

# Carbon Dioxide Monitor

## Model 2156 0.5% (5000 ppm)

### Features:

- Complete self contained units
- Non dispersive infrared (**NDIR**) technology
- **ECONO-CAL™** 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 - **NEMA-4X** enclosure
- No moving parts - gas diffusion sampling
- Solid state throughout - **linear** outputs
- Humidity and moisture resistant
- Dust-tight water resistant fiberglass enclosure
- **Digital** readout with 0.56 inch red LED display

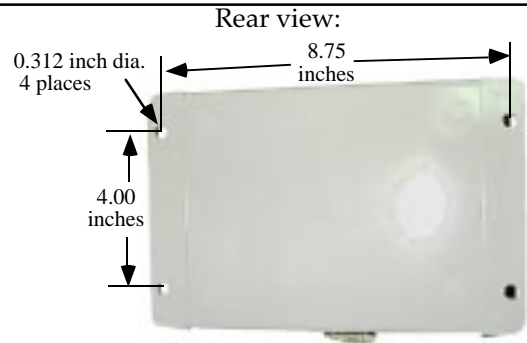
### Model 2156 0.500% (5000 ppm) CO<sub>2</sub>

<p><b>GREEN</b> Power ON Indicator</p>	<p><b>YELLOW</b> Low Limit Exceeded Indicator</p>	<p><b>RED</b> High Limit Exceeded Indicator</p>
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**Cable grommet** for signal wires and relay contact connections. AC power cable and plug. **Audio Alarm** beeps at low set point, on at high set point. Internal switch disables alarm

Fresh air is about **0.04%** (400 ppm) CO<sub>2</sub>



gas diffusion sample cell

#10-32 gas calibration hose barb for 1/8" ID tubing may be screwed in place of the # 10-32 pan head screw.

### Application:

- Greenhouses
- Mushroom Farms
- Wineries
- Breweries
- Food Processing
- Ambient Air Quality

The **VALTRONICS** Model 2156 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 2156 0.500% (5000 ppm) CO<sub>2</sub>

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### Description:

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The Model 2156 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 diffusion gas cell is not effected by variations in relative humidity from 0 to 95%. 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: 2156 0.500% (5000 ppm) CO<sub>2</sub>

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- Method: ..... **N.D. I. R. (Non-Dispersive Infra-Red)** Gas diffusion type gas cell
- Gas: ..... Carbon dioxide (CO<sub>2</sub>)
- Range: ..... **0-0.500%** (5000 ppm) CO<sub>2</sub>
- Accuracy: ..... ±0.013% CO<sub>2</sub> from 0 to 0.25% CO<sub>2</sub> & ± 5% of reading from 0.25% to 0.5% 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 0.3% and High SET Point to 0.5% 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 (**RED** LED) readout
- Output Signals:
  - Voltage: ..... 0 to 5 volt = 0 to **0.500%** CO<sub>2</sub> ( linear scale data attached)
  - Current Loop: ..... 4 to 20 mA = 0 to **0.500%** 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: ..... 0 to 95% RH (non-condensing) in gas cell
- Weight: ..... Less than 6 pounds (< 2.72 kilograms)
- External Clearance Dimensions: . 5 inches high, 8.5 inches wide, 10.5 inches long
- Mounting, four 0.312 inch dia holes ... Mounting centers 4.0 inch x 8.75 inch: see diagram



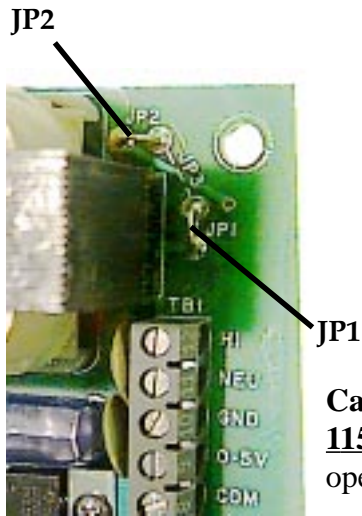
Terminal block TB1 has a linear 0 to 5 volt output signal on pin number 9 with respect to pin number 8 which is signal common. Pin number 7 has a linear 4 to 20 mA current loop signal referenced again to pin number 8. See the wiring diagram on page 4.

