



Carbon Dioxide Monitor Model 2156 3% CO₂

Features:

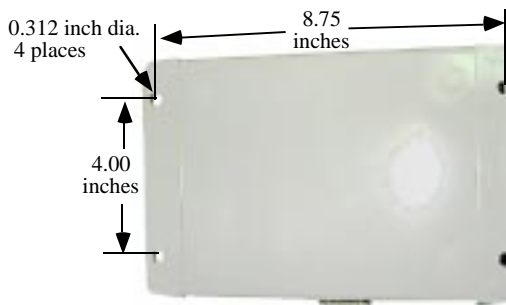
- Complete self contained units
- Non Dispersive **InfraRed (NDIR)** technology
- **ECONO-CAL™** gas calibration kit
- Fast warm-up
- Industrially robust: **0-5 V** and **4-20 mA** outputs
- **Dual** adj level detect set points and relays
- Built-in **Alarm** beeps (switch to disable) at low set point, 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

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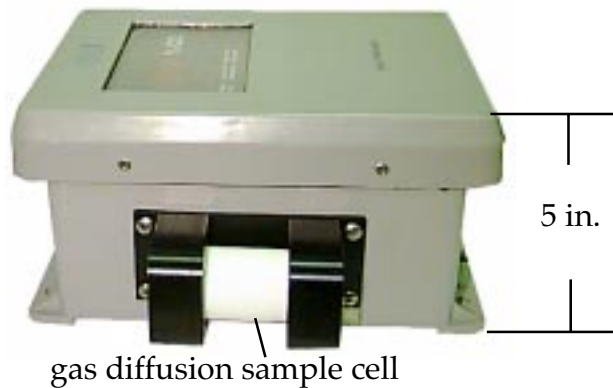
GREEN	YELLOW	RED
Power ON Indicator	Low Limit Exceeded Indicator	High Limit Exceeded Indicator



Rear view:



Clearance: 5 x 8.5 x 10.5 inches



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)CO₂

Application:

- Industrial Safety
- Mushroom Farms
- Wineries
- Breweries
- Food Processing
- with CO₂ Blasters

The **VALTRONICS** Model 2156 is a Non-Dispersive **InfraRed (NDIR)** carbon dioxide monitor for use as a **safety monitor**. It has linear 0 to 5 volt and 4-20 mA signal outputs that are proportional to the 0 to 3% CO₂. See **Application Note A11** for OSHA defined safety levels for CO₂. Dual adjustable level detects (Low Limit & High Limit) and relay contacts may be used for external control of fans, air vents, and external alarms.



Carbon Dioxide Monitor

Model 2156 3% CO₂

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 3% CO₂

Method: **N.D. I. R.** (Non-Dispersive **Infra-Red**) Gas diffusion type gas cell
Gas: Carbon dioxide (CO₂)
Range: 0-30,000 ppm (**3%**) CO₂
Accuracy: ±0.075% CO₂ from 0 to 1.5% CO₂ & ±5% of reading from 1.5% to 3% CO₂
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 0.3% CO₂ to full scale (audio alarms below)
..... **Low SET Point** adjusted to **0.5%** and **High SET Point** to **2.0%** 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 **3%** CO₂ (linear scale data attached)
Current Loop: 4 to 20 mA = 0 to **3%** 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 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: 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



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 3.0% 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 strain relieved.

Gas Calibration done near mid-scale will give the best accuracy over the entire range. **Certified** $1.0 \pm 0.02\%$ CO₂ or $2.0 \pm 0.04\%$ CO₂ would be good for gas calibration every 6 months to a year.

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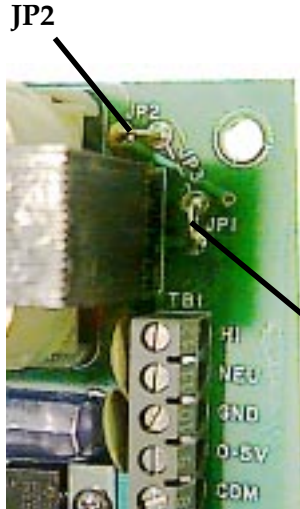
3% Gas and 5 V full scale linear

