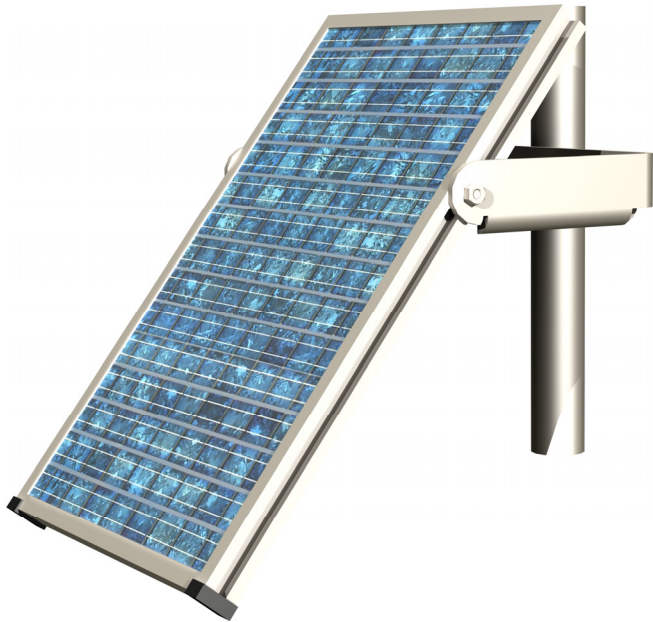


INSTRUCTION MANUAL



SP5, SP10, SP10R, SP20, and SP20R Solar Panels

Revision: 11/13



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SP5, SP10, SP10R, SP20, and SP20R Solar Panels

1. General

Solar panels provide a photovoltaic power source for charging lead acid batteries.

The SP5 has an output level that will allow it to be connected directly to the “Charge +” and “Charge –” terminals on the CR200(X)-series dataloggers. The CR200(X) will then charge a 12 Vdc (7 A h or less) battery attached to the “Battery +” and “Battery –” terminals. Batteries larger than 7 A h are not recommended as they may produce excessive heat on the CR200(X) circuit board.

The SP10 10-watt and SP20 20-watt solar panels are intended to recharge the gel cell lead acid batteries incorporated in the PS100, PS200, CR3000, CR5000, CR7, and CR9000(X), as well as the BP12 and BP24 battery packs. Either a CH100 or CH200 is also required when recharging a BP12 or BP24.

The SP10 and SP20 have two leads stripped and tinned to insert into the terminals labeled CHARGE on the PS100, PS200, CH100, CH200, or CR9000(X). The two wires attach to the green connector on the side of a CR3000 or CR5000 datalogger. 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 gel cell or AGM lead acid battery can be connected to the CR7 at the terminals marked EXTERNAL BATTERY next to the SOLAR PANEL terminals.

The SP10 or SP20 must have a barrel connector (pn 788) to plug into the retired 21XL Micrologger. See Appendix A for details.

The SP10R 10-watt and SP20R 20-watt regulated solar panels have two stripped and tinned leads for connection to a user-supplied flooded lead acid battery such as a deep-cycle marine or RV battery.

2. Specifications

	SP5	SP10/SP10R	SP20/SP20R
Typical peak power (Pp)	4.5 W	10 W	20 W
Voltage @ peak power (Vpp) (voltage from solar panel before regulator)	16.5 V	17.5 V	17.1 V
Current @ peak power (Ipp)	0.27 A	0.57 A	1.17 A
Guaranteed minimum peak power	4.05 W	9 W	18 W
Approximate effect of temperature on power	−0.45% / °C	−0.37% / °C	−0.38% / °C
Length, cm	25.1	42.0	50.1
Width, cm	26.9	26.9	42.2
Depth, cm	2.3	2.3	5.0
Weight, kg	0.8	1.50	2.95

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.

Compatible batteries:

SP10/SP20

12 V gel cell or AGM lead acid batteries such as the batteries used with the PS100, BP12, BP24, CR3000, CR5000, CR7, and CR9000(X).

SP10R/SP20R

User-supplied 12 V flooded batteries such as a deep cycle marine or RV battery.

3. Installation

3.1 Mounting

The solar panel mounts to the mast or leg of a tripod, or any 1 5/8" schedule 40 pipe. Refer to FIGURE 3-1 (SP5), FIGURE 3-2 (SP10, SP10R), or FIGURE 3-3 (SP20, SP20R) for mounting the solar panel to a tripod mast. FIGURE 3-4 shows the solar panel mounted on a tripod leg.

