LAKEWOOD SYSTEMS LTD.
Remote Data Recording Products

IP-25MV
Rain-tight Input Plug
(0 - 25 mV Input Range)

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1 Introduction

The IP-25MV is a unique input plug with screw terminals on one end to allow easy hookup of single ended millivolt sensors. The other end has a connector that will connect to an R-XP External Plug Assembly. This allows easy connection to many Lakewood Systems' products such as the R-X Data Storage Unit or Chart Pac. The screw terminals are protected from the environment by use of a Rubber Boot Cover. Through the use of advanced electronics, the IP-25MV amplifies a 0-25 millivolt input into a 0 to 2.5 volt output. The IP-25MV features a quick response time (410 milliseconds), low power consumption, wide operating temperature range and sensor excitation if needed. This makes the IP-25MV perfect for interfacing to Pyranometer sensors, Quantum sensors and other half bridge or single ended sensors.

1.1 Terminal Assignments

The four screw terminals are used to connect the sensor. If the sensor does not need excitation power only two of the terminals are used. The first screw terminal (1) is common ground. The second screw terminal (2) is an analog input that has a useful input range of 0 to 25 millivolts. It has a high input impedance to eliminate sensor loading. The next two screw terminals (3,4) offer excitation for the sensor. The third screw terminal (3) is a precision 2.500 volt excitation output. This output has minimal drive capability (5 milliamperes maximum). The power is pulsed on for a short duration then turned off. The length of the on-time power pulse can be set when programming the datalogger's header. The fourth screw terminal (4) is a B+ switched output. The voltage level of the B+ terminal depends on the battery system being used with the datalogger. The on-time is the same as that for the 2.500V precision excitation output. Fig. 1 shows the position of the screw terminals.

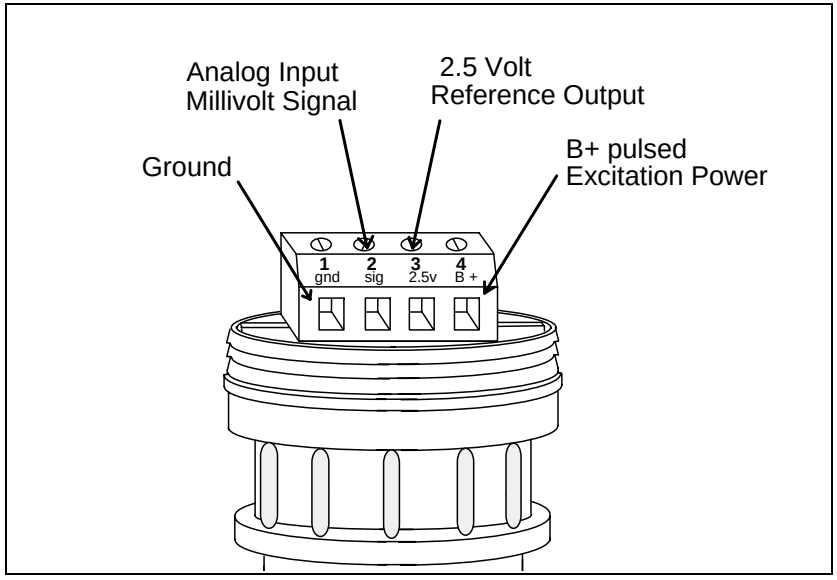

Fig. 1 IP-25MV Terminal assignment.

Make sure the screw terminal is fully open before inserting the wire. A small tug on the wire after tightening can assure the wire is secure.

1.2 Using The Rubber Boot Cover

The rubber boot cover can be used to keep the screw terminals protected from the environment. To use the cover, turn it inside out as shown in Fig. 2 and make a small hole to let the wire through. By using a tywrap you can then clamp the wire at the position you desire.

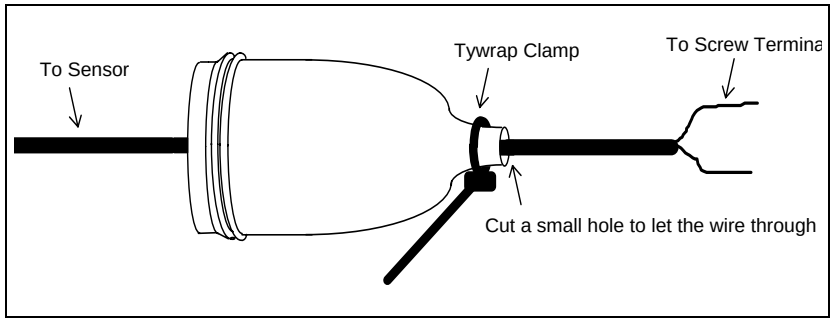

Fig. 2 Preparing the Rubber Boot Cover.

Once you have screwed the wires down and returned the rubber boot cover from the inside out position you can slip it over the screw terminals shown in Fig. 3 below.

