LI200S-LC PYRANOMETER
FOR
METDATA1

4/97

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CAMPBELL SCIENTIFIC, INC.
RMA#_____
815 West 1800 North
Logan, Utah 84321-1784

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LI200S-LC PYRANOMETER
FOR METDATA1

1. GENERAL

This manual provides information for interfacing the LI200S Pyranometer to the MetData1 system. An instruction manual provided by LI-COR contains the sensor calibration constant and serial number. Cross check this serial number against the serial number on your LI200S to ensure that the given calibration constant corresponds to your sensor.

2. SPECIFICATIONS

Stability:	<±2% change over a 1 year period
Response Time:	10 µs
Temperature Dependence:	0.15% per °C maximum
Cosine Correction:	Cosine corrected up to 80° angle of incidence
Operating Temperature:	-40 to 65°C
Relative Humidity:	0 to 100%
Detector:	High stability silicon photovoltaic detector (blue enhanced)
Sensor Housing:	Weatherproof anodized aluminum case with acrylic diffuser and stainless steel hardware
Size:	0.94" dia x 1.00" H (2.38 x 2.54 cm);
Weight:	1 oz. (28 g)
Accuracy:	Absolute error in natural daylight is ±5% maximum; ±3% typical
Typical Sensitivity:	0.2 $kWm^{-2}mV^{-1}$
Linearity:	Maximum deviation of 1% up to 3000 Wm^{-2}
Shunt Resistor:	Adjustable, 40.2 to 100 Ω, factory set to give the above sensitivity
Light Spectrum Waveband:	400 to 1100 nm

NOTE: The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and UV degradation. However, this jacket will support combustion in air. It is rated as slow burning when tested according to U.L. 94 H.B. and will pass FMVSS302. Local fire codes may preclude its use inside buildings.

3. DATALOGGER PROGRAMMING

NOTE: Information in this section is not necessary when programming the MetData1 with the Short Cut Program Builder software.

The LI200S outputs a low level voltage ranging from 0 to a maximum of about 12mV depending on sensor calibration and radiation level. The MetData1 datalogger measures the LI200S differentially (Instruction 2) using channels 3H and 3L.

MetData1 Datalogger Program Instruction

```
01      P2              Volt (Diff)
  01:        1          Rep
  02:        8          Range
  03:        3          Diff Chan
  04:        *          Loc [: Solar]
  05:     (**)          Multiplier
  06:        0          Offset
```

* Proper entries will vary with input location assignment.

** Refer to following sections.

3.1 INPUT RANGE

An example showing how to determine the optimum input range for a given sensor calibration and maximum irradiance follows. **This is an example only. Your values will be different.**

3.2 EXAMPLE

-<u>Sensor Calibration:</u> Assume the sensor calibration is 87 microamps kW^{-1} m^{-2}. The LI200S outputs amperage which is converted to voltage by 100 ohm shunt resistor in the cable, as shown in Figure 1. To convert the calibration from microamps to millivolts, multiply the calibration by 0.100. The example calibration changes to 8.7 mV kW^{-1} m^{-2}.

-<u>Maximum Irradiance:</u> A reasonable estimate of maximum irradiance at the earth's surface is 1 kW m^{-2}.

-<u>Input Range Selection:</u> An estimate of the maximum input voltage is obtained by multiplying the calibration by the maximum expected irradiance. That product is 8.61mV for this example. Select the smallest input range which is greater than the maximum expected input voltage. In this case the 15mV range for the 21X and CR7, and the 25mV range for the CR10(X) are selected.

Measurement integration time is specified in the input range parameter code. A more noise free reading is obtained with the slow or 60 Hz rejection integration. A fast integration takes less power and allows for faster throughput.

3.3 MULTIPLIER

The multiplier converts the millivolt reading to engineering units. Commonly used units and how to calculate the multiplier are shown in Table 1.

Table 1. Multipliers Required for Flux Density and Total Fluxes

UNITS	MULTIPLIERS	
kJ m-2	(1/C)*t	(Total)
kW m-2	(1/C)	(Average)
cal cm-2	(1/C)*t*(0.0239)	(Total)
cal cm-2 min-1	(1/C)*(1.434)	(Average)

C = (LI-COR calibration)*0.100
t = datalogger program execution interval in seconds

3.4 OUTPUT FORMAT CONSIDERATIONS

The largest number that the datalogger can output is 6999 in low resolution and 99999 in high resolution (Instruction 78, set resolution). If the measurement value is totalized, there is some danger of overranging the output limits, as shown in the following example.

EXAMPLE

Assume that **daily total flux** is desired, and the datalogger scan rate is 1 second. With a multiplier that converts the readings to units of kJ m^{-2} and an average irradiance of .5 kW m^{-2}, the maximum low resolution output limit will be exceeded in less than four hours.

Solution #1 - Record **average** flux density and later multiply the result by the number of seconds in the output interval to arrive at total flux.

Solution #2 - Record total flux using the high resolution format. The drawback to high resolution is that it requires 4 bytes of memory per data point, consuming twice as much memory as low resolution.

4. CONNECTIONS

The LI200S cable is attached to the MetData1 connector #3. Close the MetData1 internal jumper #2 as shown in Figure 4-1. Open jumper #3.

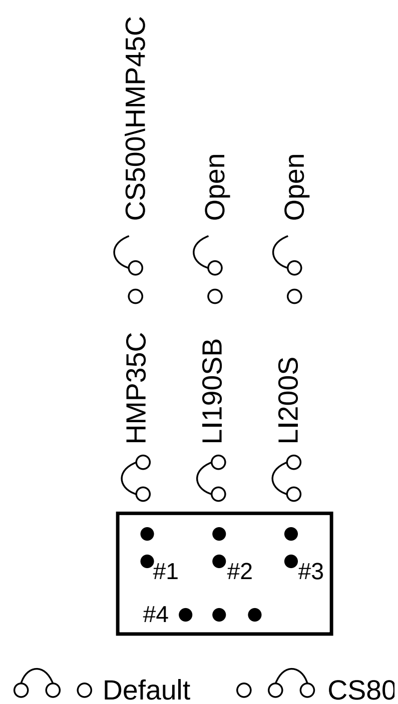

FIGURE 4-1. MetData1 Jumper Configuration