



Carbon Dioxide Monitor

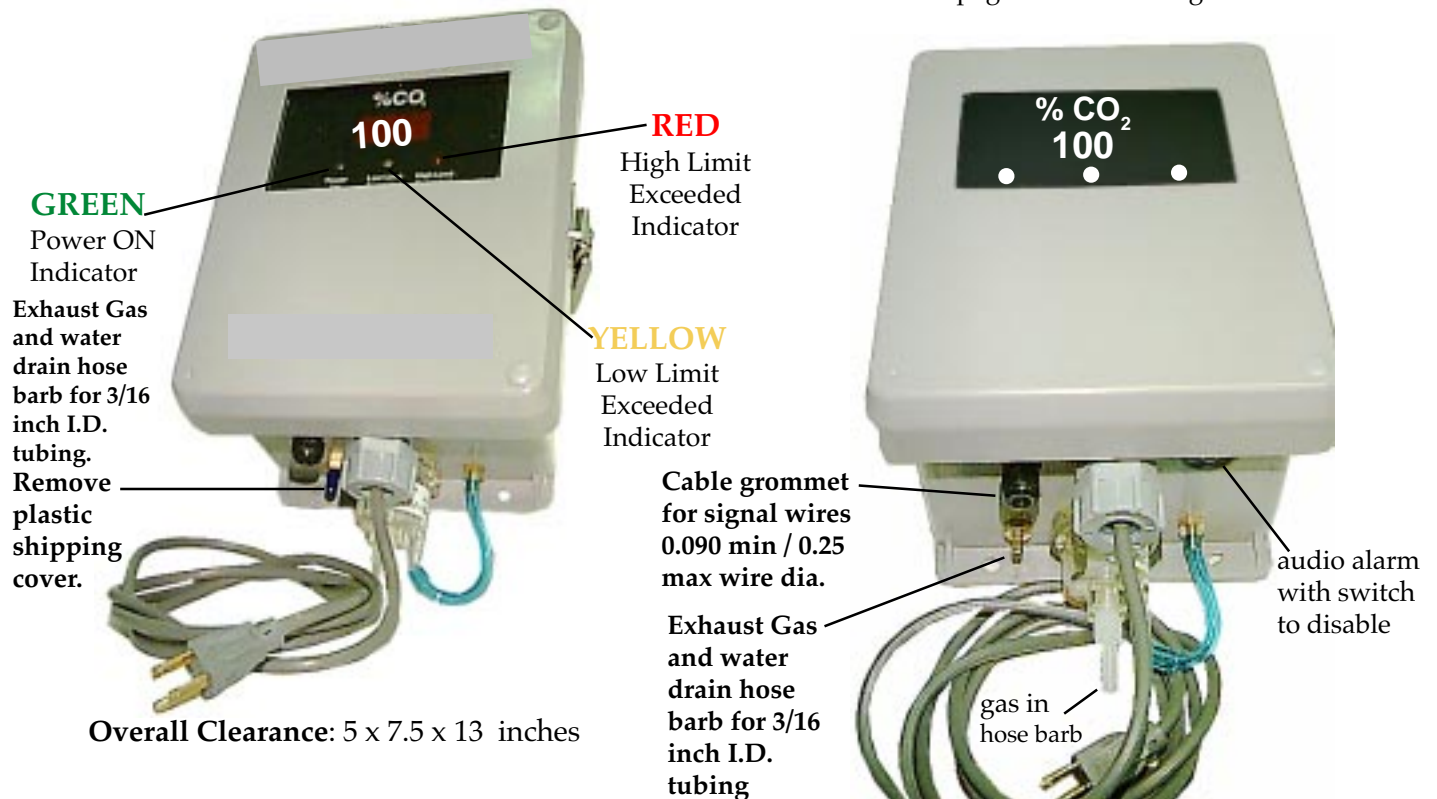
Model 2166 100% CO₂

Features:

