Amplified Pyranometer

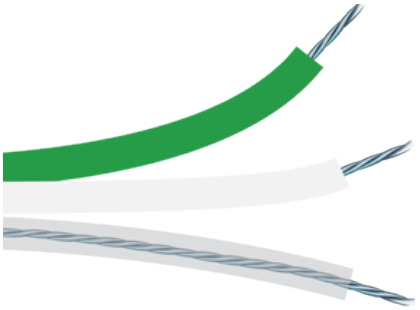
SP-212 & 215

Amplified Pyranometer Sensor

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

Connection Instructions

DO NOT exceed 5.5 Volts in power supply.
Do not connect green wire to power supply.



Green Positive (signal from sensor)

White Input power

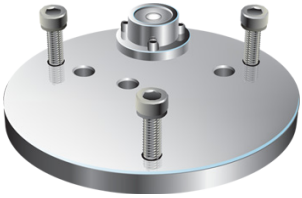
Clear or Gray Ground (for sensor signal and input power)

	2.5 Option	**5.0 Option**
Power Supply	2.5 to 5.5 V	5.0 to 5.5 V
Conversion Factor	0.5 W m^{-2} per mV	0.25 W m^{-2} per mV
Output (Volts)	0.0 to 2.5 V	0.0 to 5.0 V
Full Sunlight	2.2 V (1100 W m^{-2})	4.4 V (1100 W m^{-2})

The model, serial number, production date, and calibration factor are located on the sensor cable.

Mounting the Sensor

Nylon Screw: 10-32x3/8



Model AL-100

Mount the sensor to a solid surface with the nylon mounting screw. The sensor should be mounted level for the most accurate measurements. We recommend using our leveling plate (AL-100). The sensor should be mounted with the cable pointing toward true north in the northern hemisphere or true south in the southern hemisphere to minimize azimuth error. The azimuth error is typically less than 1%.

Orientation

Cleaning

Debris on the pyranometer 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.*

Calibration

All Apogee pyranometer models have a standard calibration of exactly:

0.5 or 0.25 W m^{-2} per mV

Use this conversion factor to convert the mV signal from the sensor to shortwave radiation in Watts m^{-2}. Multiply the mV output by the conversion factor to get shortwave radiation in W m^{-2}.

Sensor Output: 4.4 V

Conversion Factor: 0.250

Sensor Output: 2.2 V

Conversion Factor: 0.500

Solar radiation = sensor output * conversion factor

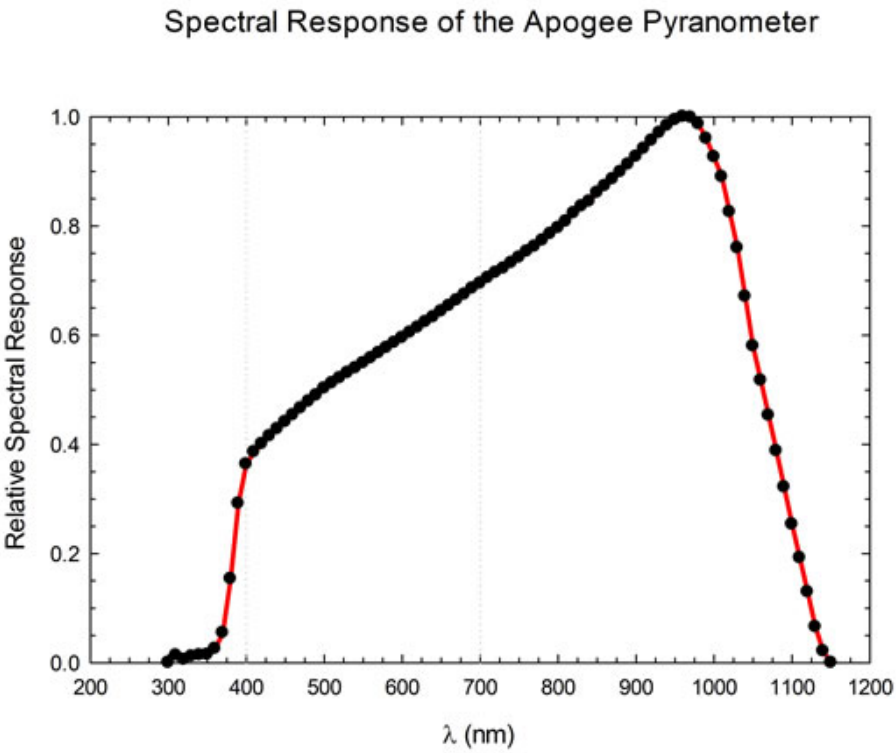
= 4.4 V * 0.250 W m^{-2} per mV = 1100 W m^{-2}

= 2.2 V * 0.500 W m^{-2} per mV = 1100 W m^{-2}

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 to 1100 nm.

