

INSTRUCTION MANUAL



LI200R Pyranometer

Revision: 1/18



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General

- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a **hardhat** and **eye protection**, and take **other appropriate safety precautions** while working on or around tripods and towers.
- **Do not climb** tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- **You can be killed** or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in **contact with overhead or underground utility lines**.
- Maintain a distance of at least one-and-one-half times structure height, 20 feet, or the distance required by applicable law, **whichever is greater**, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

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LI200R Pyranometer

1. Introduction

The LI200R pyranometer measures sun plus sky radiation. It connects directly to our dataloggers and is used extensively in solar, agricultural, and meteorological applications. The input range and multipliers vary from one pyranometer to another.

NOTE

This manual provides information only for CRBasic dataloggers. It is also compatible with most of our retired Edlog dataloggers. For Edlog datalogger support, see an older LI200X manual at www.campbellsci.com/old-manuals.

2. Precautions

- READ AND UNDERSTAND the *Safety* section at the front of this manual.
- Care should be taken when opening the shipping package to not damage or cut the cable jacket. If damage to the cable is suspected, contact Campbell Scientific.
- Although the LI200R is rugged, it should be handled as a precision scientific instrument.
- Keep the sensor clean. The vertical edge of the diffuser must be kept clean to maintain appropriate cosine correction.
- Clean the sensor only with water, mild detergent, or vinegar. Alcohol, organic solvents, abrasives, or strong detergents harm the acrylic materials, which will adversely affect the cosine response of the sensor.
- The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and UV degradation. However, this jacket will support combustion in air. It is rated as slow burning when tested according to U.L. 94 H.B. and will pass FMVSS302. Local fire codes may preclude its use inside buildings.

3. Initial Inspection

- Upon receipt of the LI200R, inspect the packaging and contents for damage. File damage claims with the shipping company.
- The model number and cable length are printed on a label at the connection end of the cable. Check this information against the shipping documents to ensure the correct product and cable length are received.

3.1 Ships With

- (1) Calibration Sheet

The LI200R is also shipped with a red cap on it. Ensure that this red cap is removed after installing the sensor. Save the cap for shipping or storing the sensor.

NOTE

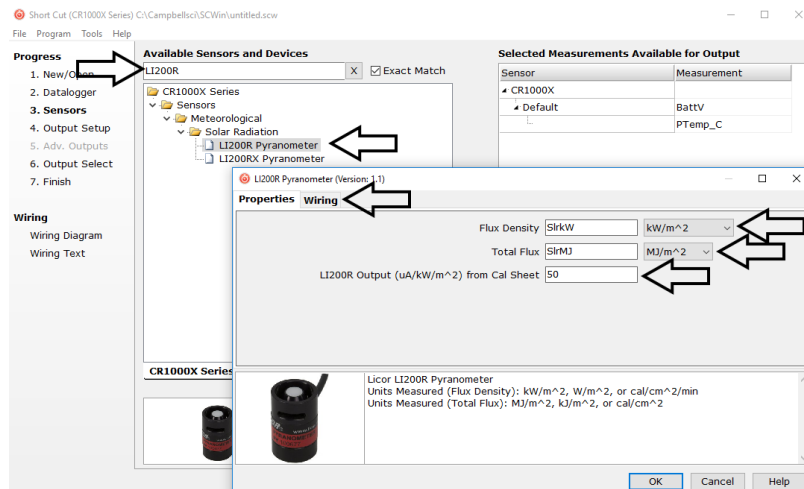
The calibration sheet shipped with each sensor includes a serial number and calibration constant. The calibration constant is unique for each sensor, and is used to compute the multiplier for the measurement instruction in the datalogger program.

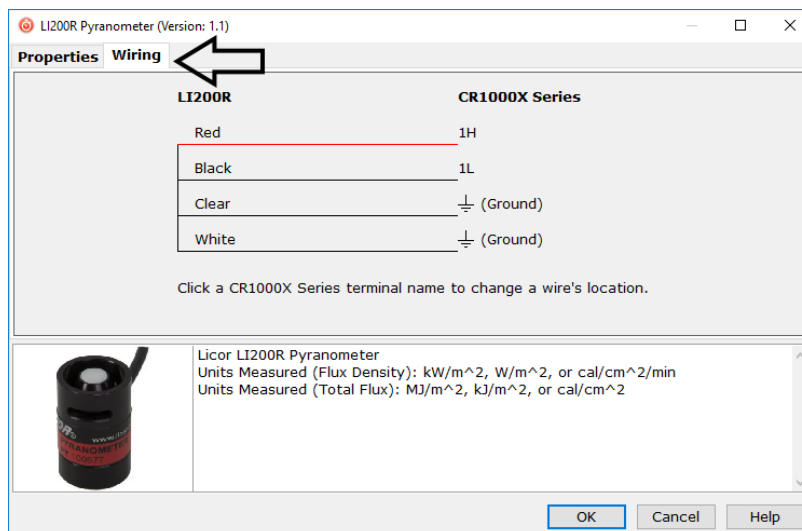
4. QuickStart

Short Cut is an easy way to program your datalogger to measure the LI200R and assign datalogger wiring terminals. *Short Cut* is available as a download on www.campbellsci.com. It is included in installations of *LoggerNet*, *PC200W*, *PC400*, or *RTDAQ*.

