Digital NDIR Methane (CH_4) Sensor
with flow through gas cell Model 2015SPI-4

VALTRONICS

Description:

The *VALTRONICS* Model **2015SPI-4** is an OEM **NDIR** CH_4 sensor with digital signal processing and temperature compensation. The **SPI** (Serial Peripheral Interface) see Application Notes **A59** & **A64**. Each serial numbered sensor is individually gas calibrated and temperature compensated at the factory. Single Point field calibration is supported. On board & remote switches for calibration .

Model 2015SPI-4 Specifications:

Method: ..... **NDIR** with Digital Signal processing and temperature compensation
Gas: ..... **Methane** (CH_4)
Range: ..... **0-100% CH_4** (Full scale is **user selectable RANGE** from **4** to **100%** CH_4)
CAUTION: ..... **Lower Explosive Limit (LEL)** is **5.0** % CH_4 by volume in air
..... **Upper Explosive Limit (UEL)** is **15**% CH_4 by volume in air
Note: CH_4 levels near or above the LEL, unit should be enclosed in an **explosion proof housing** with flame arrestors in the gas path.
Input Power ..... **+12 VDC** (@ 0.250 amp max., 0.135 amp typ, 16.0 volts max, 8.0 volts min)
Accuracy: ..... if calibrated at 5% CH_4 using 5±0.1% CH_4 gas, the accuracy is best at
..... 0 to 5±0.25% CH_4 and 5% of reading from 5.5 to 100% CH_4.
Resolution / Repeatability : ..... **±0.1**% CH_4 on 5% Range(challenge w/same gas sample multiple times& assure zero)
Stability: ..... Less than 0.05% CH_4 digital out in any 20 second period at constant temperature
Output Signal: ..... **Digital SPI** and linear **0** to **1 volt linear output** signal. See App **Note A64**
..... Optional RS-232 Serial interface board. See **Application Note A66**
LED Indicators: ..... IR Source ON/OFF Indicator, Power ON indicator, Cal Switch Indicators.
Input Signal: ..... **Digital SPI** input for calibration and diagnostic modes. See App **Note A59**
Calibration Switches: ..... SW1 (Zero), SW2 (Span Target), SW3 (Span), SW4 (Range adj), remote via J3
Operating Temperature Range: ..... 0 to 50°C (32° to 122°F) see **Application Note A12**
Ambient Relative Humidity: ..... 0 to 95% RH non-condensing: see **Application Note A30**
Storage Temperature range:- ..... -40 to +70°C (-40 to +158°F)
Weight: ..... Less than 0.25 pound (<0.11 kilogram)
External Dimensions: PCB Card: ... **4.9**" x **2.9**" x **3.25**" see page 2 for mounting

0.156 dia. hole four places on 2.5 x 4.5 inch centers

Hose barbs for 1/8 inch ID tube, Flow between 0.2 to 0.9 LPM

All dimensions are in **inches,** max. vertical clearance is **3.25** inches

IR source ON/OFF indicator

J3: **remote cal switch intfc: Thomas & Betts 501-6-27ES**

J1: **I/O connector: Thomas & Betts 501-6-27ES**
a 6 pin keyed header with ejector latches.
SPI input/output & 0-1 volt linear

J2: 12 VDC input power
2 pin, 0.156 inch center header for insulation displacement connector like AMP or Panduit.

