Transmitters (Not Recommended)

To wire the PCB's input and output connections:

1. Strip 1/4 in. (6.35 mm) of the wire insulation for wiring to the terminal block.
2. Connect the 24V supply between the PCB's positive (⏦) and negative (⎓) terminals (shown in Figure 7).

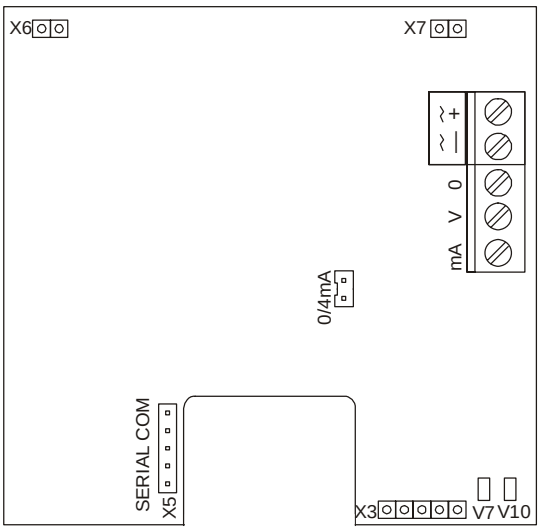

Figure 7: Transmitter PCB (Front View)

The transmitter can generate either voltage or current output. Refer to Figure 7.

3. To configure the analog output connect the following:
   - Common wire to Terminal 0
   - Other wire to either:
     - Terminal V (for voltage output)
     - Terminal mA (for current output)
4. Choose the current output type with the PCB jumper at pins labeled 0/4mA (shown in Figure 7):
   - 4 to 20 mA: connect the jumper so that it shorts the pins (default)
   - 0 to 20 mA: disconnect (do not discard) the jumper
5. If the unit has an optional accessory (relay, relay and display, or temperature module), follow the procedure described in the applicable wiring section before repositioning the cover.
6. Reposition the cover (see Figure 3).

Wiring the Relay Module

Model CD-WR0-00-0 is shipped with a relay module. To wire the relay, refer to Figure 8 and attach the relay wires to the relay PCB's two screw terminals.

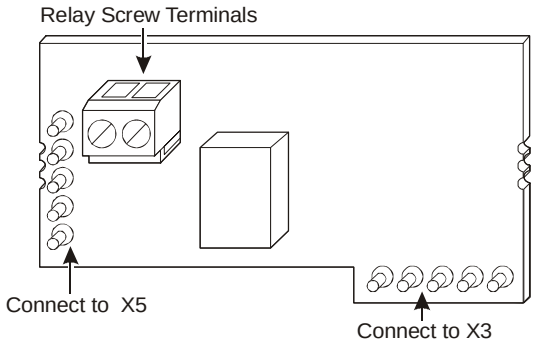

Figure 8: Relay PCB (Front View)

Wiring the Relay and Display Module

Model CD-WRD-00-0 is shipped with a relay and display module. To wire the module, refer to Figure 7 and Figure 9, and:

1. Carefully unplug the relay and display module from the transmitter PCB.
2. Attach the two relay wires to the screw terminals.

Note: The module's relay and its terminal pins are located on the back of the relay and display PCB (see Figure 9).

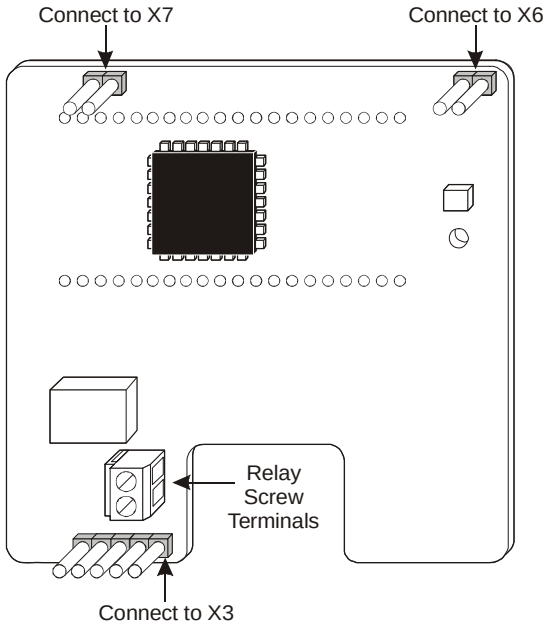

Figure 9: Relay and Display Module (Back View)

3. Plug the relay and display module into the 5-pin (X3) and two 2-pin (X6 and X7) connectors on the main PCB, shown in Figure 7.

