



## Carbon Dioxide Monitor Model 2156 1.0%

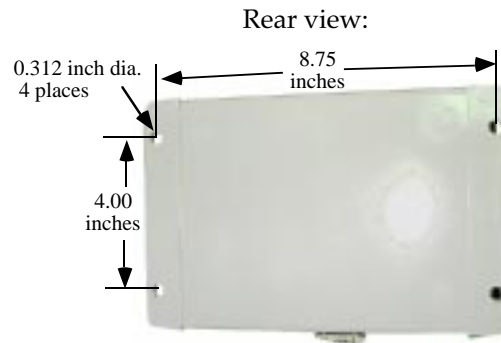
### Features:

- 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
- Built in **Audio Alarm** that beeps at low level & is on continuous at high level (switch to turn off)
- 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 1.0% CO<sub>2</sub>



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



Clearance: 5 x 8.5 x 10.5 inches



gas diffusion sample cell

### Application:

- Greenhouses
- Mushroom Farms
- Wineries
- Breweries
- Food Processing
- with CO<sub>2</sub> 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.



## Carbon Dioxide Monitor Model 2156 1.0%

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### 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.

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### Specifications: 2156 1.0% CO<sub>2</sub>

Method: ..... N.D. I. R. (Non-dispersive Infra-red) Gas diffusion type gas cell  
 Gas: ..... Carbon dioxide (CO<sub>2</sub>)  
 Range: ..... 0-10,000 ppm (1.0%) CO<sub>2</sub>  
 Accuracy: ..... ±0.025% CO<sub>2</sub> from 0 to 0.5% CO<sub>2</sub> & ± 5% of reading from 0.5% to 1.0% 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 0.10% 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 (LED) readout  
 Output Signals:  
   Voltage: ..... 0 to 5 volt = 0 to 1.0% CO<sub>2</sub> ( linear scale data attached)  
   Current Loop: ..... 4 to 20 mA = 0 to 1.0% 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 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  
 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 1.0% 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 relieved.