Power on indicator

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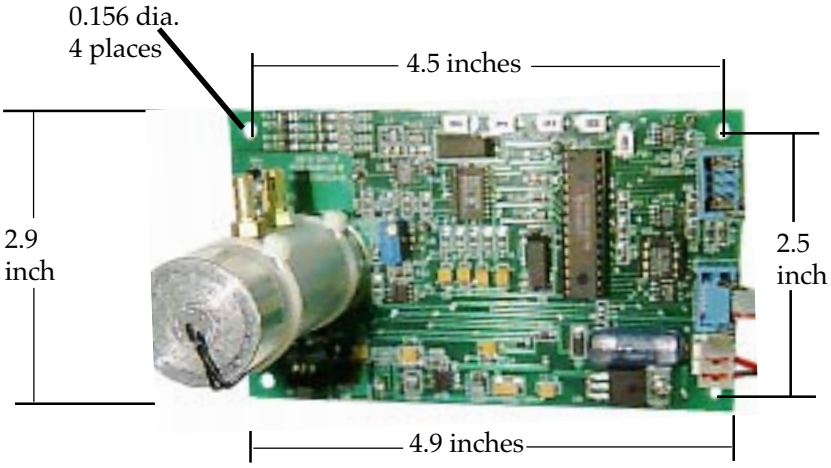
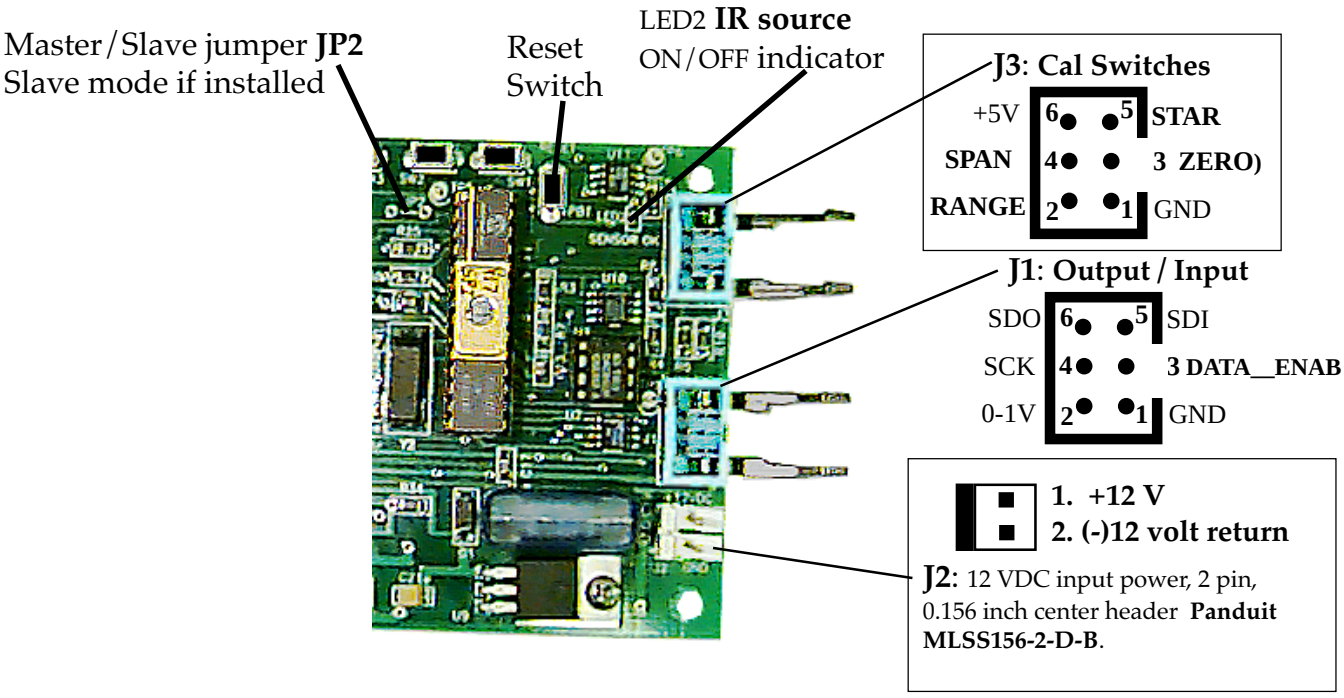
Model 2015SPI-4 (methane)

Hose barbs for 1/8 inch ID tube, Flow adjust between 0.2 to 0.8 LPM. Max. vertical clearance is **3.25** inches.



See **Application Note A67** for gas conditioning requirements and information about gas sample pumps and filters.

See **Application Note A75** for **interface connector** part numbers.