The relay has two setpoint values, the On level and the Off level. These provide hysteresis and desired control function. The On level must be higher than the Off level. When CO_2 concentration is increasing, the relay closes at the On level and opens when concentration is reduced to the Off level.

Note: The default relay setpoints are 1,000 ppm On and 950 ppm Off. To change these settings, use the Relay Setpoint Software ACC-CD-S to enter new values.

Wiring the Temperature Module

Model CD-WA0-00-0 is shipped with a temperature module. Observing polarity, connect the temperature output wires to the screw terminals marked + and – (see Figure 10).

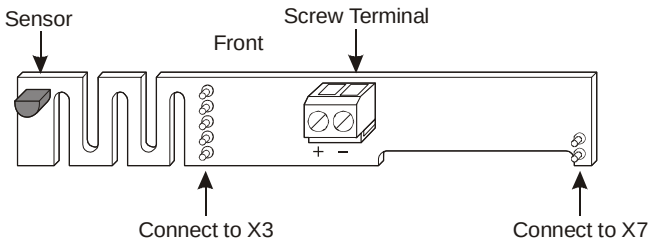

Figure 10: Temperature Module (Front View)

Setup and Adjustments

Commissioning

Johnson Controls® CO_2 transmitters come calibrated for the following:

- output signal (0 to 10V) proportional to CO_2 concentration (0 to 2,000 ppm)
- altitude range of 0 to 1,969 ft (0 to 600m) above sea level without compensation
- default relay output trigger point of 1,000 ppm

Altitude Compensation

The sensors are calibrated for an altitude of 984 ft (300m) above sea level and are intended for applications within the range of 0 to 1,969 ft (0 to 600m) without compensation.

For altitudes above 1,969 ft (600m) where optimum accuracy of the CO_2 concentration measurement is essential, modify the Building Automation System (BAS) controller's Analog Input (AI) high range to compensate for sensor placement at other than the standard calibration altitude.

Note: For altitude compensation, only adjust the AI high range. The AI low range should remain at zero.

To do this, reset the 2,000 ppm value using the controller's Compensation Factor (CF) shown in Figure 11 or Figure 12, as follows:

Corrected Value = CF x 2,000

For example, if the sensor is situated at an altitude of 3,000 ft (914.4m) above sea level, the CF is 1.10 (see Figure 11 or Figure 12).

The new value is calculated as follows:

