VALTRONICS

Carbon Dioxide Monitor
Model 2156 2% CO_2

Features:

- Complete self contained units
- Non dispersive **infrared** (**NDIR**) technology
- **ECONO-CAL™** gas calibration kit
- Fast warm-up
- Industrially robust: **0-5 V** and **4-20 mA** outputs
- **Dual** adj level detect set points and relays
- Built-in **Alarm** beeps at low set point, on at high set point - **Dual** SET Point indicators
- Cost effective - High quality
- 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

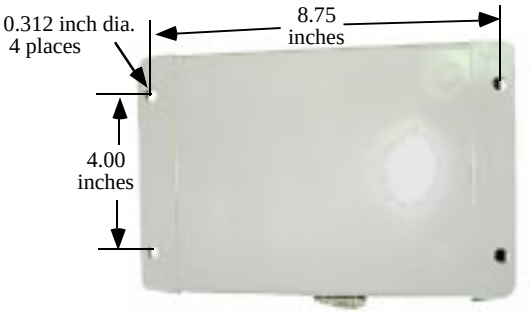
Model 2156 2% CO_2

GREEN
Power ON
Indicator

YELLOW
Low Limit
Exceeded
Indicator

RED
High Limit
Exceeded
Indicator

Rear view:



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_2**

Clearance: 5 x 8.5 x 10.5 inches

Application:

- Industrial Safety
- Mushroom Farms
- Wineries
- Breweries
- Food Processing
- with CO_2 Blasters

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.

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Carbon Dioxide Monitor
Model 2156 2% CO_2

Description:

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.

Specifications: 2156 2% CO_2

Method: ..... **N.D. I. R.** (Non-dispersive **Infra-red**) Gas diffusion type gas cell
Gas: ..... Carbon dioxide (CO_2)
Range: ..... 0-20,000 ppm (**2%**) CO_2
Accuracy: ..... ±0.05% CO_2 from 0 to 1.0% CO_2 & ± 5% of reading from 1.0% to 2% CO_2
Repeatability: ..... ± 1% of full scale (challenge with same gas sample and assure zero)
External Power Source: ..... 115/220 VAC , 50/60 Hz (6 foot long power cord is standard)
Power Consumption: ..... less than 8 watts @ 115 VAC
Adjustable Set Points: ..... Dual set points adjustable from 0.2% CO_2 to full scale (audio alarms below)
..... Low SET Point adjusted to 0.5% and High SET Point to 1.0% 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: ..... **GREEN** power on indicator
- Voltage: ..... 0 to 5 volt = 0 to **2%** CO_2 (linear scale data attached)
- Current Loop: ..... 4 to 20 mA = 0 to **2%** CO_2 (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, see **Application Note A30**
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

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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 2.0% 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 stain reliefed.

Gas Calibration done near mid-scale will give the best accuracy over the entire range. **Certified 1.0**±0.02% CO_2 would be good for gas calibration every 6 months to a year.