The following procedure shows using *Short Cut* to program the LI200R.

1. Open *Short Cut* and create a new program.
2. Double-click the datalogger model.
3. In the search box, under the **Available Sensors and Devices** heading, type in **LI200R**, or find the sensor in the **Sensors | Meteorological | Solar Radiation** folder, and then double-click **LI200R Pyranometer**. Enter the **LI200R Output** that is provided on the calibration sheet shipped with the sensor. This value is unique to the individual sensor. The flux density defaults to kW/m² and the total flux defaults to MJ/m². This can be changed by clicking the **Flux Density** or **Total Flux** box and selecting one of the other options. After entering the **Properties**, click on the **Wiring** tab to see how the sensor is to be wired to the datalogger.





4. Select any other sensors you have, then finish the remaining *Short Cut* steps to complete the program. The remaining steps are outlined in *Short Cut Help*, which is accessed by clicking on **Help | Contents | Programming Steps**.
5. If *LoggerNet*, *PC400*, *RTDAQ*, or *PC200W* is running on your computer, and the computer to datalogger connection is active, you can click **Finish** in *Short Cut* and you will be prompted to send the program just created to the datalogger.
6. If the sensor is connected to the datalogger, as shown in the wiring diagram, check the output of the sensor in the datalogger support software data display to make sure it is making reasonable measurements.

NOTE

Short Cut uses the execution interval to make total flux calculations (Section 7.4.2, *Multiplier (p. 10)*). You need to take this into account while editing the *Short Cut* program.

5. Overview

The LI200R measures incoming solar radiation with a silicon photovoltaic detector mounted in cosine-corrected head. The detector outputs current; a shunt resistor in the sensor cable converts the signal from current to voltage, allowing the LI200R to be measured directly by Campbell Scientific dataloggers.

The LI200R is calibrated against an Eppley Precision Spectral Pyranometer to accurately measure sun plus sky radiation. Do not use the LI200R under vegetation or artificial lights because it is calibrated for the daylight spectrum (400 to 1100 nm). FIGURE 5-1 shows the pyranometer's spectral response.

During the night, the LI200R may read slightly negative incoming solar radiation. This negative signal is caused by electrical noise. Negative values may be set to zero in the datalogger program.

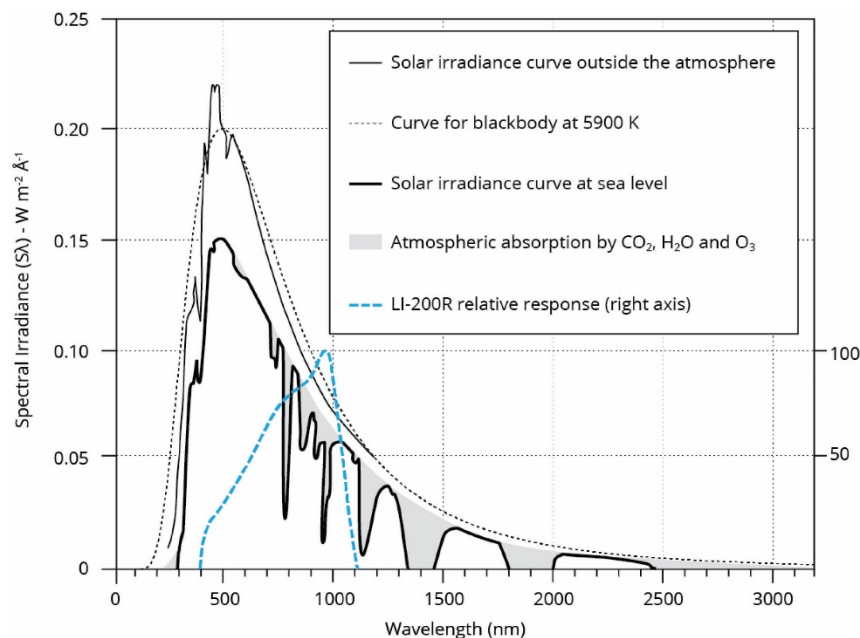


FIGURE 5-1. LI200R spectral response

The -L portion of the model number indicates that the LI200R has a user-specified cable length. Its cables can terminate in:

- Pigtails that connect directly to a Campbell Scientific datalogger (cable termination option -PT).
- Connector that attaches to a CWS900-series interface (cable termination option -CWS). Connection to a CWS900-series interface allows this sensor to be used in a wireless sensor network.

For more theoretical information on the silicon photovoltaic detector, see Kerr, J. P., G. W. Thurtell, and C. B. Tanner: 1967, "An integrating pyranometer for climatological observer stations and mesoscale networks", *J. Appl. Meteor.*, **6**, 688-694.

