

## Installation and User's Guide For Sovonics Solar Chargers: MA-6, MA-12, MA-21, MA-33

CONGRATULATIONS. You are the proud owner of a Sovonics Solar Charger. Welcome to the world of clean, silent, non-polluting, reliable solar electric power. The convenience and safety of boating with a Sovonics Solar Charger aboard is remarkable. It converts sunlight directly into electricity: No moving parts, fuel, maintenance or hassels. Sovonics Solar Chargers are designed to make installation

simple and operation automatic, safe and reliable.

Please read these instructions carefully. Important procedures on how to install and use your Sovonics Solar Charger are covered. This manual also offers you a basic understanding of the Sovonics Solar Charger technology: "photovoltaics" (photo—from light, voltaics—from voltage).

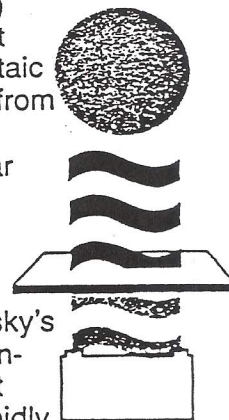
### How They Work

Sovonics Solar Chargers convert sunlight directly to DC electricity by the photovoltaic effect. A photovoltaic effect occurs when light energy causes electrons to become excited and flow between two materials, typically silicon alloys. Sovonics Solar Systems utilizes the unique world famous technology of its parent company Energy Conversion Devices (ECD). Sovonics photovoltaic modules are tandem junction thin film amorphous silicon alloy devices.

A pioneer in the field, Stanford Ovshinsky, founder of Energy Conversion Devices (parent company of Sovonics Solar Systems), identified tandem junction thin film amorphous

silicon alloy materials placed on a flexible substrate (stainless steel) as the means to achieve low cost high efficiency versatile photovoltaic modules. Mr. Ovshinsky's ideas from almost 20 years ago have been translated into the Sovonics Solar Chargers for marine batteries.

Sovonics Solar Systems is also making inroads on conventional electric utility power. Mr. Ovshinsky's visions of a cleaner, safer environment through advanced low cost amorphous technologies are rapidly becoming reality.



# Installation:

## Mounting Options

A Sovonics Solar Charger is flexible and durable; it can even be walked on. This permits you to mount your panel virtually anywhere on the boat. Best performance will be obtained with the module mounted in a flat open area such as the main hatch cover, lassarette,

foredeck or side deck. Other mounting options include placing it on the main sail cover, or securing it to the safety rail. The more sun it absorbs, the more it can convert to electricity; so mount it where it will be exposed to the most sun.

## Portable Mount

Simply lie the panel down, face up (Sovonics label side up) and it will start generating electricity. For most portable mounting situations, simple hooked

elastic cord tie-downs are adequate. Care should be taken to hold the module securely without putting excessive strain on the grommets.

## Fixed Mount

Sovonics Solar Charger is designed for long term outdoor exposure. Many boaters find it convenient to mount the panel permanently on their boat.

First determine how the lead wire will pass into the boat from connection to the battery. Will it pass through an existing hole or will you use a cable outlet?

For deck area or hatch cover mounting, consider the following method. Position the panel where it is to be mounted. Mark holes and remove panel. Drill pilot holes. Use silicone sealant in each pilot hole. Reposition module and fasten with stainless pan head screws or bolts and matching washers.

# Safety Notes:

## Solar Charger

A solar battery charger is a live power source in sunlight. Take care to prevent personal shock or equipment damage. Cover it or turn it over to stop generation of electricity.

A solar battery charger is a direct current device like your battery. Observe correct polarities positive (+) and negative (-) when making interconnections.

## Batteries

Observe proper care when working with batteries. Never run anything (wires, tools, etc.) directly between terminal posts. This will short the battery and can cause bodily harm or a fire hazard. Also avoid skin contact with the acid of a battery. If contact is made, immediately flush the affected area with water and consult a physician.

A lead-acid battery (most deep cycle marine or automotive are this type) may generate hydrogen gas when being charged. Keep any source of sparks or flame away from the battery area.

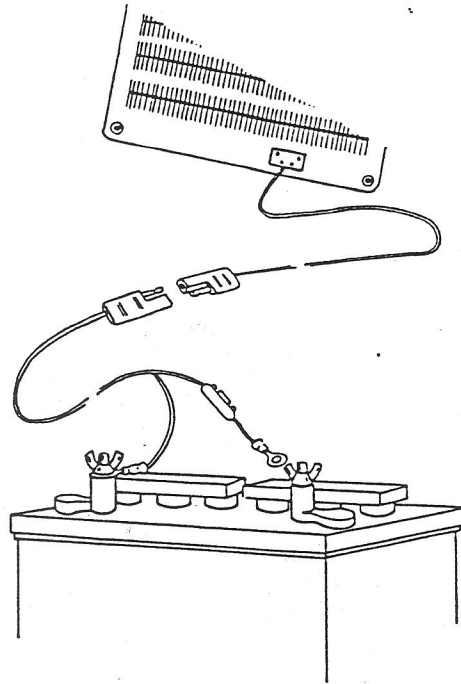
Keep all connections to battery and SAE connector tight and away from water.