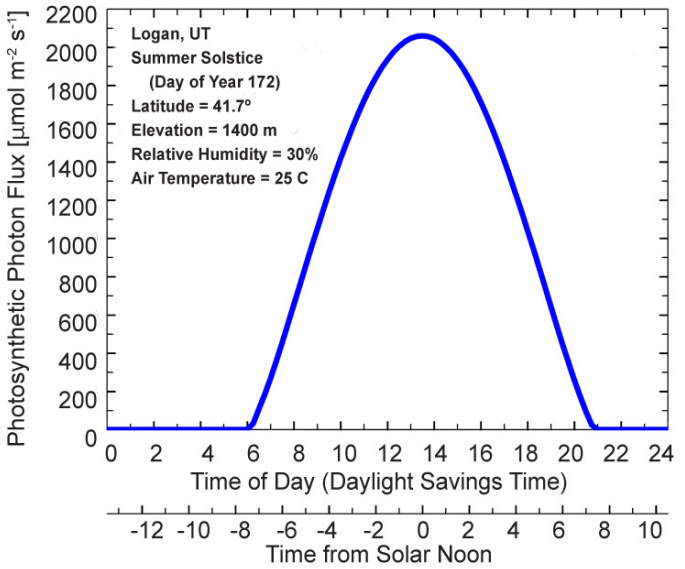
Models SP-212 and SP-215 are calibrated to estimate the shortwave energy from sunlight. Apogee pyranometers are calibrated under sunlight over a multiple day period to a heated and ventilated Kipp & Zonen model CM21 precision reference radiometer.



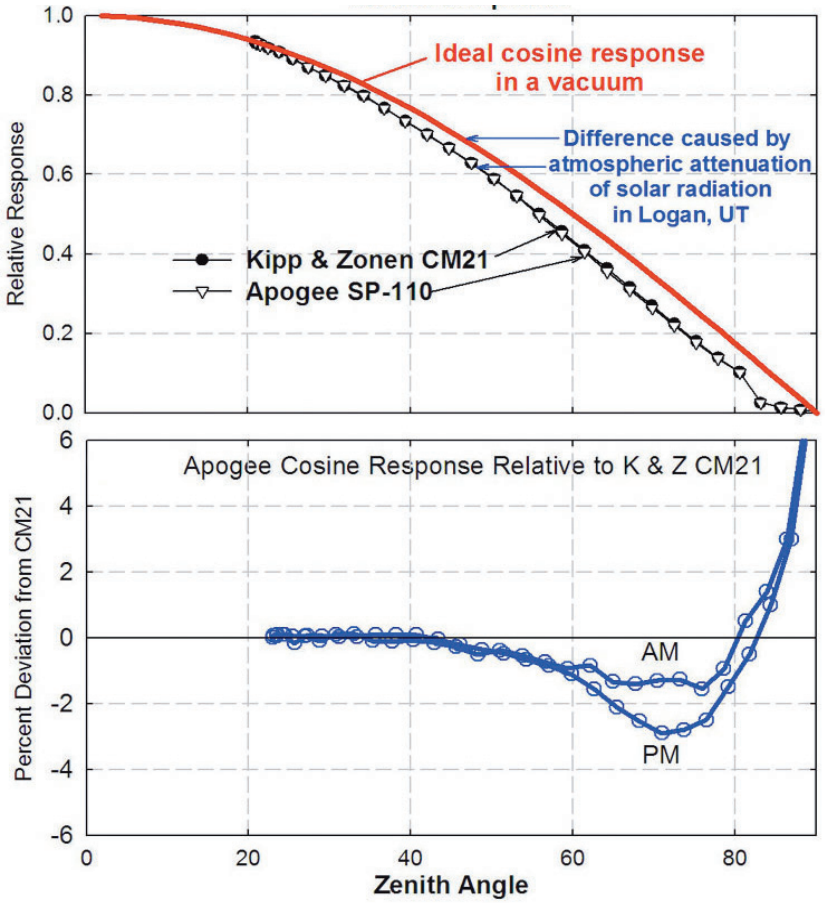
The Clear Sky Calculator is designed to determine the need for radiation sensor recalibration. It determines the intensity of radiation falling on a horizontal surface at any time of the day in any location in the world. It is most accurate when used near solar noon in the summer months.

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@apogeeinstruments.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 ± 4% in all climates and locations around the world.

Example of Model Output



Cosine Response



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

Long-Term Stability
Our research indicates that the output increases about 1% per year because of changes in the optical transparency of the diffusion disk. We recommend returning the sensor for recalibration every 2 years.

Specifications

Cosine Response
- 45º zenith angle: ± 1%
- 75º zenith angle: ± 5%

Absolute Accuracy
- ± 5%

Repeatability
- ± 1%

2.5 V Option
- Output: 0 to 2.5 V (2.2 V = full sunlight 1100 W m^{-2})
- Input Power: 2.5 to 5.5 VDC
- Sensitivity: Custom calibrated to exactly 0.5 W m^{-2} per mV

5.0 V Option
- Output: 0 to 5 V (4.4 V = full sunlight 1100 W m^{-2})
- Input Power: 5 to 5.5 VDC
- Sensitivity: Custom calibrated to exactly 0.25 W m^{-2} per mV

Materials
- Anodized aluminum with cast acrylic lens

Long-Term Drift
- Less than 3% per year

Operating Environment
- -25 to 55 C
- 0 to 100% relative humidity
- Designed for continuous outdoor use
- Can be submerged in water

Current Draw
- 285 µA

Cable
- 5 meters of twisted-pair wire
- Foil shield
- Santoprene jacket
- Ending in pigtail leads
- Additional cable is available in multiples of 5 meters

Dimensions
- 2.4 cm diameter by 2.75 cm height

Mass
- 70 g (with 2 meter lead wire)

Warranty
- 1 year against defects in materials and workmanship

apogee

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