6. Specifications

Features:

- Calibrated for the daylight spectrum (400 to 1100 nm)
- Compatible with Campbell Scientific CRBasic dataloggers: CR300 series, CR6 series, CR800 series, CR1000, CR1000X, CR3000, CR5000, and CR9000(X)

Stability: < ±2% change over a 1 year period

Response Time: < 1 μs

Cosine Correction: Cosine corrected up to 82° angle of incidence

Operating Temperature: -40 to 65 °C

Temperature Dependence:	±0.15% per °C maximum
Relative Humidity:	0 to 100%
Detector:	High stability silicon photovoltaic detector (blue enhanced)
Sensor Housing:	Weatherproof anodized aluminum case with acrylic diffuser and stainless steel hardware; O-ring seal on the removable base and cable assembly
Diameter:	2.36 cm (0.93 in)
Height:	3.63 cm (1.43 in)
Weight:	84 g (2.96 oz)
Accuracy:	Absolute error in natural daylight is ±5% maximum; ±3% typical
Sensitivity:	Typically 0.13 kW m ⁻² mV ⁻¹
Linearity:	Maximum deviation of 1% up to 3000 W m ⁻²
Shunt Resistor:	100 Ω, 1%, 50 PPM
Light Spectrum Waveband:	400 to 1100 nm

7. Installation

If you are programming your datalogger with *Short Cut*, skip Section 7.3, *Wiring* (p. 8), and Section 7.4, *Programming* (p. 9). *Short Cut* does this work for you. See Section 4, *QuickStart* (p. 2), for a *Short Cut* tutorial.

7.1 Siting

The LI200R should be mounted such that no shadows or reflections are cast on it by the tripod/tower or other sensors. The sensor should be mounted with the cable pointing towards the nearest magnetic pole. For example, in the Northern Hemisphere, point the cable toward the North Pole.

Mounting height is not critical for the accuracy of the measurement. However, pyranometers mounted at heights of 3 m or less are easier to level and clean.

7.2 Mounting to an Instrument Mount

7.2.1 Required Tools

Tools required for installation on a tripod or tower:

- Small and medium Phillips screwdrivers
- 1/2-inch open-end wrench for CM225 or 015ARM
- Tape measure
- UV-resistant cable ties
- Side-cut pliers
- Compass
- Step ladder

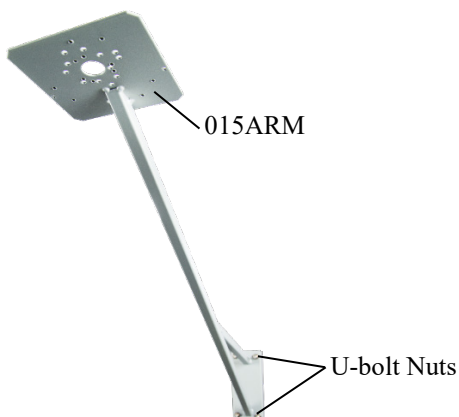
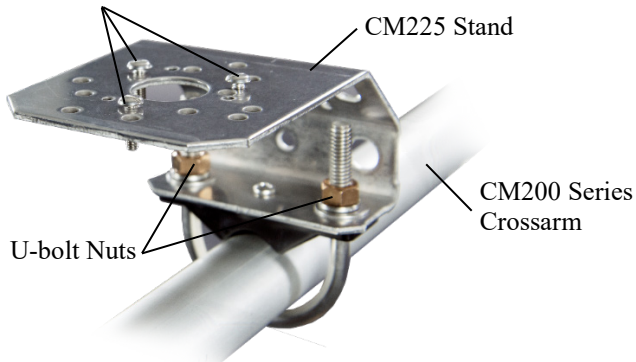
7.2.2 Mounting Procedure

