



# Carbon Dioxide Monitor Model 2008DHL 2% (20,000 ppm) CO<sub>2</sub>

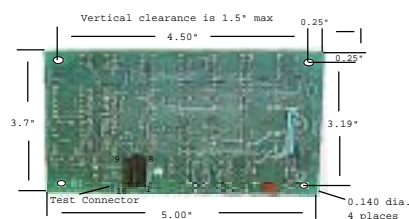
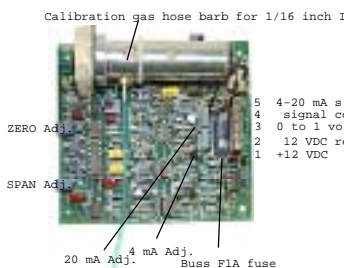
## Description:

The Valtronics Model 2008DHL is a Non-Dispersive Infrared gas monitor, designed for continuous monitoring of Carbon Dioxide in the range of zero to 2% CO<sub>2</sub> full scale.

The Optical Diffusion Head is completely unaffected by humidity, and requires no gas sampling pump. The transducer output may be interfaced to any controller unit via the linear 0 to 1 Volt or the 4 to 20 mA current loop output signals.

## Model 2008DHL 2% (20,000 ppm) CO<sub>2</sub> Specifications:

Method:	N.D. I. R. (Non-dispersive Infra-red) gas diffusion sample cell
Gas:	Carbon dioxide (CO <sub>2</sub> )
Range:	0-2% (20,000 ppm) CO <sub>2</sub>
Accuracy:	±0.05% CO <sub>2</sub> from 0 to mid scale (0 - 1.0% CO <sub>2</sub> ) ± 5% of reading from mid to full scale (1.0 - 2.0% CO <sub>2</sub> )
Repeatability:	± 1% of full scale (challenge with same gas sample and assure zero)
External Power Source:	12 Volts D.C. @ 0.6 amp. max. ( 10.0 to 16.0 VDC absolute min./max.)
Power Consumption:	3 watts typical @ 12.0 VDC
Output Signals:	0 to 1 volt = 0 to 1% CO <sub>2</sub> (linear scale data attached) 4 to 20 mA = 0 to 1% CO <sub>2</sub> (linear scale data attached) <b>300ohm max loop R</b>
Electronic Response Time:	8 seconds typical to a step change in gas concentration gas response depends on gas diffusion physics
Zero Noise at Constant Temperature:	Less than 10 mV peak to peak (measured during any 10 to 20 sec.ond period) see VTI Application Note A4-How to avoid GROUND LOOPS & EMI
Zero Drift at Constant Temperature:	Less than 2% of full scale per 24 hours (random not cumulative)
Zero Drift due to Ambient Temperature:	Less than 0.5% of full scale per degree Centigrade
Operating Temperature Range:	5 to 40°C (41° to 104°F) see <b>Application Note A12</b>
Ambient Relative Humidity:	5 to 95% RH non-condensing: see <b>Application Note A30</b>
Storage Temperature range:-	40 to +70°C (-40 to +158°F)
Weight:	Less than 0.5 pound (0.23 kilogram)
External Dimensions: PCB Card:	3.7" x 5" x 1.5" see page 3



