



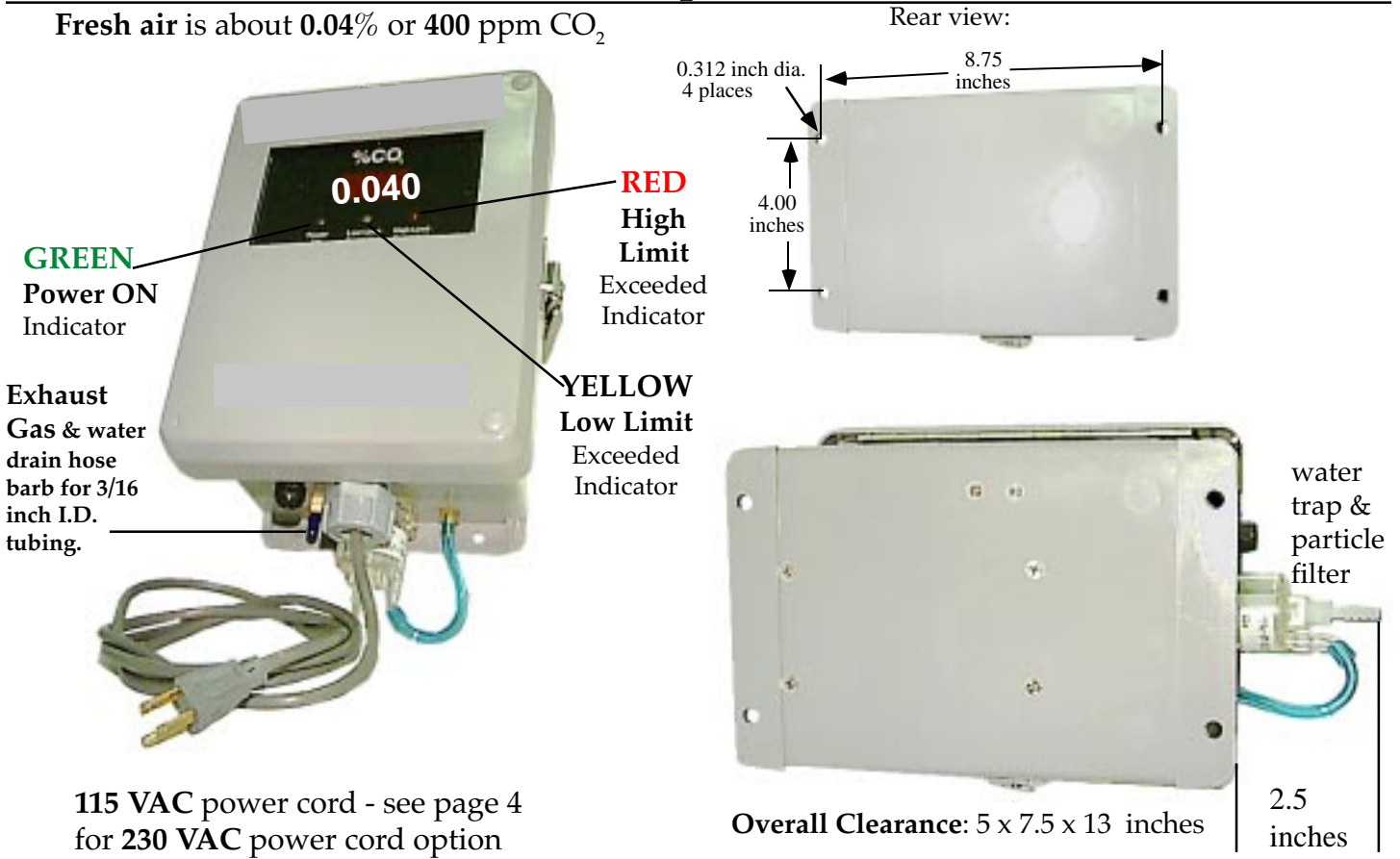
# Carbon Dioxide Monitor Model 2166 0.300%

## Features:

- Complete self contained units
- Non dispersive infrared (NDIR) technology
- Precision gas calibration kit available
- Fast warm-up
- Industrially robust: 0-5 V and 4-20 mA outputs
- Dual level detect set points and relays
- Cost effective - High quality
- Sample draw system with pump switch for calib.
- Solid state throughout - linear outputs
- Humidity and moisture resistant
- Dust-tight water resistant fiberglass enclosure
- Digital readout with 0.56 inch red LED display