CAUTION

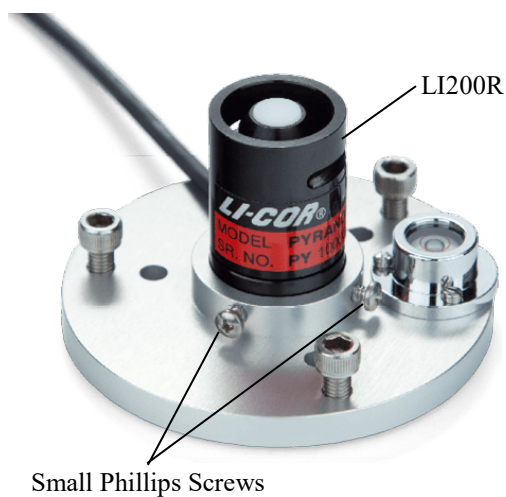
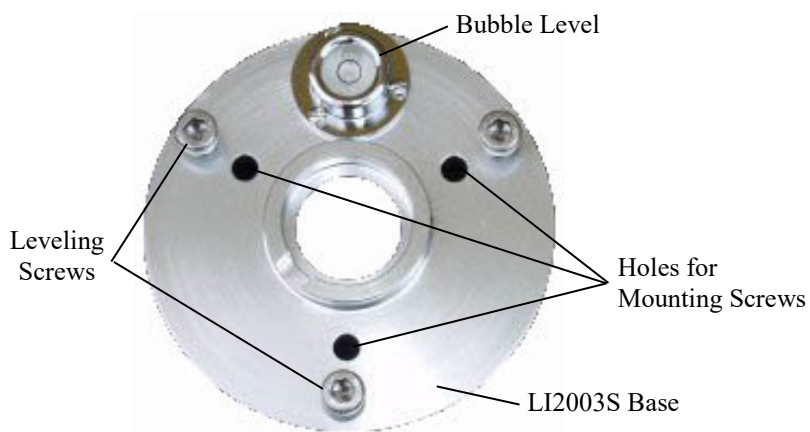
The CM225 should never be mounted directly to a vertical pipe. Instead the CM225 should be mounted to a crossarm. This avoids reflections from the vertical pipe onto the sensor.

1. Mount the crossarm to the tripod or the tower if using a CM225.
2. Secure the CM225 to the crossarm by placing the CM225 U-bolt in the bottom holes and tightening the nuts. Secure the 015ARM to the mast by tightening the U-bolt nuts.

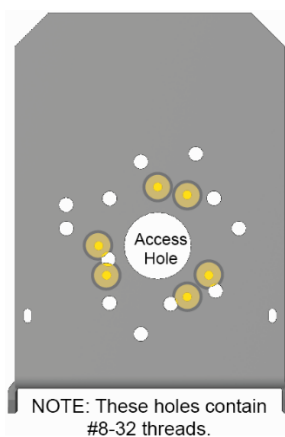
Mounting Screws



3. Place the LI200R in the center of the LI2003S base/leveling fixture. Secure the LI200R to the LI2003S by tightening the small Phillips screws.



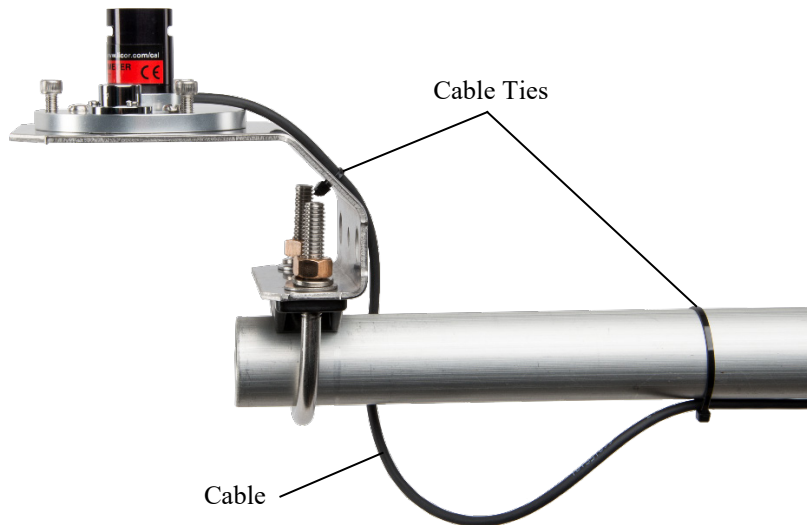
4. Loosely mount the LI2003S and LI200R on the CM225 or 015ARM. Do not fully tighten the three mounting screws.



Mounting holes used for the LI200R are indicated in yellow.

5. Turn the leveling screws as required to bring the bubble of the bubble level within the ring.

6. Tighten the mounting screws to secure the assembly in its final position. Check that the pyranometer is still correctly leveled and adjust as necessary.
7. Route the sensor cable along the underside of the crossarm or 015ARM mounting arm to the tripod/tower, and to the instrument enclosure.
8. Secure the cable to the crossarm or 015ARM mounting arm and mast using cable ties.



9. Remove the red cap after installing the sensor. Save this cap for shipping or storing the sensor.

7.3 Wiring

A schematic diagram of the LI200R is shown in FIGURE 7-1.

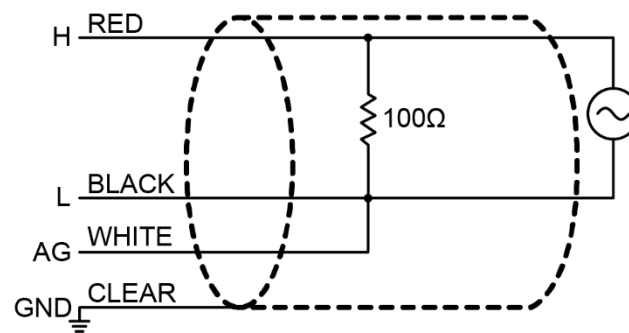


FIGURE 7-1. LI200R schematic

Connections to Campbell Scientific dataloggers are given in TABLE 7-1. When *Short Cut* is used to create the datalogger program, the sensor should be wired to the channels shown in the wiring diagram created by *Short Cut*.

