CAMPBELL SCIENTIFIC

QUICK DEPLOY GUIDE

CR-PVS1

PV Soiling Loss Index RTU

Document Part Number: 33045
Revision Date: July 2019

Info Link

IMPORTANT NOTE: *This Quick Deploy Guide is a general installation reference. Refer to the Owner's Manual for detailed installation instructions and information.*

1 Caution!

To prevent injury, completely cover the panels during installation to limit output current and voltage. Do not short the solar panel (+) and (–) leads together.

2 Item List

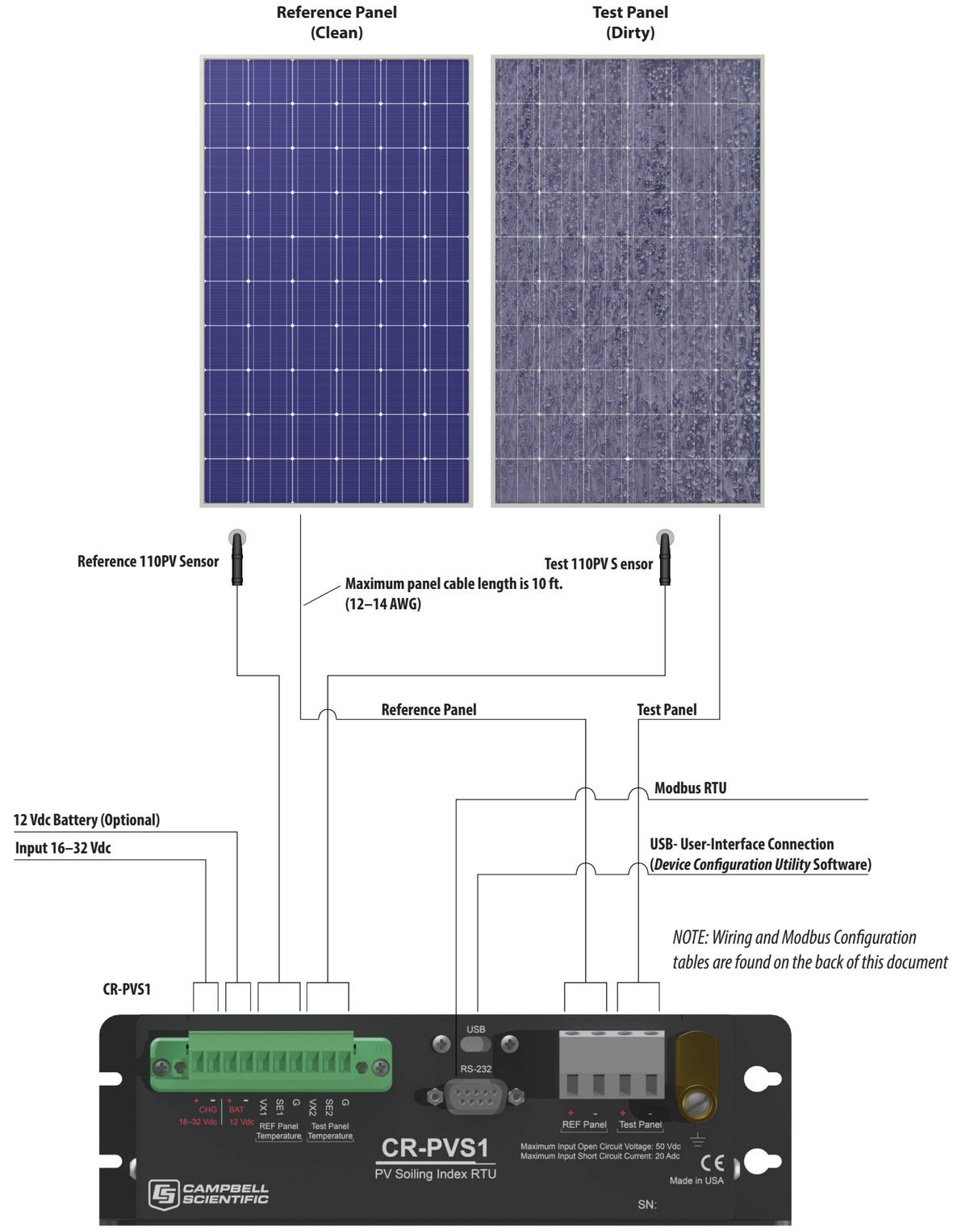
Ships With

- CR-PVS1 x 1
- UV resistant cable ties x 2
- Kapton tape x 1
- 110PV-L15-PT surface mount thermistor x 2
- Flathead screwdriver x 1
- Grommet x 4
- Screw x 4
- USB 2.0 Cable Type A Male to Micro B Male
- CR300 Calibration Documentation
- Quick Deploy Guide
- Labels for Reference and Test Modules
- USB flash drive with *Device Configuration Utility* software (*DevConfig*)

Other required items

- Rubbing alcohol or non-residue cleaner
- 16–32 Vdc power supply

System Overview



3 Physical Deployment

3.1 Install the CR-PVS1 near the Test and Reference panels. The length of the solar panel wires should not exceed 10 feet. Connect the ground lug to earth ground.

