

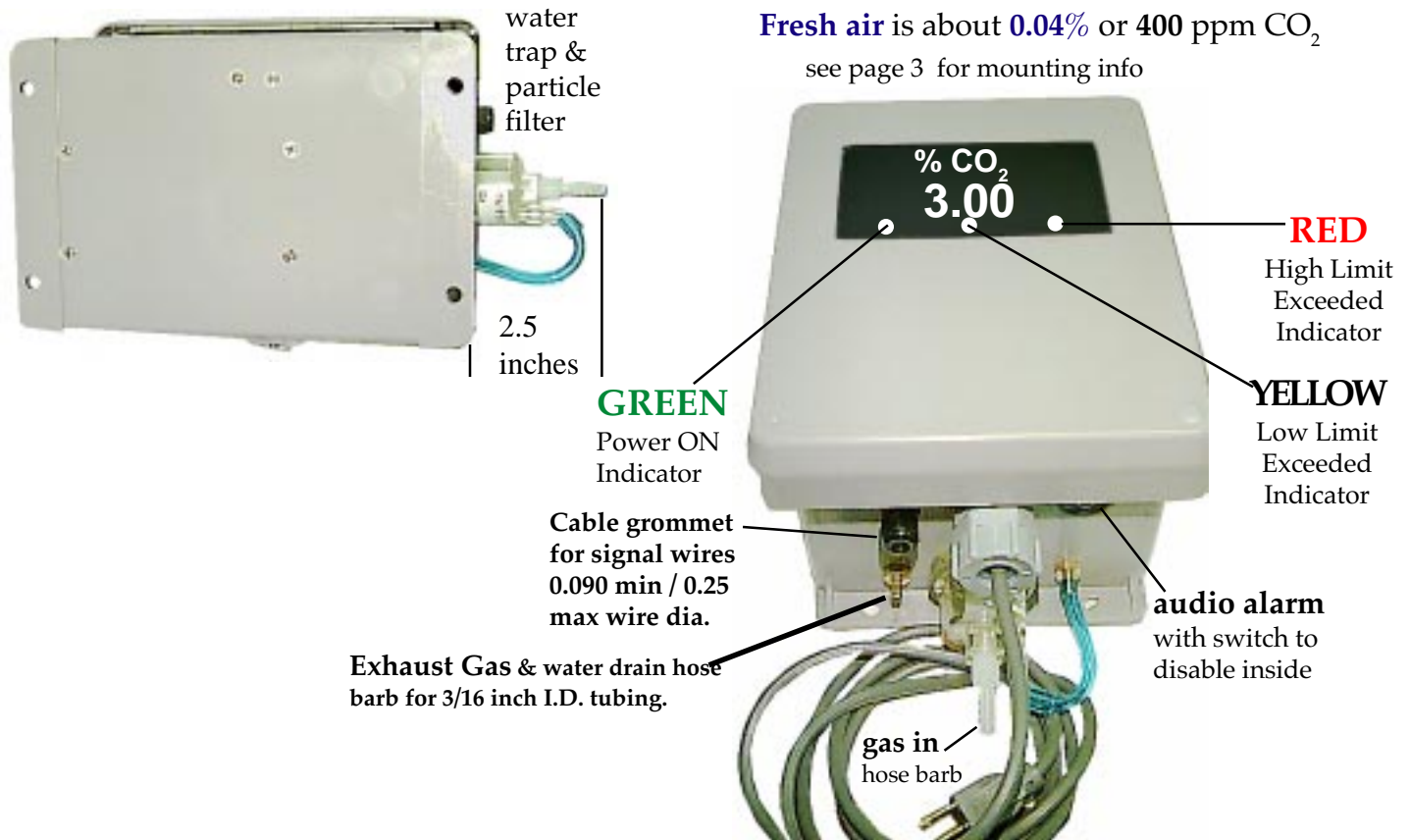
# Carbon Dioxide Monitor

## Model 2166 3% CO<sub>2</sub>

### Features:

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

### Model 2166 3% CO<sub>2</sub>



**Overall Clearance:** 5 x 7.5 x 13 inches including the water trap and 1/8" hose barb

### Application:

- Industrial Safety
- Process Control
- Wineries
- Breweries
- Food Processing
- with CO<sub>2</sub> Blasters

