



Carbon Dioxide Monitor

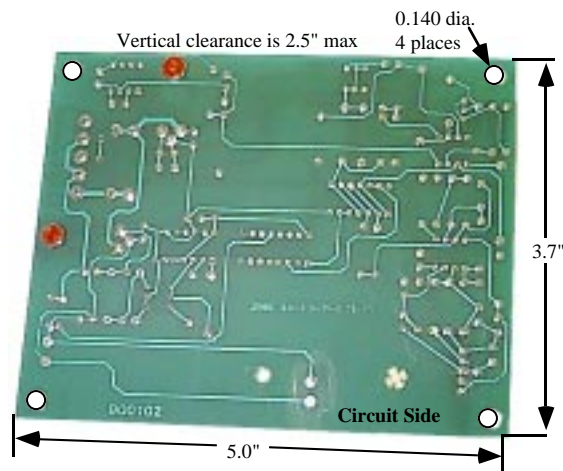
Model 2015N Rev-D 20% CO₂

Description:

The Valtronics Model 2015N Rev-D is a Non-Dispersive Infrared gas monitor, designed for continuous monitoring of Carbon Dioxide in the range of zero to 20% CO₂ full scale. Thermopile detector. The sample draw type of gas cell, with adjustable flow valve, is completely unaffected by humidity as long as no condensation occurs (refer to Valtronics Application Note A7- Recommended gas conditioning). The transducer output may be interfaced to any controller unit using its analog 0 to 1 Volt output signal (see data attached).

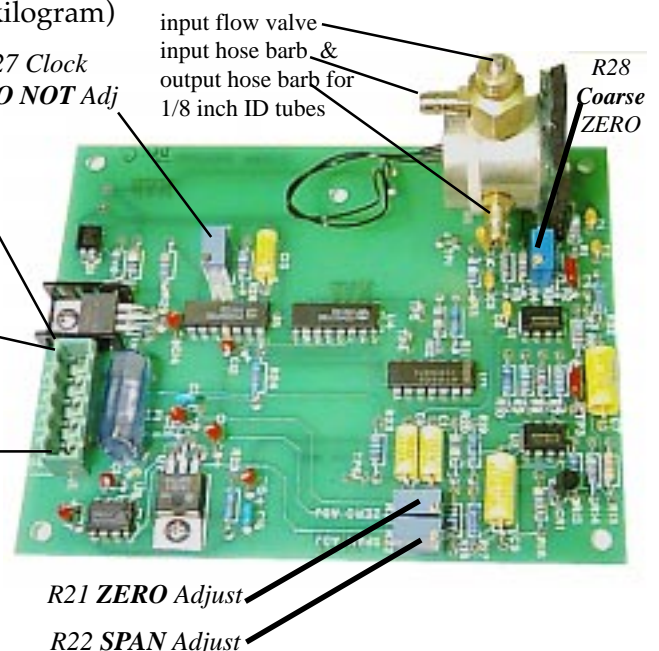
Model 2015N Rev-D 20% CO₂ Specifications:

- Method: N.D. I. R. (Non-dispersive Infra-red) Sample draw type gas cell: Hose barbs for 1/8 inch I.D. tubing. Adjustable flow valve on top as shown below: see Application Note A67
- Gas: Carbon dioxide (CO₂) 0.25 to 1.0 Liter per minute flow rate -**Hydrophobic filter**
- Range: 0-20% CO₂
- Accuracy: ± 5% of reading 5 to 18.5 CO₂ (± 0.25 CO₂ 0 to 5% CO₂) ± 7.5% of reading above 18.5%
- Repeatability: ± 1% of full scale, ± 0.1% CO₂ at 5% CO₂ (challenge with same gas sample and assure zero)
- External Power Source: 12 Volts D.C. @ 0.5 amp. max. (7.7 to 16.0 VDC absolute min. / max.)
see VTI **Application Note A3** -How to avoid GROUND LOOPS & EMI
- Power Consumption: 3 watts typical @ 12.0 VDC
- Output Signal: 0 to 1 volt = 0 to 20% CO₂ (non-linear scale data attached)
- Electronic Response Time: 8 seconds typical to a step change in gas concentration, gas response depends on flow rate
- Zero Noise at Constant Temperature: Less than 10 mV peak to peak (measured during any 20 second period)
- Zero Drift at Constant Temperature: .. Less than 2% of full scale per 24 hours (random not cumulative)
- Zero Drift due to Ambient Temp: Less than 0.5% of full scale per degree Centigrade
- Operating Temperature Range: 5 to 60°C see VTI Application Note A12
- Storage Temperature range: -40 to +70°C (-40 to +158°F)
- Operating Humidity Range: 5 to 95% RH (non-condensing) see Application Note A7 and A30
- Weight: Less than 0.5 pound (0.23 kilogram)
- Clearance Dimensions: 4" x 5" x 2.5"



Terminal Block interface to J1 is supplied:

1. +12 VDC
2. 12V return
3. 0-1 volt signal
4. Signal common
5. External zero adj





Model 2015N Rev-D 20% CO₂

The scale data table is shown below. The accuracy is based upon gas calibration points at 0.0 and 5.0% CO₂ at 25°C. Certified calibration gas of at least 5.0±0.1% accuracy is required. To check the rest of the scale requires the use of a precision flow blender or multiple bottles of laboratory grade ±1% of reading certified gases.

