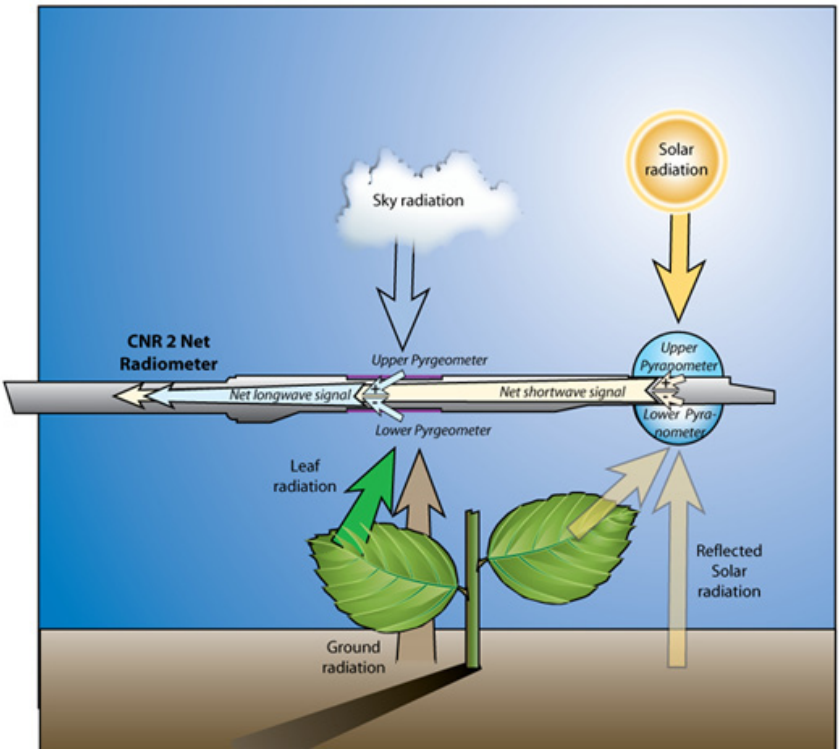
Net Radiometer

CNR2

CNR2 Net Radiometer

The CNR2 measures net radiation in Watts per meter squared. Net longwave is calculated by combining the output of two longwave sensors. Net shortwave is calculated separately by combining the output of two shortwave sensors.



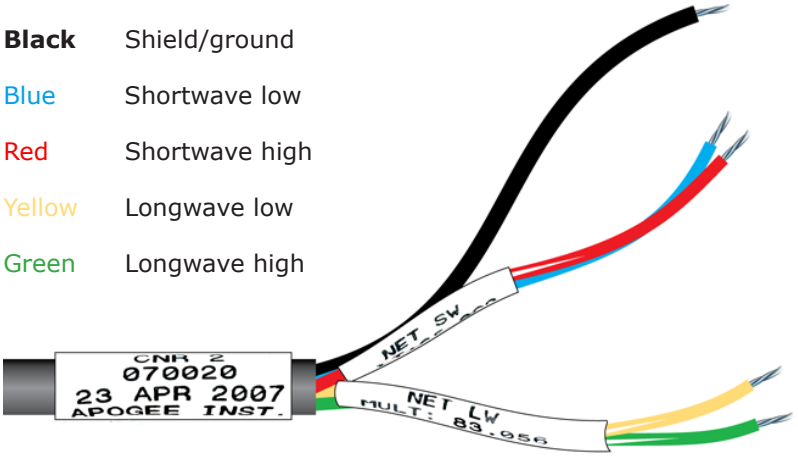
Application

This model includes two shortwave and two longwave sensors, which are combined to provide separate outputs for net shortwave and net longwave radiation.

The use of four sensors solves the problem of accurately measuring short- and longwave radiation with a single instrument. The CNR2 has similar accuracy to the Kipp & Zonen CNR1 and is half the cost. The compact, rugged, and lightweight design facilitates mounting.

Connection Instructions

Black	Shield/ground
Blue	Shortwave low
Red	Shortwave high
Yellow	Longwave low
Green	Longwave high



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

Never attach a power source to the sensor.