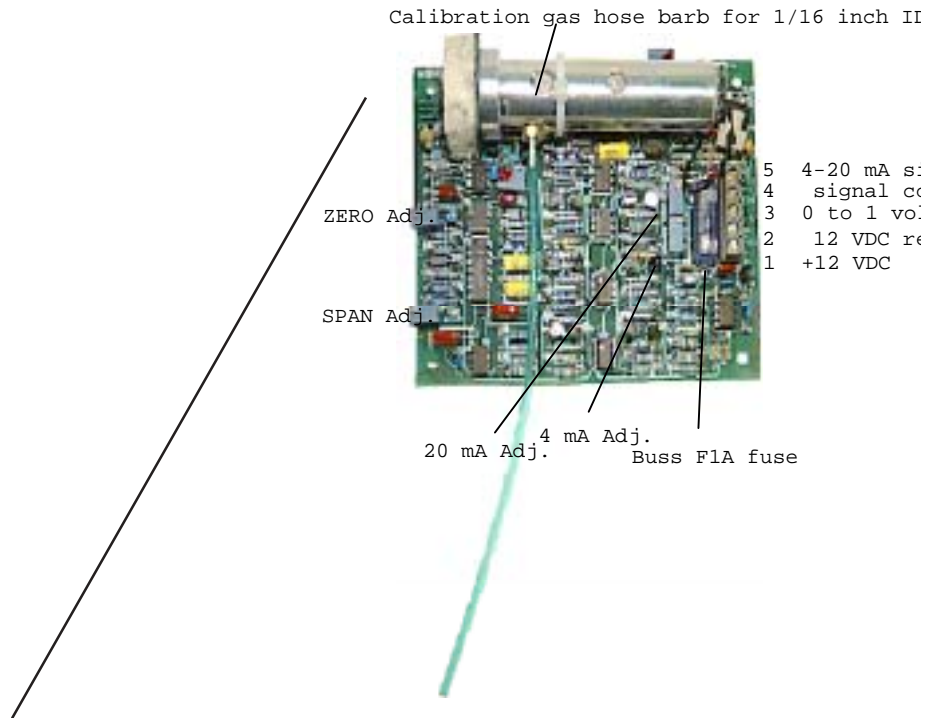


# Model 2008DHL 2% CO<sub>2</sub>

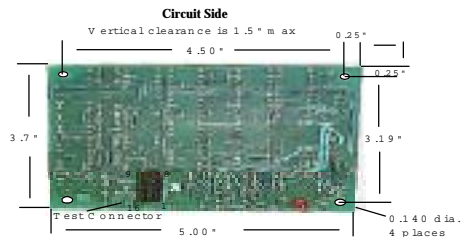
## VALTRONICS 2% & 1 volt linear full scale

