

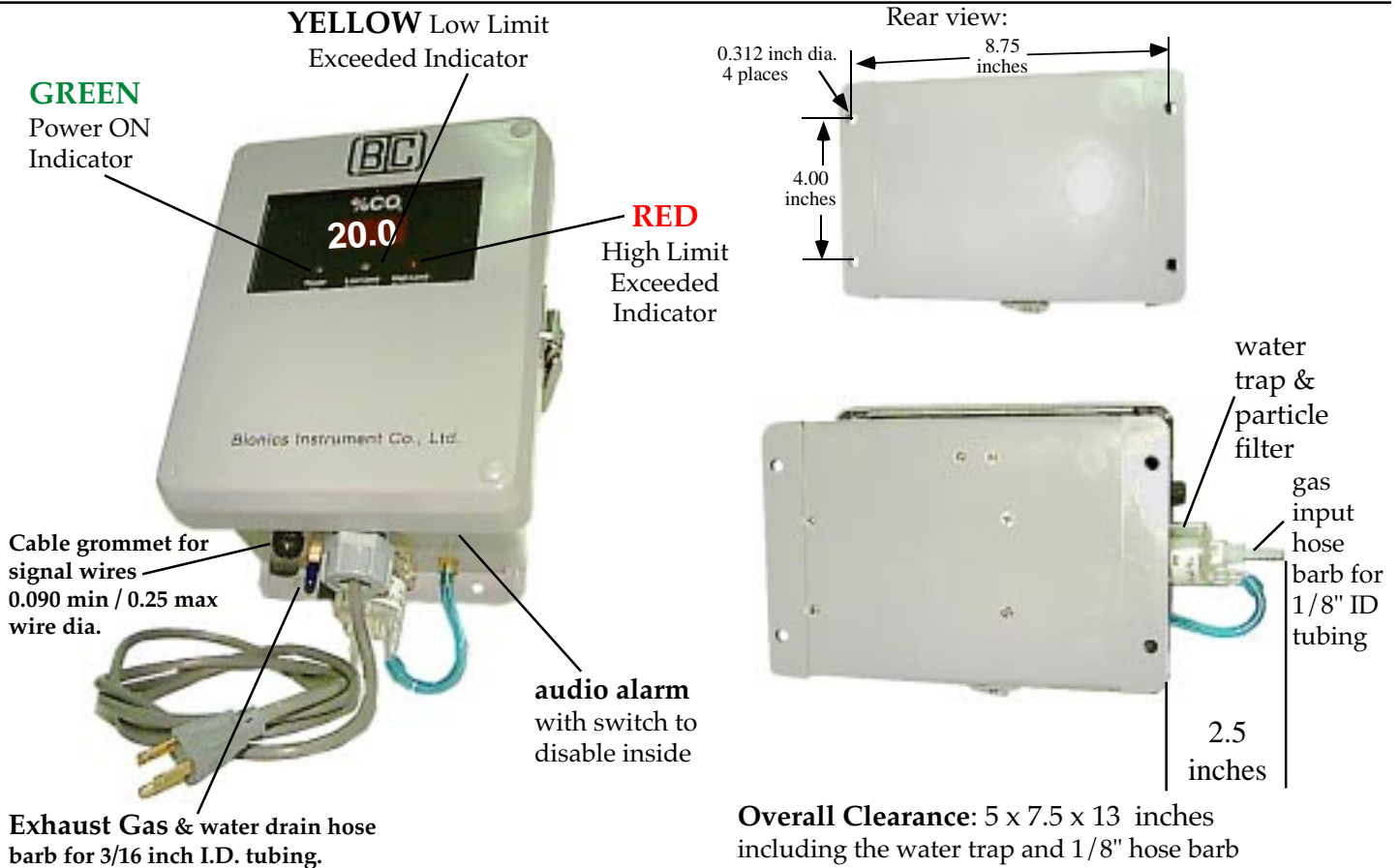
Carbon Dioxide Monitor

Model 2166 20% CO₂

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 20% CO₂



Application:

- Industrial Safety
- Process Control
- Wineries
- Breweries
- Food Processing
- with CO₂ 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 20% CO₂

Description:

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.