Cleaning

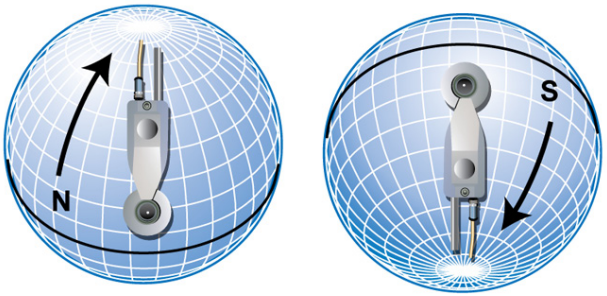
Debris on the domes and sensor head is a common cause of low readings. The sensor has a domed head for improved self-cleaning from rainfall, but salt deposits can accumulate from evaporation of sprinkler irrigation water and dust can accumulate during periods of low rainfall. Salt deposits should be 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.*

Mounting the CNR2

Mount the sensor out and away from the mounting device to minimize interference. The mounting device must provide rigid and stable support for the sensor.

The sensor should be mounted level with cable and rod oriented towards the nearest pole and an unobstructed view of the horizon. It should also be kept away from any heat sources.

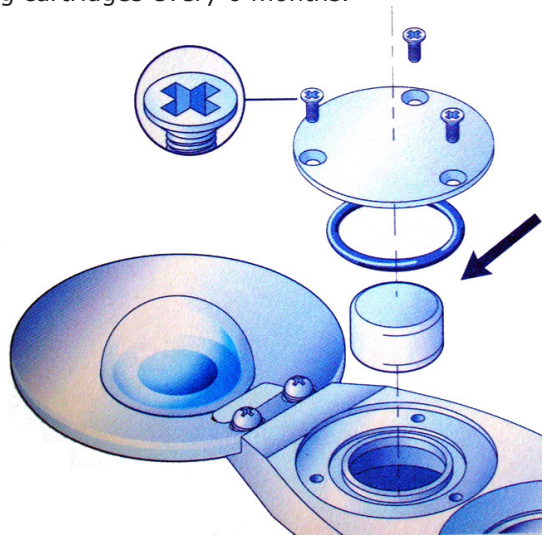
The sensor is typically mounted at a height of 1.5 to 2 meters.



Maintenance

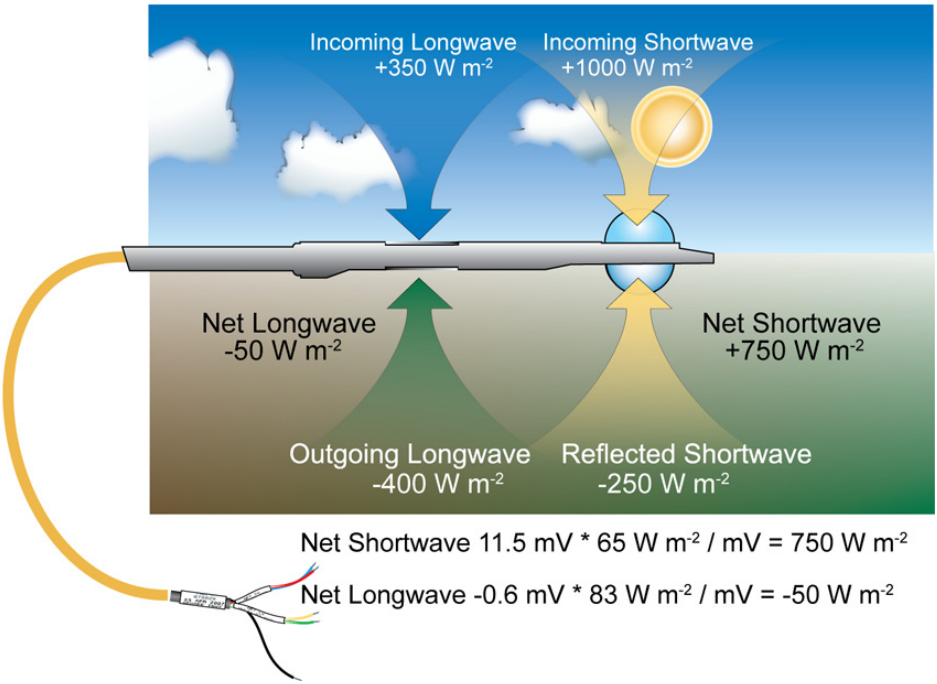
Recalibrate the instrument every two years. Contact Apogee Instruments for information on recalibration.