TABLE 7-1. Datalogger Connections for Differential Measurements		
Wire Color	Wire Function	Datalogger Connection Terminal
Red	Signal	U configured for differential high input ¹ , DIFF H (differential high, analog-voltage input)
Black	Signal Reference	U configured for differential input low ¹ , DIFF L (differential low, analog-voltage input)
White	Analog Ground	⏏ (analog ground)
Clear	Shield	⏏ (analog ground)
¹ U channels are automatically configured by the measurement instruction.		

7.4 Programming

Short Cut is the best source for up-to-date datalogger programming code. Programming code is needed when:

- Creating a program for a new datalogger installation
- Adding sensors to an existing datalogger program

If your data acquisition requirements are simple, you can probably create and maintain a datalogger program exclusively with *Short Cut*. If your data acquisition needs are more complex, the files that *Short Cut* creates are a great source for programming code to start a new program or add to an existing custom program.

NOTE

Short Cut cannot edit programs after they are imported and edited in *CRBasic Editor*.

A *Short Cut* tutorial is available in Section 4, *QuickStart* (p. 2). If you wish to import *Short Cut* code into *CRBasic Editor* to create or add to a customized program, follow the procedure in Appendix A, *Importing Short Cut Code Into CRBasic Editor* (p. A-1). Programming basics for CRBasic dataloggers are provided in the following sections. Complete program examples for CRBasic dataloggers can be found in Appendix B, *Example Programs* (p. B-1). Programming basics and programming examples for Edlog dataloggers are provided at www.campbellsci.com/old-manuals.

The LI200R output is measured by the datalogger using the **VoltDiff()** CRBasic instruction. CRBasic is included in *PC400* and *LoggerNet* datalogger support software. The **VoltDiff()** instruction has the following structure:

```
VoltDiff(Dest, Repts, Range, DiffChan, RevDiff, SettlingTime,
Integ/FNotch, Mult, Offset)
```

Section 7.4.1, *Input Range* (p. 10), provides information about choosing the **Range**. Nearby ac power lines, electric pumps, or motors can be a source of electrical noise. If the sensor or datalogger is located in an electrically noisy environment, the measurement should be made with the 60 or 50 Hz rejection integration option as shown in CRBasic Example B-1, *CR1000X Program for*

Measuring the LI200R (p. B-1). The **Multiplier** parameter converts the millivolt reading to engineering units (Section 7.4.2, *Multiplier (p. 10)*).

7.4.1 Input Range

The following is an example of how to determine the optimum input range for a given sensor calibration and maximum expected irradiance. This is an example only. Your values will be different.

This example uses the calibration provided by LI-COR®, Inc. Assume that the sensor calibration is $87 \mu\text{A kW}^{-1} \text{ m}^2$. The pyranometer outputs current that is converted to voltage by the 100Ω shunt resistor in the cable or on the wiring panel. To convert the calibration from current to voltage, multiply the LI-COR® calibration by $0.1 \text{ k}\Omega$ (shunt resistor). The example calibration changes to $8.7 \text{ mV kW}^{-1} \text{ m}^2$.

A reasonable estimate of maximum of irradiance at the earth's surface is 1 kW m^{-2} . Thus, an estimate of the maximum input voltage is obtained by multiplying the calibration by the maximum expected irradiance. In this example that product is 8.7 mV . Now, select the smallest input range that is greater than the maximum expected input voltage.

7.4.2 Multiplier

The multiplier converts the millivolt reading to engineering units. The most common units and equations to calculate the multiplier are listed in TABLE 7-2.

TABLE 7-2. Multipliers Required for Average Flux and Total Flux Density for SI and English Units		
Units	Multiplier	Process
W m^{-2}	$(1/C) \cdot 1000$	Average
MJ m^{-2}	$t \cdot (1/C) \cdot 0.001$	Total
kJ m^{-2}	$t \cdot (1/C)$	Total
$\text{cal cm}^{-2} \text{ min}^{-1}$	$(1/C) \cdot (1.4333)$	Average
cal cm^{-2}	$t \cdot (1/C) \cdot (0.02389)$	Total
$C = (\text{LI-COR}^{\circledR} \text{ calibration}) \cdot 0.1$ $t = \text{datalogger execution interval in seconds}$		

7.4.3 Total Solar Radiation

Solar measurements are often totalized, which has the following structure:

Totalize(Reps,Source,Data Type,Disable Variable)

If the solar radiation is totalized in units of kJ m^{-2} , there is a possibility of overranging the output limits. For CRBasic dataloggers, you can avoid this by using the IEEE4 or long data type. For example, the following **Totalize()** instruction uses the IEEE4 data type to prevent overranging:

Totalize(1,S1rMJ,IEEE4,False)

8. Troubleshooting, Maintenance, and Calibration

NOTE

All factory repairs and recalibrations require a returned material authorization (RMA) and completion of the “Declaration of Hazardous Material and Decontamination” form. Refer to the [Assistance](#) page at the beginning of this document for more information.