Specifications: 2166 20% CO₂

Method: **N.D. I. R. (Non-Dispersive Infra-Red)** Gas sample pump (see app note A67)
Gas: Carbon dioxide (CO₂)
Range: 0-20% CO₂
Accuracy: $\pm 0.7\%$ CO₂ from 0 -10% CO₂ and $\pm 7\%$ of reading from 10.5% to 20% CO₂
Repeatability: $\pm 1\%$ 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 2% CO₂ to full scale (audio alarms below)
..... Low SET Point adjusted to 5% and High SET Point to 10% 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 20% CO₂ (linear scale data attached)
Current Loop: 4 to 20 mA = 0 to 20% CO₂ (linear scale data attached) 0 to 550 Ω 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
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



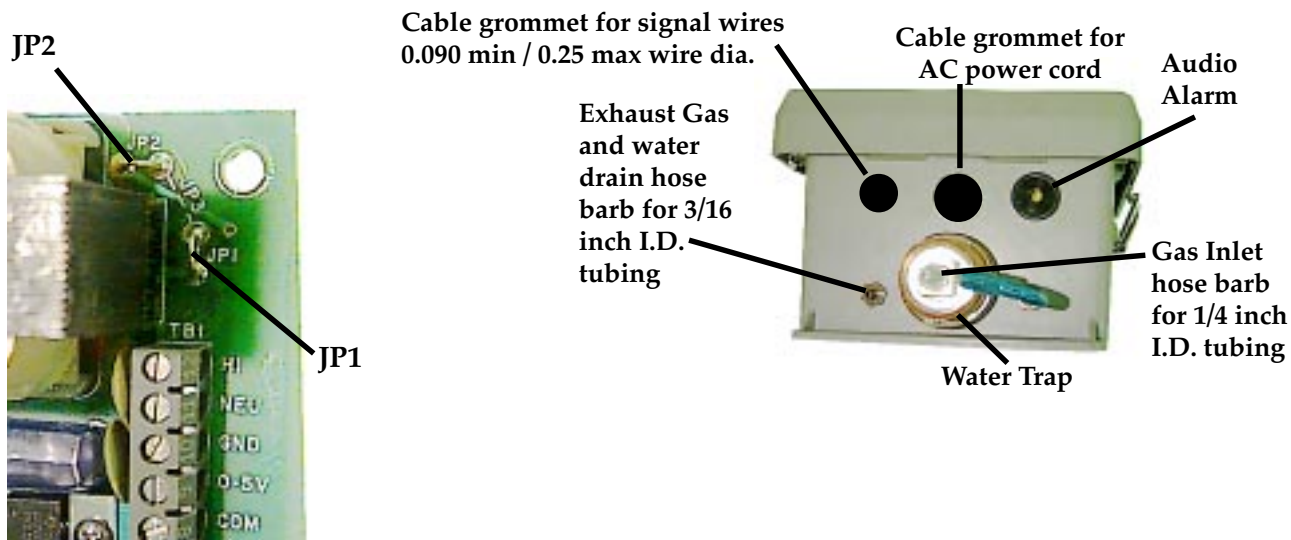
Terminal block TB1 has a linear 0 to 5 volt output signal on pin number 9 with respect to pin number 8 which is signal common. Pin number 7 has a linear 4 to 20 mA current loop signal referenced again to pin number 8. See the wiring diagram on page 4.