- Self contained unit with pump / water trap
- Non Dispersive **InfraRed (NDIR)** technology
- **SD Gas** calibration kit available
- Fast warm-up
- Industrially robust: **0-5 V** and **4-20 mA** outputs
- **Dual** level detect set points and relays
- **Audio Alarm** beeps when **Low** level exceeded, **ON** continuous when **High** level exceeded
- 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 100% CO₂

see page 3 for mounting info



Application:

- Industrial Safety
- Oil & Gas Drilling
- Refineries
- Gas Processing
- Petrochemical Plants
- Gas Pipelines

The **VALTRONICS** Model 2166 is a non-dispersive infrared (NDIR) carbon dioxide monitor for use in industrial applications. It produces a control signal proportional to CO₂ concentration. Dual adjustable level detect circuits may be used for alarms or control functions. The Low Level Detect and High Level Detect may be adjusted anywhere from 10% of full scale to full scale. A **YELLOW** indicator comes on when Low is exceeded and **RED** when the High is exceeded.



Carbon Dioxide Monitor Model 2166 100% 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 CO₂. 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 CO₂ must be monitored or controlled.

Specifications: 2166 100% CO₂

- Method: N.D. I. R. (Non-dispersive Infra-red) Gas sample pump (see **App Note A67**)
- Gas: Carbon Dioxide (CO₂)
- Range: 0-100% CO₂
- Accuracy: ±2.5% CO₂ from 0 -50% CO₂ and ± 10% of reading from 52% to 100% CO₂
- Repeatability: ± 2% 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 10% CO₂ to full scale (audio alarms below)
..... Low SET Point adjusted to 33% and High SET Point to 67% 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 max
- Display: 0.56 inch high digital Light Emitting Diode (RED LED) readout
- Output Signals: Alarm switch will disable Audio Alarms
 - Voltage: 0 to 5 volt = 0 to 100% CO₂ (linear scale data attached)
 - Current Loop: 4 to 20 mA = 0 to 100% CO₂ (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 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 on page 3



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.

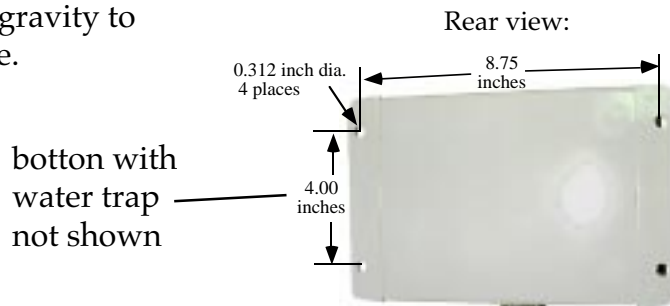
The table below shows both the linear 0 to 5 volt and the 4 to 20 mA current loop responses to 0 to 100% CO₂ being drawn through the gas cell by the sample pump. The wires from TB1 go through the strain relief cable grommet shown on page 4. The resulting wire bundle must be between 0.090 and 0.25 inch diameter to be properly strain relieved.