Gas in %	Output ±0.05% CO <sub>2</sub>		4-20 mA ±0.4 mA			Gas in %	Output ±5% of reading		4-20 mA ±5% of reading		
	in volts	Max. Min.	Output	Max.	Min.		in volts	Max. Min.	Output	Max.	Min.
<b>0.00</b>	<b>0.000</b>	0.025 -0.025	<b>4.00</b>	4.40	3.60	<b>1.02</b>	<b>0.510</b>	0.536 0.485	<b>12.16</b>	12.57	11.75
<b>0.02</b>	<b>0.010</b>	0.035 -0.015	<b>4.16</b>	4.56	3.76	<b>1.04</b>	<b>0.520</b>	0.546 0.494	<b>12.32</b>	12.74	11.90
<b>0.04</b>	<b>0.020</b>	0.045 -0.005	<b>4.32</b>	4.72	3.92	<b>1.06</b>	<b>0.530</b>	0.557 0.504	<b>12.48</b>	12.90	12.06
<b>0.06</b>	<b>0.030</b>	0.055 0.005	<b>4.48</b>	4.88	4.08	<b>1.08</b>	<b>0.540</b>	0.567 0.513	<b>12.64</b>	13.07	12.21
<b>0.08</b>	<b>0.040</b>	0.065 0.015	<b>4.64</b>	5.04	4.24	<b>1.10</b>	<b>0.550</b>	0.578 0.523	<b>12.80</b>	13.24	12.36
<b>0.10</b>	<b>0.050</b>	0.075 0.025	<b>4.80</b>	5.20	4.40	<b>1.12</b>	<b>0.560</b>	0.588 0.532	<b>12.96</b>	13.41	12.51
<b>0.12</b>	<b>0.060</b>	0.085 0.035	<b>4.96</b>	5.36	4.56	<b>1.14</b>	<b>0.570</b>	0.599 0.542	<b>13.12</b>	13.58	12.66
<b>0.14</b>	<b>0.070</b>	0.095 0.045	<b>5.12</b>	5.52	4.72	<b>1.16</b>	<b>0.580</b>	0.609 0.551	<b>13.28</b>	13.74	12.82
<b>0.16</b>	<b>0.080</b>	0.105 0.055	<b>5.28</b>	5.68	4.88	<b>1.18</b>	<b>0.590</b>	0.620 0.561	<b>13.44</b>	13.91	12.97
<b>0.18</b>	<b>0.090</b>	0.115 0.065	<b>5.44</b>	5.84	5.04	<b>1.20</b>	<b>0.600</b>	0.630 0.570	<b>13.60</b>	14.08	13.12
<b>0.20</b>	<b>0.100</b>	0.125 0.075	<b>5.60</b>	6.00	5.20	<b>1.22</b>	<b>0.610</b>	0.641 0.580	<b>13.76</b>	14.25	13.27
<b>0.22</b>	<b>0.110</b>	0.135 0.085	<b>5.76</b>	6.16	5.36	<b>1.24</b>	<b>0.620</b>	0.651 0.589	<b>13.92</b>	14.42	13.42
<b>0.24</b>	<b>0.120</b>	0.145 0.095	<b>5.92</b>	6.32	5.52	<b>1.26</b>	<b>0.630</b>	0.662 0.599	<b>14.08</b>	14.58	13.58
<b>0.26</b>	<b>0.130</b>	0.155 0.105	<b>6.08</b>	6.48	5.68	<b>1.28</b>	<b>0.640</b>	0.672 0.608	<b>14.24</b>	14.75	13.73
<b>0.28</b>	<b>0.140</b>	0.165 0.115	<b>6.24</b>	6.64	5.84	<b>1.30</b>	<b>0.650</b>	0.683 0.618	<b>14.40</b>	14.92	13.88
<b>0.30</b>	<b>0.150</b>	0.175 0.125	<b>6.40</b>	6.80	6.00	<b>1.32</b>	<b>0.660</b>	0.693 0.627	<b>14.56</b>	15.09	14.03
<b>0.32</b>	<b>0.160</b>	0.185 0.135	<b>6.56</b>	6.96	6.16	<b>1.34</b>	<b>0.670</b>	0.704 0.637	<b>14.72</b>	15.26	14.18
<b>0.34</b>	<b>0.170</b>	0.195 0.145	<b>6.72</b>	7.12	6.32	<b>1.36</b>	<b>0.680</b>	0.714 0.646	<b>14.88</b>	15.42	14.34
<b>0.36</b>	<b>0.180</b>	0.205 0.155	<b>6.88</b>	7.28	6.48	<b>1.38</b>	<b>0.690</b>	0.725 0.656	<b>15.04</b>	15.59	14.49
<b>0.38</b>	<b>0.190</b>	0.215 0.165	<b>7.04</b>	7.44	6.64	<b>1.40</b>	<b>0.700</b>	0.735 0.665	<b>15.20</b>	15.76	14.64
<b>0.40</b>	<b>0.200</b>	0.225 0.175	<b>7.20</b>	7.60	6.80	<b>1.42</b>	<b>0.710</b>	0.746 0.675	<b>15.36</b>	15.93	14.79
<b>0.42</b>	<b>0.210</b>	0.235 0.185	<b>7.36</b>	7.76	6.96	<b>1.44</b>	<b>0.720</b>	0.756 0.684	<b>15.52</b>	16.10	14.94
<b>0.44</b>	<b>0.220</b>	0.245 0.195	<b>7.52</b>	7.92	7.12	<b>1.46</b>	<b>0.730</b>	0.767 0.694	<b>15.68</b>	16.26	15.10
<b>0.46</b>	<b>0.230</b>	0.255 0.205	<b>7.68</b>	8.08	7.28	<b>1.48</b>	<b>0.740</b>	0.777 0.703	<b>15.84</b>	16.43	15.25
<b>0.48</b>	<b>0.240</b>	0.265 0.215	<b>7.84</b>	8.24	7.44	<b>1.50</b>	<b>0.750</b>	0.788 0.713	<b>16.00</b>	16.60	15.40
