

PYRANOMETER METER

MP-100 & 200 Series



Pyranometer Meter

This sensor is calibrated to measure total shortwave radiation. The evaporation of water from soil and transpiration of water from plant leaves are partly determined by the intensity of shortwave radiation, which is measured in Joules per meters squared per second or Watts per meters squared.



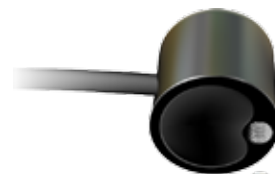
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Cleaning

Debris on the meter is a common cause of low readings. Salt deposits can accumulate on a sensor from evaporation of sprinkler irrigation water and dust, which can accumulate during periods of low rainfall. Salt deposits should be dissolved and removed with vinegar and a soft cloth or q-tip. Dust and other organic deposits are best removed with water, rubbing alcohol or window cleaner. *Never use an abrasive cleaner on the lens.*

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Mounting the Sensor



Bolt: 10-32x5/8



Model AL-100

Mount the sensor to a solid surface with the stainless steel mounting bolt.

Photon Flux is most accurately measured when the sensor is mounted level. We recommend using our leveling plate (AL-100) for the most accurate measurements. The sensor should be mounted with the cable pointing toward the nearest magnetic pole to minimize azimuth error.

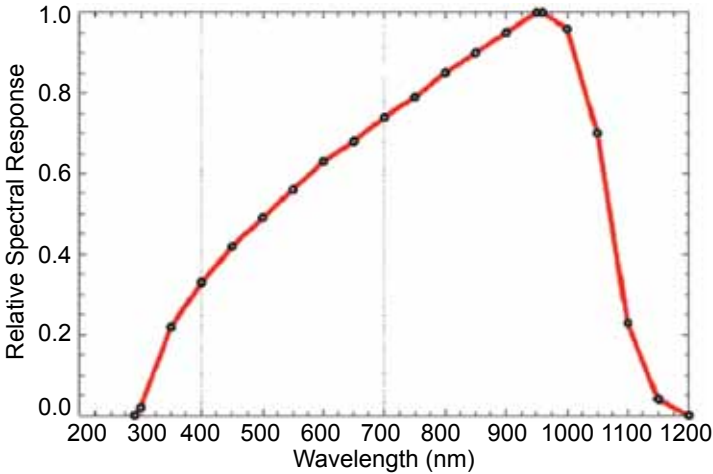


Orientation

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Spectral Response and Calibration

An ideal pyranometer measures the entire solar spectrum, 280 to 2800 nm. However, about 90% of sunlight energy is between 300 and 11000 nm. Models MP-100 and MP-200 are calibrated to estimate all of the shortwave energy from sunlight. Apogee pyranometers are calibrated under sunlight over a multiple day period to a heated and ventilated Kipp & Zonen model CM21 precision reference radiometer.



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Characteristics

Cosine Response

Some of the radiation coming into a sensor at low angles is reflected, which causes low readings. The convex optical disc found on meters and sensors is designed to capture radiation at low angles and minimize cosine response errors. The cosine error for typical applications is less than 2%.

Temperature Response

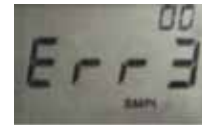
The temperature response is less than 0.1% per degree C. This temperature error is not significant in most applications.

Long-Term Stability

Our research indicates that the average output increases approximately 1% per year because of changes in the optical transparency of the diffusion disk. We recommend returning the meter for recalibration every 2 years.

Error Codes

- Err 1 Battery voltage out of range.
- Err 2 Sensor voltage out of range.
- Err 3 Not calibrated.
- Err 4 CPU voltage below minimum.



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Using the Meter

1) Press the power button to start. The meter will turn itself off 2 minutes after button is pushed to conserve battery.



2) Choose Mode: To choose between SMPL and LOG modes push **mode** twice and use **up/down** to make choice. Once desired mode is blinking press **mode** two more times to begin.

For Automatic Measurements: Use LOG mode. Meter will power on/off to record a measurement every thirty seconds.



For Manual Measurements: Use SMPL mode. Press **sample** when you want to take a measurement. Store up to 99 manual measurements.



3) To Reset Meter: From LOG or SMPL mode, press **mode** twice (RUN should be blinking), then while pressing **down**, press **mode** once.