The accuracy tolerance band and the method of gas calibration is based upon the need for the **best accuracy at 5.0% CO₂** (the SPAN calibration point) to above 10% CO₂. The table shows the precise limits of this tolerance band.

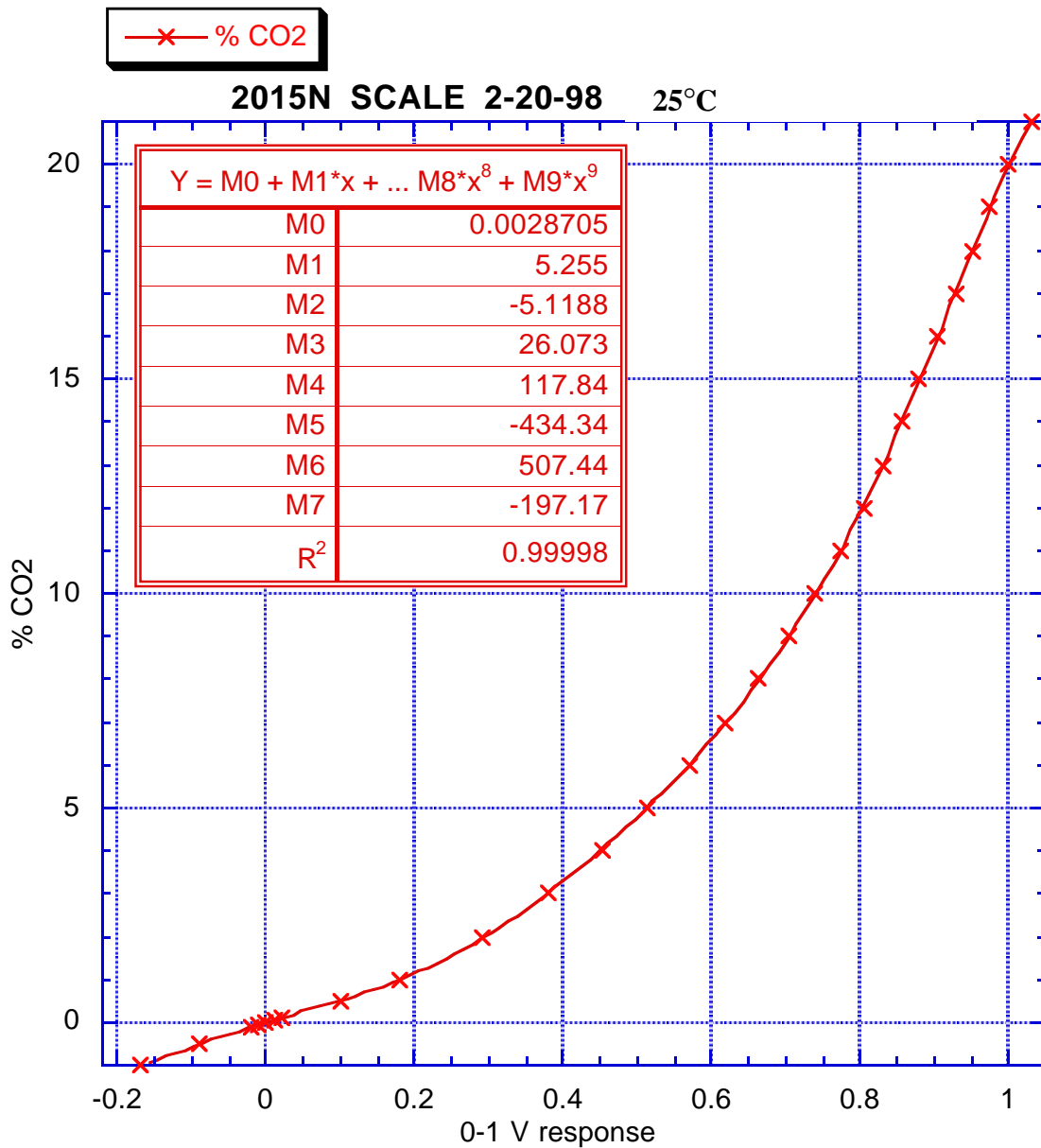
VALTRONICS 20% & 1 volt full scale, Model 2015N Data taken on 2-20-98 @ 25°C

