Interfacing PMA Detectors to a Campbell Datalogger

Application Note 111

Overview

Following is a set of instructions to guide you through programming and wiring a PMA series detector to a Campbell CR10 datalogger. This example uses an outdoor UVB detector with temperature compensation algorithm, model PMA1102.

The PMA series detectors require a ±5V power supply. A power supply inverter is available from Solar Light Co. (part number PMA2010). This inverter requires a positive voltage from 5 to 12V DC and will produce a ±5V supply for the detector. Current requirements may vary, be sure to check your detector's current requirement on the product specification sheet.

Connecting a PMA1102 to Campbell CR10 Datalogger

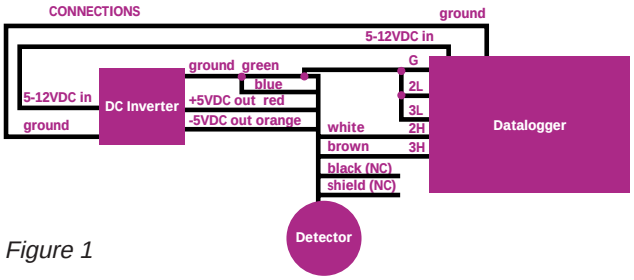

Figure 1

PMA series detector connected to a Campbell CR10 datalogger using a PMA2010 inverter box. The inverter box is only required if a –5V supply is not available.

Programming

The following programming example is a guideline. Before deploying, careful testing must be done by each user to determine if all functions of their program are functioning properly.

```
*       . . . . . .1 . . . .Table 1 Programs
    01:  . . . . . .1 . . . .Sec. Execution Interval
```

Section 1.0

Measure CR10 Battery Voltage

```
01:   . . . . .P   . .10 . . .Battery Voltage
      01 . . . . . .10 . . .Loc[:BatryVolt]
```

Section 2.0

The Multiplier (M) will equal the calibration factor provided by Solar Light Co. Typical values are 25 to 50 MEDs/Hr/V or 0.025 to 0.050 MEDs/Hr/mV

The offset (O) will equal the dark value multiplied by –1. The offset will also be supplied by Solar Light Co. Typical values are between –3mV and +3mV.

```
02:   . . . . .P   . .2 . . . .Volt(DIFF)
      01:  . . . . . .1 . . . .Rep
      02:  . . . . . .25 . . .2500mV 60 Hz rejection Range
      03:  . . . . . .2 . . . .IN Chan
      04:  . . . . . .1 . . . .Loc[:MED / Hr]
      05:  . . . . . M . . .Mult          User entered value
      06:  . . . . . O . . .Offset        User entered value
```

Section 3.0

Measure PMA1102 Temperature Sensor

```
08:   . . . . .P   . .2 . . . .Volt(DIFF)
      01:  . . . . . .1 . . . .Rep
      02:  . . . . . .25 . . .2500 mV 60 Hz rejection Range
      03:  . . . . . .3 . . . .IN Chan
      04:  . . . . . .2 . . . .Loc [:PMA_Temp]
      05:  . . . . . .0.1  . .Mult
      06:  . . . . . .-500  .Offset
```

Section 4.0

This section applies a temperature effect correction factor of 1.0% per degree C using the following formula:

$$SUVcorr = \frac{SUVmeas}{1 + (T\ det\text{-}25) \times 0.01}$$

where SUVmeas is 'MED/Hr' prior to correction, SUVcorr is 'MED/Hr' after correction, and Tdet is 'PMA_Temp'.

```
09:   . . . . .P   . .34 . . .Z=X+F
      01:  . . . . . .2 . . . .X Loc PMA_Temp
      02:  . . . . . .-25  . .F User input: Temp in degrees C at
      03:  . . . . . .3 . . . .ZLOC[:TcorFactr]   calibration * -1

10:   . . . . .P   . .37 . . .Z=X+F
      01:  . . . . . .3 . . . .X Loc TcorFactr
      02:  . . . . . .0.01  .F
      03:  . . . . . .3 . . . .Z Loc [:TcorFactr]

11:   . . . . .P   . .34 . . .Z=X+F
      01:  . . . . . .3 . . . .X Loc TcorFactr
      02:  . . . . . .1 . . . .F
      03:  . . . . . .3 . . . .Z Loc[:TcorFactr]
```

```
12:  . . . . .P   . .38 . . .Z=X/Y
     01:  . . . . . .1 . . . .X Loc MED/Hr
     02:  . . . . . .3 . . . .Y Loc TcorFactr
     03:  . . . . . .1 . . . .Z Loc[:MED/Hr]
```

Section 5.0

Calculate KW/m^2 from MEDs/Hr. The conversion factor from Solar Light Co. is 58.3E-6 kW/m^2 / MED/Hr. This is performed in two steps.

```
13:  . . . . .P   . .37 . . .Z=X*F
     01:  . . . . . .1 . . . .X Loc MED/HR
     02:  . . . . . .5.85  .F
     03:  . . . . . .11  . . .Z Loc[:kWm^-2]

14:  . . . . .P   . .37 . . .Z=X*F
     01:  . . . . . .11  . . .X Loc kWm^-2
     02:  . . . . . .0.00001    F
     03:  . . . . . .11  . . .Z Loc[:kWm^-2]
```

Section 6.0

Calculate MEDs and kJ / m^2

```
15:  . . . . .P   . .30 . . .Z=F
     01:  . . . . . .2.7778
       . . . . . . . . . . . . . .F (Exec. Interval in secs. / 3600)
     02:  . . . . . .4 - -  .Exponent of 10
     03:  . . . . . .6 . . . .Z Loc[:HrsLapsed]

16:  . . . . .P   . .36 . . .Z=X*Y
     01:  . . . . . .1 . . . .X Loc MED/Hr
     02:  . . . . . .6 . . . .Y Loc HrsLapsed
     03:  . . . . . .7 . . . .Z Loc[:MEDs]

17:  . . . . .P   . .37 . . .Z=X*F
     01:  . . . . . .11  . . .X Loc kW m^-2
     02:  . . . . . .1 . . . .F (Execution Interval in Seconds)
     03:  . . . . . .12  . . .Z Loc[:kJ m^-2]
```

Section 7.0

Output hourly averages (MED / Hr, kW / m^2) and totals (MEDs, kJ / m2)

```
18:  . . . . .P   . .92 . . .If time is
     01:  . . . . . .0 . . . .minutes (seconds—) into a
     02:  . . . . . .60  . . .minute or second interval
     03:  . . . . . .10  . . .set high Flag 0 (output)

19:  . . . . .P   . .77 . . .Real Time
     01:  . . . . . .220 . .Day, Hour-Minute

20:  . . . . .P   . .71 . . .Average
     01:  . . . . . .1 . . . .Rep
     02:  . . . . . .1 . . . .Loc MED / Hr

21:  . . . . .P   . .71 . . .Average
     01:  . . . . . .1 . . . .Rep
     02:  . . . . . .11  . . .Loc kW m^-2

22:  . . . . .P   . .72 . . .Totalize
     01:  . . . . . .1 . . . .Rep
     02:  . . . . . .7 . . . .Loc MEDs

23:  . . . . .P   . .72 . . .Totalize
     01:  . . . . . .1 . . . .Rep
     02:  . . . . . .12  . . .Loc kJ m^-2
```

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