

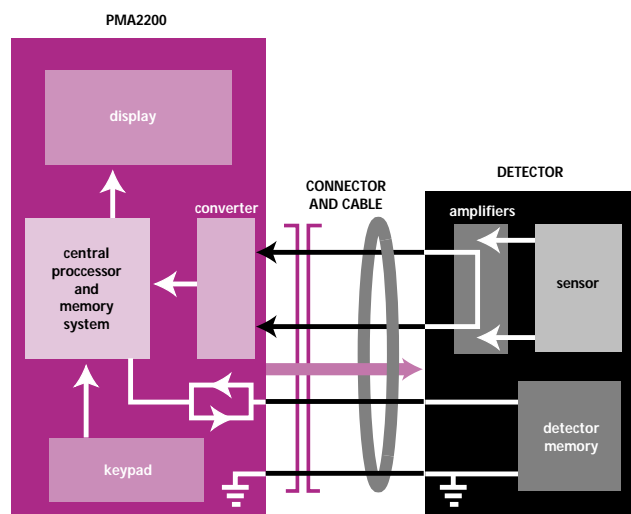
# PMA Meter Operation

## APPLICATION NOTE 112

### Overview

The PMA family of meters are designed to save customers the time and cost of finding, purchasing, learning, and utilizing meters which are dedicated to one operation. The PMA meters incorporate a patented technology which allows the user to interchange detectors without sacrificing the functionality of a dedicated meter. At present, Solar Light Company offers over 30 different detectors for radiation measurement (light measurement), plus additional detectors for temperature and humidity. However, the PMA's flexibility allows other manufacturers' detectors to be integrated quickly and inexpensively.

### PMA Meter Diagram



### Description of Meter Operation

The PMA family of instruments utilize a highly accurate A/D converter (18 to 22 bits) to measure voltage inputs from the detector. The PMA has a series of analog inputs (the number varies between meters) which are multiplexed together before being applied to the Analog to Digital converter. The problem with just measuring the voltage is that the meter must be able to convert the voltage into usable units. This is accomplished using Solar Light's patented intelligent sensor technology. By storing the conversion algorithms (along with other data) in a memory module contained in the detector itself, the PMA can download this program and execute it as necessary. This capability demonstrates the unlimited number of different kinds of detectors the PMA can handle.

### Sensor Technology

Dedicated meters with built in sensors become expensive and bulky when more than one parameter must be measured. The PMA family reduces this awkwardness by using the interchangeable intelligent detector technology. It incorporates many detectors which measure different parameters in a single handheld instrument. This not only reduces size, weight and cost, but also shortens the learning curve for using multiple meters simultaneously.

The memory module incorporated into the detector itself holds the voltage-to-units conversion routines, all calibration factors, and the name, type and serial number of the detector as well as other data.

### User Selectable Units

Since multiple voltage conversion routines can be stored in the detector memory, multiple units for the same measurement are also possible. For instance, to measure a UV irradiance, the detector can display units of mW/cm<sup>2</sup>, μW/cm<sup>2</sup>, W/m<sup>2</sup>, etc. Each of the units which were programmed into the detector can be viewed on the meter one at a time by cycling through them using the UNITS key (F1 softkey on the PMA2100). Programs which use more than one analog input can also be run. For instance, the PMA2170 detector is a temperature and humidity probe. In this case, one analog voltage input is a voltage which represents the temperature, and a second analog voltage represents humidity.

By cycling through the units, the user can see readings of temperature in °C or °F and humidity can be displayed in %RH. In addition to temperature and humidity, Dew Point can be calculated by measuring both temperature and humidity and combining them in an algorithm which is stored like any other algorithm in the memory module. The units for dew point are DP°C and DP°F. Therefore, for the PMA2170 pressing the UNITS key will cycle through units of °C, °F, %RH, DP°C, DP°F.