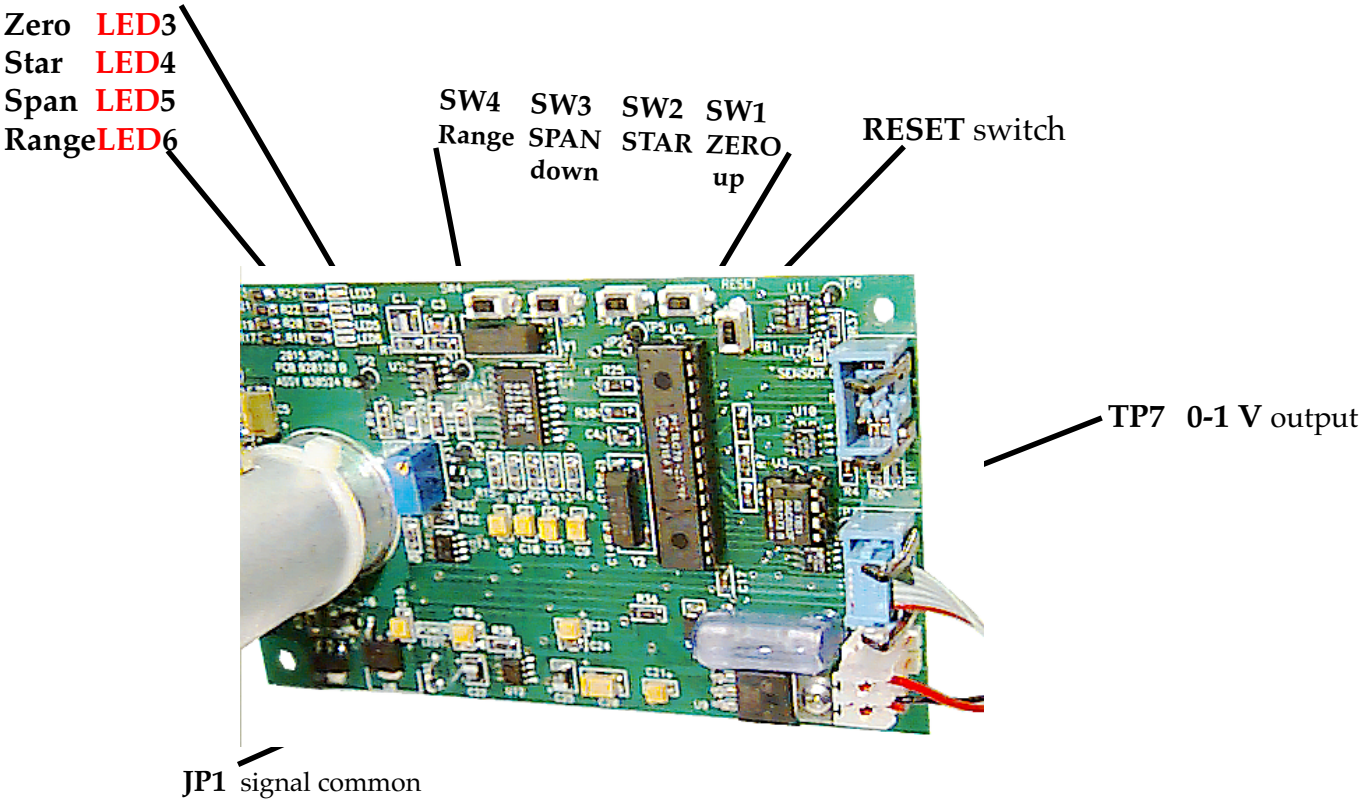
Gas calibration may be initiated via a command from the SPI input on **J3** (see Application Note A59) or from the on board or remote **switches** (Logic "0" to initiate) below :

ZERO (**SW1** or remote J4-3): With nitrogen flowing in gas calibration tube press and hold SW1 for 2 seconds. **LED3** through **6** will flash on & off together. If they flash on/off sequentially the sensor has detected an error & the **RESET** button must be pressed. Wait 1 minute and continue where you left off. The 0 to 1 volt output should snap to **0.0**±0.01 volt measured with a **DVM** "**+**" lead connected to **TP7** and "**-**" lead connected to **GND** test point. **LED3** will be **ON** to indicate a ZERO calibration.

RANGE (**SW4** or remote J4-2): To set the full scale or range press and hold SW4. From the chart on page 4 find the voltage value that corresponds to the full scale that you want from **4** to **100**% CH_4. **LED6** will be **ON** . Use SW1 as an **UP** and SW3 as a **DOWN** switch to adjust this value(100% = 1.00 v, 50% = 0.50 v, 30% = 0.3 v).

STAR (**SW2** or remote J4-5): To set the Span Target (calibration gas value) press and hold SW2. **LED4** will be **ON** Use SWI as an **UP** and SW3 as a **DOWN** switch to adjust this value read on the DVM. See chart on page 4.

SPAN (**SW3** or remote J4-4): To SPAN calibrate while flowing certified span gas like 5.0±0.1% CH_4 in gas calibration tube for at least 30 seconds at about 300 ml/min. Press & hold **SW3** for 2 seconds. **LED5** will be **ON** . The DVM voltage should snap to the STAR value entered above.



2015SPI-4 0-100% CH_4

RS232 test board connects to COM port

Use any PC with a terminal emulation program like **HyperTerminal** to test & calibrate the 2015SPI-4. See **Application Note A66** for commands and responses.