3.2 Using the stickers supplied with the CR-PVS1, identify one panel as Test and the other as Reference. Do the same with the two temperature sensor cables by writing on the white band near the cable end.

3.3 Route the Test panel sensor cable to the enclosure. Use cable ties to attach the cable to the panel framework, but do not tighten them yet. Repeat with the sensor cable for the Reference panel.

3.4 On the back of the Test panel, choose a solar cell as close to the center as possible. Clean the surface of the cell with rubbing alcohol or non-residue cleaner. Clean the cell in the same reference position on the Reference panel in the same manner.

3.5 IMPORTANT: Before mounting, wash your hands and then clean the back of the PV module or other device with ethyl alcohol.

Use Kapton tape for cable strain relief; a yellow label on the cable indicates where the cable must be secured. If the temperature might exceed 70 °C, Kapton tape is also required to better secure the sensor to the measurement surface.

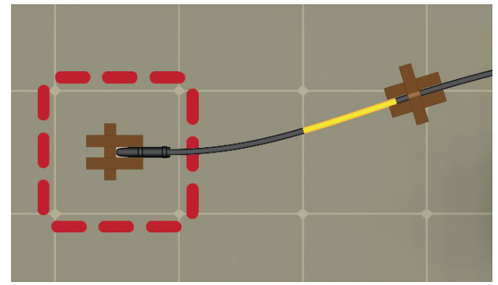
To ensure that the sensor disk and cable are adequately fastened to the measurement surface, use three strips of Kapton tape in two places each:

a. For strain relief, place the first strip of tape across the cable just below the yellow heat shrink and rub the tape surface to remove bubbles.

b. Place the other strips of tape on the ends of the first strip of tape and rub the tape surface to remove bubbles. These strips of tape should be perpendicular to the first strip of tape—forming an "H". They hold the first strip of tape down against the weight of the cable.

c. To secure the sensor to the module surface, remove the paper from the bottom of the disk and adhere the disk to the center of the module most center cell.

d. Place a strip of tape across the sensor head, perpendicular to the cable and rub the tape surface to remove bubbles. Rub as close as possible to the sensor's disk. Do not go over the sensor molding with the tape; only put tape over the metal disk portion of the sensor.



e. Place the two other strips of tape on the ends of the sensor disk, perpendicular to the first piece of tape and parallel to the cable then rub the tape surface into the module surface.

3.6 Tighten the cable ties securing the sensor wires to the solar panel frame.

3.7 Wire the Test and Reference panels and sensors to the CR-PVS1 terminals shown in the wiring tables in Section 4.

3.8 Supply an input voltage of 16-32 Vdc through the CHG + and – terminals. If backup power is needed, connect a 12 V battery to the Bat + and – terminals.

Note: Cover the panels while wiring to reduce the voltage on the lead wires. Do not allow the wires to touch each other.

4 Wiring Tables

Panel Connections

Panel	Wire	Function	CR-PVS1 Terminal
REF	RED	+	REF Panel +
	BLACK	–	REF Panel –
TEST	RED	+	Test Panel +
	BLACK	–	Test Panel –

110PV Temperature Sensor Connections

Panel	Wire	Function	CR-PVS1 Terminal
REF	BLACK	Power	REF Panel Temperature VX1
	RED	Signal	REF Panel Temperature SE1
	VIOLET	Ground	REF Panel Temperature G
	CLEAR	Shield	REF Panel Temperature G
TEST	BLACK	Power	Test Panel Temperature VX2
	RED	Signal	Test Panel Temperature SE2
	VIOLET	Ground	Test Panel Temperature G
	CLEAR	Shield	Test Panel Temperature G

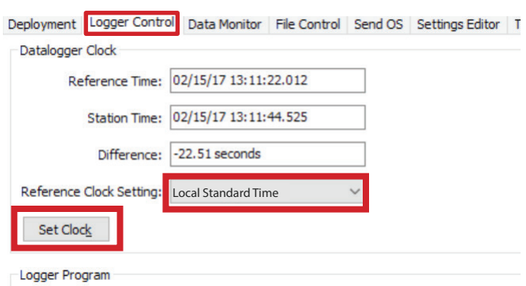
5 Device Configuration Utility (DevConfig)

To complete the following steps, connect to the CR-PVS1 using *Device Configuration Utility (DevConfig)*. A copy of *DevConfig* is provided on the USB flash drive included with the CR-PVS1. *DevConfig* is also available as a free download from Campbell Scientific. *www.campbellsci.com/devconfig*

In the **Device Type** panel, select **CR300 Series**. Follow the steps shown in the right panel of the window to connect.