Corrected Value = (1.10)(2,000 ppm) = 2,200 ppm

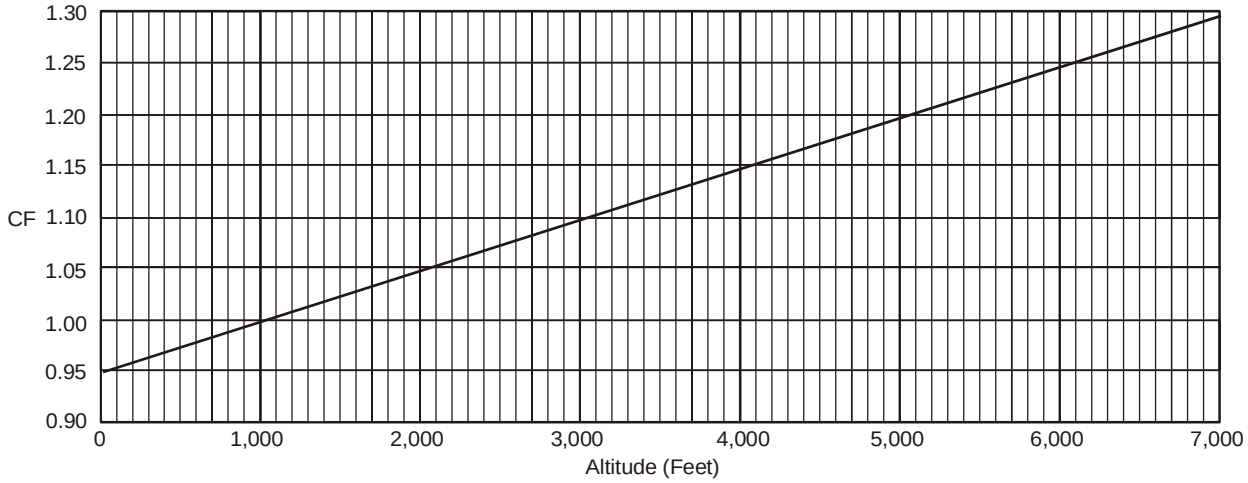

Figure 11: Altitude Compensation in Feet above Sea Level

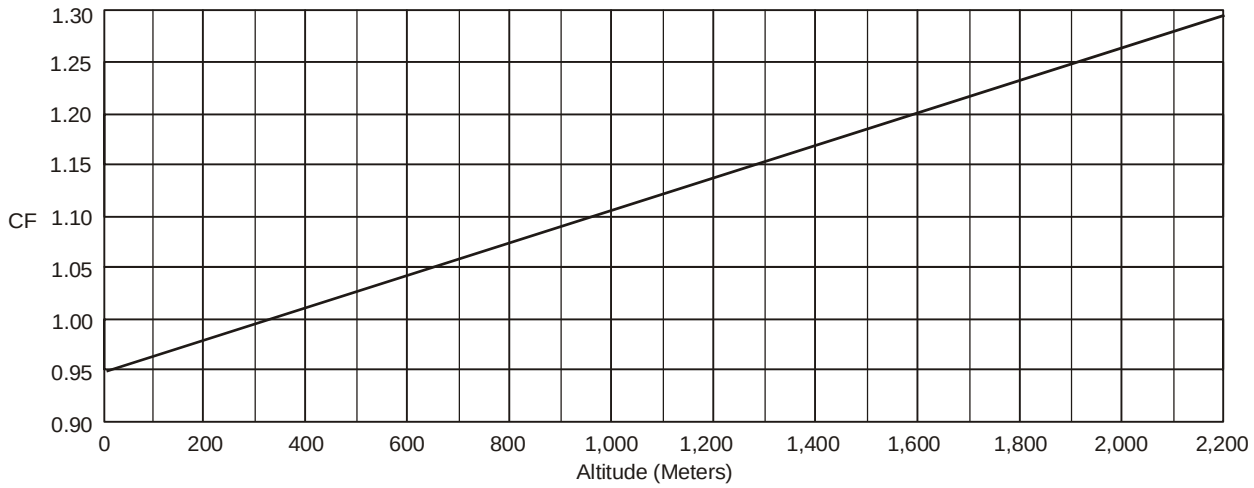

Figure 12: Altitude Compensation in Meters above Sea Level

Troubleshooting

The transmitter is not field-repairable.

If the unit is not functioning properly, use the following checklist to identify the symptoms and determine a solution:

1. Verify that the unit is mounted properly and the appropriate output jumper is selected.
2. Verify that all wiring is correct.
3. Verify that the power supply voltage level is 20 to 30 VAC or 18 to 30 VDC.

Note: The diagnostic Light-Emitting Diode (LED) shown at the right-hand corner of Figure 7 indicates operational status:

- V7 lights up if the self-diagnostics procedure detects an abnormality.
- V10 pulses to indicate that the device is operational.

If the transmitter will not operate after completing these steps, replace the unit.