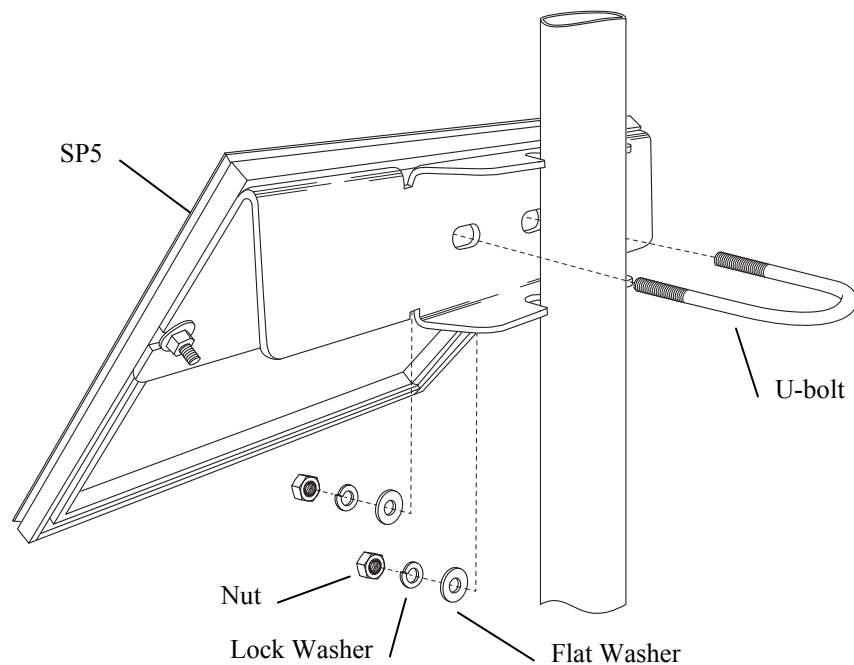


FIGURE 3-1. SP5 mounting

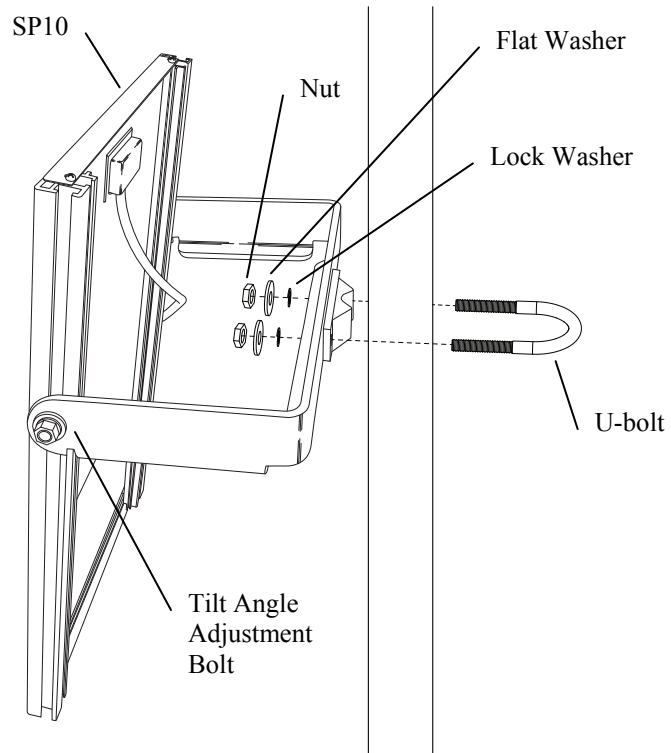


FIGURE 3-2. SP10, SP10R mounting

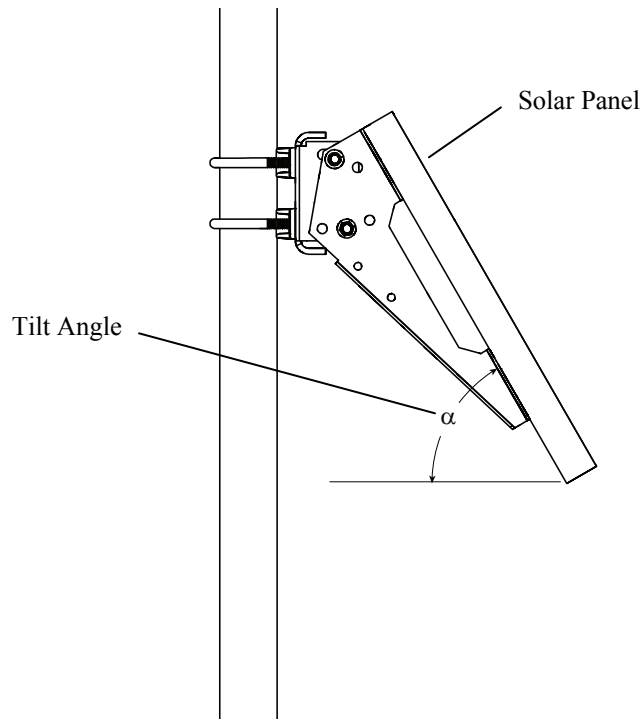


FIGURE 3-3. Solar panel orientation

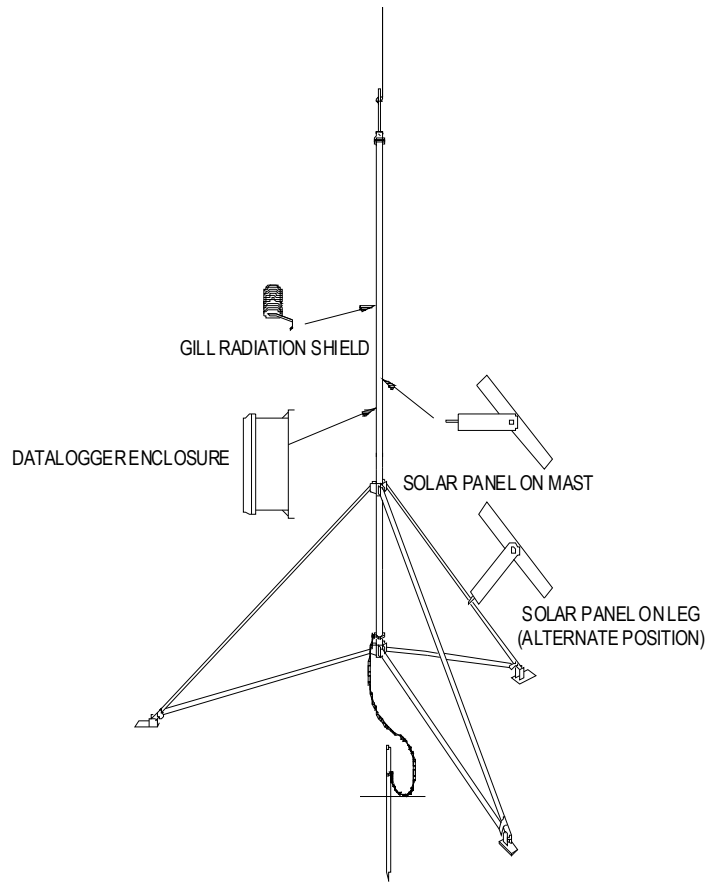


FIGURE 3-4. Solar panel mounting

The solar panel is oriented to face the equator, and then mounted to the mast using the U-bolts and 5/16 NC (course) nuts provided with the panel. The nuts fastening the bracket to the pipe must be as tight as possible without bending the bracket.