| <b>VALTRONICS 1% Gas &amp; 5 volt fu</b> |                    |                |        |                   |                |       |                                 |
|--|--------------------|----------------|--------|-------------------|----------------|-------|---------------------------------|
| Gas<br>in %                              | Output<br>in volts | ±5% of Reading |        | 4-20 mA<br>output | ±5% of Reading |       | 4-20 mA across<br>500Ω in volts |
|  |                    | Max.           | Min.   |                   | Max.           | Min.  |                                 |
| 0.00                                     | 0.000              | 0.125          | -0.125 | 4.00              | 4.40           | 3.60  | 2.00                            |
| 0.02                                     | 0.100              | 0.225          | -0.025 | 4.32              | 4.72           | 3.92  | 2.16                            |
| 0.04                                     | 0.200              | 0.325          | 0.075  | 4.64              | 5.04           | 4.24  | 2.32                            |
| 0.06                                     | 0.300              | 0.425          | 0.175  | 4.96              | 5.36           | 4.56  | 2.48                            |
| 0.08                                     | 0.400              | 0.525          | 0.275  | 5.28              | 5.68           | 4.88  | 2.64                            |
| 0.10                                     | 0.500              | 0.625          | 0.375  | 5.60              | 6.00           | 5.20  | 2.80                            |
| 0.12                                     | 0.600              | 0.725          | 0.475  | 5.92              | 6.32           | 5.52  | 2.96                            |
| 0.14                                     | 0.700              | 0.825          | 0.575  | 6.24              | 6.64           | 5.84  | 3.12                            |
| 0.16                                     | 0.800              | 0.925          | 0.675  | 6.56              | 6.96           | 6.16  | 3.28                            |
| 0.18                                     | 0.900              | 1.025          | 0.775  | 6.88              | 7.28           | 6.48  | 3.44                            |
| 0.20                                     | 1.000              | 1.125          | 0.875  | 7.20              | 7.60           | 6.80  | 3.60                            |
| 0.22                                     | 1.100              | 1.225          | 0.975  | 7.52              | 7.92           | 7.12  | 3.76                            |
| 0.24                                     | 1.200              | 1.325          | 1.075  | 7.84              | 8.24           | 7.44  | 3.92                            |
| 0.26                                     | 1.300              | 1.425          | 1.175  | 8.16              | 8.56           | 7.76  | 4.08                            |
| 0.28                                     | 1.400              | 1.525          | 1.275  | 8.48              | 8.88           | 8.08  | 4.24                            |
| 0.30                                     | 1.500              | 1.625          | 1.375  | 8.80              | 9.20           | 8.40  | 4.40                            |
| 0.32                                     | 1.600              | 1.725          | 1.475  | 9.12              | 9.52           | 8.72  | 4.56                            |
| 0.34                                     | 1.700              | 1.825          | 1.575  | 9.44              | 9.84           | 9.04  | 4.72                            |
| 0.36                                     | 1.800              | 1.925          | 1.675  | 9.76              | 10.16          | 9.36  | 4.88                            |
| 0.38                                     | 1.900              | 2.025          | 1.775  | 10.08             | 10.48          | 9.68  | 5.04                            |
| 0.40                                     | 2.000              | 2.125          | 1.875  | 10.40             | 10.80          | 10.00 | 5.20                            |
| 0.42                                     | 2.100              | 2.225          | 1.975  | 10.72             | 11.12          | 10.32 | 5.36                            |
| 0.44                                     | 2.200              | 2.325          | 2.075  | 11.04             | 11.44          | 10.64 | 5.52                            |
| 0.46                                     | 2.300              | 2.425          | 2.175  | 11.36             | 11.76          | 10.96 | 5.68                            |
| 0.48                                     | 2.400              | 2.525          | 2.275  | 11.68             | 12.08          | 11.28 | 5.84                            |
| 0.50                                     | 2.500              | 2.625          | 2.375  | 12.00             | 12.40          | 11.60 | 6.00                            |
| 0.52                                     | 2.600              | 2.730          | 2.470  | 12.32             | 12.74          | 11.90 | 6.16                            |
| 0.54                                     | 2.700              | 2.835          | 2.565  | 12.64             | 13.07          | 12.21 | 6.32                            |
| 0.56                                     | 2.800              | 2.940          | 2.660  | 12.96             | 13.41          | 12.51 | 6.48                            |
| 0.58                                     | 2.900              | 3.045          | 2.755  | 13.28             | 13.74          | 12.82 | 6.64                            |
| 0.60                                     | 3.000              | 3.150          | 2.850  | 13.60             | 14.08          | 13.12 | 6.80                            |
| 0.62                                     | 3.100              | 3.255          | 2.945  | 13.92             | 14.42          | 13.42 | 6.96                            |
| 0.64                                     | 3.200              | 3.360          | 3.040  | 14.24             | 14.75          | 13.73 | 7.12                            |
| 0.66                                     | 3.300              | 3.465          | 3.135  | 14.56             | 15.09          | 14.03 | 7.28                            |
| 0.68                                     | 3.400              | 3.570          | 3.230  | 14.88             | 15.42          | 14.34 | 7.44                            |
| 0.70                                     | 3.500              | 3.675          | 3.325  | 15.20             | 15.76          | 14.64 | 7.60                            |
| 0.72                                     | 3.600              | 3.780          | 3.420  | 15.52             | 16.10          | 14.94 | 7.76                            |
| 0.74                                     | 3.700              | 3.885          | 3.515  | 15.84             | 16.43          | 15.25 | 7.92                            |
| 0.76                                     | 3.800              | 3.990          | 3.610  | 16.16             | 16.77          | 15.55 | 8.08                            |
| 0.78                                     | 3.900              | 4.095          | 3.705  | 16.48             | 17.10          | 15.86 | 8.24                            |
| 0.80                                     | 4.000              | 4.200          | 3.800  | 16.80             | 17.44          | 16.16 | 8.40                            |
| 0.82                                     | 4.100              | 4.305          | 3.895  | 17.12             | 17.78          | 16.46 | 8.56                            |
| 0.84                                     | 4.200              | 4.410          | 3.990  | 17.44             | 18.11          | 16.77 | 8.72                            |
| 0.86                                     | 4.300              | 4.515          | 4.085  | 17.76             | 18.45          | 17.07 | 8.88                            |
| 0.88                                     | 4.400              | 4.620          | 4.180  | 18.08             | 18.78          | 17.38 | 9.04                            |
| 0.90                                     | 4.500              | 4.725          | 4.275  | 18.40             | 19.12          | 17.68 | 9.20                            |
| 0.92                                     | 4.600              | 4.830          | 4.370  | 18.72             | 19.46          | 17.98 | 9.36                            |
| 0.94                                     | 4.700              | 4.935          | 4.465  | 19.04             | 19.79          | 18.29 | 9.52                            |
| 0.96                                     | 4.800              | 5.040          | 4.560  | 19.36             | 20.13          | 18.59 | 9.68                            |
| 0.98                                     | 4.900              | 5.145          | 4.655  | 19.68             | 20.46          | 18.90 | 9.84                            |
| 1.00                                     | 5.000              | 5.250          | 4.750  | 20.00             | 20.80          | 19.20 | 10.00                           |

Accuracy = ± 0.025 % CO2 from 0.0% CO2 to 0.5% CO2  
 Accuracy = ±5% of reading from 0.5% CO2 to 1.0% CO2  
 Chart revised on 10-8-97



JP2



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 0.5% CO<sub>2</sub>) at least once a year. Span calibration using 0.5% CO<sub>2</sub> 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<sub>2</sub> 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.