<b>0.50</b>	<b>0.250</b>	0.275 0.225	<b>8.00</b>	8.40	7.60	<b>1.52</b>	<b>0.760</b>	0.798 0.722	<b>16.16</b>	16.77	15.55
<b>0.52</b>	<b>0.260</b>	0.285 0.235	<b>8.16</b>	8.56	7.76	<b>1.54</b>	<b>0.770</b>	0.809 0.732	<b>16.32</b>	16.94	15.70
<b>0.54</b>	<b>0.270</b>	0.295 0.245	<b>8.32</b>	8.72	7.92	<b>1.56</b>	<b>0.780</b>	0.819 0.741	<b>16.48</b>	17.10	15.86
<b>0.56</b>	<b>0.280</b>	0.305 0.255	<b>8.48</b>	8.88	8.08	<b>1.58</b>	<b>0.790</b>	0.830 0.751	<b>16.64</b>	17.27	16.01
<b>0.58</b>	<b>0.290</b>	0.315 0.265	<b>8.64</b>	9.04	8.24	<b>1.60</b>	<b>0.800</b>	0.840 0.760	<b>16.80</b>	17.44	16.16
<b>0.60</b>	<b>0.300</b>	0.325 0.275	<b>8.80</b>	9.20	8.40	<b>1.62</b>	<b>0.810</b>	0.851 0.770	<b>16.96</b>	17.61	16.31
<b>0.62</b>	<b>0.310</b>	0.335 0.285	<b>8.96</b>	9.36	8.56	<b>1.64</b>	<b>0.820</b>	0.861 0.779	<b>17.12</b>	17.78	16.46
<b>0.64</b>	<b>0.320</b>	0.345 0.295	<b>9.12</b>	9.52	8.72	<b>1.66</b>	<b>0.830</b>	0.872 0.789	<b>17.28</b>	17.94	16.62
<b>0.66</b>	<b>0.330</b>	0.355 0.305	<b>9.28</b>	9.68	8.88	<b>1.68</b>	<b>0.840</b>	0.882 0.798	<b>17.44</b>	18.11	16.77
<b>0.68</b>	<b>0.340</b>	0.365 0.315	<b>9.44</b>	9.84	9.04	<b>1.70</b>	<b>0.850</b>	0.893 0.808	<b>17.60</b>	18.28	16.92
<b>0.70</b>	<b>0.350</b>	0.375 0.325	<b>9.60</b>	10.00	9.20	<b>1.72</b>	<b>0.860</b>	0.903 0.817	<b>17.76</b>	18.45	17.07
<b>0.72</b>	<b>0.360</b>	0.385 0.335	<b>9.76</b>	10.16	9.36	<b>1.74</b>	<b>0.870</b>	0.914 0.827	<b>17.92</b>	18.62	17.22
<b>0.74</b>	<b>0.370</b>	0.395 0.345	<b>9.92</b>	10.32	9.52	<b>1.76</b>	<b>0.880</b>	0.924 0.836	<b>18.08</b>	18.78	17.38
<b>0.76</b>	<b>0.380</b>	0.405 0.355	<b>10.08</b>	10.48	9.68	<b>1.78</b>	<b>0.890</b>	0.935 0.846	<b>18.24</b>	18.95	17.53
<b>0.78</b>	<b>0.390</b>	0.415 0.365	<b>10.24</b>	10.64	9.84	<b>1.80</b>	<b>0.900</b>	0.945 0.855	<b>18.40</b>	19.12	17.68
<b>0.80</b>	<b>0.400</b>	0.425 0.375	<b>10.40</b>	10.80	10.00	<b>1.82</b>	<b>0.910</b>	0.956 0.865	<b>18.56</b>	19.29	17.83
<b>0.82</b>	<b>0.410</b>	0.435 0.385	<b>10.56</b>	10.96	10.16	<b>1.84</b>	<b>0.920</b>	0.966 0.874	<b>18.72</b>	19.46	17.98
<b>0.84</b>	<b>0.420</b>	0.445 0.395	<b>10.72</b>	11.12	10.32	<b>1.86</b>	<b>0.930</b>	0.977 0.884	<b>18.88</b>	19.62	18.14
<b>0.86</b>	<b>0.430</b>	0.455 0.405	<b>10.88</b>	11.28	10.48	<b>1.88</b>	<b>0.940</b>	0.987 0.893	<b>19.04</b>	19.79	18.29
<b>0.88</b>	<b>0.440</b>	0.465 0.415	<b>11.04</b>	11.44	10.64	<b>1.90</b>	<b>0.950</b>	0.998 0.903	<b>19.20</b>	19.96	18.44
<b>0.90</b>	<b>0.450</b>	0.475 0.425	<b>11.20</b>	11.60	10.80	<b>1.92</b>	<b>0.960</b>	1.008 0.912	<b>19.36</b>	20.13	18.59
<b>0.92</b>	<b>0.460</b>	0.485 0.435	<b>11.36</b>	11.76	10.96	<b>1.94</b>	<b>0.970</b>	1.019 0.922	<b>19.52</b>	20.30	18.74
<b>0.94</b>	<b>0.470</b>	0.495 0.445	<b>11.52</b>	11.92	11.12	<b>1.96</b>	<b>0.980</b>	1.029 0.931	<b>19.68</b>	20.46	18.90
<b>0.96</b>	<b>0.480</b>	0.505 0.455	<b>11.68</b>	12.08	11.28	<b>1.98</b>	<b>0.990</b>	1.040 0.941	<b>19.84</b>	20.63	19.05
<b>0.98</b>	<b>0.490</b>	0.515 0.465	<b>11.84</b>	12.24	11.44	<b>2.00</b>	<b>1.000</b>	1.050 0.950	<b>20.00</b>	20.80	19.20
<b>1.00</b>	<b>0.500</b>	0.525 0.475	<b>12.00</b>	12.40	11.60						