The table below shows both the linear 0 to 5 volt and the 4 to 20 mA current loop responses to 0 to 0.5% carbon dioxide diffusing through the gas cell. 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 0.500 % (5000 ppm) & 1 volt full scale** Chart rev on 5-6-98

Gas Concentration in %	Output in volts	±5% of Reading		4-20 mA output	±5% of Reading		4-20 mA output across 250Ω in volts
		Max.	Min.		Max.	Min.	
0.000	0.000	0.125	-0.125	4.00	4.40	3.60	1.00
0.010	0.100	0.225	-0.025	4.32	4.72	3.92	1.08
0.020	0.200	0.325	0.075	4.64	5.04	4.24	1.16
0.030	0.300	0.425	0.175	4.96	5.36	4.56	1.24
0.040	0.400	0.525	0.275	5.28	5.68	4.88	1.32
0.050	0.500	0.625	0.375	5.60	6.00	5.20	1.40
0.060	0.600	0.725	0.475	5.92	6.32	5.52	1.48
0.070	0.700	0.825	0.575	6.24	6.64	5.84	1.56
0.080	0.800	0.925	0.675	6.56	6.96	6.16	1.64
0.090	0.900	1.025	0.775	6.88	7.28	6.48	1.72
0.100	1.000	1.125	0.875	7.20	7.60	6.80	1.80
0.110	1.100	1.225	0.975	7.52	7.92	7.12	1.88
0.120	1.200	1.325	1.075	7.84	8.24	7.44	1.96
0.130	1.300	1.425	1.175	8.16	8.56	7.76	2.04
0.140	1.400	1.525	1.275	8.48	8.88	8.08	2.12
0.150	1.500	1.625	1.375	8.80	9.20	8.40	2.20
0.160	1.600	1.725	1.475	9.12	9.52	8.72	2.28
0.170	1.700	1.825	1.575	9.44	9.84	9.04	2.36
0.180	1.800	1.925	1.675	9.76	10.16	9.36	2.44
0.190	1.900	2.025	1.775	10.08	10.48	9.68	2.52
0.200	2.000	2.125	1.875	10.40	10.80	10.00	2.60
0.210	2.100	2.225	1.975	10.72	11.12	10.32	2.68
0.220	2.200	2.325	2.075	11.04	11.44	10.64	2.76
0.230	2.300	2.425	2.175	11.36	11.76	10.96	2.84
0.240	2.400	2.525	2.275	11.68	12.08	11.28	2.92
0.250	2.500	2.625	2.375	12.00	12.40	11.60	3.00
0.260	2.600	2.730	2.470	12.32	12.74	11.90	3.08
0.270	2.700	2.835	2.565	12.64	13.07	12.21	3.16
0.280	2.800	2.940	2.660	12.96	13.41	12.51	3.24
0.290	2.900	3.045	2.755	13.28	13.74	12.82	3.32
0.300	3.000	3.150	2.850	13.60	14.08	13.12	3.40
0.310	3.100	3.255	2.945	13.92	14.42	13.42	3.48
0.320	3.200	3.360	3.040	14.24	14.75	13.73	3.56
0.330	3.300	3.465	3.135	14.56	15.09	14.03	3.64
0.340	3.400	3.570	3.230	14.88	15.42	14.34	3.72
0.350	3.500	3.675	3.325	15.20	15.76	14.64	3.80
0.360	3.600	3.780	3.420	15.52	16.10	14.94	3.88
0.370	3.700	3.885	3.515	15.84	16.43	15.25	3.96
0.380	3.800	3.990	3.610	16.16	16.77	15.55	4.04
0.390	3.900	4.095	3.705	16.48	17.10	15.86	4.12
0.400	4.000	4.200	3.800	16.80	17.44	16.16	4.20
0.410	4.100	4.305	3.895	17.12	17.78	16.46	4.28
0.420	4.200	4.410	3.990	17.44	18.11	16.77	4.36
0.430	4.300	4.515	4.085	17.76	18.45	17.07	4.44
0.440	4.400	4.620	4.180	18.08	18.78	17.38	4.52
0.450	4.500	4.725	4.275	18.40	19.12	17.68	4.60
0.460	4.600	4.830	4.370	18.72	19.46	17.98	4.68
0.470	4.700	4.935	4.465	19.04	19.79	18.29	4.76
0.480	4.800	5.040	4.560	19.36	20.13	18.59	4.84
0.490	4.900	5.145	4.655	19.68	20.46	18.90	4.92
0.500	5.000	5.250	4.750	20.00	20.80	19.20	5.00