8.1 Troubleshooting

Symptom: –9999 or radiation values around 0

1. Check that the sensor is wired to the differential channel specified by the measurement instruction.
2. Verify that the range code is correct for the datalogger type.
3. Disconnect the sensor leads from the datalogger and use a digital voltmeter to check the voltage between the red (+) and the black (–) wires. No voltage indicates a problem with the photodiode, the cable, or the variable shunt resistor.

Symptom: Incorrect solar radiation

1. Make sure the top surface of the sensor head is clean and that the sensor is properly leveled.
2. Verify that the range code, multiplier, and offset parameters are correct for the desired engineering units and datalogger type.

8.2 Maintenance

On a monthly basis, the level of the pyranometer should be checked. Keep the sensor clean and treat it as a scientific instrument to maintain the accuracy of the calibration. The vertical edge of the diffuser must be kept clean to maintain appropriate cosine correction.

Clean the sensor only with water and/or a mild detergent such as dishwashing soap. Vinegar can also be used to remove hard water deposits from the diffuser element if necessary.

CAUTION

Do not use alcohol, organic solvents, abrasives, or strong detergents to clean the diffuser element. Exposure to alcohol or organic solvents harm the acrylic materials of the sensor, which will adversely affect the cosine response of the sensor.

8.3 Calibration

Recalibrate the LI200R every two years.

The LI200R is designed so that the sensor can be separated into two parts — the sensor head containing the photodiode can be disconnected from the base

and cabling. Calibration values follow the sensor head. Each sensor head has a unique calibration value. When the sensor is cabled at the factory, the sensor calibration value, as received from LI-COR®, is put on a heat shrink label close to the end of the cable. We recommend sending the entire sensor and cable to Campbell Scientific for recalibration. Along with a calibration certificate, a new heat shrink label will be put on the cable with the new calibration value.

In instances where it's problematic to send in the sensor and the cable, you can send only the sensor head for recalibration. A new calibrated LI200R head can be used with the base or a protective cover put over it. Never leave the base part of the sensor exposed to the environment while the sensor head is being calibrated.

NOTE

The cable will no longer have the correct calibration information on the label when calibration is done in this manner.

The datalogger program will need to be updated with the new calibration value regardless of which method is used.

8.3.1 Taking the Sensor Apart

Replace the O-ring gasket on the base each time a sensor head is sent in for calibration. You will need the parts listed in TABLE 8-1; part numbers and pricing are available from our website.

TABLE 8-1. Replacement Parts	
Description	Notes
LI-COR® Replacement LI190R and LI200R O-ring	Replace this O-ring every time a sensor is separated.
LI-COR® LI190R and LI200R Sensor Base Cover	Cover comes with three small Phillips screws. Cap and screws can be reused.
LI-COR® LI200R Replacement Head	When replacing the sensor head, the sensor base cover is only required if the sensor head cannot be immediately swapped out.

Tools needed:

- Small Phillips screwdriver
- Small slotted screwdriver

NOTE

Collect all data from the datalogger before working on any sensors. Power the datalogger down while removing the sensor. Power can be applied to the datalogger after work is completed. The datalogger program can be run without a sensor attached but the values will be erroneous. Write down the time and date that the station was worked on to keep track of when bad data occurs in the data file for these readings and when a calibrated sensor is put back in place.

8.3.2 Remove the Sensor

1. Remove the sensor from the LI2003S leveling fixture.
2. Remove the three small Phillips screws from the underside of the sensor. Don't lose them.
3. Gently pull the sensor apart. Notice the two wires coming up from the base into a small printed circuit board. This printed circuit board has two gold-plated sockets that mate with two gold plated pins from the sensor head.
4. With a small screwdriver, gently pry the printed circuit board away from the pins. Do not twist the wires any more than absolutely necessary.
5. Put the sensor head in a safe place.



8.3.2.1 If Using a Cover

1. Place the sensor cover over the base and screw it into place using the three Phillips screws. Screw it down tight, but be careful not to strip the screw heads.
2. Secure the base and cover to the LI2003S leveling fixture.



8.3.2.2 Putting On a Calibrated Sensor Head

1. If using a cover:
 - a. Remove the base and cover from the LI2003S leveling fixture.
 - b. Turn the base over and remove the three small Phillips screws holding the cover in place. Don't lose the screws.
 - c. Remove the protective cover. Put the cover in a safe place.
2. Replace the O-ring on the base with a new one. You might need to use the small slotted screwdriver to gently pry off the old O-ring.