Testing the Relay Module

To confirm that the relay is operating correctly, perform the following procedure:

1. Temporarily turn off power to the unit.
2. Temporarily remove wires connected to the relay screw terminal.
3. Connect a multimeter to the relay terminals.
4. Read the resistance level to determine whether the contacts are open or closed.
   - If the contacts are closed, replace the unit with the appropriate relay module and restart this procedure.
   - If the contacts are open, apply power to the transmitter.
5. Determine whether the contacts are open or closed.
   - If the contacts are closed, the relay is functioning properly and no further testing is necessary.
   - If the contacts are open, increase the CO_2 concentration by exhaling near the sensor looking for a change in the resistance value. (See Figure 3.)
   - If no change is noted, confirm that the CO_2 concentration has been raised above the trip point.
     - Check the transmitter output signal with a voltmeter to make sure the signal has risen above the 1000 ppm relay trip point.
     - If the output signal has not reached the trip point, it may be necessary to further increase the CO_2 concentration.
   - If the contacts are open after exceeding the trip point, replace the unit with the appropriate module and restart this procedure.
6. Disconnect power to the transmitter.
7. Disconnect the multimeter from the relay terminals.

8. Reconnect the wires to the relay screw terminal.
9. Reconnect power to the transmitter.
10. Reposition the cover, shown in Figure 3.

Testing the Relay and Display Module

To confirm that the the relay and display are operating correctly, perform the following procedure:

1. Test the relay following Step 1 through Step 10 in the previous section, *Testing the Relay Module*.

Note: When the relay contacts are closed, the yellow LED next to the display should be on.

2. A CO_2 concentration should be displayed. If not, replace the unit.
3. Reposition the cover. (See Figure 3.)

Testing the Temperature Module

To confirm that the temperature module is operating correctly, perform the following procedure:

1. Temporarily turn off power to the unit.
2. Observing polarity, connect a voltmeter across the screw terminals marked + and – (see Figure 10).
3. Apply power to the transmitter.
4. Apply heat to the temperature sensor by gently holding it between a finger and thumb (see Figure 10).
5. Verify that the voltage reading rises. If no increase is noted, replace the module.
6. Disconnect power to the transmitter.
7. Disconnect the voltmeter from the temperature module screw terminals.
8. Apply power to the transmitter.
9. Reposition the cover. (See Figure 3.)

Repairs and Replacement

The following modules are replaceable:

- Relay Module ACC-CD-R
- Relay and Display Module ACC-CD-DR
- Temperature Module ACC-CD-A

Technical Data

Product	CD-Wxx-00-0 Series Wall Mount CO_2 Transmitter
Measuring Range	0 to 2,000 ppm CO_2
Accuracy at 68°F (20°C)	<±[30 ppm CO_2 + 2.0% of reading] (includes manufacturing deviation and drift). All accuracy specifications reflect testing the transmitters using high-grade, certified gases. Transmitters are intended for an altitude range of 0 to 1,969 ft (0 to 600 m) above sea level without compensation.
Non-Linearity	<1.0% of Full Scale (FS)
Temperature Dependence of Output	<0.056% of Full Scale/F° (< 0.1% of Full Scale/C°)
Long-Term Stability	<±5.0% of Full Scale/5 Years
Response Time (0 to 63%)	1 Minute
Operating Temperature Range	23 to 113°F (-5 to +45°C)
Storage Temperature Range	-4 to 158°F (-20 to +70°C)
Humidity Range	0 to 85% RH (non-condensing)
Transmitter Output Signals	
CO_2	Jumper Selectable: 0 to 20 mA or 4 to 20 mA or 0 to 10 VDC (Default) Maximum Output Current: 25 mA; Maximum Output Voltage: 12.5V
Relay Contact Ratings (Optional)	30V, 0.5 A Class 2
Analog Temperature Module (Optional)	Linear 0 to 10 VDC for 32 to 122°F (0 to 50°C)
Resolution of CO_2 Output	10 ppm
Recommended External Load	Current Output: Maximum 500 ohms Load Resistance Voltage Output: Minimum 1,000 ohms Load Resistance
Power Supply Range	20 to 30 VAC (18 to 30 VDC), Class 2
Power Consumption	<2.5W Average, 4.1 VA
Warm-up Time	<5 Minutes for CO2 Measurement <30 Minutes for Temperature Measurement
Housing Material	ABS Plastic
Dimensions (H x W x D)	3-5/32 x 4-9/32 1-3/8 in. (80 x 108.5 x 35 mm)
Shipping Weight	3.5 oz (100g)
Agency Listings	UL Listed, CCN XAPX (US) and XAPX7 (Canada); EMC Directive (CE Mark), 89/336/EEC; FCC and DOC Compliant

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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