Gas in %		Output in volts		±0.024 V		Gas in %		Output in volts		±5% Reading		Gas in %		Output in volts		±10% Reading			
in %	in volts	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max	Min	Max	Min	Max	Min	
0.0	0.000	0.024	-0.024																
0.1	0.022	0.046	-0.002	5.1	0.521	0.547	0.495	10.1	0.744	0.781	0.707	15.1	0.882	0.970	0.794				
0.2	0.044	0.068	0.020	5.2	0.527	0.553	0.501	10.2	0.747	0.784	0.710	15.2	0.884	0.972	0.796				
0.3	0.064	0.088	0.040	5.3	0.533	0.560	0.506	10.3	0.751	0.789	0.713	15.3	0.887	0.976	0.798				
0.4	0.083	0.107	0.059	5.4	0.538	0.565	0.511	10.4	0.754	0.792	0.716	15.4	0.889	0.978	0.800				
0.5	0.101	0.125	0.077	5.5	0.544	0.571	0.517	10.5	0.758	0.796	0.720	15.5	0.891	0.980	0.802				
0.6	0.119	0.143	0.095	5.6	0.549	0.576	0.522	10.6	0.761	0.799	0.723	15.6	0.894	0.983	0.805				
0.7	0.134	0.158	0.110	5.7	0.555	0.583	0.527	10.7	0.764	0.802	0.726	15.7	0.896	0.986	0.806				
0.8	0.150	0.174	0.126	5.8	0.560	0.588	0.532	10.8	0.768	0.806	0.730	15.8	0.899	0.989	0.809				
0.9	0.164	0.188	0.140	5.9	0.565	0.593	0.537	10.9	0.771	0.810	0.732	15.9	0.901	0.991	0.811				
1.0	0.179	0.203	0.155	6.0	0.570	0.599	0.542	11.0	0.774	0.813	0.735	16.0	0.903	0.993	0.813				
1.1	0.192	0.216	0.168	6.1	0.575	0.604	0.546	11.1	0.778	0.817	0.739	16.1	0.906	0.997	0.815				
1.2	0.205	0.229	0.181	6.2	0.580	0.609	0.551	11.2	0.781	0.820	0.742	16.2	0.908	0.999	0.817				
1.3	0.217	0.241	0.193	6.3	0.585	0.614	0.556	11.3	0.784	0.823	0.745	16.3	0.911	1.002	0.820				
1.4	0.229	0.253	0.205	6.4	0.590	0.620	0.561	11.4	0.787	0.826	0.748	16.4	0.913	1.004	0.822				
1.5	0.240	0.264	0.216	6.5	0.595	0.625	0.565	11.5	0.790	0.830	0.751	16.5	0.916	1.008	0.824				
1.6	0.252	0.276	0.228	6.6	0.600	0.630	0.570	11.6	0.793	0.833	0.753	16.6	0.918	1.010	0.826				
1.7	0.262	0.286	0.238	6.7	0.605	0.635	0.575	11.7	0.796	0.836	0.756	16.7	0.921	1.013	0.829				
1.8	0.273	0.297	0.249	6.8	0.609	0.639	0.579	11.8	0.799	0.839	0.759	16.8	0.923	1.015	0.831				
1.9	0.283	0.307	0.259	6.9	0.614	0.645	0.583	11.9	0.802	0.842	0.762	16.9	0.925	1.018	0.833				
2.0	0.292	0.316	0.268	7.0	0.619	0.650	0.588	12.0	0.805	0.845	0.765	17.0	0.928	1.021	0.835				
2.1	0.302	0.326	0.278	7.1	0.623	0.654	0.592	12.1	0.808	0.848	0.768	17.1	0.930	1.023	0.837				
2.2	0.311	0.335	0.287	7.2	0.628	0.659	0.597	12.2	0.811	0.852	0.770	17.2	0.933	1.026	0.840				
2.3	0.320	0.344	0.296	7.3	0.632	0.664	0.600	12.3	0.813	0.854	0.772	17.3	0.935	1.029	0.842				
2.4	0.329	0.353	0.305	7.4	0.637	0.669	0.605	12.4	0.816	0.857	0.775	17.4	0.938	1.032	0.844				
2.5	0.338	0.362	0.314	7.5	0.641	0.673	0.609	12.5	0.819	0.860	0.778	17.5	0.940	1.034	0.846				
2.6	0.347	0.371	0.323	7.6	0.645	0.677	0.613	12.6	0.822	0.863	0.781	17.6	0.942	1.036	0.848				
2.7	0.355	0.379	0.331	7.7	0.650	0.683	0.618	12.7	0.824	0.865	0.783	17.7	0.945	1.040	0.851				
2.8	0.363	0.387	0.339	7.8	0.654	0.687	0.621	12.8	0.827	0.868	0.786	17.8	0.947	1.042	0.852				