VALTRONICS 100% & 5 volt full scale

Gas in %	Output in volts	±2.5% gas		4-20 mA output	±0.7 mA		Gas in %	Output in volts	±10% of reading		4-20 mA output	±10% of reading	
		Max	Min		Max	Min			Max	Min		Max	Min
0	0.000	0.125	-0.125	4.00	4.70	3.30	52	2.600	2.860	2.340	12.32	13.15	11.49
2	0.100	0.225	-0.025	4.32	5.02	3.62	54	2.700	2.970	2.430	12.64	13.50	11.78
4	0.200	0.325	0.075	4.64	5.34	3.94	56	2.800	3.080	2.520	12.96	13.86	12.06
6	0.300	0.425	0.175	4.96	5.66	4.26	58	2.900	3.190	2.610	13.28	14.21	12.35
8	0.400	0.525	0.275	5.28	5.98	4.58	60	3.000	3.300	2.700	13.60	14.56	12.64
10	0.500	0.625	0.375	5.60	6.30	4.90	62	3.100	3.410	2.790	13.92	14.91	12.93
12	0.600	0.725	0.475	5.92	6.62	5.22	64	3.200	3.520	2.880	14.24	15.26	13.22
14	0.700	0.825	0.575	6.24	6.94	5.54	66	3.300	3.630	2.970	14.56	15.62	13.50
16	0.800	0.925	0.675	6.56	7.26	5.86	68	3.400	3.740	3.060	14.88	15.97	13.79
18	0.900	1.025	0.775	6.88	7.58	6.18	70	3.500	3.850	3.150	15.20	16.32	14.08
20	1.000	1.125	0.875	7.20	7.90	6.50	72	3.600	3.960	3.240	15.52	16.67	14.37
22	1.100	1.225	0.975	7.52	8.22	6.82	74	3.700	4.070	3.330	15.84	17.02	14.66
24	1.200	1.325	1.075	7.84	8.54	7.14	76	3.800	4.180	3.420	16.16	17.38	14.94
26	1.300	1.425	1.175	8.16	8.86	7.46	78	3.900	4.290	3.510	16.48	17.73	15.23
28	1.400	1.525	1.275	8.48	9.18	7.78	80	4.000	4.400	3.600	16.80	18.08	15.52
30	1.500	1.625	1.375	8.80	9.50	8.10	82	4.100	4.510	3.690	17.12	18.43	15.81
32	1.600	1.725	1.475	9.12	9.82	8.42	84	4.200	4.620	3.780	17.44	18.78	16.10
34	1.700	1.825	1.575	9.44	10.14	8.74	86	4.300	4.730	3.870	17.76	19.14	16.38
36	1.800	1.925	1.675	9.76	10.46	9.06	88	4.400	4.840	3.960	18.08	19.49	16.67
38	1.900	2.025	1.775	10.08	10.78	9.38	90	4.500	4.950	4.050	18.40	19.84	16.96
40	2.000	2.125	1.875	10.40	11.10	9.70	92	4.600	5.060	4.140	18.72	20.19	17.25
42	2.100	2.225	1.975	10.72	11.42	10.02	94	4.700	5.170	4.230	19.04	20.54	17.54
44	2.200	2.325	2.075	11.04	11.74	10.34	96	4.800	5.280	4.320	19.36	20.90	17.82
46	2.300	2.425	2.175	11.36	12.06	10.66	98	4.900	5.390	4.410	19.68	21.25	18.11
48	2.400	2.525	2.275	11.68	12.38	10.98	100	5.000	5.500	4.500	20.00	21.60	18.40
50	2.500	2.625	2.375	12.00	12.70	11.30							

Accuracy = ±2.5% gas from 0 to 50% and ±10% of reading from 52 to 100% gas
 Revised on 1-19-98

Mount the enclosure vertically so that the water trap is at the bottom. This will allow gravity to remove the water from the gas sample.





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

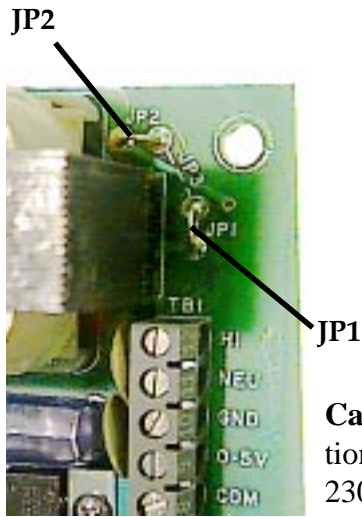
Cable grommet for
AC power cord

Audio
Alarm

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

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

Water Trap



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

Preventive Maintenance: See Application Note A67 for replacement parts:

Gas calibration should be done every six months. At least calibration with zero gas (nitrogen or fresh air) every six months and both zero and span (certified 50% 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. The pump switch should be turned off during calibration and the flow rate set to at least 2 Liters per minute if you flow into the inlet hose barb. If you flow into the **INLET side of the hydrophobic filter** you can save calibration gas by flowing only **0.3 liter 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 filter cleaning and replacement.