VALTRONICS 2% & 5 volt linear full scale

Gas	Output	±0.05% CO2		4-20 mA	±0.4 mA		Gas	Output	±5% of reading		4-20 mA	±5% of reading	
in %	in volts	Max.	Min.	0utput	Max.	Min.	in %	in volts	Max.	Min.	0utput	Max.	Min.
0.00	**0.000**	0.125	-0.125	**4.00**	4.40	3.60							
0.02	**0.050**	0.175	-0.075	**4.16**	4.56	3.76	**1.02**	**2.550**	2.678	2.423	**12.16**	12.57	11.75
0.04	**0.100**	0.225	-0.025	**4.32**	4.72	3.92	**1.04**	**2.600**	2.730	2.470	**12.32**	12.74	11.90
0.06	**0.150**	0.275	0.025	**4.48**	4.88	4.08	**1.06**	**2.650**	2.783	2.518	**12.48**	12.90	12.06
0.08	**0.200**	0.325	0.075	**4.64**	5.04	4.24	**1.08**	**2.700**	2.835	2.565	**12.64**	13.07	12.21
0.10	**0.250**	0.375	0.125	**4.80**	5.20	4.40	**1.10**	**2.750**	2.888	2.613	**12.80**	13.24	12.36
0.12	**0.300**	0.425	0.175	**4.96**	5.36	4.56	**1.12**	**2.800**	2.940	2.660	**12.96**	13.41	12.51
0.14	**0.350**	0.475	0.225	**5.12**	5.52	4.72	**1.14**	**2.850**	2.993	2.708	**13.12**	13.58	12.66
0.16	**0.400**	0.525	0.275	**5.28**	5.68	4.88	**1.16**	**2.900**	3.045	2.755	**13.28**	13.74	12.82
0.18	**0.450**	0.575	0.325	**5.44**	5.84	5.04	**1.18**	**2.950**	3.098	2.803	**13.44**	13.91	12.97
0.20	**0.500**	0.625	0.375	**5.60**	6.00	5.20	**1.20**	**3.000**	3.150	2.850	**13.60**	14.08	13.12
0.22	**0.550**	0.675	0.425	**5.76**	6.16	5.36	**1.22**	**3.050**	3.203	2.898	**13.76**	14.25	13.27
0.24	**0.600**	0.725	0.475	**5.92**	6.32	5.52	**1.24**	**3.100**	3.255	2.945	**13.92**	14.42	13.42
0.26	**0.650**	0.775	0.525	**6.08**	6.48	5.68	**1.26**	**3.150**	3.308	2.993	**14.08**	14.58	13.58
0.28	**0.700**	0.825	0.575	**6.24**	6.64	5.84	**1.28**	**3.200**	3.360	3.040	**14.24**	14.75	13.73
0.30	**0.750**	0.875	0.625	**6.40**	6.80	6.00	**1.30**	**3.250**	3.413	3.088	**14.40**	14.92	13.88
0.32	**0.800**	0.925	0.675	**6.56**	6.96	6.16	**1.32**	**3.300**	3.465	3.135	**14.56**	15.09	14.03
0.34	**0.850**	0.975	0.725	**6.72**	7.12	6.32	**1.34**	**3.350**	3.518	3.183	**14.72**	15.26	14.18
0.36	**0.900**	1.025	0.775	**6.88**	7.28	6.48	**1.36**	**3.400**	3.570	3.230	**14.88**	15.42	14.34
0.38	**0.950**	1.075	0.825	**7.04**	7.44	6.64	**1.38**	**3.450**	3.623	3.278	**15.04**	15.59	14.49
0.40	**1.000**	1.125	0.875	**7.20**	7.60	6.80	**1.40**	**3.500**	3.675	3.325	**15.20**	15.76	14.64
0.42	**1.050**	1.175	0.925	**7.36**	7.76	6.96	**1.42**	**3.550**	3.728	3.373	**15.36**	15.93	14.79
0.44	**1.100**	1.225	0.975	**7.52**	7.92	7.12	**1.44**	**3.600**	3.780	3.420	**15.52**	16.10	14.94
0.46	**1.150**	1.275	1.025	**7.68**	8.08	7.28	**1.46**	**3.650**	3.833	3.468	**15.68**	16.26	15.10
0.48	**1.200**	1.325	1.075	**7.84**	8.24	7.44	**1.48**	**3.700**	3.885	3.515	**15.84**	16.43	15.25
0.50	**1.250**	1.375	1.125	**8.00**	8.40	7.60	**1.50**	**3.750**	3.938	3.563	**16.00**	16.60	15.40
0.52	**1.300**	1.425	1.175	**8.16**	8.56	7.76	**1.52**	**3.800**	3.990	3.610	**16.16**	16.77	15.55
0.54	**1.350**	1.475	1.225	**8.32**	8.72	7.92	**1.54**	**3.850**	4.043	3.658	**16.32**	16.94	15.70