2.9	0.371	0.395	0.347	7.9	0.658	0.691	0.625	12.9	0.830	0.872	0.789	17.9	0.949	1.044	0.854				
3.0	0.379	0.403	0.355	8.0	0.662	0.695	0.629	13.0	0.832	0.874	0.790	18.0	0.952	1.047	0.857				
3.1	0.387	0.411	0.363	8.1	0.666	0.699	0.633	13.1	0.835	0.877	0.793	18.1	0.954	1.049	0.859				
3.2	0.395	0.419	0.371	8.2	0.671	0.705	0.637	13.2	0.837	0.879	0.795	18.2	0.956	1.052	0.860				
3.3	0.402	0.426	0.378	8.3	0.675	0.709	0.641	13.3	0.840	0.882	0.798	18.3	0.959	1.055	0.863				
3.4	0.410	0.434	0.386	8.4	0.679	0.713	0.645	13.4	0.842	0.884	0.800	18.4	0.961	1.057	0.865				
3.5	0.417	0.441	0.393	8.5	0.683	0.717	0.649	13.5	0.845	0.887	0.803	18.5	0.963	1.059	0.867				
3.6	0.424	0.448	0.400	8.6	0.687	0.721	0.653	13.6	0.847	0.889	0.805	18.6	0.965	1.062	0.869				
3.7	0.431	0.455	0.407	8.7	0.691	0.726	0.656	13.7	0.849	0.891	0.807	18.7	0.967	1.064	0.870				
3.8	0.439	0.463	0.415	8.8	0.695	0.730	0.660	13.8	0.852	0.895	0.809	18.8	0.970	1.067	0.873				
3.9	0.445	0.469	0.421	8.9	0.699	0.734	0.664	13.9	0.854	0.897	0.811	18.9	0.972	1.069	0.875				
4.0	0.452	0.476	0.428	9.0	0.703	0.738	0.668	14.0	0.856	0.899	0.813	19.0	0.974	1.071	0.877				
4.1	0.459	0.483	0.435	9.1	0.706	0.741	0.671	14.1	0.859	0.902	0.816	19.1	0.976	1.074	0.878				
4.2	0.466	0.490	0.442	9.2	0.710	0.746	0.675	14.2	0.861	0.904	0.818	19.2	0.978	1.076	0.880				
4.3	0.472	0.496	0.448	9.3	0.714	0.750	0.678	14.3	0.863	0.906	0.820	19.3	0.981	1.079	0.883				
4.4	0.479	0.503	0.455	9.4	0.718	0.754	0.682	14.4	0.866	0.909	0.823	19.4	0.983	1.081	0.885				
4.5	0.485	0.509	0.461	9.5	0.722	0.758	0.686	14.5	0.868	0.911	0.825	19.5	0.986	1.085	0.887				
4.6	0.491	0.515	0.467	9.6	0.725	0.761	0.689	14.6	0.870	0.914	0.827	19.6	0.988	1.087	0.889				
4.7	0.497	0.521	0.473	9.7	0.729	0.765	0.693	14.7	0.873	0.917	0.829	19.7	0.991	1.090	0.892				
4.8	0.504	0.528	0.480	9.8	0.733	0.770	0.696	14.8	0.875	0.919	0.831	19.8	0.994	1.093	0.895				
4.9	0.510	0.534	0.486	9.9	0.736	0.773	0.699	14.9	0.877	0.921	0.833	19.9	0.997	1.097	0.897				
5.0	0.515	0.539	0.491	10.0	0.740	0.777	0.703	15.0	0.880	0.924	0.836	20.0	1.000	1.100	0.900				

Accuracy = ±0.25% CO₂ from 0 to 5% CO₂, ±5% of reading from 5 to 15% CO₂ and ±10% of reading from 15.1 to 20% Chart revised on 7-2-98



A 7th order polynomial equation is shown below in the box. This may be used by a computer or microprocessor to calculate the non-linear response in % CO₂ (Y) from the measured 0 to 1 volt output signal (x).





The scale data table on page 2 is graphed below. The accuracy is based upon gas calibration points at 0.0 and 5.0% CO₂ at 25°C. Certified calibration gas of at least 5.0±0.1% accuracy is required. To check the rest of the scale requires the use of a precision flow blender or multiple bottles of laboratory grade ±1% of reading certified gases.

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