The table below shows both the linear 0 to 5 volt and the 4 to 20 mA current loop responses to 0 to 20% 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 **20% & 5 volt FS Linear** Chart revised on 6-1-98

Gas in %	Linear Output	±0.7% CO ₂						Gas in %	Linear Output	±7% of reading					
		Min	Max	4-20 mA	Min	Max	Min			Max	4-20 mA	Min	Max		
0.00	0.000	-0.175	0.175	4.00	3.44	4.56	10.20	2.550	2.372	2.729	12.16	11.59	12.73		
0.20	0.050	-0.125	0.225	4.16	3.60	4.72	10.40	2.600	2.418	2.782	12.32	11.74	12.90		
0.40	0.100	-0.075	0.275	4.32	3.76	4.88	10.60	2.650	2.465	2.836	12.48	11.89	13.07		
0.60	0.150	-0.025	0.325	4.48	3.92	5.04	10.80	2.700	2.511	2.889	12.64	12.04	13.24		
0.80	0.200	0.025	0.375	4.64	4.08	5.20	11.00	2.750	2.558	2.943	12.80	12.18	13.42		
1.00	0.250	0.075	0.425	4.80	4.24	5.36	11.20	2.800	2.604	2.996	12.96	12.33	13.59		
1.20	0.300	0.125	0.475	4.96	4.40	5.52	11.40	2.850	2.651	3.050	13.12	12.48	13.76		
1.40	0.350	0.175	0.525	5.12	4.56	5.68	11.60	2.900	2.697	3.103	13.28	12.63	13.93		
1.60	0.400	0.225	0.575	5.28	4.72	5.84	11.80	2.950	2.744	3.157	13.44	12.78	14.10		
1.80	0.450	0.275	0.625	5.44	4.88	6.00	12.00	3.000	2.790	3.210	13.60	12.93	14.27		
2.00	0.500	0.325	0.675	5.60	5.04	6.16	12.20	3.050	2.837	3.264	13.76	13.08	14.44		
2.20	0.550	0.375	0.725	5.76	5.20	6.32	12.40	3.100	2.883	3.317	13.92	13.23	14.61		
2.40	0.600	0.425	0.775	5.92	5.36	6.48	12.60	3.150	2.930	3.371	14.08	13.37	14.79		
2.60	0.650	0.475	0.825	6.08	5.52	6.64	12.80	3.200	2.976	3.424	14.24	13.52	14.96		
2.80	0.700	0.525	0.875	6.24	5.68	6.80	13.00	3.250	3.023	3.478	14.40	13.67	15.13		
3.00	0.750	0.575	0.925	6.40	5.84	6.96	13.20	3.300	3.069	3.531	14.56	13.82	15.30		
3.20	0.800	0.625	0.975	6.56	6.00	7.12	13.40	3.350	3.116	3.585	14.72	13.97	15.47		
3.40	0.850	0.675	1.025	6.72	6.16	7.28	13.60	3.400	3.162	3.638	14.88	14.12	15.64		
3.60	0.900	0.725	1.075	6.88	6.32	7.44	13.80	3.450	3.209	3.692	15.04	14.27	15.81		
3.80	0.950	0.775	1.125	7.04	6.48	7.60	14.00	3.500	3.255	3.745	15.20	14.42	15.98		
4.00	1.000	0.825	1.175	7.20	6.64	7.76	14.20	3.550	3.302	3.799	15.36	14.56	16.16		
4.20	1.050	0.875	1.225	7.36	6.80	7.92	14.40	3.600	3.348	3.852	15.52	14.71	16.33		
4.40	1.100	0.925	1.275	7.52	6.96	8.08	14.60	3.650	3.395	3.905	15.68	14.86	16.50		
4.60	1.150	0.975	1.325	7.68	7.12	8.24	14.80	3.700	3.441	3.959	15.84	15.01	16.67		
4.80	1.200	1.025	1.375	7.84	7.28	8.40	15.00	3.750	3.487	4.012	16.00	15.16	16.84		
5.00	1.250	1.075	1.425	8.00	7.44	8.56	15.20	3.800	3.534	4.066	16.16	15.31	17.01		
5.20	1.300	1.125	1.475	8.16	7.60	8.72	15.40	3.850	3.580	4.119	16.32	15.46	17.18		