If the SP10 or SP20 solar panel is being used, route the solar panel cable to the datalogger power supply and charging circuitry. If the SP10R or SP20R is being used, attach the leads of the solar panel directly to the external battery with a user-supplied connector. FIGURE 3-5 shows an example of a regulated solar panel connected to an external battery to run a radiotelemetry system.

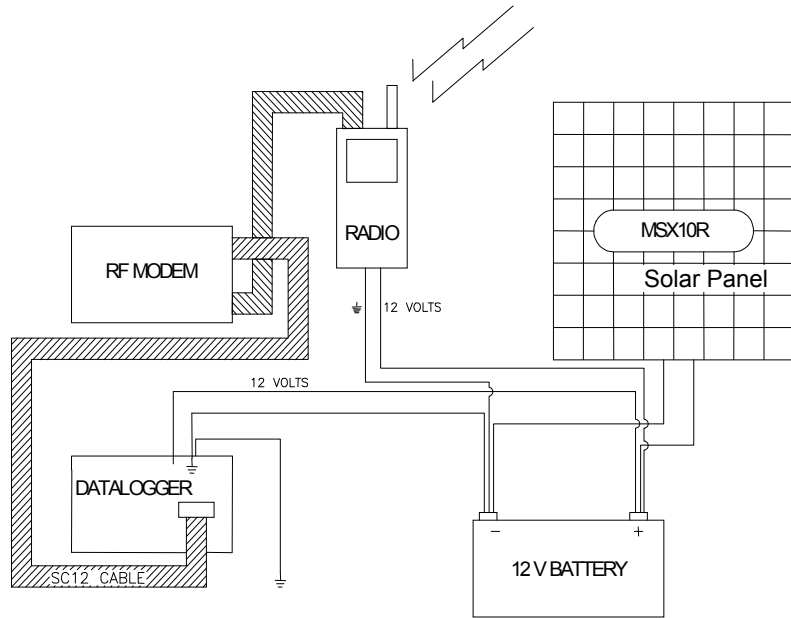


FIGURE 3-5. Regulated solar panel and external battery

3.2 Orientation

The solar panel should be oriented to receive maximum insolation (incident solar radiation) over the course of a year. TABLE 3-1 suggests optimal angles for the solar panel through a range of latitudes.