3. The printed circuit board will only fit inside the sensor head one way. Line up the sensor head pins with the printed circuit board sockets and gently push them together. You might need to use the small slotted screwdriver to make sure the printed circuit board is completely seated into the mating sensor head.
4. Seat the sensor head on to the base and use the three small Phillips screws to secure the assembly. Screw it down tight, but be careful not to strip the screw heads.
5. Remember to update the datalogger program with the new sensor head calibration value.
6. Pack the head for shipment and send it to Campbell Scientific. Refer to the [Assistance](#) page at the beginning of this document for the required procedure for sending equipment to Campbell Scientific.

9. Acknowledgements

Campbell Scientific, Inc. gratefully acknowledges the contribution of LI-COR[®] to concepts, text, and images used in this manual.

Appendix A. Importing Short Cut Code Into CRBasic Editor

This tutorial shows:

- How to import a *Short Cut* program into a program editor for additional refinement
- How to import a wiring diagram from *Short Cut* into the comments of a custom program

Short Cut creates files, which can be imported into *CRBasic Editor*. Assuming defaults were used when *Short Cut* was installed, these files reside in the C:\campbellsci\SCWin folder:

- .DEF (wiring and memory usage information)
- .CR300 (CR300-series datalogger code)
- .CR6 (CR6-series datalogger code)
- .CR8 (CR800-series datalogger code)
- .CR1 (CR1000 datalogger code)
- .CR1X (CR1000X datalogger code)
- .CR3 (CR3000 datalogger code)
- .CR5 (CR5000 datalogger code)
- .CR9 (CR9000 datalogger code)

Use the following procedure to import *Short Cut* code and wiring diagram into *CRBasic Editor*.

1. Create the *Short Cut* program following the procedure in Section 4, *QuickStart* (p. 2). Finish the program. On the **Advanced** tab, click the **CRBasic Editor** button. The program opens in CRBasic with the name **noname.CR_**. Now save the program with your desired name in any folder.

NOTE

Once the file is edited with *CRBasic Editor*, *Short Cut* can no longer be used to edit the datalogger program. Change the name of the program file or move it, or *Short Cut* may overwrite it next time it is used.

2. The program can now be edited, saved, and sent to the datalogger.
3. Import wiring information to the program by opening the associated .DEF file. Copy and paste the section beginning with heading “-Wiring for CRXXX-” into the CRBasic program, usually at the head of the file. After pasting, edit the information such that an apostrophe (') begins each line. This character instructs the datalogger compiler to ignore the line when compiling.

Appendix B. Example Programs

The following programs measure the LI200R every 10 seconds, and converts the mV output to Wm^{-2} and MJ m^{-2} . The programs output an hourly average flux (Wm^{-2}) and a daily total flux density (MJm^{-2}). Negative values are set to zero before being processed. Wiring for the examples is given in TABLE B-1. These examples assume the LI-COR calibration value is 71.37. This value is unique to the sensor; therefore, your program will be different.

TABLE B-1. Wiring for Example Programs

Color	Description	CR1000X	CR6
Red	Signal	1H	U1
Black	Signal Reference	1L	U2
White	Analog Ground	\perp	\perp
Clear	Shield	\perp	\perp

CRBasic Example B-1. CR1000X Program for Measuring the LI200R

```
'CR1000X

'Declare Variables and Units
Public BattV
Public PTemp_C
Public S1rW
Public S1rMJ

Units BattV=Volts
Units PTemp_C=Deg C
Units S1rW=W/m^2
Units S1rMJ=MJ/m^2

'Define Data Tables
DataTable(Hourly,True,-1)
  DataInterval(0,60,Min,10)
  Average(1,S1rW,FP2,False)
EndTable

'The Totalize instruction uses the IEEE4 data type to prevent overranging.
DataTable(Daily,True,-1)
  DataInterval(0,1440,Min,10)
  Minimum(1,BattV,FP2,False,False)
  Totalize(1,S1rMJ,IEEE4,False)
EndTable

'Main Program
BeginProg
'Main Scan
Scan(10,Sec,1,0)
'Default Datalogger Battery Voltage measurement 'BattV'
Battery(BattV)

'Default Wiring Panel Temperature measurement 'PTemp_C'
PanelTemp(PTemp_C,_60Hz)

'LI200R Pyranometer measurements 'S1rMJ' and 'S1rW'
```

```

'Measurement returns SlrW in millivolts.
VoltDiff(SlrW,1,mV200,1,True,0,_60Hz,1,0)

'Set negative value to zero.
If SlrW<0 Then SlrW=0
'Convert millivolts to Megajoules/m² using equation from TABLE 7-2.
'Multiplier = t*(1/C)*0.001
'Where t = execution interval in seconds = 1
'Where C = (LI-COR calibration) * 0.1 = 71.37 * 0.1 = 7.137
'Therefore, Multiplier = 1*(1/7.137)*0.001 = 0.001401149
SlrMJ=SlrW*0.001401149

'Convert millivolts to Watts/m² using equation from TABLE 7-2.
'Multiplier = (1/C) * 1000
'Where C = (LI-COR calibration) * 0.1 = 71.37 * 0.1 = 7.137
'Therefore, Multiplier = (1/7.137)*1000 = 140.1149
SlrW=SlrW*140.1149

'Call Data Tables and Store Data
CallTable Hourly
CallTable Daily
NextScan
EndProg

