

**MSX10, MSX10R, MSX20R, MSX64R, AND MSX128R  
SOLAR PANELS  
INSTRUCTION MANUAL**

**REVISION: 10/01**

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# Warranty and Assistance

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The **MSX10, MSX10R, MSX20R, MSX64R, AND MSX128R SOLAR PANELS** are warranted by CAMPBELL SCIENTIFIC, INC. to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise. Batteries have no warranty. CAMPBELL SCIENTIFIC, INC.'s obligation under this warranty is limited to repairing or replacing (at CAMPBELL SCIENTIFIC, INC.'s option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return such products by surface carrier prepaid. This warranty shall not apply to any CAMPBELL SCIENTIFIC, INC. products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CAMPBELL SCIENTIFIC, INC. is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 753-2342. After an applications engineer determines the nature of the problem, an RMA number will be issued. Please write this number clearly on the outside of the shipping container. CAMPBELL SCIENTIFIC's shipping address is:

**CAMPBELL SCIENTIFIC, INC.**

RMA# \_\_\_\_\_  
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Logan, Utah 84321-1784

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

Non-warranty products returned for repair should be accompanied by a purchase order to cover the repair.



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# ***MSX10, MSX10R, MSX20R, MSX64R, and MSX128R Solar Panels***

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## **1. General**

The solar panel is a photovoltaic power source used for charging lead acid batteries. The MSX10, MSX10R, MSX20R, MSX64R, and MSX128R are 10, 10, 20, 64, and 128-watt solar panels, respectively.

The MSX10 Solar Panels has two leads stripped and tinned to insert into the terminals labeled 'CHG' on the PS12-LA Charging Regulator. With a CR7, the two wires from the solar panel are inserted into the terminals marked SOLAR PANEL located underneath the 700X Control Module. An external lead acid battery can be connected to the CR7 at the terminals marked EXTERNAL BATTERY next to the SOLAR PANEL terminals.

The MSX10 must have a connector (Part No. 788) to plug into the 21XL Micrologger. This connector is supplied and attached if the solar panel is purchased with the 21XL. If the solar panel is not purchased with a 21XL, the connector is taped to the cable and can be discarded if not needed. See Appendix A for details.

The MSX10R, MSX20R, MSX64R, and MSX128R are regulated solar panels with two stripped and tinned leads for direct connection to an external 12-volt lead acid battery.

## **2. Specifications**

	<b>MSX10/MSX10R</b>	<b>MSX20R</b>	<b>MSX64R</b>	<b>MSX128R</b>
Typical peak power (Pp)	10 W	20 W	64	128
Voltage @ peak power (Vpp)	17.5 V	17.1 V	17.5	17.5
Current @ peak power (Ipp)	0.57 A	1.17 A	3.66	7.32
Guaranteed minimum peak power	9 W	18 W	62	124
Approximate effect of temperature on power	-0.37%/°C	-0.38%/°C	-.38/°C	-.38/°C
Length, cm	42.0	50.1	111.3	111.3
Width, cm	26.9	42.2	50.2	100.4
Depth, cm	2.3	5.0	5	5
Weight, kg	1.50	2.95	7.2	14.4

### **NOTE**

The above solar panel characteristics assume a 1 kilowatt per square meter illumination and a solar panel temperature of 25°C. Individual panels may vary up to 10%. The output panel voltage increases as the panel temperature decreases.

\*The MSX128R includes two 64-watt solar panels. An MSX64R can be updated to an MSX128R with part number 13968.

### 3. Installation

#### 3.1 Mounting

The panel should be mounted facing south if located in the Northern Hemisphere, or facing north in the Southern Hemisphere. The solar panel mounts to the mast or leg of the CM10/CM6 Tripod, or any 1 5/8" schedule 40 pipe, see Figure 1. The panel should be mounted to the pipe using the U-bolts and 5/16 NC (course) nuts provided with the solar panel. The nuts fastening the bracket to the pipe should be as tight as possible without bending the bracket.

If the MSX10 solar panel is being used, route the solar panel cable to the datalogger power supply and charging circuitry. If the MSX10R, MSX20R, MSX64R, or MSX128R is being used, attach the leads of the solar panel directly to the external battery with a user supplied connector. Figure 2 shows an example of a regulated solar panel connected to an external battery to run a radiotelemetry system.