## Model 2166 0.300% ( 3000 ppm ) CO<sub>2</sub>

Fresh air is about 0.04% or 400 ppm CO<sub>2</sub>



## Application:

- Greenhouses
  - Mushroom Farms
  - Wineries
  - Breweries
  - Food Processing
  - **Outside Air Monitor**
- The VALTRONICS Model 2166 is a non-dispersive infrared (NDIR) carbon dioxide monitor for use as an outdoor air sensor. It produces a control signal proportional to carbon dioxide concentration. This control signal is then used to provide remote control of the outdoor air dampers; thereby controlling the fresh air intake or varying the ventilation rates while maintaining safe indoor air quality. Dual adjustable level detect circuits may be used for alarms.



# Carbon Dioxide Monitor

## Model 2166 0.300 %

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### Description:

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The Model 2166 is a non dispersive infrared gas monitor designed as a fully functioning stand-alone unit for the continuous monitoring of carbon dioxide. The optical system is not effected by humidity. The pumped gas sampling circuit has a self-draining water trap. This eliminates difficulties with water condensation in the sample lines. It has a 0.56 inch high digital readout and two adjustable level detect circuits with associated front panel indicators (yellow and red) and SPDT relay contacts.

This low power, water resistant system makes this an ideal remote sensor to interface with any central control unit. It has linear 0 to 5 volt and 4 to 20 mA current loop outputs. In either configuration, interfaced or stand-alone, this device is an excellent choice for any environment in which the level of carbon dioxide must be monitored or controlled.

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### Specifications: 2166 0.300 % ( 3000 ppm ) CO<sub>2</sub>

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- Method: ..... N.D. I. R. (Non-dispersive Infra-red) Gas sample pump (see application note A7)
- Gas: ..... Carbon dioxide (CO<sub>2</sub>)
- Range: ..... 0-0.300% CO<sub>2</sub>
- Accuracy: ..... ±0.008% CO<sub>2</sub> from 0 -0.15% CO<sub>2</sub> and ± 5% of reading from 0.15% to 0.3% CO<sub>2</sub>
- Repeatability: ..... ± 1% of full scale (challenge with same gas sample and assure zero )
- External Power Source: ..... 115/220 VAC , 50/60 Hz
- Power Consumption: ..... less than 8 watts @ 115 VAC
- Adjustable Set Points: ..... Dual set points adjustable from 0.05% CO<sub>2</sub> to full scale (audio alarms below)  
..... Low SET Point adjusted to 0.1% and High SET Point to 0.2% unless specified on PO
- SET POINT Relay Contact Rating: ... SPDT contacts: non-latching N.C., N.O. 3 amp max. at 250 VAC or 30 VDC
- Display: ..... 0.56 inch high digital Light Emitting Diode (LED) readout
- Output Signals: ..... Note #20 AWG MAX wire size for TB1
  - Voltage: ..... 0 to 5 volt = 0 to 0.3% CO<sub>2</sub> ( linear scale data attached)
  - Current Loop: ..... 4 to 20 mA = 0 to 0.3% CO<sub>2</sub> ( linear scale data attached) 0 to 550Ω load
  - Audio Alarms: ..... Beeps once a second when Low SET Point is exceeded, continuous when High exceeded
  - Set Point Indicators: ..... Yellow flashes when Low SET Point is exceeded, RED on continuous when High exceeded
- Zero Drift at Constant Temperature: ..... Less than 2% of full scale per month (random not cumulative)
- Zero Noise atConstant Temperature: ..... Less than 50 mV peak to peak measured during any 20 second period  
..... measured on voltage output (equals less than 1% of full scale)
- Zero Drift due toAmbient Temperature: Less than 0.5% of full scale per degree Centigrade
- Operating Temperature Range: .. 0 to 50°C (32° to 122°F) see **Application Note A12**
- Storage Temperature Range: ..... -40 to +70°C (-40 to +158°F)
- Operating Humidity Range: ..... 5 to 95% RH (non-condensing) in gas cell
- Weight: ..... Less than 6 pounds (< 2.72 kilograms)
- External Clearance Dimensions: . 5 inches high, 7.5 inches wide, 13 inches long (including 3.5" water trap)
- Mounting, four 0.312 inch dia holes ... Mounting centers 4.0 inch x 8.75 inch: see diagram



Terminal block TB1 has a linear 0 to 5 volt output signal on pin number 9 with respect to pin number 8 which is signal common. Pin number 7 has a linear 4 to 20 mA current loop signal referenced again to pin number 8. See the wiring diagram on page 4. The table below shows both the linear 0 to 5 volt and the 4 to 20 mA current loop responses to 0 to 0.3% carbon dioxide being drawn through the gas cell by the sample pump. The wires from TB1 go through the strain relief cable grommet shown on page 4. The resulting wire bundle must be between 0.090 and 0.25 inch diameter to be properly strain relieved.