CAUTION—Resetting will erase ALL measurements.

4) Review data: press **up/down**. To exit and return to present conditions and the capability to take measurements, press **sample**.

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5) In LOG mode, every 30 minutes the meter will average sixty 30-second measurements taken and store the average. Ninety-nine 30-minute averaged measurements can be stored. Every forty-eight measurements (making a 24-hour period) the meter will also store a daily total. In addition, 99 daily averages can be stored and are available for download only. These measurements are not viewable on the meter LCD. All measurements taken in LOG mode will continue to be stored, eliminating the oldest measurement. To keep data, switch out of log mode.

(SMPL) 99 Sample Measurements	(LOG) 99 Log Measurements	(LOG) 99 Daily Averages Measurements
Viewable on meter LCD & downloadable		Downloadable Only

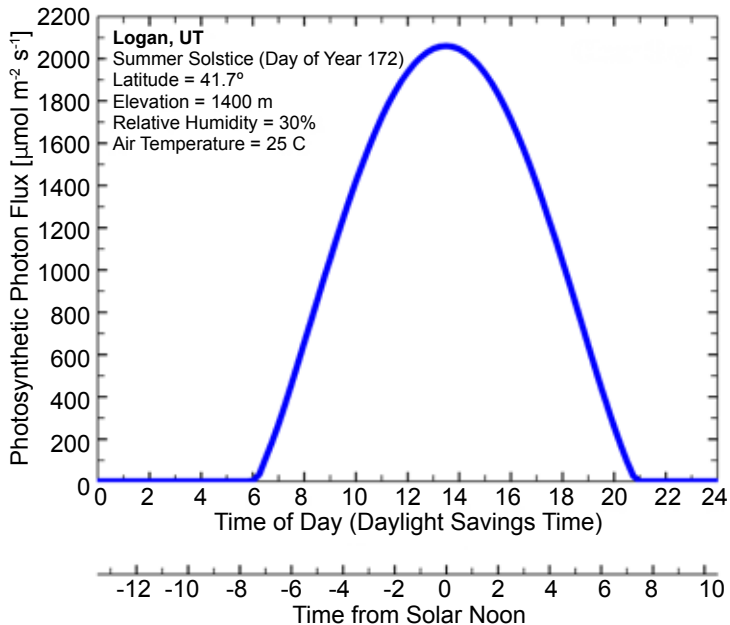
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The Clear Sky Calculator is designed to determine the need for radiation sensor recalibration. It determines the intensity of radiation falling on a horizontal surface at any time of the day in any location in the world. It is most accurate when used near solar noon in the summer months.

The calculator is found at www.clearskycalculator.com and is used by typing conditions into the Clear Sky model and comparing measured values with the calculated value for a clear sky. If the output of the sensor over multiple days at solar noon is consistently less than the model value (by more than 8%), the sensor should be cleaned and re-leveled. If the output is still low after a second test, email calibration@apogee-inst.com to discuss test results and the possible return of sensors. When used near solar noon over multiple clear, unpolluted days during the spring and summer months, it is estimated that the accuracy of the model can be $\pm 4\%$ in all climates and locations around the world.

Example of Model Output



Specifications

Memory

- 99 manually stored data points
- Automatically store 99 consecutive 30 minute averages
- 99 daily averages

Cosine Response

- 45° zenith angle: $\pm 1\%$
- 75° zenith angle: $\pm 4\%$

Absolute Accuracy

- $\pm 5\%$

Repeatability

- $\pm 1\%$

Uniformity

- $\pm 3\%$

Sensitivity

- Custom calibrated to exactly 5.0 W m² per mV

Operating Environment

- 0 to 50° C
- Less than 90% non-condensing, relative humidity up to 30° C
- Less than 70% relative humidity from 30 to 50° C

Input Power

- Standard 3 V coin cell battery

Range

- 0 - 1999 W m²

Display

- 4.2 by 2.8 cm

Materials

- Anodized aluminum with cast acrylic lens

Cable (MP-200 Series)

- 2 meters of twisted-pair wire
- Foil shield
- Santoprene jacket
- Longer cable lengths are available in multiples of 5 meters

Dimensions

- 2.4 cm diameter by 2.75 cm height

Mass

- MP-100: 150 g
- MP-200: 180 g

Warranty

- 1 year against defects in materials and workmanship



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