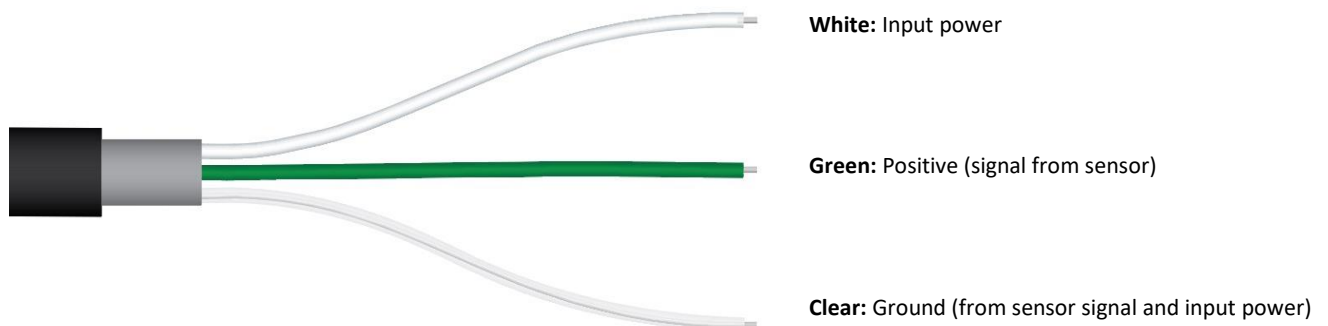# OPERATION AND MEASUREMENT

Connect the sensor to a measurement device (meter, datalogger, controller) capable of measuring and displaying or recording a voltage signal (an input measurement range of 0-2.5 V or 0-5 V is required to cover the entire range of total shortwave radiation from the sun). In order to maximize measurement resolution and signal-to-noise ratio, the input range of the measurement device should closely match the output range of the pyranometer. **DO NOT connect the sensor to a power source greater than 24 VDC.**

VERY IMPORTANT: **Apogee changed the wiring colors of all our bare-lead sensors in March 2018 in conjunction with the release of inline cable connectors on some sensors. To ensure proper connection to your data device, please note your serial number or if your sensor has a stainless-steel connector 30 cm from the sensor head then use the appropriate wiring configuration listed below. With the switch to connectors, we also changed to using cables that only have 4 or 7 internal wires. To make our various sensors easier to connect to your device, we clip off any unused wire colors at the end of the cable depending on the sensor. If you cut the cable or modify the original pigtail, you may find wires inside that are not used with your particular sensor. In this case, please disregard the extra wires and follow the color-coded wiring guide provided.**

Wiring for SP-212 and SP-215 with Serial Numbers 9898 above or with a cable connector

White: Positive (signal from sensor)

Red: Input Power SP-212 5-24 V DC, SP-215 5.5-24 V DC

Black: Ground (from sensor signal and output power)

Clear: Shield/Ground

Wiring for SP-212 and SP-215 with Serial Numbers range 0-9897

White: Input power

Green: Positive (signal from sensor)

Clear: Ground (from sensor signal and input power)

Sensor Calibration

Serial Number Range 0-10516. Apogee amplified pyranometer models have a standard calibration factor of exactly:

$$\text{SP-212: 0.5 W m}^{-2} \text{ per mV}$$
$$\text{SP-215: 0.25 W m}^{-2} \text{ per mV}$$

Multiply this calibration factor by the measured mV signal to convert sensor output to total shortwave radiation in units of W m^{-2}:

Calibration Factor (0.5 W m^{-2} per mV) * Sensor Output Signal (mV) = Shortwave Radiation (W m^{-2})

| 0.5 | * | 2000 | = | 1000 |

Serial Numbers 10517 and above. Apogee amplified pyranometer models have a standard calibration factor of exactly:

$$\text{SP-212: 0.8 W m}^{-2} \text{ per mV}$$
$$\text{SP-215: 0.4 W m}^{-2} \text{ per mV}$$

Multiply this calibration factor by the measured mV signal to convert sensor output to total shortwave radiation in units of W m^{-2}:

Calibration Factor (0.8 W m^{-2} per mV) * Sensor Output Signal (mV) = Shortwave Radiation (W m^{-2})

| 0.8 | * | 1250 | = | 1000 |

Full Sunlight

(1000 W m^{-2})

Sensor Output
2000 mV
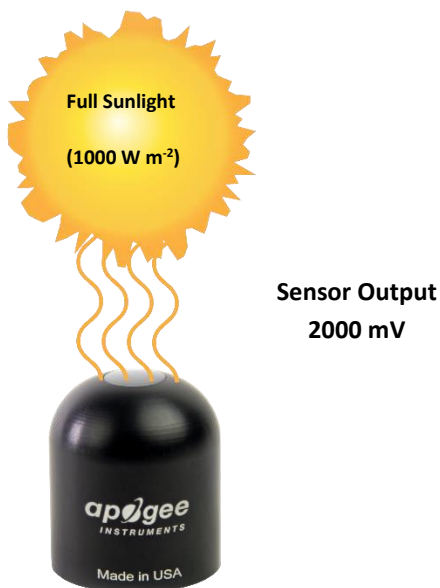
Serial Number Range 0-10516. Example of total shortwave radiation measurement with an Apogee SP-212 pyranometer. Full sunlight yields total shortwave radiation on a horizontal plane at the Earth's surface of approximately 1000 W m^{-2} s^{-1}. This yields an output signal of 2000 mV. The signal is converted to shortwave radiation by multiplying by the calibration factor of 0.5 W m^{-2} per mV.

Serial Numbers 10517 and above. Example of total shortwave radiation measurement with an Apogee SP-212 pyranometer. Full sunlight yields total shortwave radiation on a horizontal plane at the Earth's surface of approximately 1000 W m^{-2} s^{-1}. This yields an output signal of 1250 mV. The signal is converted to shortwave radiation by multiplying by the calibration factor of 0.8 W m^{-2} per mV.