5.1 Set Time

In the **Logger Control** tab, select **Local Standard Time**. Click **Set Clock**.



5.2 Set Location and Solar Panel Coefficients

a. In the **Data Monitor** tab, select the **Public** table from the list on the left.

b. Double-click on the value in the **UTC_Offset_UserEntered** field. Enter the correct Coordinated Universal Time (UTC) offset value for the location and press **Enter**.

c. Double-click on the value in the **Latitude_UserEntered** field. Enter the latitude for your location and press **Enter**. Do the same for the longitude in **Longitude_UserEntered**.

d. Double-click on the value in the **AlphaTest_UserEntered** field. Enter the correct value and press **Enter**. Do the same for the **AlphaRef_UserEntered**, **IscTeststc_UserEntered**, and **IscRefstc_UserEntered** values.

e. Double-click on the value in the **HrSolNoonOffset_UserEntered** field. Enter the correct value and press Enter. Do the same for **GeffThreshold_UserEntered**.

Definitions:

UTC_Offset_UserEntered: User-entered UTC offset of site location, hours

Latitude_UserEntered: User-entered latitude of site location

Longitude_UserEntered: User-entered longitude of site location

AlphaTest_UserEntered: Published panel short circuit current (Isc) temperature coeffecient of the test panel (if published in units of %/deg_C then enter published value/100)

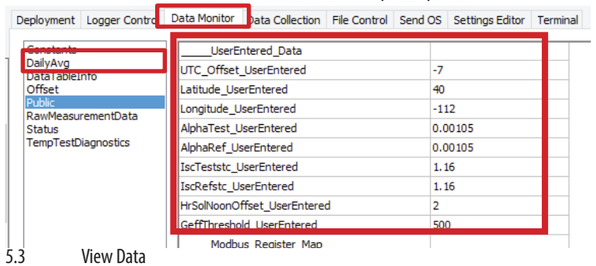
AlphaRef_UserEntered: Published panel short circuit current (Isc) temperature coeffecient of the reference panel (if published in units of %/deg_C then enter published value/100)

IscTeststc_UserEntered: Published panel short circuit current (Isc) of the test panel at STC

IscRefstc_UserEntered: Published panel short circuit current (Isc) of the reference panel at STC

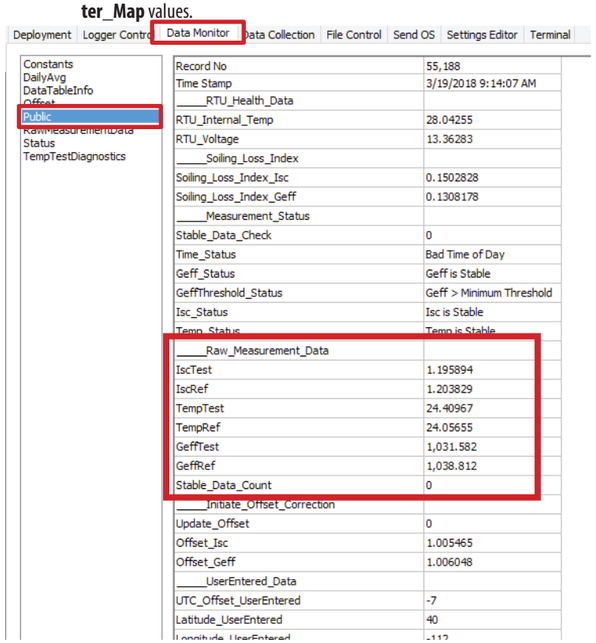
HrSolNoonOffset_UserEntered: User-entered field that defines that number of hours before and after solar noon to include measurements for calculating soiling index.