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 3%

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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 3% CO<sub>2</sub>

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- Method: ..... N.D. I. R. (Non-dispersive Infra-red) Gas sample pump (see **app note A67**)
- Gas: ..... Carbon dioxide (CO<sub>2</sub>)
- Range: ..... 0-30,000 ppm (3.0%) CO<sub>2</sub>
- Accuracy: ..... ±0.075% CO<sub>2</sub> from 0 -1.5% CO<sub>2</sub> and ± 5% of reading from 1.5% to 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 0.3% CO<sub>2</sub> to full scale (audio alarms below)
- ..... Low SET Point adjusted to 0.5% and High SET Point to 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:
- Voltage: ..... 0 to 5 volt = 0 to 3% CO<sub>2</sub> ( linear scale data attached)
  - Current Loop: ..... 4 to 20 mA = 0 to 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 at Constant 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 to Ambient 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, see **Application Note A30**
- 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.

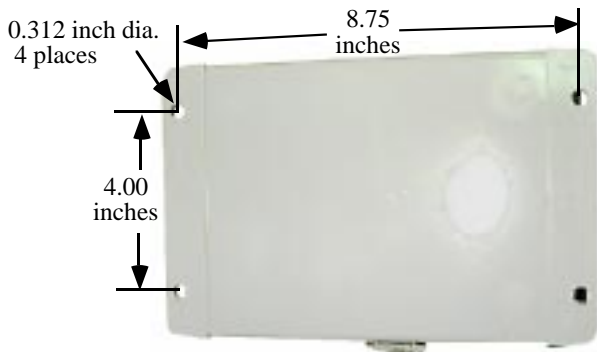
The table below shows both the linear 0 to 5 volt and the 4 to 20 mA current loop responses to 0 to 3% carbon dioxide being drawn through the gas cell by the sample pump. The wires from TB1 go through the strain relief cable grommet shown on page 4. The resulting wire bundle must be between 0.090 and 0.25 inch diameter to be properly strain relieved.