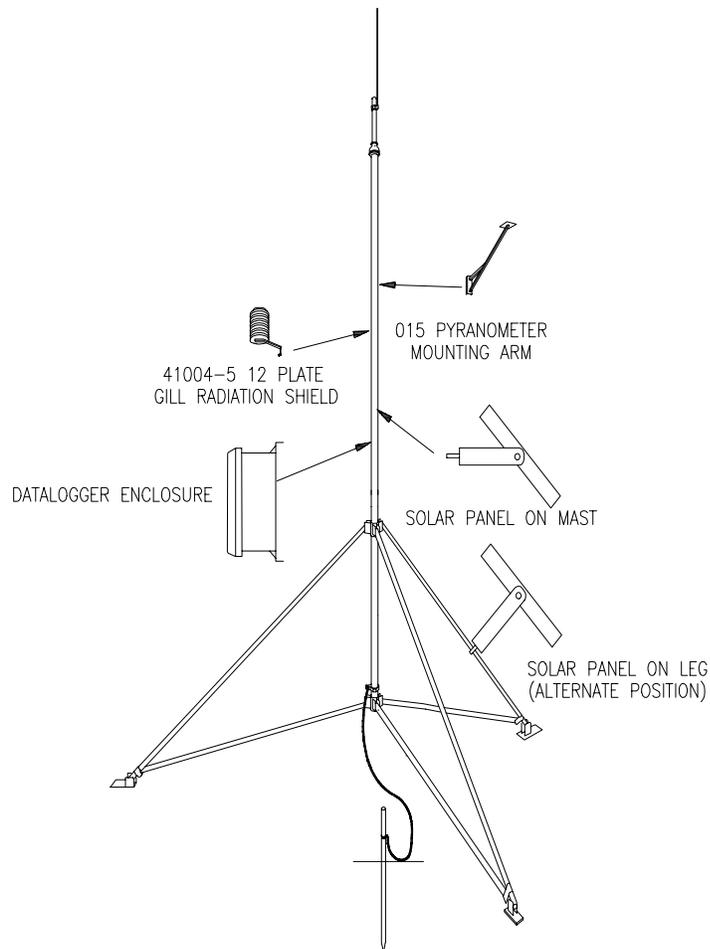


FIGURE 1. Solar Panel Mounting

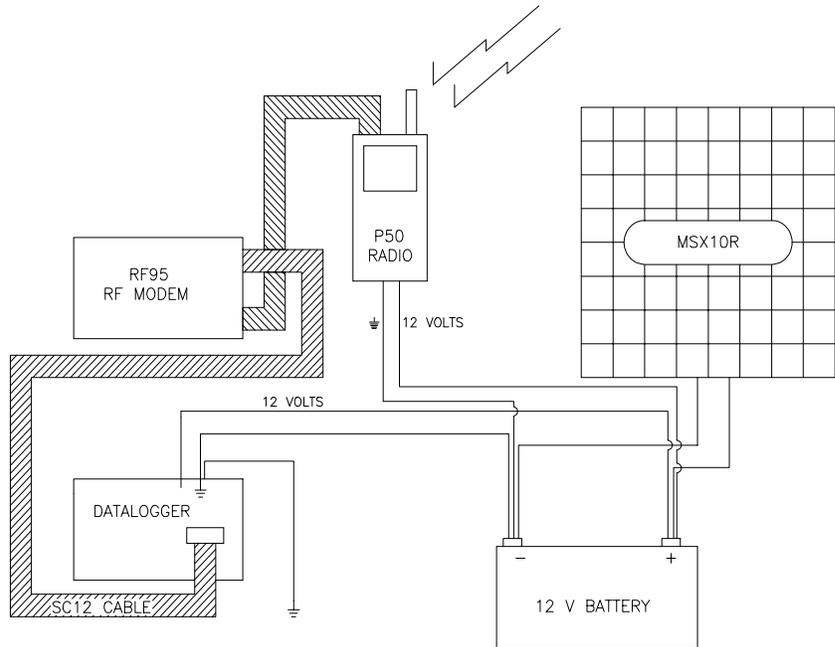


FIGURE 2. Regulated Solar Panel and External Battery

### 3.2 Orientation

The solar panel should be oriented to receive maximum insolation (incident solar radiation) over the course of a year. Suggested tilt angles of the solar panel are given in Table 1.

After determining the tilt angle, loosen the 5/16" nuts on each side of the solar panel, adjust the panel, and tighten the two nuts to secure the position. See Figure 3.

<u>Site Latitude (N or S)</u>	<u>Tilt Angle</u>
0 – 10°	10°
11 – 20°	Latitude +5°
21 – 45	Latitude +10°
46 – 65	Latitude +15°
> 65	80°

\* From "Design Aids for Small PV Power Systems", Solorex Corp.

## 4. Maintenance

An occasional cleaning of the glass improves the solar panel's efficiency.

If a problem with the solar panel is suspected, the panel may be checked by measuring the voltage output. Check the voltage with a voltmeter connected

between the two leads of the solar panel. There must be solar radiation incident on the panel and there must be a load connected to the solar panel. The load can be the datalogger, other equipment, or a 75 ohm resistor capable of dissipating solar panel power between the two leads. No voltage output implies a bad solar panel, regulator, or cable. The magnitude of the voltage output depends on the incident solar radiation.

## 5. Power Considerations

### 5.1 Solar Power and Lead Acid Batteries

The solar panel converts light energy to electricity, or specifically direct current. The direct current produced is used as a charging source for lead acid batteries.

The solar panel operates in both direct and diffuse light (cloudy days), but not at night.