Replace drying cartridges every 6 months.



Making a Measurement

Connect the sensor to a datalogger; a differential measurement will be used. Both outputs are labeled with a custom multiplier. To convert the mV signals from the sensor to net shortwave and net longwave radiation, multiply the mV output by the appropriate multiplier. This yields radiation in W m^{-2}. Example multipliers are used below (65 and 83 W m^{-2} / mV). Typically, the longwave output ranges from -5 to 5, the shortwave ranges from 0 to 25 mV.



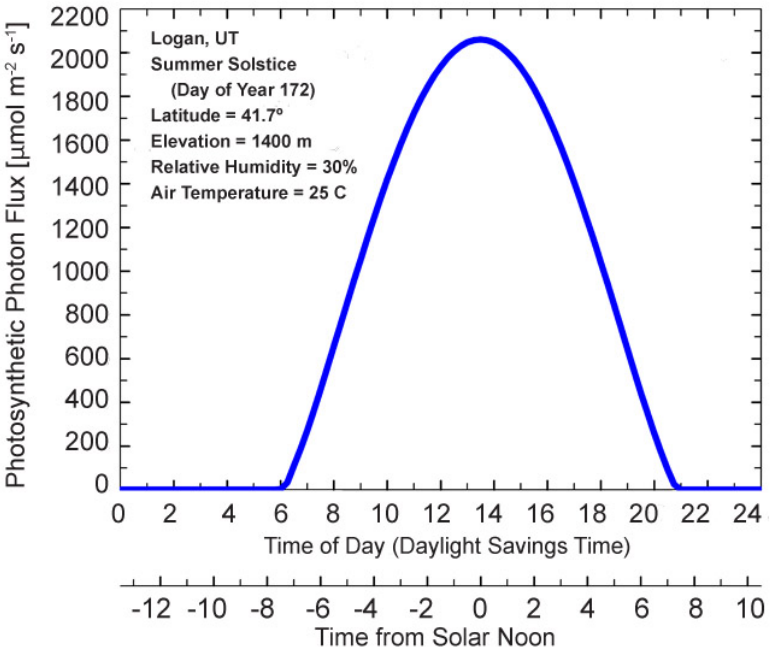
Typical Measurements in W m^{-2}

	Net Shortwave	Net Longwave
Fully Clouded	0 to 100	-50 to 25
Partly Clouded	50 to 500	-50 to 25
Full Sun	200 to 1,000	-200 to 50

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



Specifications

Range

- Pyranometer: 0 to 4000 W m^{-2}
- Pyrgeometer: -250 to 250 W m^{-2}

Non-Linearity

- Pyranometer: (0 to 1000 W m^{-2}) < 2%
- Pyrgeometer: (-250 to 250 W m^{-2}) < 1%

Spectral Range (50% points)

- Pyranometer: 0.31 to 2.8 µm
- Pyrgeometer: 4.5 to 42 µm

Field of View

- Pyranometer: Upper - 180º, Lower - 150º
- Pyrgeometer: Upper - 150º, Lower - 150º

Zero Offset

- Pyranometer: < 15 W m^{-2}

Directional Error

- < 20 W m^{-2}

Operating Environment

- - 40 to 80º C
- Designed for continuous outdoor use

Response Time 95%

- 10 s

Temperature Error

- (-10 to 40º C) < 5%

Sensor Asymmetry

- < 5%

Sensitivity

- 10 to 20 µV per W m^{-2} (for both short and longwave)

Annual Sensitivity Change

- < 1%

Tilt Error

- < 1%

Uncertainty in Daily Total

- < 10%

Cable

- 10 meters

Dimensions

- 4 by 20 by 7 cm long
- 30 cm mounting rod

Mass

- 250 g (+300 g for 10 m cable)

Warranty

- 1 year against defects in materials and workmanship

www.apogeeinstruments.com
techsupport@apogeeinstruments.com

435.792.4700
Fax: 435.787.8268