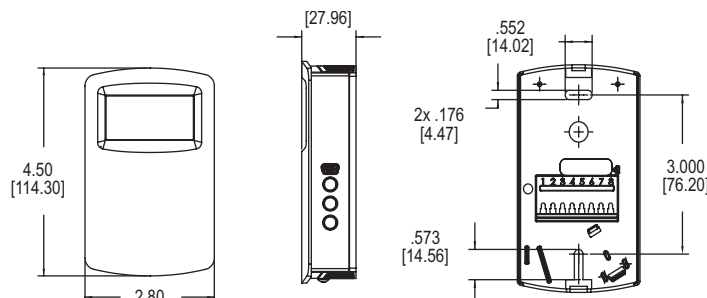




Series CDTV Wall Mount Carbon Dioxide / Volatile Organic Compound Transmitter

Specifications - Installation and Operating Instructions



The **SERIES CDTV** Carbon Dioxide / Volatile Organic Compound (VOC) Transmitter reduces energy cost in buildings by lowering the amount of conditioned air based on the occupancy of the space. By detecting both CO₂ and VOC, the transmitter can also detect fumes that may need to be exhausted during lower occupancy periods. Combining both measurements in one transmitter reduces both labor and material costs by only having to install one CDTV-VOC unit, instead of separate CO₂ and VOC transmitters.

Carbon dioxide measurements are taken using our proven Single-Beam Dual-Wavelength Non-Dispersive Infrared (NDIR) sensor. Our sensor allows users to get accurate measurements without waiting for the settling / correction periods of other logic based sensors. Transmitters can be used in buildings and applications that have 24 hour occupancy and can be calibrated on site to match environmental conditions for improved accuracy.

The VOC measurement is a single value derived from the presence of substances including alcohols, aldehydes, aliphatic hydrocarbons, amines, aromatic hydrocarbons, CO, CH₄, LPG, ketones, and organic acids. Although a standard unit of measure is not currently defined, the VOC measurement unit "ppm CO₂ equivalent" used by the device is commonly used in the industry. The VOC measurement does not actually measure CO₂, but instead senses and indicates an air quality value that approximately correlates perceived comfort levels to similar concentrations of CO₂ in the environment.

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...

SPECIFICATIONS

Range: CO₂: 0 to 2000 or 0 to 5000 ppm (depending on model); VOC: 0 to 2000 ppm CO₂ equivalent.

Accuracy: CO₂: ±40 ppm +3% of reading.

Temperature Dependence: ±8 ppm / °C at 1100 ppm.

Non-Linearity: CO₂: 16 ppm.

Pressure Dependence: CO₂: 0.13% of reading per mm of Hg.

Response Time: CO₂: 2 minutes for 99% step change; VOC: 5 minutes.

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

Power Requirements: 16 to 35 VDC / 19 to 28 VAC.

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

Sensor: CO₂: Single-beam, dual-wavelength NDIR; VOC: MEMS metal oxide semiconductor.

Output: Current: 0 to 20 mA, 4 to 20 mA, 0 to 10 mA, or 2 to 10 mA (depending on selection jumper, max 500 Ω); Voltage: 0 to 10 VDC, 2 to 10 VDC, 0 to 5 VDC, or 1 to 5 VDC (depending on selection jumper, min 500 Ω); Relay: SPST NO 2A @ 30 VDC.

Weight: 4.4 oz (125 g).

Agency Approvals: CE.

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 CO₂ concentration.

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

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.

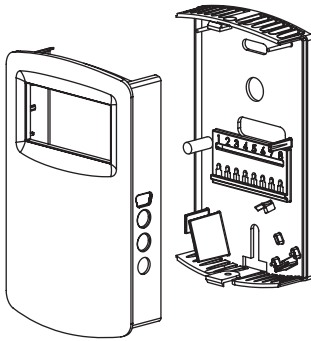


Figure 1: Removal Of Cover From Back Plate

WIRING

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



Figure 2: Diagram Of Circuit Board

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.

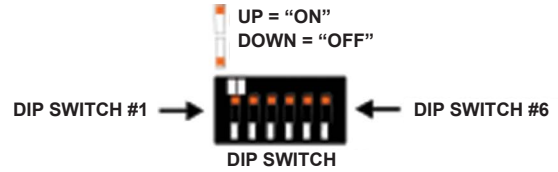


Figure 3: DIP Switch Settings

DIP Switch Position 1: CO₂ Output Selection

ON: Output set to voltage output
OFF: Output set to current output

DIP Switch Position 2: VOC 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

Output Range	DIP Switch 3 Position	DIP Switch 4 Position
2 to 10 V 4 to 20 mA	ON	OFF
0 to 10 V 0 to 20 mA	OFF	OFF
0 to 5 V 0 to 10 mA	OFF	ON
1 to 5 V 2 to 10 mA	ON	ON

Dip Switch Position 5: Menu Access

ON: Menu Enabled
OFF: Menu Disabled

Current / Voltage Outputs

The transmitter may be wired for current or voltage output for both carbon dioxide and VOC. The transmitter can be powered with either 16 or 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.