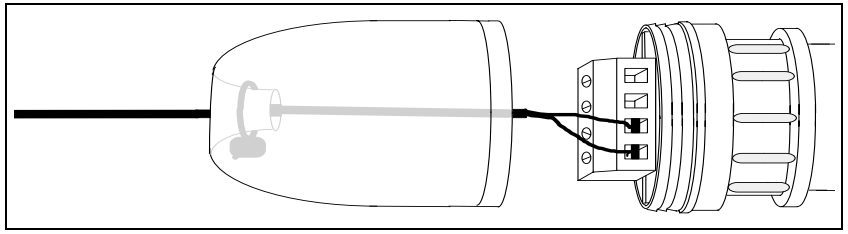

Fig. 3 Final Mounting of the Rubber Boot Cover.

1.3 Software Requirements

The IP-25MV has two settings in the datalogger's programming header that must be correct. The first is warm-up time and the second is a 0 to 2.5 volt range setting. The following example in Fig. 4 would be used if the IP-25MV was connected to analog channel one and if the probe connected to the IP-25MV did not require a longer excitation warm-up time than the 410 milliseconds. The IP-25MV requires a minimum warm-up time of 410 milliseconds. If the excitation warm-up time is too short, the probe's output will differ between AUX PULSED readings and AUX CONTINUOUS readings. AUX PULSED readings are monitor screen values taken when AUX power is being pulsed. AUX CONTINUOUS readings are monitor screen values taken when AUX power is turned on continuously. Keep increasing the warm-up time until the AUX PULSED readings and the AUX CONTINUOUS readings match.

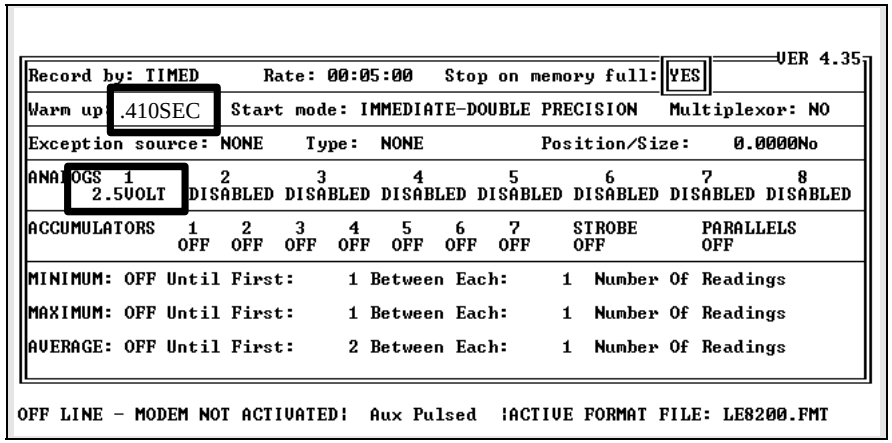

Fig. 4 Example Header Settings

1.4 Entering the IP-25MV into the Library

The IP-25MV amplifies the sensor's output by 100. This makes the entries for the Library 100 times what the sensor calibration sheets show. For example a pyranometer sensor outputs:

10 mV x CaI for $^{1000W}/_{m^2}$

Where CAL is a constant for the specific probe. After looking at the calibration sheet we see a Calibration Constant in microamps. We can use the suggested 147Ω resistor to convert the microamps into millivolts. The following formula shows the conversion.

Since 83.6 microamps = $^{1000Watts}/_{m^2}$

83.6 microamps x 147W = 12.29 mV

So when the sensor is exposed to 1000 Watts/m^2 it will output 12.29mV if it's calibration constant on the Certificate of Calibration is 83.6 microamps per 1000 watts m^{-2}. Since the IP-25MV amplifies the sensor's signal by 100 times, the voltage going into the datalogger will be:

12.29 mV x 100 = 1.229V

Our library entries would then be as shown in Fig. 5.

Fig. 5 Example Library Curve Fitting for a Pyranometer.

```
 -LEAST SQUARES CURVE FITTING -

ENTER A DATA PAIR IN RESPONSE TO EACH QUESTION MARK.
EACH PAIR IS A DATALOGGER VALUE AND AN ENGINEERING UNIT
VALUE SEPARATED BY A COMMA. THIS WILL ALLOW YOU TO
ENTER THE EXPECTED OUTPUTS AT DIFFERENT VOLTAGES.

WHEN YOU HAVE ENTERED ENOUGH POINTS TYPE  999 , 999 TO END.
MAXIMUM OF 30 DATA PAIRS WILL BE ACCEPTED.

Voltage,Units? 0,0
Voltage,Units? 1.229,1000
Voltage,Units? 999,999

 2 DATA PAIRS ENTERED

DEGREE OF POLYNOMIAL TO BE FITTED ? 1

X POWER          COEFFICIENT
   0           0
   1           813.66965012205

Accuracy of Curve Fit = 100

CONTINUATION OPTIONS
  1 - DETERMINE SPECIFIC POINTS
  2 - FIT ANOTHER DEGREE TO THE SAME DATA
  3 - SAVE COEFFICIENTS TO DISK FOR LOTUS
  4 - SAVE DATA PAIRS TO DISK FOR LOTUS
  5 - LIST TABLE OF CALC. Y POINTS
  6 - EXIT AND USE THE COEFFICIENTS FOR THE PROBE BEING EDITED
  7 - EXIT AND DISCARD THE FITTED COEFFICIENTS
WHAT NEXT? 6
```

The probe's description and other parameters can also be entered as shown in Fig. 6.