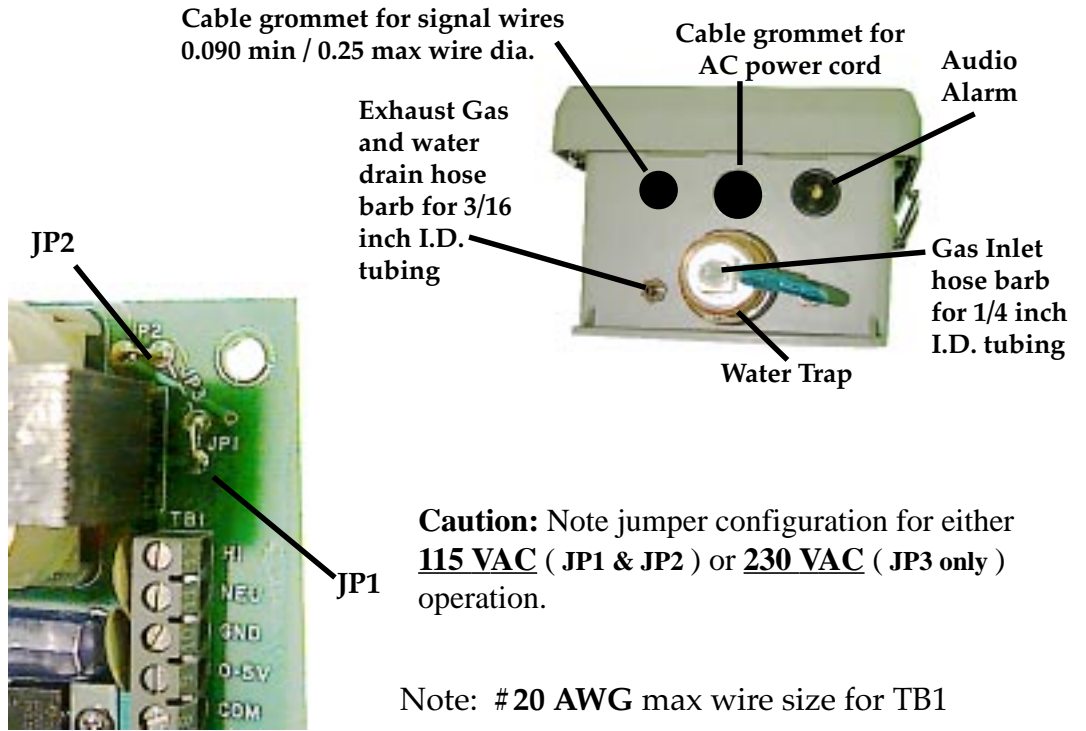
**VALTRONICS 0.3% & 5 volt full scale**

Gas in %	Output 0-5 volts	±0.075% CO2		output 4-20 mA	±0.075% CO2		Gas in %	Output 0-5 volts	±5% of Reading		output 4-20 mA	±5% of Reading	
		Max.	Min.		Max.	Min.			Max.	Min.		Max.	Min.
0.000	0.000	0.125	-0.125	4.00	4.40	3.60							
0.005	0.083	0.208	-0.042	4.27	4.67	3.87	0.155	2.583	2.708	2.458	12.27	12.67	11.87
0.010	0.167	0.292	0.042	4.53	4.93	4.13	0.160	2.667	2.792	2.542	12.53	12.93	12.13
0.015	0.250	0.375	0.125	4.80	5.20	4.40	0.165	2.750	2.875	2.625	12.80	13.20	12.40
0.020	0.333	0.458	0.208	5.07	5.47	4.67	0.170	2.833	2.958	2.708	13.07	13.47	12.67
0.025	0.417	0.542	0.292	5.33	5.73	4.93	0.175	2.917	3.042	2.792	13.33	13.73	12.93
0.030	0.500	0.625	0.375	5.60	6.00	5.20	0.180	3.000	3.125	2.875	13.60	14.00	13.20
0.035	0.583	0.708	0.458	5.87	6.27	5.47	0.185	3.083	3.208	2.958	13.87	14.27	13.47
0.040	0.667	0.792	0.542	6.13	6.53	5.73	0.190	3.167	3.292	3.042	14.13	14.53	13.73
0.045	0.750	0.875	0.625	6.40	6.80	6.00	0.195	3.250	3.375	3.125	14.40	14.80	14.00
0.050	0.833	0.958	0.708	6.67	7.07	6.27	0.200	3.333	3.458	3.208	14.67	15.07	14.27
0.055	0.917	1.042	0.792	6.93	7.33	6.53	0.205	3.417	3.542	3.292	14.93	15.33	14.53
0.060	1.000	1.125	0.875	7.20	7.60	6.80	0.210	3.500	3.625	3.375	15.20	15.60	14.80
0.065	1.083	1.208	0.958	7.47	7.87	7.07	0.215	3.583	3.708	3.458	15.47	15.87	15.07
0.070	1.167	1.292	1.042	7.73	8.13	7.33	0.220	3.667	3.792	3.542	15.73	16.13	15.33
0.075	1.250	1.375	1.125	8.00	8.40	7.60	0.225	3.750	3.875	3.625	16.00	16.40	15.60
0.080	1.333	1.400	1.267	8.27	8.48	8.05	0.230	3.833	4.025	3.642	16.27	16.88	15.65
0.085	1.417	1.488	1.346	8.53	8.76	8.31	0.235	3.917	4.113	3.721	16.53	17.16	15.91
0.090	1.500	1.575	1.425	8.80	9.04	8.56	0.240	4.000	4.200	3.800	16.80	17.44	16.16
0.095	1.583	1.663	1.504	9.07	9.32	8.81	0.245	4.083	4.288	3.879	17.07	17.72	16.41
0.100	1.667	1.750	1.583	9.33	9.60	9.07	0.250	4.167	4.375	3.958	17.33	18.00	16.67