Accuracy = ±5% of reading from 0.25 to 0.50 % gas and ±0.013 % gas from 0 to 0.250 % gas



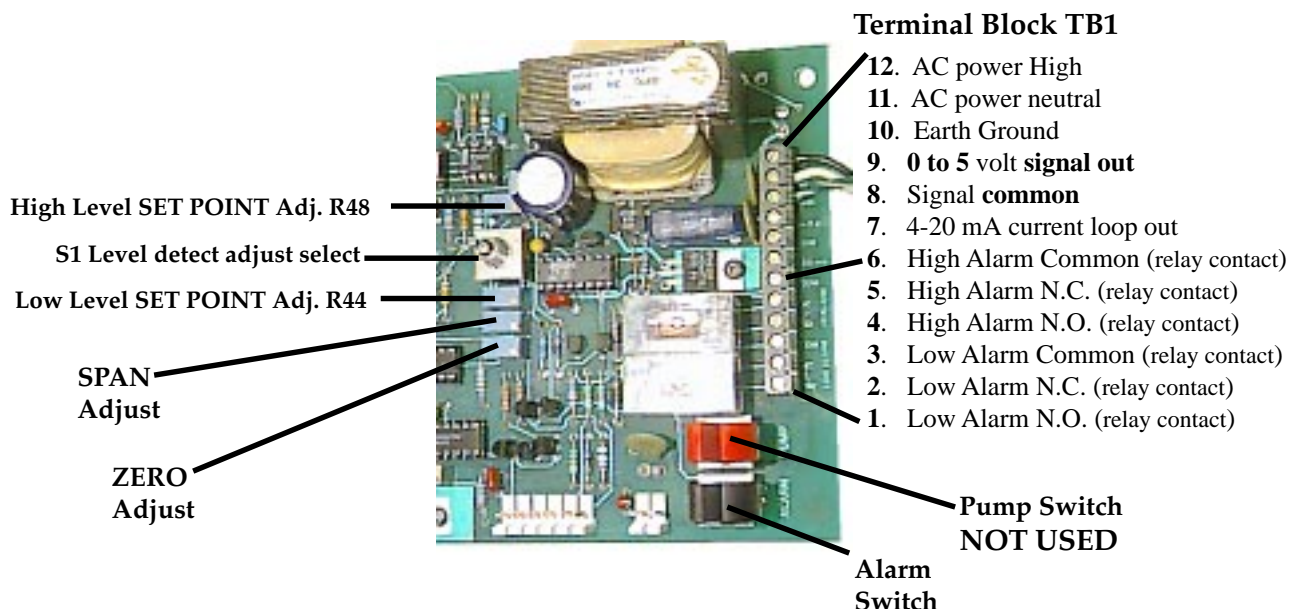
**Caution:** Note jumper configuration for either 115 VAC ( JP1 & JP2 ) or 230 VAC ( JP3 only ) operation.



#10-32 **gas calibration hose barb** may be screwed in place of the #10-32 pan head screw.

**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 0.1% CO<sub>2</sub>) at least once a year. Span calibration using 0.1% CO<sub>2</sub> would give you better accuracy on the low end of the scale where most measurements may occur (see **Application Note A11** for an example of typical Industrial Safety CO<sub>2</sub> measurements). Span calibration using certified 0.50% CO<sub>2</sub> may be used if most of your measurements occur near that level. 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 A35** for detailed calibration instructions. The flow rate into the gas calibration hose barb should be set to about 0.3 Liters per minute.



- Terminal Block TB1**
- 12. AC power High
  - 11. AC power neutral
  - 10. Earth Ground
  - 9. 0 to 5 volt signal out
  - 8. Signal common
  - 7. 4-20 mA current loop out
  - 6. High Alarm Common (relay contact)
  - 5. High Alarm N.C. (relay contact)
  - 4. High Alarm N.O. (relay contact)
  - 3. Low Alarm Common (relay contact)
  - 2. Low Alarm N.C. (relay contact)
  - 1. Low Alarm N.O. (relay contact)

**Pump Switch NOT USED**  
**Alarm Switch**