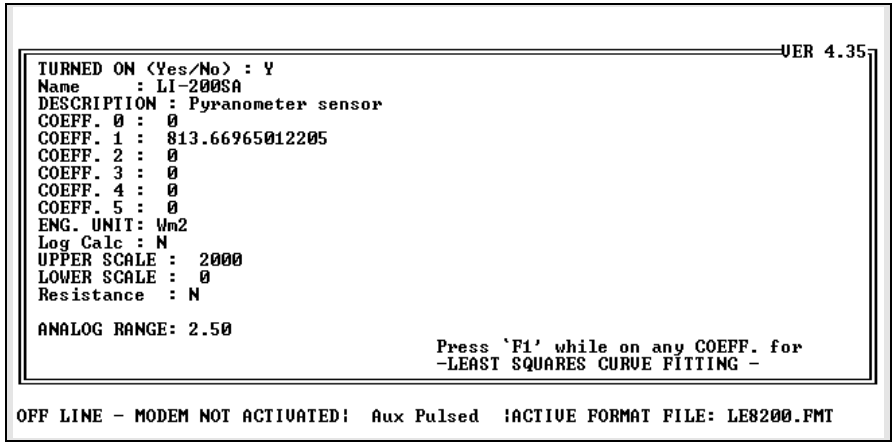

Fig. 6 Library Parameters for our Example Pyranometer.

1.5 Using a R-XP External Plug with the IP-25MV

The IP-25MV can be wired to an *Ultra-Logger* directly through the UL16-TB Terminal Board by using an R-XP External Plug Assembly. The wiring and mounting information is shown in Fig. 7 .

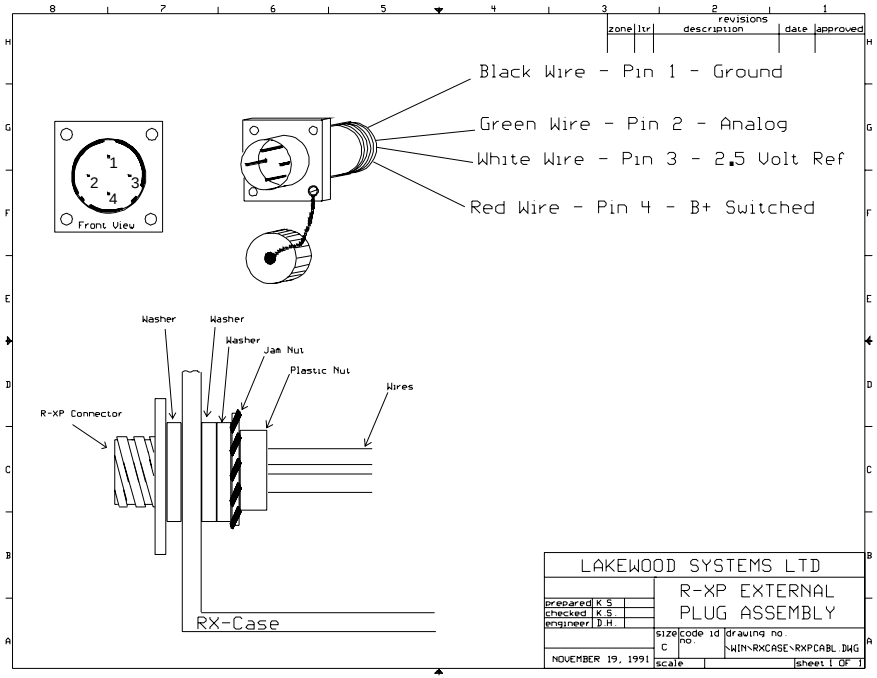

Fig. 7 R-XP Wiring and Mounting Information

1.6 Specifications

Parameter	Min	Typical	Max	Units
Operating Voltage Pin 4	5.5	12	16	Volts
Maximum Output Voltage		2.5	4.7	Volts
Input Range	0.0		25.0	mV
Input Offset Voltage		±2.0	±10.0	µV
Average Input Offset Drift		±0.02	±0.1	µV/°C
Current Consumption (no probe)		70	100	µA
Operating Temperature Range	-40	25	65	°C
Voltage Gain of Output/Input	99.8	100.0	100.2	Av
Turn On Delay	330	410	∞	ms

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