Model 2015SPI-4 0-100% CH_4 (methane)

Below is a table that shows the 0 to 1 volt output equivalent to any value for Full Scale **RANGE** or Span Target (**STAR**) anywhere from 4 to 100% CH_4. See page 3 & **Application Notes A59 & A66** for more detail. A typical application would be a full scale range of 100.0 and a **STAR** of 50.0

The Full Scale **Range** will set what % CH_4 will give an output of 1.00 volt in **normal operation**.

A Range of **100** will give a 0-1 V output of **0.500** volt for a reading of **50**% CH_4.
A Range of **80** will give a 0-1 V output of **0.500** volt for a reading of **40**% CH_4.
A Range of **5** will give a 0-1 V output of **1.000** volt for a reading of **5**% CH_4.

Please remember that calibration using the RS-232 Test board will give the user much better visibility. If you use the digital output you will not have to worry about the **RANGE** (16 bit digital resolution).

Table used for **Calibration** for setting the Full Scale & the Target Span Gas value, **STAR**(certified tank %)

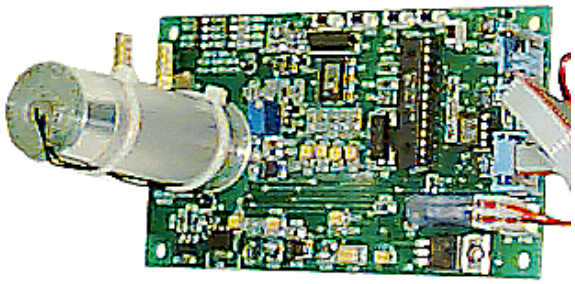
Range / STAR % gas	0 to1 V Output	Range / STAR % gas	0 to1 V Output
100	1.000	**50**	0.500
99	0.990	**49**	0.490
98	0.980	**48**	0.480
97	0.970	**47**	0.470
96	0.960	**46**	0.460
95	0.950	**45**	0.450
94	0.940	**44**	0.440
93	0.930	**43**	0.430
92	0.920	**42**	0.420
91	0.910	**41**	0.410
90	0.900	**40**	0.400
89	0.890	**39**	0.390
88	0.880	**38**	0.380
87	0.870	**37**	0.370
86	0.860	**36**	0.360
85	0.850	**35**	0.350
84	0.840	**34**	0.340
83	0.830	**33**	0.330
82	0.820	**32**	0.320
81	0.810	**31**	0.310
80	0.800	**30**	0.300
79	0.790	**29**	0.290
78	0.780	**28**	0.280
77	0.770	**27**	0.270
76	0.760	**26**	0.260
75	0.750	**25**	0.250
74	0.740	**24**	0.240
73	0.730	**23**	0.230
72	0.720	**22**	0.220
71	0.710	**21**	0.210
70	0.700	**20**	0.200
69	0.690	**19**	0.190
68	0.680	**18**	0.180
67	0.670	**17**	0.170
66	0.660	**16**	0.160
65	0.650	**15**	0.150
64	0.640	**14**	0.140
63	0.630	**13**	0.130
62	0.620	**12**	0.120
61	0.610	**11**	0.110
60	0.600	**10**	0.100
59	0.590	**9**	0.090
58	0.580	**8**	0.080
57	0.570	**7**	0.070
56	0.560	**6**	0.060
55	0.550	**5**	0.050
54	0.540	**4**	0.040
53	0.530		
52	0.520		
51	0.510		

See **Application Note A67** for information about gas conditioning and parts for filtering the gas and preventing water droplets from entering the gas cell. A **hydrophobic filter** in front of the gas inlet hose barb is required as a minimun to prevent particles & droplets from getting into the gas cell.

Equivalent Full scale % of some hydrocarbon compounds that the 2015SPI-4 will respond to:

Gas	*Chemical formula*	*LEL*	*% that produces a full scale response*	*Relative response*
Methane	**CH_4**	5.0 % in air	5.00 % CH_4	**1.00**
Propane	C_3H_8	2.1 % in air	1.50 % C_3H_8	3.33
Butane	C_4H_{10}	1.8 % in air	0.75 % C_4H_{10}	6.67
Ethane	C_2H_6	3.0 % in air	1.79 % C_2H_6	4.21
Ethylene	C_2H_4	2.7 % in air	2.37 % C_2H_4	2.11
Hexane	C_6H_{14}	1.2 % in air	0.75 % C_6H_{14}	6.67

response accuracy is not specified for compounds other than methane.



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