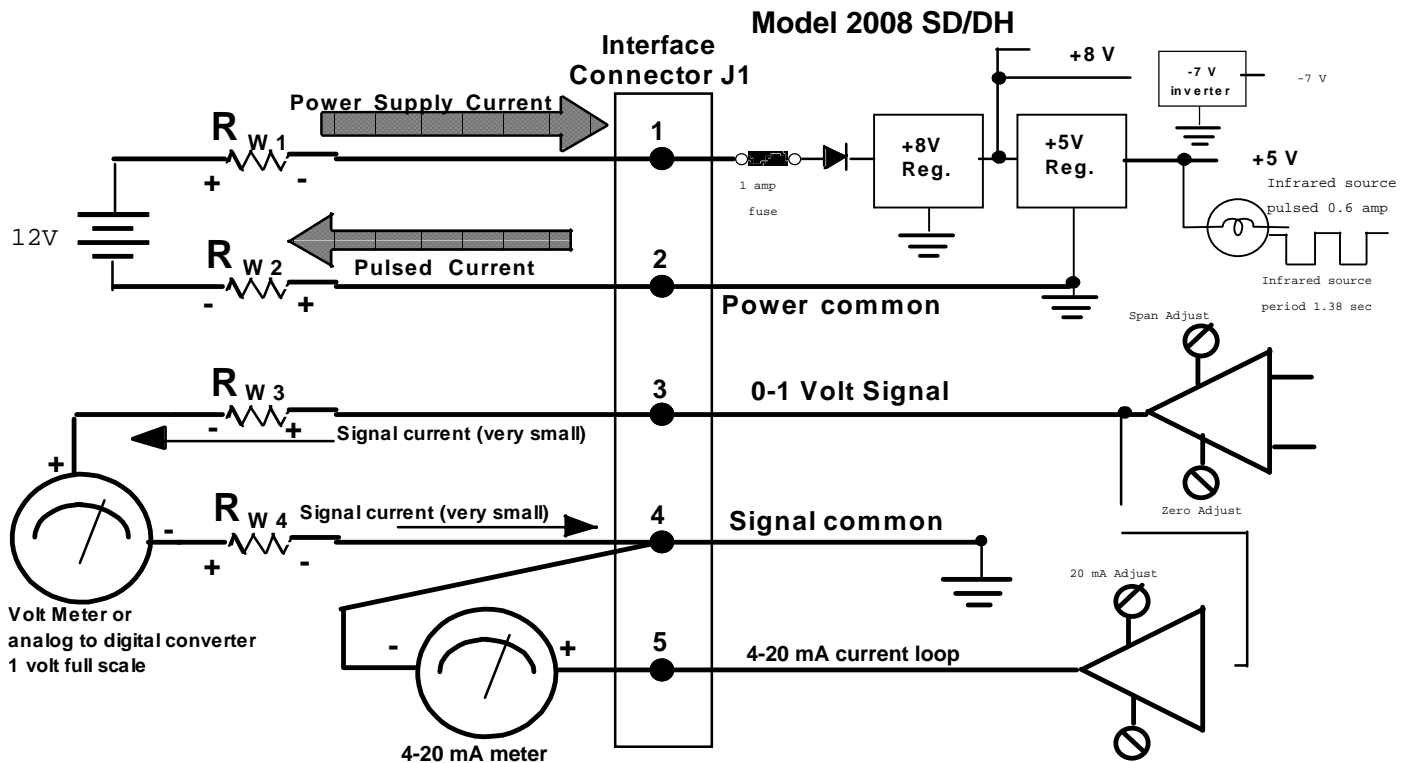
Accuracy = ±5% of reading from 1% CO<sub>2</sub> to 2% CO<sub>2</sub> and ±0.05% CO<sub>2</sub> from 0 to 1% CO<sub>2</sub> Chart modified on 10-9-97



