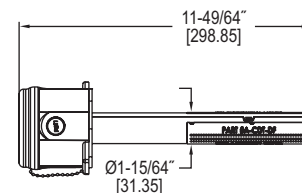
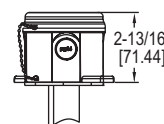
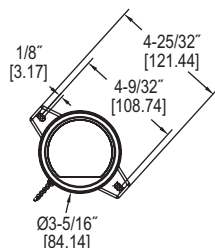




## Series CDTV Duct Mount Carbon Dioxide / Volatile Organic Compound Transmitter

### 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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, CH<sub>4</sub>, LPG, ketones, and organic acids. Although a standard unit of measure is not currently defined, the VOC measurement unit "ppm CO<sub>2</sub> equivalent" used by the device is commonly used in the industry. The VOC measurement does not actually measure CO<sub>2</sub>, but instead senses and indicates an air quality value that approximately correlates perceived comfort levels to similar concentrations of CO<sub>2</sub> 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:** CO<sub>2</sub>: 0 to 2000 or 0 to 5000 ppm (depending on model); VOC: 0 to 2000 ppm CO<sub>2</sub> equivalent.

**Accuracy:** CO<sub>2</sub>: ±40 ppm +3% of reading.

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

**Non-Linearity:** CO<sub>2</sub>: 16 ppm.

**Pressure Dependence:** CO<sub>2</sub>: 0.13% of reading per mm of Hg.

**Response Time:** CO<sub>2</sub>: 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:** CO<sub>2</sub>: 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:** 5.6 oz (158.8 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 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.

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**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 & PG16 knockouts are molded into the housing.

**WIRING**

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

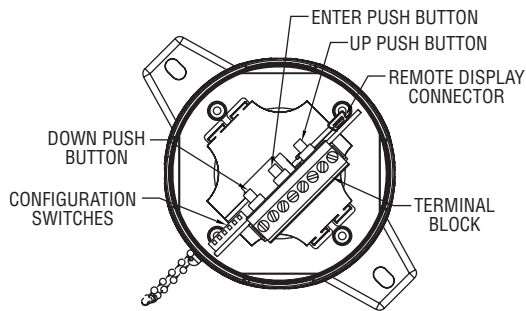


Figure 1: Diagram of circuit board

**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 to 10 VDC, 0 to 5 VDC, 2 to 10 VDC or 1 to 5 VDC. See Figure 3 for the type of voltage output selection switches (positions 3 & 4).

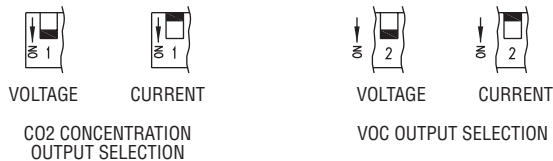


Figure 2: Current/Voltage Output Selection Jumper (PJ1 and PJ2)

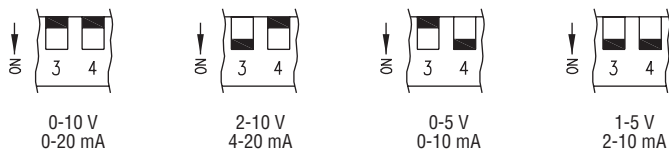


Figure 3: Output range selection jumper

**Current / Voltage Outputs**

The transmitter may be wired for current or voltage output for both carbon dioxide and 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.

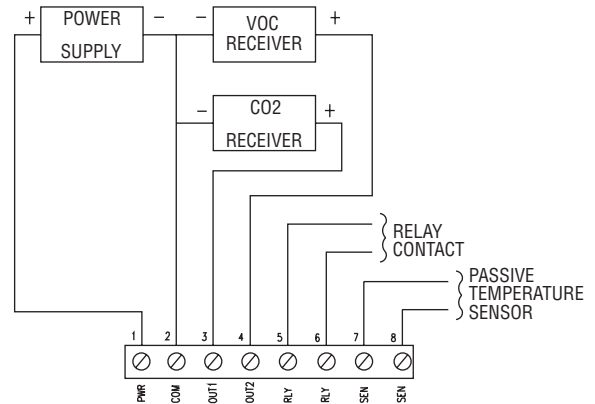


Figure 4: Active output wiring diagram

**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.

**ACCESSING MENU PARAMETERS**

- Step 1: To enter the menu structure, press  $\Delta$  and  $\nabla$  simultaneously for 5 seconds (display will show RON parameter).
- Step 2: Press  $\Delta$  or  $\nabla$  to cycle between menu items.
- Step 3: Press  $\square$  to edit the value for the displayed menu item (SET will appear on display).
- Step 4: Press  $\Delta$  or  $\nabla$  to adjust the value of the menu item.
- Step 5: Press  $\square$  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  $\Delta$  and  $\nabla$  simultaneously for 5 seconds or wait 10 seconds without pushing any buttons.