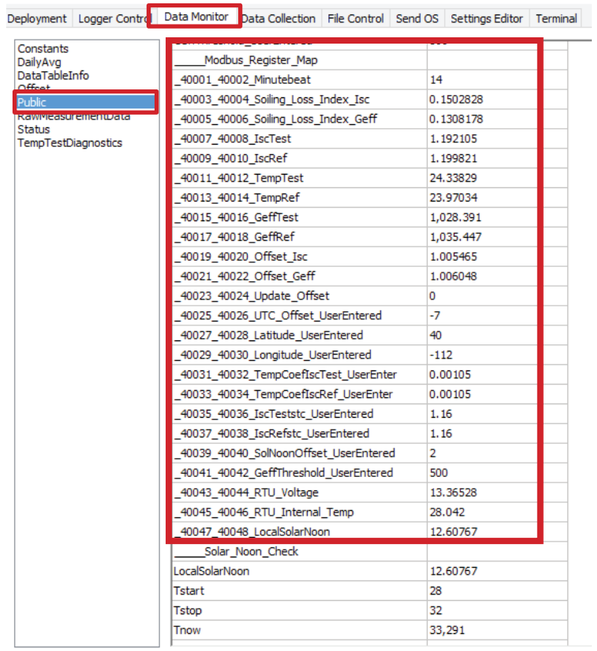
GeffThreshold_UserEntered: User-entered field that defines that minimum effective irradiance value for calculating soiling index.



5.3 View Data

Live data is shown in the **Public** table. To verify that the system is working as expected, review the **Raw_Measurement_Data** and the **Modbus_Register_Map** values.

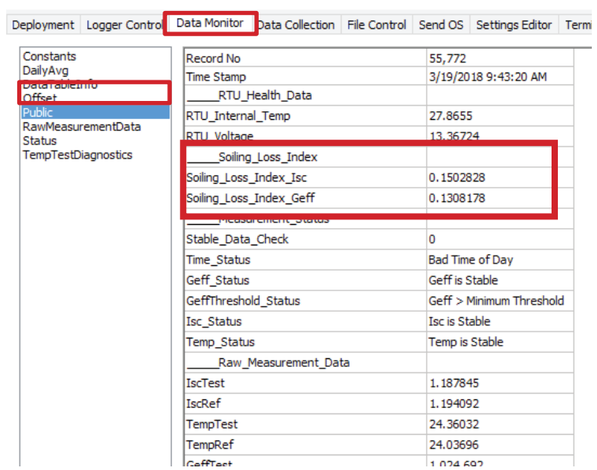




This table shows the default Modbus serial settings for the CR-PVS1. Any device connected to the the CR-PVS1 must have the same configuration for successful communication.

Modbus Configuration	
ComPort	Com RS-232
Baud Rate	19200, 8-bit
Parity	Even
Address	11
Data	32-bit Float
Data Format	CDAB

5.4 The soiling loss index based on short circuit current only and effective irradiance (including temperature correction) will show the previous day's average soiling loss index assuming the minimum number of stable data points are recorded. If zero stable data are recorded for the day, the SLI will show NAN. If the minimum number of stable data points are recorded, the soiling loss indices will update at midnight.



6 Offset Correction

A difference in power output of the two modules under identical conditions, including cleanliness, weather, and position of the sun is expected. This difference is called the "offset" and can significantly vary between solar modules, even of the same model and batch.

The "offset" should be determined at the beginning of the soiling measurement campaign and should be updated periodically.

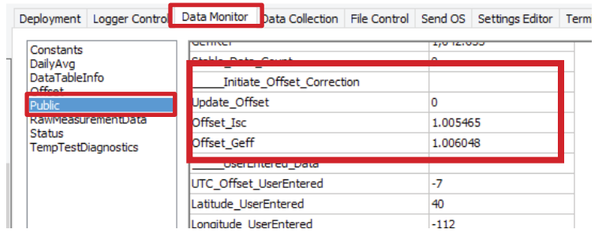
The procedure below causes the program to automatically determine the offset, and then implements a correction factor into the measurement sequence to remove any effects that may be caused by the offset.

NOTE: *The procedure is only followed to remove the "offset" when both modules are clean. It is not used as an indicator of when the reference module only is cleaned.*

NOTE: *The offset correction procedure is normally initiated in the morning, immediately after both modules are cleaned. In this case, the offset will be updated at midnight if the minimum number of good data points is met. If the offset correction is applied in the afternoon, then the offset will be updated at the end of the following day assuming the minimum number of data points has been met.*

1. Double-click on the value in the **Update_Offset** field. Enter **–1** and press **Enter**.
2. Results will be available when the minimum number of data points has been met for calculating a good offset value. This is typically at midnight if the offset was initiated in the morning or midnight of the following day if the offset was initiated in the afternoon.

Inital Value



Entered Value