```

CRBasic Example B-2. CR6 Program for Measuring the LI200R

```

'CR6 Series

'Declare Variables and Units
Public BattV
Public PTemp_C
Public SlrW
Public SlrMJ

Units BattV=Volts
Units PTemp_C=Deg C
Units SlrW=W/m^2
Units SlrMJ=MJ/m^2

'Define Data Tables
DataTable(Hourly,True,-1)
  DataInterval(0,60,Min,10)
  Average(1,SlrW,FP2,False)
EndTable

'The Totalize instruction uses the IEEE4 data type to prevent overranging.
DataTable(Daily,True,-1)
  DataInterval(0,1440,Min,10)
  Minimum(1,BattV,FP2,False,False)
  Totalize(1,SlrMJ,IEEE4,False)
EndTable

'Main Program
BeginProg
'Main Scan
Scan(10,Sec,1,0)
'Default Datalogger Battery Voltage measurement 'BattV'
Battery(BattV)

'Default Wiring Panel Temperature measurement 'PTemp_C'
PanelTemp(PTemp_C,60)

'LI200R Pyranometer measurements 'SlrMJ' and 'SlrW'
'Measurement returns SlrW in millivolts.
VoltDiff(SlrW,1,mV200,U1,True,0,60,1,0)

```

```
'Set negative value to zero.
If S1rW<0 Then S1rW=0

'Convert millivolts to Megajoules/m² using equation from TABLE 7-2.
'Multiplier = t*(1/C)*0.001
'Where t = execution interval in seconds = 1
'Where C = (LI-COR calibration) * 0.1 = 71.37 * 0.1 = 7.137
'Therefore, Multiplier = 1*(1/7.137)*0.001 = 0.001401149
S1rMJ=S1rW*0.001401149

'Convert millivolts to Watts/m² using equation from TABLE 7-2.
'Multiplier = (1/C) * 1000
'Where C = (LI-COR calibration) * 0.1 = 71.37 * 0.1 = 7.137
'Therefore, Multiplier = (1/7.137)*1000 = 140.1149
S1rW=S1rW*140.1149

'Call Data Tables and Store Data
CallTable Hourly
CallTable Daily
NextScan
EndProg
```


Campbell Scientific Companies

Campbell Scientific, Inc.

815 West 1800 North
Logan, Utah 84321
UNITED STATES

www.campbellsci.com • info@campbellsci.com

Campbell Scientific Canada Corp.

14532 – 131 Avenue NW
Edmonton AB T5L 4X4
CANADA

www.campbellsci.ca • dataloggers@campbellsci.ca

Campbell Scientific Africa Pty. Ltd.

PO Box 2450
Somerset West 7129
SOUTH AFRICA

www.campbellsci.co.za • cleroux@csafrica.co.za

Campbell Scientific Centro Caribe S.A.

300 N Cementerio, Edificio Breller
Santo Domingo, Heredia 40305
COSTA RICA

www.campbellsci.cc • info@campbellsci.cc

Campbell Scientific Southeast Asia Co., Ltd.

877/22 Nirvana@Work, Rama 9 Road
Suan Luang Subdistrict, Suan Luang District
Bangkok 10250
THAILAND

www.campbellsci.asia • info@campbellsci.asia

Campbell Scientific Ltd.

Campbell Park
80 Hathern Road
Shepshed, Loughborough LE12 9GX
UNITED KINGDOM

www.campbellsci.co.uk • sales@campbellsci.co.uk

Campbell Scientific Australia Pty. Ltd.

PO Box 8108
Garbutt Post Shop QLD 4814
AUSTRALIA

www.campbellsci.com.au • info@campbellsci.com.au

Campbell Scientific Ltd.

3 Avenue de la Division Leclerc
92160 ANTONY
FRANCE

www.campbellsci.fr • info@campbellsci.fr

Campbell Scientific (Beijing) Co., Ltd.

8B16, Floor 8 Tower B, Hanwei Plaza
7 Guanghua Road
Chaoyang, Beijing 100004
P.R. CHINA

www.campbellsci.com • info@campbellsci.com.cn

Campbell Scientific Ltd.

Fahrenheitstraße 13
28359 Bremen
GERMANY

www.campbellsci.de • info@campbellsci.de

Campbell Scientific do Brasil Ltda.

Rua Apinagés, n.br. 2018 — Perdizes
CEP: 01258-00 — São Paulo — SP
BRASIL

www.campbellsci.com.br • vendas@campbellsci.com.br

Campbell Scientific Spain, S. L.

Avda. Pompeu Fabra 7-9, local 1
08024 Barcelona
SPAIN

www.campbellsci.es • info@campbellsci.es

Please visit www.campbellsci.com to obtain contact information for your local US or international representative.