The gas calibration hose barb (for 1/16 inch ID tubing) should be used every six to twelve months to adjust the ZERO and SPAN. Fresh air with about 400 ppm (0.04%) CO<sub>2</sub> would be OK as a zero gas and to adjust the ZERO potentiometer. A tank of dry nitrogen would be better because you would be sure that you do not pump any oil or particles into the gas cell. This calibration port should not be used as a gas sample port unless you are sure that all water droplets, oil, and dust particles are removed from that sample. The flow rate should not exceed 300 ml/min to avoid pressurizing the gas cell. Certified 0.5±0.01% CO<sub>2</sub> should be used to adjust the SPAN potentiometer. A span gas concentration near mid-scale (0.5%) will give better accuracy near that point. See Application Note A25 or A40 for more detailed calibration instructions. Valtronics will supply complete gas calibration kits upon request.



The following diagram is a symbolic representation of the interface terminal block TB1 (J1 on some 2008 units) and connections made to it. It shows why it is important to use a minimum of four (4) wires to operate it. If you use the 4 to 20 mA current loop output (pins 5 and 4), please remember that it will not drive more than about 300 ohms total resistance in that current loop. This is because the current loop's amplifier is powered from 8 volts DC. The full scale output of 20 mA multiplied by the loop resistance of 300 ohms results in an output voltage of 6.0 volts. Greater than 6 volts may not be reliably produced given worst case component tolerances and temperature conditions.



The pulsating power supply return current will take the path of least resistance. If the wire from pin# 2 is of a large diameter and short, the current will travel through it and not in the signal path which would introduce noise. The SIGNAL COMMON must have a separate wire for signal current to flow through. There must be a minimum of four (4) wires. A three (3) wire connection where one wire is used for both power supply and signal common will not work well even with the current loop. The current loop will compensate for wire resistance but it takes a few seconds to do that since we filter its response to about 10 seconds. The voltage produced across the wire resistance  $R_w$ , (source current of about 0.6 amp peak times the wire resistance) every 1.38 seconds will appear as noise.

Units are delivered gas calibrated at an elevation of about 700 ft. and 23°C (see Application Note A12). We will custom calibrate for special altitudes upon request. Calibration adjustments made to the ZERO potentiometer R11 and SPAN potentiometer R22 should only be done using certified (at least  $\pm 2\%$  of reading) calibration gas. Please refer to your manual and **VALTRONICS** Application Note A25 or A40 for detailed gas calibration instructions. Adjustments made to the 4 mA potentiometer R64 and the 20 mA potentiometer R63 should only be done after R11 and R22 are properly adjusted.