5.40	1.350	1.175	1.525	8.32	7.76	8.88	15.60	3.900	3.627	4.173	16.48	15.61	17.35		
5.60	1.400	1.225	1.575	8.48	7.92	9.04	15.80	3.950	3.673	4.226	16.64	15.76	17.52		
5.80	1.450	1.275	1.625	8.64	8.08	9.20	16.00	4.000	3.720	4.280	16.80	15.90	17.70		
6.00	1.500	1.325	1.675	8.80	8.24	9.36	16.20	4.050	3.766	4.333	16.96	16.05	17.87		
6.20	1.550	1.375	1.725	8.96	8.40	9.52	16.40	4.100	3.813	4.387	17.12	16.20	18.04		
6.40	1.600	1.425	1.775	9.12	8.56	9.68	16.60	4.150	3.859	4.440	17.28	16.35	18.21		
6.60	1.650	1.475	1.825	9.28	8.72	9.84	16.80	4.200	3.906	4.494	17.44	16.50	18.38		
6.80	1.700	1.525	1.875	9.44	8.88	10.00	17.00	4.250	3.952	4.547	17.60	16.65	18.55		
7.00	1.750	1.575	1.925	9.60	9.04	10.16	17.20	4.300	3.999	4.601	17.76	16.80	18.72		
7.20	1.800	1.625	1.975	9.76	9.20	10.32	17.40	4.350	4.045	4.654	17.92	16.95	18.89		
7.40	1.850	1.675	2.025	9.92	9.36	10.48	17.60	4.400	4.092	4.708	18.08	17.09	19.07		
7.60	1.900	1.725	2.075	10.08	9.52	10.64	17.80	4.450	4.138	4.761	18.24	17.24	19.24		
7.80	1.950	1.775	2.125	10.24	9.68	10.80	18.00	4.500	4.185	4.815	18.40	17.39	19.41		
8.00	2.000	1.825	2.175	10.40	9.84	10.96	18.20	4.550	4.231	4.868	18.56	17.54	19.58		
8.20	2.050	1.875	2.225	10.56	10.00	11.12	18.40	4.600	4.278	4.922	18.72	17.69	19.75		
8.40	2.100	1.925	2.275	10.72	10.16	11.28	18.60	4.650	4.324	4.975	18.88	17.84	19.92		
8.60	2.150	1.975	2.325	10.88	10.32	11.44	18.80	4.700	4.371	5.029	19.04	17.99	20.09		
8.80	2.200	2.025	2.375	11.04	10.48	11.60	19.00	4.750	4.417	5.082	19.20	18.14	20.26		
9.00	2.250	2.075	2.425	11.20	10.64	11.76	19.20	4.800	4.464	5.136	19.36	18.28	20.44		
9.20	2.300	2.125	2.475	11.36	10.80	11.92	19.40	4.850	4.510	5.189	19.52	18.43	20.61		
9.40	2.350	2.175	2.525	11.52	10.96	12.08	19.60	4.900	4.557	5.243	19.68	18.58	20.78		
9.60	2.400	2.225	2.575	11.68	11.12	12.24	19.80	4.950	4.603	5.296	19.84	18.73	20.95		
9.80	2.450	2.275	2.625	11.84	11.28	12.40	20.00	5.000	4.650	5.350	20.00	18.88	21.12		
10.00	2.500	2.325	2.675	12.00	11.44	12.56									





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 10.0±0.2% CO₂) 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 A73** for detailed calibration instructions. The **pump switch should be turned OFF** during calibration and the flow rate set to about 2 to 4 Liters per minute. You can flow directly into the **hydrophobic filter** at about 0.3 liter per min.

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 4 to 6 liters per minute if measured at the water trap input, Gas Inlet (both sides of the pump drawing). See **Application Note A67** for maintenance information.