**VALTRONICS**

3% Gas and 5 V full scale linear

±0.08% CO2				4-20 mA ±0.08% CO2			±10% of reading				4-20 mA ±10% of reading		
Gas in %	Output in volts	Max.	Min.	output	Max.	Min.	Gas in %	Output in volts	Max.	Min.	output	Max.	Min.
0.00	0.000	0.130	-0.130	4.00	4.40	3.60	1.55	2.583	2.713	2.454	12.27	12.68	11.85
0.05	0.083	0.213	-0.047	4.27	4.67	3.87	1.60	2.667	2.800	2.533	12.53	12.96	12.11
0.10	0.167	0.297	0.037	4.53	4.93	4.13	1.65	2.750	2.888	2.613	12.80	13.24	12.36
0.15	0.250	0.380	0.120	4.80	5.20	4.40	1.70	2.833	2.975	2.692	13.07	13.52	12.61
0.20	0.333	0.463	0.203	5.07	5.47	4.67	1.75	2.917	3.063	2.771	13.33	13.80	12.87
0.25	0.417	0.547	0.287	5.33	5.73	4.93	1.80	3.000	3.150	2.850	13.60	14.08	13.12
0.30	0.500	0.630	0.370	5.60	6.00	5.20	1.85	3.083	3.238	2.929	13.87	14.36	13.37
0.35	0.583	0.713	0.453	5.87	6.27	5.47	1.90	3.167	3.325	3.008	14.13	14.64	13.63
0.40	0.667	0.797	0.537	6.13	6.53	5.73	1.95	3.250	3.413	3.088	14.40	14.92	13.88
0.45	0.750	0.880	0.620	6.40	6.80	6.00	2.00	3.333	3.500	3.167	14.67	15.20	14.13
0.50	0.833	0.963	0.703	6.67	7.07	6.27	2.05	3.417	3.588	3.246	14.93	15.48	14.39
0.55	0.917	1.047	0.787	6.93	7.33	6.53	2.10	3.500	3.675	3.325	15.20	15.76	14.64
0.60	1.000	1.130	0.870	7.20	7.60	6.80	2.15	3.583	3.763	3.404	15.47	16.04	14.89
0.65	1.083	1.213	0.953	7.47	7.87	7.07	2.20	3.667	3.850	3.483	15.73	16.32	15.15
0.70	1.167	1.297	1.037	7.73	8.13	7.33	2.25	3.750	3.938	3.563	16.00	16.60	15.40
0.75	1.250	1.380	1.120	8.00	8.40	7.60	2.30	3.833	4.025	3.642	16.27	16.88	15.65
0.80	1.333	1.463	1.203	8.27	8.67	7.87	2.35	3.917	4.113	3.721	16.53	17.16	15.91
0.85	1.417	1.547	1.287	8.53	8.93	8.13	2.40	4.000	4.200	3.800	16.80	17.44	16.16
0.90	1.500	1.630	1.370	8.80	9.20	8.40	2.45	4.083	4.288	3.879	17.07	17.72	16.41
0.95	1.583	1.713	1.453	9.07	9.47	8.67	2.50	4.167	4.375	3.958	17.33	18.00	16.67
1.00	1.667	1.797	1.537	9.33	9.73	8.93	2.55	4.250	4.463	4.038	17.60	18.28	16.92
1.05	1.750	1.880	1.620	9.60	10.00	9.20	2.60	4.333	4.550	4.117	17.87	18.56	17.17
1.10	1.833	1.963	1.703	9.87	10.27	9.47	2.65	4.417	4.638	4.196	18.13	18.84	17.43
1.15	1.917	2.047	1.787	10.13	10.53	9.73	2.70	4.500	4.725	4.275	18.40	19.12	17.68
1.20	2.000	2.130	1.870	10.40	10.80	10.00	2.75	4.583	4.813	4.354	18.67	19.40	17.93
1.25	2.083	2.213	1.953	10.67	11.07	10.27	2.80	4.667	4.900	4.433	18.93	19.68	18.19
1.30	2.167	2.297	2.037	10.93	11.33	10.53	2.85	4.750	4.988	4.513	19.20	19.96	18.44
1.35	2.250	2.380	2.120	11.20	11.60	10.80	2.90	4.833	5.075	4.592	19.47	20.24	18.69
1.40	2.333	2.463	2.203	11.47	11.87	11.07	2.95	4.917	5.163	4.671	19.73	20.52	18.95
1.45	2.417	2.547	2.287	11.73	12.13	11.33	3.00	5.000	5.250	4.750	20.00	20.80	19.20
1.50	2.500	2.630	2.370	12.00	12.40	11.60							

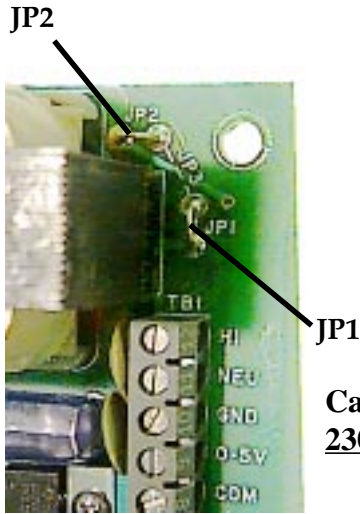
Accuracy = ±0.075% CO2 from 0 to 1.5% CO2 and ±5% of reading from 1.5 to 3% CO2  
Chart Revised on 3-5-97



Rear view:



Signal and relay wires pass through this strain relief cable grommet.



Cable grommet for signal wires  
0.090 min / 0.25 max wire dia.

Exhaust Gas  
and water  
drain hose  
barb for 3/16  
inch I.D.  
tubing

Cable grommet for  
AC power cord

Audio  
Alarm

Gas Inlet  
hose barb  
for 1/4 inch  
I.D. tubing

Water Trap

**Caution:** Note jumper configuration for either **115 VAC** ( JP1 & JP2 ) or **230 VAC** ( JP3 only ) operation.

**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 1% or 2% 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 & A73** for detailed calibration instructions. The **pump switch** should be **turned off** during gas 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 be 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 A67** for spare parts information. See **Application Note A46** for detailed info on PC board.