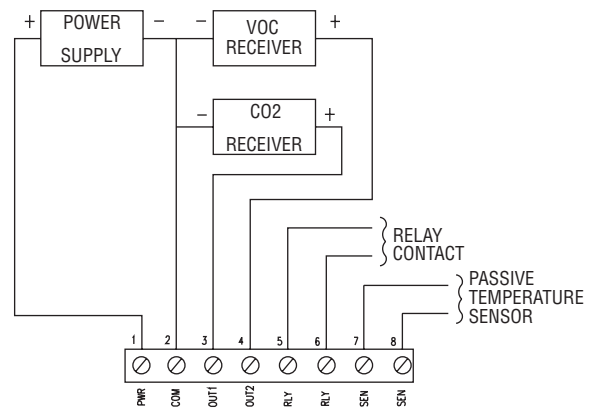


Figure 4: Active Output Wiring Diagram

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.

Remote Display

Remote display Model A-449 can be used to display the VOC or 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 VOC or carbon dioxide measurements.

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)

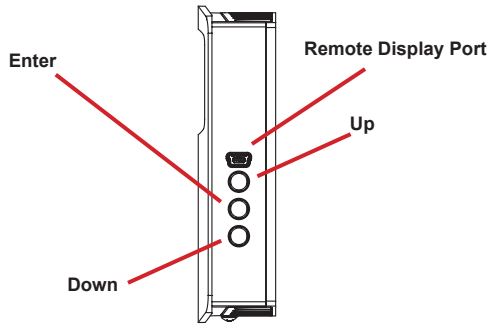


Figure 5: Side View of Wall Transmitter

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

- ROC** Define which output relay will be configured.
 - CO₂ default
 - VOC
 - Max CO₂ / VOC
- RON** Relay set point
Sets the CO₂ or VOC concentration which the optional relay is energized.
 - Low limit: 0 PPM
 - Factory setting: 1000 PPM
 - High limit: 2000 PPM (CO₂ or VOC), 5000 PPM (only CO₂)
- ROF** Relay off set point
Sets the CO₂ or VOC 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 or 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 PPM (CO₂ or VOC), 5000 PPM (only CO₂)
- DSP** Display configuration
Determines the LCD display configuration during normal operation. The LCD display can indicate the CO₂ concentration or VOC concentration.
 - C CO₂ concentration only
 - V VOC only

- UNI** Units selection
Temperature and barometric pressure values can be displayed in US engineering units or SI engineering units. The factory default is to display US engineering units.
- COL** CO₂ low output range
Sets the CO₂ concentration for the lowest output (0 V, 1 V, 2 V, 0 mA, 2 mA, 4 mA).
 - Low limit: 0 PPM
 - Factory setting: 0 PPM
 - High limit: 2000 PPM (CO₂ or VOC), 5000 PPM (only CO₂)
- COH** CO₂ high output range
Sets the CO₂ concentration for the highest output (10 mA or 5 V, 20 mA or 10 V). 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 PPM (CO₂ or VOC), 5000 PPM (only CO₂)
 - High limit: 2000 PPM (CO₂ or VOC), 5000 PPM (only CO₂)
- VOL** VOC low output range
Sets the VOC for the lowest output (0 V, 1 V, 2 V, 0 mA, 2 mA, 4 mA). To configure output for 450 PPM equal 0V, set VOL to 450 PPM. Even if power is lost the VOL setpoint will remain in memory.
 - Low limit: 0 PPM
 - Factory setting: 0 PPM
 - High limit: 2000 PPM CO₂ equivalent
- VOH** VOC high output range
Sets the VOC level for the highest output (10 mA or 5 V, 20 mA or 10 V). When VOH is set above VOL, the transmitter is direct acting and the output will increase with an increase in VOC level. When VOH is below VOL, the transmitter is reverse acting and the output will increase with a decrease in VOC level.
 - Low limit: 450 PPM
 - Factory setting: 2000 PPM CO₂ equivalent
 - High limit: 2000 PPM CO₂ equivalent
- 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 in carbon dioxide sensor to a known gas valve. Read calibration instructions before using this feature. Hold for 5 seconds.

CALIBRATING CO₂ 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.

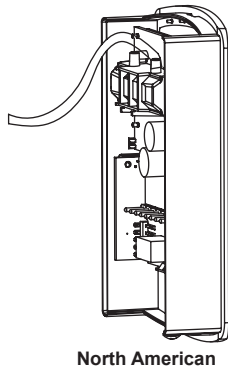


Figure 6: Wall Mount Calibration

MAINTENANCE/REPAIR

Upon final installation of the Series CDTV, no routine maintenance is required. The Series CDTV is 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 return 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.

MODEL CHART							
Series	CDTV	-2	N	4	A	4	-RLY
Range		2					Example: CDTV-2N4A4-RLY
		5					0 to 2000 ppm CO ₂ range 0 to 5000 ppm CO ₂ range
Configuration			N				North American style wall mount
CO ₂ Output				4			4 to 20 mA / 0 to (5 or 10) VDC
Temperature Output					0		None
					A		10 KΩ NTC thermistor type III
					B		10 KΩ NTC thermistor type II
					C		3 KΩ NTC thermistor
					D		Pt100 Ω RTD
					E		Pt1000 Ω RTD
					F		20 KΩ NTC thermistor
VOC Output						4	4 to 20 mA / 0 to (5 or 10) VDC
Options							RLY Relay FC Factory calibration certificate LCD LCD display (wall only) COC Certificate of Calibration

Figure 7: Model Chart

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 8: 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 9: Resistance vs. Temperature Table