### Detector Inputs

All PMA meters can accept at least one detector with multiple analog inputs for each detector. A description follows:

Meter	Max Detector inputs	Analog inputs
PMA2100	.2	.4 (Max 2 per det)
PMA2200	.1	.4 (Max 4 per det)
PMA2300	.4	.8 (Max 4 per det)

(adapter required after 2)

### Dose Integration

Dose integration is the process which calculates the accumulated dose over time. Dose is derived by integrating the intensity of the parameter being measured over time. For instance, the intensity is added to the dose once every second. This feature is very valuable for integrating a dose of energy especially if the source being measured is not continuous or stable.

### Min/Max

The Min/Max feature displays a record of the minimum and maximum reading which has been observed since the Min/Max feature was enabled. Min/Max is useful in situations where continuous observation of the meter is not possible, and minimum or maximum readings are necessary.

### Average

The average feature displays a record of the average reading since the average feature was enabled. The Average feature is useful in situation where an unstable source needs to be monitored. The average function will smooth out all of the noise generated by the source.

# PMA Meter Operation

## A P P L I C A T I O N   N O T E   1 1 2

### Scale and Offset

Scale and offset features are not available on the PMA2200 meter. The scale and offset can be changed to account for inaccuracies or offsets in a given situation. Offset (usually set to 0.00) may be useful for subtracting out errors due to stray light or ambient light. This can also be done by using the ZERO function on the PMA2200. Scale is used to change the scale or multiplication factor of the detector (usually set to 1.00). Scale may be useful if you want to calibrate the detector to your own source. Both scale and offset are stored in the detectors memory module and will be remembered next time the detector is plugged into the PMA meter. For more information on scale and offset please refer to application note AN-117.

### Datalogging

Datalogging is not available in the PMA2200. Datalogging in the PMA family of detectors is accomplished by saving the displayed reading to non-volatile memory. Along with the data reading, the PMA will also save additional information to annotate the data point. The annotated information includes detector type (model), detector serial number, the date, the time, the data point itself, the units in which the data point was saved, the level at which the scale factor was set, flags which indicate enabled features such as integration etc, and the detector's calibration due date. The value which is stored is an instantaneous value which is sampled at the moment of storage. However, if the PMA is integrating when datalogging takes place, an average value will be logged instead of the instantaneous value. The average value is calculated as the average intensity since the last data point was saved. Although the PMA2200 does not have datalogging capabilities within the meter itself, the PMA23XXD series detectors can be purchased to handle a small amount of data logging themselves. Please see detector data sheets for details.

### Alarms

Threshold alarms can be set in the PMA meters to indicate a threshold has been crossed. When the alarm is tripped, an audible warning and a message on the LCD will be seen. Alarm capabilities vary depending on the PMA meter itself. Following is a comparison of alarm capabilities among the PMA family of meters:

PMA2100 . . . . .High value and dose alarms.  
PMA2200 . . . . .No alarms available.  
PMA2300 . . . . .High and low value and dose alarms.

### I/O

All PMA meters have optically coupled inputs and outputs. On the PMA2100 meter, the I/O is used in conjunction with the alarms. When an alarm is triggered, a digital output is set to give feedback to the outside world. The PMA2200 and PMA2300 have I/Os which can be programmed by the detector which is plugged into the meter. In this case, the I/O can be used as an alarm indicator (if available) or it can be some other function depending on the detector itself. For more information on I/O and applications please refer to application note AN-119.

### Serial Port

All PMA meters have an RS232 port on a 25-pin D connector located on the bottom of the instrument. The RS232 port functionality varies among the meters and is described below.

- PMA2100 Datalogging download (download of data)
- PMA2200 Set time, date, and detector data download (if available)
- PMA2300 to be determined

### Multiple Options

As previously described, the PMA family of meters have many useful features which make it a precise yet flexible instrument. This is largely due to Solar Light's patented detector technology. The flexibility of the instrument makes it ideal for users who need to measure one or more parameters. This is often the case in many industries. Also, detectors can be purchased at any time which will make purchasing additional meters and learning how to use them unnecessary. Third party detectors are easily adapted to the PMA or OEM meters can be purchased with custom artwork (please see application note AN-120). The features of the PMA make it ideal for all users, whether one or twenty detectors are required.



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