SOLAR CHARGERS

Model SC (P/N 2.60)

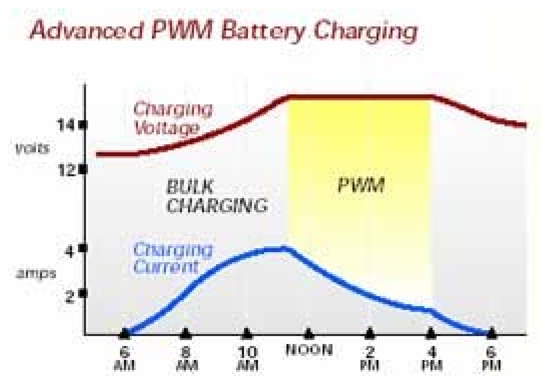
Instructions

Description:

Our Solar Charger Model SC (P/N 2.60) is a fully-regulated commercial photovoltaic module designed to recharge 12 volt batteries with capacities in the range of 10 to 20 or more amps. The unit has a built-in and advanced solar battery charge controller (SBCC) that regulates the voltage and current going to your battery as a function of the state of the battery. The controller is 100% solid state using MOSFETs. The SBCC controller uses a series PWM charge control for constant voltage charging. It provides a true 0 to 100% PWM duty cycle is very fast and is stable for highly efficient charging (see Fig. 1). And, the controller is temperature compensated; a sensor measures ambient temperature and corrects the constant voltage setpoint by –28 mV per °C with a 25°C reference.

Under conditions of full sum (100 mW/cm2) the SC panel produces a current of 1.75 amps. When in full sunlight, the module behaves like fully regulated battery chargers. Overcharging will not occur if the battery is left connected to a panel after it is fully charged, and continued charging will not dry out your battery. The SBCC also prevents the battery from discharging back into the solar panel if no light is falling on the unit.

What is PWM?



Pulse Width Modulation (PWM) is the most effective means to achieve constant voltage battery charging by switching the solar system controller's power devices. When in PWM regulation, the current from the solar array tapers according to the battery's condition and recharging needs. Charging a battery with a solar system is a unique and difficult challenge. In the "old days", simple on-off regulators were used to limit battery outgassing when a solar panel produced excess energy. However, as solar systems matured it became clear how much these simple devices interfered with the charging process. The history for on-off regulators has been early battery failures, increasing load disconnects, and growing user dissatisfaction. PWM has recently surfaced as the first significant advance in solar battery charging.

PWM solar chargers use technology similar to our other, modern high quality battery chargers. When a battery voltage reaches the regulation setpoint, the PWM algorithm slowly reduces the charging current to avoid heating and gassing of the battery, yet the charging continues to return the maximum amount of energy to the battery in the shortest time. The result is a higher charging efficiency, rapid recharging, and a healthy battery at full capacity.

PWM cont'd.

In addition, this new method of solar battery charging promises some very interesting and unique benefits from the PWM pulsing. These include:

- Ability to recover lost battery capacity and desulfate a battery.
- Dramatically increase the charge acceptance of the battery.
- Maintain high average battery capacities (90% to 95%) compared to on-off regulated state-of-charge levels that are typically 55% to 60%.
- Equalize drifting battery cells.
- Reduce battery heating and gassing.
- Automatically adjust for battery aging.
- Self-regulate for voltage drops and temperature effects in solar systems.

Safety instructions:

• Follow these instructions carefully during use.

• WARNING - Be very careful when working with batteries. Lead acid batteries can generate explosive gases, and short circuits can draw many amps from the battery instantly. Read all instructions provided with the battery.

• Use only with a 12 volt battery.

• Do not SHORT CIRCUIT the module. This will DAMAGE the SBCC regulator.

• REVERSE POLARITY, i.e., connecting the red alligator clip from the module to the negative battery terminal and the black alligator clip to the positive battery terminal WILL DAMAGE THE SBCC regulator.

General Handling and Use:

Handle with care. Although the SC Charger is rugged, blows to the front or rear surface can result in damage to the module. Do not bend the module and do not attempt to dissemble the module. Do not concentrate light on the module in an attempt to increase its power output. Again, treat the output terminals as you would those of a charged battery.

Operation:

Panel Tilt Angle.

The aluminum bars supplied with each unit attach to either side at the top of the unit and allow you to tilt the panel at the correct angle for your latitude. The following table shows the angle (from horizontal) at which the module should be placed in order to maximize annual energy output. Aiming the panel directly at the sun on a particular day always maximized the current produced. At most latitudes, annual performance can be improved by a somewhat flatted angle during the summer and a somewhat steeper angle during the winter. Locate the panel in a shade-free area, especially during the middle hours of the day when solar insolation is highest. Face the panel in a southerly direction, directly toward the equator.

Note: If you measure the module's output with a multi-meter without a battery attached, you will read zero volts—the controller senses that there is no battery present and the controller shunts the panel's power.

Latitude	Panel Angle
1 - 4°	10° from horizontal
5 - 20°	Add 5° to local latitude
21 - 45°	Add 10° to local latitude
46 - 65°	Add 10° to local latitude
66 - 75°	80° from horizontal

Example: For maximum annual production, a panel used in Miami, Florida (latitude 26°) should be tilted at approximately 36° from horizontal and should be faced due south.

Electrical Connections and Charging:

The leads from the Solar Charger have black (-) and red (+) alligator clips for attaching to the battery. The black alligator clip should be connected to the negative terminal of the battery (-) and the red clip should go be connected to the positive terminal of the battery (+).

Example: For a 12 volt blacklight trap like the Updraft Blacklight (UV) Trap, Model 1312, the assume the output of the SC panel to be 1.4 amps per hour. The charging time required for a new battery in good condition that was fully charged and then ran this trap for 10 hours would be approximately:

[(10 hrs * 0.5 amps/hr) / 1.4 amps/hr charge rate] * 1.1 = 3.9 hrs.

The 1.1 factor accounts for the efficiency of charging.

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