NOTE The SP5 mounting bracket has a fixed tilt angle that cannot be adjusted.

Site Latitude (N or S)	Tilt Angle
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.	

For the SP10 and SP10R, once the proper tilt angle has been determined, adjust the angle by loosening the two tilt angle adjustment bolts (FIGURE 3-6) and rotating the solar panel to the correct tilt angle. Tighten the tilt angle adjustment bolts to secure the solar panel.

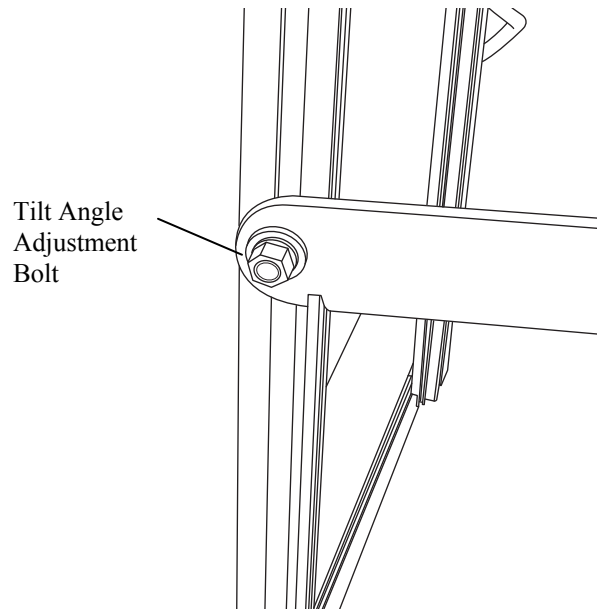


FIGURE 3-6. Adjust the tilt angle of the SP10

For the SP20 and SP20R, the angle is set by the alignment of holes on the mount and arm brackets (FIGURE 3-7). Refer to TABLE 3-2 to determine which holes need to be aligned for the correct angle. Use the following procedure to mount the solar panel.

1. Insert a bolt through the correct upper hole on each arm bracket (hole 1 or 2) and through the upper opening (Y and Z) in the mount.
2. Place a washer and nut on the end of each upper bolt, but do not tighten the nuts.
3. Insert a bolt through the correct lower hole on each arm bracket (hole A, B, or C) and through hole P on the mount.
4. Once again, place washers and nuts on the end of each bolt, but do not tighten the nuts.
5. Slide the upper bolts into the correct position (Y or Z) on the bracket, and fully tighten all four nuts.