0.56	**1.400**	1.525	1.275	**8.48**	8.88	8.08	**1.56**	**3.900**	4.095	3.705	**16.48**	17.10	15.86
0.58	**1.450**	1.575	1.325	**8.64**	9.04	8.24	**1.58**	**3.950**	4.148	3.753	**16.64**	17.27	16.01
0.60	**1.500**	1.625	1.375	**8.80**	9.20	8.40	**1.60**	**4.000**	4.200	3.800	**16.80**	17.44	16.16
0.62	**1.550**	1.675	1.425	**8.96**	9.36	8.56	**1.62**	**4.050**	4.253	3.848	**16.96**	17.61	16.31
0.64	**1.600**	1.725	1.475	**9.12**	9.52	8.72	**1.64**	**4.100**	4.305	3.895	**17.12**	17.78	16.46
0.66	**1.650**	1.775	1.525	**9.28**	9.68	8.88	**1.66**	**4.150**	4.358	3.943	**17.28**	17.94	16.62
0.68	**1.700**	1.825	1.575	**9.44**	9.84	9.04	**1.68**	**4.200**	4.410	3.990	**17.44**	18.11	16.77
0.70	**1.750**	1.875	1.625	**9.60**	10.00	9.20	**1.70**	**4.250**	4.463	4.038	**17.60**	18.28	16.92
0.72	**1.800**	1.925	1.675	**9.76**	10.16	9.36	**1.72**	**4.300**	4.515	4.085	**17.76**	18.45	17.07
0.74	**1.850**	1.975	1.725	**9.92**	10.32	9.52	**1.74**	**4.350**	4.568	4.133	**17.92**	18.62	17.22
0.76	**1.900**	2.025	1.775	**10.08**	10.48	9.68	**1.76**	**4.400**	4.620	4.180	**18.08**	18.78	17.38
0.78	**1.950**	2.075	1.825	**10.24**	10.64	9.84	**1.78**	**4.450**	4.673	4.228	**18.24**	18.95	17.53
0.80	**2.000**	2.125	1.875	**10.40**	10.80	10.00	**1.80**	**4.500**	4.725	4.275	**18.40**	19.12	17.68
0.82	**2.050**	2.175	1.925	**10.56**	10.96	10.16	**1.82**	**4.550**	4.778	4.323	**18.56**	19.29	17.83
0.84	**2.100**	2.225	1.975	**10.72**	11.12	10.32	**1.84**	**4.600**	4.830	4.370	**18.72**	19.46	17.98
0.86	**2.150**	2.275	2.025	**10.88**	11.28	10.48	**1.86**	**4.650**	4.883	4.418	**18.88**	19.62	18.14
0.88	**2.200**	2.325	2.075	**11.04**	11.44	10.64	**1.88**	**4.700**	4.935	4.465	**19.04**	19.79	18.29
0.90	**2.250**	2.375	2.125	**11.20**	11.60	10.80	**1.90**	**4.750**	4.988	4.513	**19.20**	19.96	18.44
0.92	**2.300**	2.425	2.175	**11.36**	11.76	10.96	**1.92**	**4.800**	5.040	4.560	**19.36**	20.13	18.59
0.94	**2.350**	2.475	2.225	**11.52**	11.92	11.12	**1.94**	**4.850**	5.093	4.608	**19.52**	20.30	18.74
0.96	**2.400**	2.525	2.275	**11.68**	12.08	11.28	**1.96**	**4.900**	5.145	4.655	**19.68**	20.46	18.90
0.98	**2.450**	2.575	2.325	**11.84**	12.24	11.44	**1.98**	**4.950**	5.198	4.703	**19.84**	20.63	19.05
1.00	**2.500**	2.625	2.375	**12.00**	12.40	11.60	**2.00**	**5.000**	5.250	4.750	**20.00**	20.80	19.20

Accuracy = ±5% of reading from 1% gas to 2% gas and ±0.05% gas from 0 to 1% gas Chart modified on 11-19-97

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JP1

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

#10-32 screw may be replaced by a #10-32 hose barb for gas calibration

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% CO_2) at least once a year. Span calibration using 1% CO_2 would give you better accuracy on the low end of the scale where most measurements will occur (see Application Note A11 for an example of typical Industrial Safety CO_2 measurements). 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 should be set to about 0.3 Liters per minute.