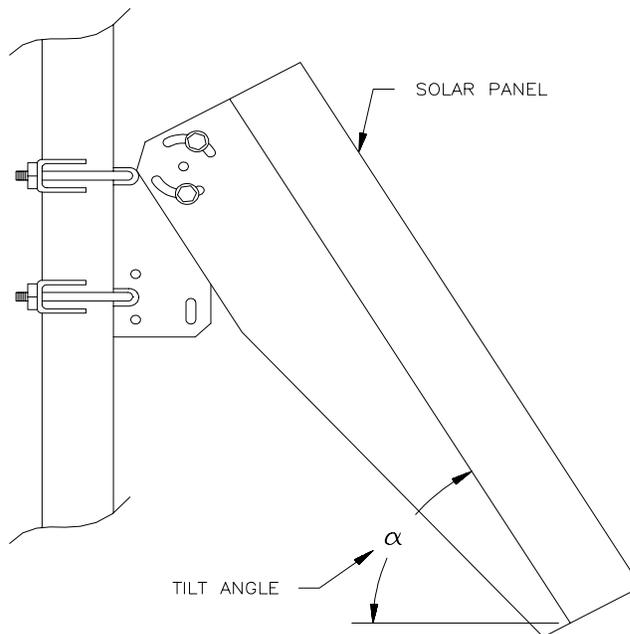


FIGURE 3. Solar Panel Orientation

The minimum battery size and solar panel output required depends on 1) the average current drain of the system, 2) the maximum time the battery must supply power to the system without being charged, and 3) the location of the site. When some batteries are discharged below a specified voltage, the battery becomes damaged and cannot be recharged.

The battery supplies power directly to the operating system, the solar panel supplies power to recharge the battery. Therefore, on the average, the solar panel must provide at least as much power to the battery as is being used by the system.

The battery must have enough capacity to power the system during times of no charging (night) or low charging (stormy winter days).

## **5.2 Voltage Regulator**

The solar panel must be regulated either with a Campbell Scientific regulator or an attached regulator. The regulator has two basic functions: 1) blocks any current flow from the battery to the solar panel, and 2) limits the source current to the battery.

The MSX10 is unregulated and must be connected to a Campbell Scientific voltage regulator. These regulators include the PS12-LA, PS512M, CH12R, CH512R, 21XL base, and the CR7 solar panel input.

The MSX10R, MSX20R, MSX64R, and MSX128R have a voltage regulator attached. These panels are connected directly to a battery.



# Appendix A. Solar Panel Connector

The MSX10 solar panel is shipped standard with the two lead wires stripped and tinned and a connector taped to the cable. This connector must be attached to use the MSX10 with the 21XL.

With the connector, the cable can be inserted directly into the 21XL Charging Port on the side of the Micrologger.

If it is necessary to solder the connector on the cable, please refer to the diagram below.

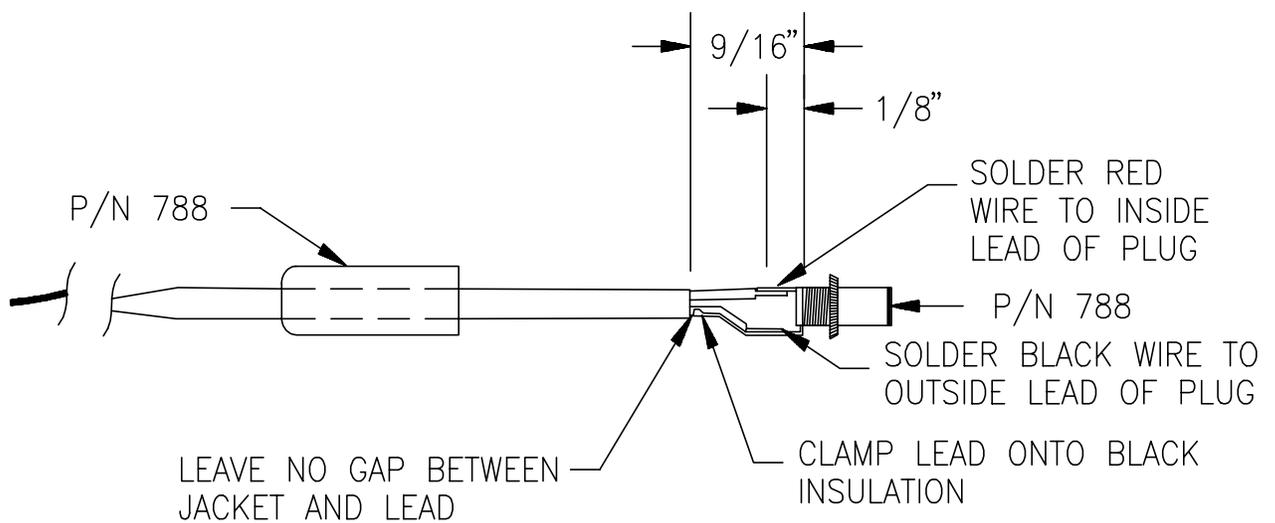


FIGURE A-1. Connector Wiring