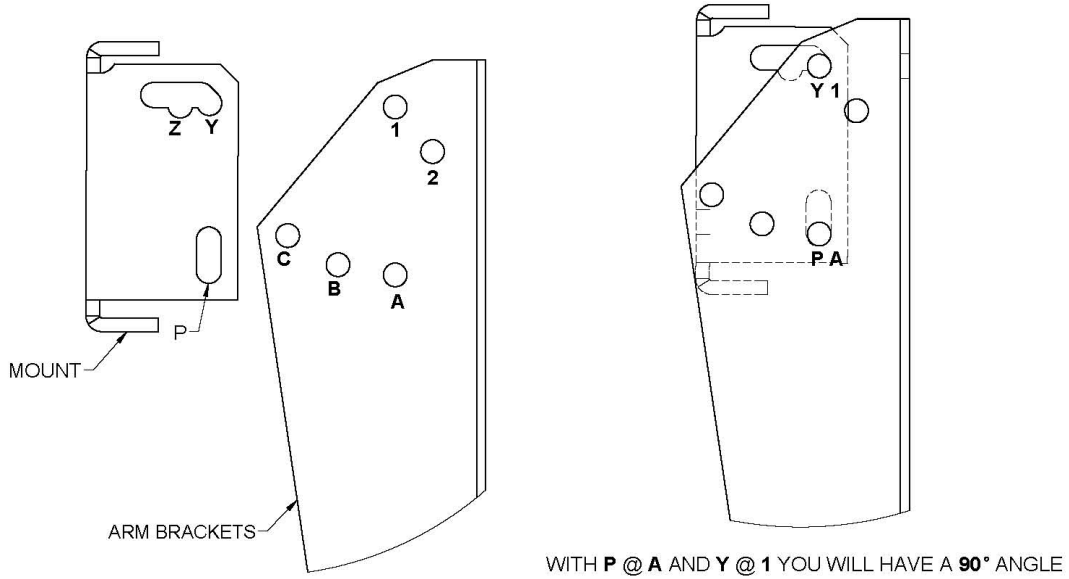


FIGURE 3-7. Angle settings on mounting bracket of SP20

Hole Locations	Angle
Holes P and A Aligned with Holes 1 and Y	90°
Holes P and A Aligned with Holes 1 and Z	80°
Holes P and B Aligned with Holes 1 and Y	70°
Holes P and B Aligned with Holes 1 and Z	60°
Holes P and C Aligned with Holes 1 and Y	50°
Holes P and C Aligned with Holes 1 and Z	40°
Holes P and C Aligned with Holes 2 and Y	30°
Holes P and C Aligned with Holes 2 and Z	20°

4. Maintenance

An occasional cleaning of the glass improves the solar panel's efficiency. Use a soft sponge and warm water with a small amount of dishwashing detergent to gently clean the solar panel of any dust, grime, or bird droppings. Use a soft, dry cloth or squeegee to remove any residual water from the panel.

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.

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. 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) blocking any current flow from the battery to the solar panel, and 2) limiting the source current to the battery.

The SP5 may be connected directly to the “Charge +” and “Charge —” terminals on the CR200(X) datalogger. Otherwise, the SP5 must be connected to a Campbell Scientific PS100, PS200, CH100, or CH200 voltage regulator.

The SP10 and SP20 must be connected to a Campbell Scientific voltage regulator. Campbell Scientific voltage regulators include the PS100, PS200, CH100, CH200, and the voltage regulator integrated in the base of our CR3000, CR5000, CR7, and CR9000(X) dataloggers.

The SP10R and SP20R have an on-board voltage regulator that connects directly to a user-supplied flooded lead-acid battery such as a deep-cycle marine or RV battery.

Appendix A. Solar Panel Connector

The SP10 and SP20 solar panels are shipped with the two lead wires stripped and tinned. A barrel connector (pn 788) connector must be attached to use an SP10 or SP20 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.

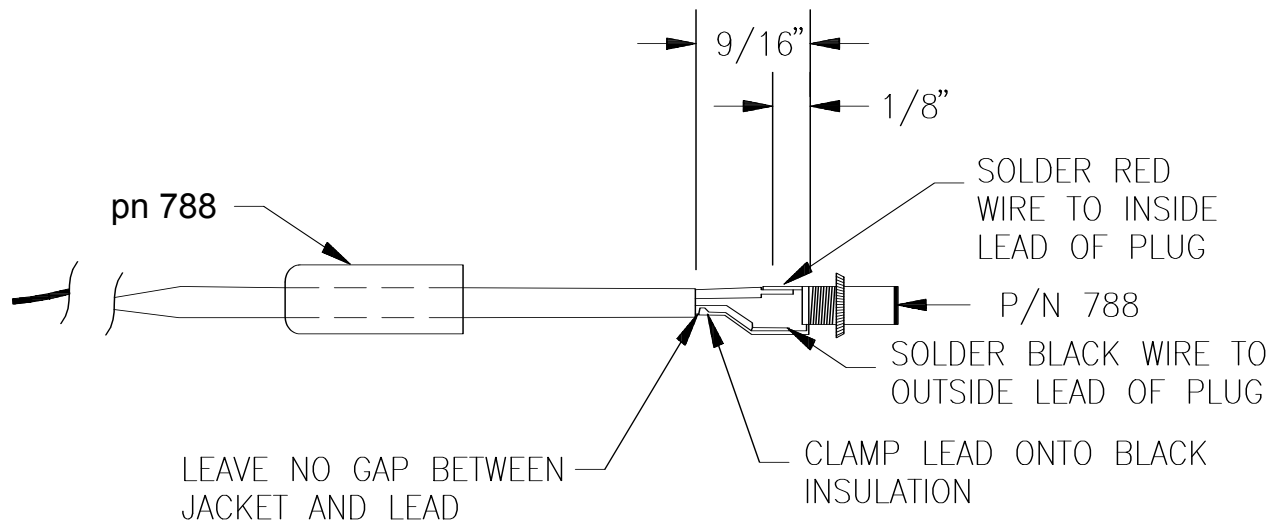


FIGURE A-1. Connector wiring

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