During the initial 5 minute warm-up phase, the VOC reading will be 0 ppm or an indeterminate value. After warming up, the device is operational and note the VOC output level will be approximately 450 PPM. If the device outputs 0 ppm after the warm-up, there is either an operational error or a disconnected sensor error and customer service should be contacted.

**Note:** Reference menu descriptions for changing factory settings.

## Menu Descriptions

**ROC** Define which output relay will be configured.

CO<sub>2</sub> default  
VOC  
Max CO<sub>2</sub> / VOC

**RON** Relay set point  
Sets the CO<sub>2</sub> or VOC concentration which the optional relay is energized.

Low limit: 0 PPM  
Factory setting: 1000 PPM  
High limit: 2000 PPM (CO<sub>2</sub> or VOC), 5000 PPM (only CO<sub>2</sub>)

**ROF** Relay off set point  
Sets the CO<sub>2</sub> or VOC 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>. (△) 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 (CO<sub>2</sub> or VOC), 5000 PPM (only CO<sub>2</sub>)

**DSP** Display configuration  
Determines the LCD display configuration during normal operation. The LCD display can indicate the CO<sub>2</sub> concentration or VOC concentration.

C CO<sub>2</sub> 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.

US units Hg for barometric pressure  
SI units hPa for barometric pressure

**COL** CO<sub>2</sub> low output range  
Sets the CO<sub>2</sub> 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 (CO<sub>2</sub> or VOC), 5000 PPM (only CO<sub>2</sub>)

**COH** CO<sub>2</sub> high output range  
Sets the CO<sub>2</sub> 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 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.

Low limit: 0 PPM  
Factory setting: 2000 PPM (CO<sub>2</sub> or VOC), 5000 PPM (only CO<sub>2</sub>)  
High limit: 2000 PPM (CO<sub>2</sub> or VOC), 5000 PPM (only CO<sub>2</sub>)

**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 CO<sub>2</sub> 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 CO<sub>2</sub> equivalent  
High limit: 2000 PPM CO<sub>2</sub> 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 CO<sub>2</sub> SENSOR**

- Step 1: Slide probe into sealed calibration tube.
- Step 2: Tighten screws to lock probe in place.
- Step 3: Attach gas to the calibration tube.
- Step 4: Follow the steps in the accessing parameter section to access the calibration parameter (CAL).
- Step 5: Press the  button.
- Step 6: Flow zero reference gas at 0.3 SLPM for 5 minutes.
- Step 7: Press and hold the  button for 3 seconds.
- Step 8: Flow the full scale reference gas at 0.3 SLPM for 5 minutes.
- Step 9: Press and hold the  button for 3 seconds.
- Step 10: Exit the parameter menu.
- Step 11: Loosen screws to release probe.
- Step 12: Remove probe from sealed calibration tube.

**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.



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 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.

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	21.10	2500	761

Figure 6: Elevation Chart

MODEL CHART						
Series	CDTV	-2	D	A	4	-RLY
Range		2 5				Example: CDTV-2D4A4-RLY 0 to 2000 ppm CO <sub>2</sub> range 0 to 5000 ppm CO <sub>2</sub> range
Configuration			D N			Duct North American style wall mount
CO <sub>2</sub> Output					4	4 to 20 mA / 0 to (5 or 10) VDC
Temperature Output				0 A B C D E F		None 10 KΩ NTC thermistor type III 10 KΩ NTC thermistor type II 3 KΩ NTC thermistor Pt100 Ω RTD Pt1000 Ω RTD 20 KΩ NTC thermistor
VOC Output					4	4 to 20 mA / 0 to (5 or 10) VDC
Options						RLY Relay FC Factory calibration certificate COC Certificate of calibration LCD LCD display (wall only)

Figure 5: CDTV Model 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	57480.00
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 7: Resistance vs Temperature