Gas in %	Output in volts	±0.08% CO ₂		4-20 mA output	±0.08% CO ₂		Gas in %	Output in volts	±10% of reading		4-20 mA output	±10% of reading	
		Max.	Min.		Max.	Min.			Max.	Min.		Max.	Min.
0.00	0.000	0.130	-0.130	4.00	4.40	3.60							
0.05	0.083	0.213	-0.047	4.27	4.67	3.87	1.55	2.583	2.713	2.454	12.27	12.68	11.85
0.10	0.167	0.297	0.037	4.53	4.93	4.13	1.60	2.667	2.800	2.533	12.53	12.96	12.11
0.15	0.250	0.380	0.120	4.80	5.20	4.40	1.65	2.750	2.888	2.613	12.80	13.24	12.36
0.20	0.333	0.463	0.203	5.07	5.47	4.67	1.70	2.833	2.975	2.692	13.07	13.52	12.61
0.25	0.417	0.547	0.287	5.33	5.73	4.93	1.75	2.917	3.063	2.771	13.33	13.80	12.87
0.30	0.500	0.630	0.370	5.60	6.00	5.20	1.80	3.000	3.150	2.850	13.60	14.08	13.12
0.35	0.583	0.713	0.453	5.87	6.27	5.47	1.85	3.083	3.238	2.929	13.87	14.36	13.37
0.40	0.667	0.797	0.537	6.13	6.53	5.73	1.90	3.167	3.325	3.008	14.13	14.64	13.63
0.45	0.750	0.880	0.620	6.40	6.80	6.00	1.95	3.250	3.413	3.088	14.40	14.92	13.88
0.50	0.833	0.963	0.703	6.67	7.07	6.27	2.00	3.333	3.500	3.167	14.67	15.20	14.13
0.55	0.917	1.047	0.787	6.93	7.33	6.53	2.05	3.417	3.588	3.246	14.93	15.48	14.39
0.60	1.000	1.130	0.870	7.20	7.60	6.80	2.10	3.500	3.675	3.325	15.20	15.76	14.64
0.65	1.083	1.213	0.953	7.47	7.87	7.07	2.15	3.583	3.763	3.404	15.47	16.04	14.89
0.70	1.167	1.297	1.037	7.73	8.13	7.33	2.20	3.667	3.850	3.483	15.73	16.32	15.15
0.75	1.250	1.380	1.120	8.00	8.40	7.60	2.25	3.750	3.938	3.563	16.00	16.60	15.40
0.80	1.333	1.463	1.203	8.27	8.67	7.87	2.30	3.833	4.025	3.642	16.27	16.88	15.65
0.85	1.417	1.547	1.287	8.53	8.93	8.13	2.35	3.917	4.113	3.721	16.53	17.16	15.91
0.90	1.500	1.630	1.370	8.80	9.20	8.40	2.40	4.000	4.200	3.800	16.80	17.44	16.16
0.95	1.583	1.713	1.453	9.07	9.47	8.67	2.45	4.083	4.288	3.879	17.07	17.72	16.41
1.00	1.667	1.797	1.537	9.33	9.73	8.93	2.50	4.167	4.375	3.958	17.33	18.00	16.67
1.05	1.750	1.880	1.620	9.60	10.00	9.20	2.55	4.250	4.463	4.038	17.60	18.28	16.92
1.10	1.833	1.963	1.703	9.87	10.27	9.47	2.60	4.333	4.550	4.117	17.87	18.56	17.17
1.15	1.917	2.047	1.787	10.13	10.53	9.73	2.65	4.417	4.638	4.196	18.13	18.84	17.43
1.20	2.000	2.130	1.870	10.40	10.80	10.00	2.70	4.500	4.725	4.275	18.40	19.12	17.68
1.25	2.083	2.213	1.953	10.67	11.07	10.27	2.75	4.583	4.813	4.354	18.67	19.40	17.93
1.30	2.167	2.297	2.037	10.93	11.33	10.53	2.80	4.667	4.900	4.433	18.93	19.68	18.19
1.35	2.250	2.380	2.120	11.20	11.60	10.80	2.85	4.750	4.988	4.513	19.20	19.96	18.44
1.40	2.333	2.463	2.203	11.47	11.87	11.07	2.90	4.833	5.075	4.592	19.47	20.24	18.69
1.45	2.417	2.547	2.287	11.73	12.13	11.33	2.95	4.917	5.163	4.671	19.73	20.52	18.95
1.50	2.500	2.630	2.370	12.00	12.40	11.60	3.00	5.000	5.250	4.750	20.00	20.80	19.20

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



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



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% CO₂) at least once a year. Span calibration using 1% CO₂ 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 CO₂ 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.