## Battery Connections:

Sovonics Solar Chargers contain a built-in blocking diode permitting a direct connection to the battery through an in-line fuse. Connection to the battery requires these simple steps:

1. Decide the mounting location for your solar charger.
2. Mount solar charger. (see above: Portable or Fixed Mount)
3. Connect In-line Fuse Assembly to positive and negative terminal of the battery.
4. Connect SAE Connector of In-line Fuse Assembly to the SAE Connector of the solar charger.

You can check for charging by either connecting an ammeter in the circuit or by checking battery voltage over time.

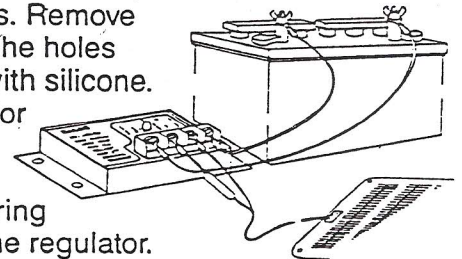


## Use of a Charge Regulator

A charge regulator prevents overcharging of the battery. When the maximum charging current of the module is less than approximately 2% of the battery capacity (example: MA-21 producing 1.4 amps and a battery of 105 AH capacity or more), a charge regulator is not required.

A charge regulator is recommended when a battery and module do not meet the 2% criteria, or when the battery is to be left on charge unattended for extended period (3 months).

When a regulator is used, it should be mounted as close to the battery as possible. Using the regulator as a template, mark the mounting holes. Remove the regulator, drill the holes and fill the holes with silicone. Secure the regulator using stainless screws or bolt/nut sets. Follow the wiring instructions with the regulator.



## Quick Disconnect

Recommended for all modules. The SAE connector is supplied as part of the solar charger

module and in-line fuse assembly.

## Operating Performance

Multiply the panel peak charging rate in amperes times 6 for southern US, 5 for middle US, and 4 for northern US to estimate ampere-hours per day (summer) delivered to the battery by the respective panel. Match panel output (in ampere-hours/day) to your load requirements to

determine which panel suits your needs.

More than one panel may be connected to a battery. Consult battery manufacturer for maximum charging amperes allowed with your particular battery.

Product Number	Panel Peak Charging Rates (typ.)	Applications
MA-6	.40 A @ 14 Volts	Starter battery charging and communications loads, radio, bilge pumps.
MA-12	.80 A @ 14 Volts	Deep discharge battery recharging and light load power, radios, bilge pumps.
MA-21	1.4 A @ 14 Volts	Main power supply for lights, radios, TV's, bilge pumps.
MA-33	2.1 A @ 14 Volts	Full power supply for lights, radios, TV's, navigation equipment, bilge pumps.

## Maintenance

The only maintenance the Sovonics Solar Charger requires is an occasional cleaning with a mild solution of soap and water. Do not use any hard abrasive cleaners or solvents as they may affect performance. Any gouges or punctures in the laminating plastic of the module should be repaired immediately using

transparent silicone caulking.

Occasionally inspect all connections and the fuse to verify soundness. Any loose or corroded connections should be repaired immediately.

## Troubleshooting

Although failures are rare, the following tests should indicate any significant performance problems.

1. Disconnect the module from the battery (at the SAE connection or other convenient termination).
2. In bright clear sunshine, measure the voltage between the positive and negative terminals of the isolated module with a volt-ohm meter. This "open circuit" voltage should be above 19 volts.
3. Also in bright sunshine, measure the "short circuit" amperes with a volt/ammeter (set the ammeter range to handle at least 1.5 times the rated current from the specifications table). The current should approximate the sunlight intensity—the rated current times 1.1 in "full sun," 50% the rated current in "half sun," and 25% the rated current in "quarter sun."

Because it is difficult to accurately measure the sunlight intensity without sophisticated meters, only gross performance deficiencies will be apparent.

## Warranty

Specifications are subject to change without notice. The information, recommendations and opinions set forth in this literature are offered solely for your consideration and inquiry and are not to be construed as constituting any warranties or guarantees for which we assume any

legal responsibility. A specific warranty as to the products manufactured by Sovonics Solar Systems is made in writing only in a separate warranty statement to customers purchasing products from Sovonics Solar Systems.

## Disclaimers of Liability

Since the condition or methods of installation, operation, use and maintenance of the Sovonics Solar Charger are beyond the control of Sovonics Solar Systems. Sovonics Solar Systems does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected

with such installation, operation, use or maintenance.

For information regarding Sovonics Solar Chargers or other Sovonics products, contact your local dealer or:

**SOVONICS**  
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