0.105	1.750	1.838	1.663	9.60	9.88	9.32	0.255	4.250	4.463	4.038	17.60	18.28	16.92
0.110	1.833	1.925	1.742	9.87	10.16	9.57	0.260	4.333	4.550	4.117	17.87	18.56	17.17
0.115	1.917	2.013	1.821	10.13	10.44	9.83	0.265	4.417	4.638	4.196	18.13	18.84	17.43
0.120	2.000	2.100	1.900	10.40	10.72	10.08	0.270	4.500	4.725	4.275	18.40	19.12	17.68
0.125	2.083	2.188	1.979	10.67	11.00	10.33	0.275	4.583	4.813	4.354	18.67	19.40	17.93
0.130	2.167	2.275	2.058	10.93	11.28	10.59	0.280	4.667	4.900	4.433	18.93	19.68	18.19
0.135	2.250	2.363	2.138	11.20	11.56	10.84	0.285	4.750	4.988	4.513	19.20	19.96	18.44
0.140	2.333	2.450	2.217	11.47	11.84	11.09	0.290	4.833	5.075	4.592	19.47	20.24	18.69
0.145	2.417	2.538	2.296	11.73	12.12	11.35	0.295	4.917	5.163	4.671	19.73	20.52	18.95
0.150	2.500	2.625	2.375	12.00	12.40	11.60	0.300	5.000	5.250	4.750	20.00	20.80	19.20

Accuracy = ±5% of reading from 0.075 to 0.3 % CO2 and ±0.0075% CO2 F.S. from 0 to 0.075%

Chart revised on 12/02/05





**Preventive Maintenance:**

Gas calibration should be done every six months. At least calibration with zero gas (nitrogen) every six months and both zero and span (certified 1000 ppm CO<sub>2</sub>) at least once a year. A calibration log book where you record how much ZERO and SPAN had drifted before it was recalibrated will help you decide what the optimum duration between calibrations should be. See Application Note A24 for detailed calibration instructions. The pump switch should be turned off during calibration and the flow rate set to about 1 to 2 Liters per minute.

The filter in the water trap and the hydrophobic / particle filter inside should inspected and changed when necessary. The flow rate of the pump should be checked to see if it is still operating properly. It should be about 3 to 5 liters per minute if measured at the water trap input, Gas Inlet (both sides of the pump drawing). See Application Note A7 for spare parts information.

