



SOLAR STIK®

**OPERATOR MANUAL
FOR
SOLAR SKIRT**



P/N 11-1000092

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Revision History

Section	Page(s)	Description	Date
		Preliminary Draft EVC	9 Jan 2024

Product Safety Information and Instructions

This manual contains important safety instructions that must be followed during the installation and operation of this product. Read all instructions and safety information contained in this manual before installing or using this product.

All electrical connections must be made using the proper polarized connectors.

While this product is designed for indoor/outdoor operation, the interior of the Power Module must not be exposed to rain, snow, moisture, or liquids. Close and latch and/or lock the cases when the System is unattended.

The Power Module is **not** field serviceable beyond simple preventive maintenance. Do not attempt to open or service the unit. If repair is needed, it must be returned to Solar Stik®, Inc. for service, or contact your field service representative (FSR).

Exercise caution when handling or operating the Power Module. Live power may be present at more than one point.

Note: Battery chemistries and voltages must never be mixed within a single battery bank or system.

Electric Shock Hazard

WARNING

Standing water around the electrical equipment and / or intrusion of water into the System components can increase the risk of electrical shock.

General

- Do not short (+) and (-) terminal with conductors.
- Do not connect in series.
- Do not reverse the polarity.
- Do not submit to excessive mechanical stress.
- Do not submerge in water.
- Do not heat directly, solder, or throw into fire.

Limitations on Liability

Since the use of this manual and the conditions or methods of operation, use, and maintenance of this product are beyond the control of Solar Stik, this company does not assume responsibility and expressly disclaims liability for loss, damage, or expense—whether direct, indirect, consequential, or incidental—arising out of or in any way connected with such operation, use, or maintenance.

Due to continuous improvements and product updates, the images shown in this manual may not exactly match the unit purchased.

This equipment **CAN BE USED FOR CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT** or devices; however, without limiting the generality of the foregoing, Solar Stik makes no representations or warranties regarding the use of the System in connection with life support systems or other medical equipment devices.

IMPORTANT PRODUCT SAFETY INFORMATION AND INSTRUCTIONS


This manual contains important safety instructions that must be followed during the installation and operation of this product. Read all instructions and safety information contained in this manual.


Exercise caution when handling or operating equipment. Live power may be present.


Safety Information Labels


Your safety and the safety of others is very important.

Always read and obey all safety messages.

 This is the safety alert symbol. This symbol alerts you to potential hazards that can kill you or hurt you and others. All safety messages will follow the safety alert symbol and the word “DANGER”, “WARNING”, or “CAUTION”. These words are defined as:

 **DANGER** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING** Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

All safety messages will tell you what the potential hazard is, how to reduce the chance of injury, and what can happen if the instructions are not followed.

First Aid Measures

EYE CONTACT: Immediately flush eyes with copious amount of water for at least 15 minutes. Seek immediate medical attention.

SKIN CONTACT: Remove contaminated clothing and flush affected areas with plenty of water for at least 15 minutes. Wash skin with soap and water. If skin irritation persists, call for medical attention.

INHALATION: Move to fresh air and seek immediate medical attention. Obtain medical advice.

Fire Hazard

Fire Types

Class A fire - Fires in ordinary combustibles such as wood, paper, cloth, trash, and plastics.

Class B fire - Fires in flammable liquids such as gasoline, petroleum, oil, and paint.

Class C fire - Fires involving energized electrical equipment such as motors, transformers, and appliances. Remove the power source and the class C fire becomes a class A or B fire.

Recommended Fire Extinguisher

Fire Extinguisher, Carbon Dioxide, 10 lb

Carbon Dioxide is a liquefied gas, which is highly effective for fighting class B and C fires. These extinguishers are ideal for areas where contamination and/or cleanup are a concern, such as data processing centers, labs, and telecommunication rooms.

WARNING

Only CO₂ (Carbon Dioxide) fire extinguishers should be used with Solar Stik equipment.

Using the Fire Extinguisher

When using the extinguisher on a fire, remember PASS:

Pull the pin.

Aim the nozzle or hose at the base of the fire from a safe distance.

Squeeze the operating lever to discharge the fire extinguishing agent.

Sweep the nozzle or hose from side to side until the fire is out. Move forward or around the fire as the fire diminishes.

Watch the area for reignition until the cause has been fixed.

Large fires: Use large quantities of water to extinguish surrounding fire and prevent further propagation. If water is used on batteries in operation, caution should be taken to avoid the electrical hazard that may be present.

SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear self-contained breathing apparatus. Use approved / certified vapor respirator to avoid breathing toxic fumes. Wear protective clothing and equipment to prevent potential body contact with electrolyte solution. It is permissible to use any class of extinguishing medium, specified above, on these batteries or their packing material. Cool exterior of batteries if exposed to fire to prevent rupture.

PARTICULAR HAZARDS RESULTING FROM EXPOSURE TO THE SUBSTANCE/PREPARATION, TO COMBUSTION AND GAS PRODUCTS: The cell can spout vaporized or decomposed electrolyte fumes with fire when heated over +100°C (+212°F) or disposed of in fire. Solvents within the electrolyte are flammable liquids and must be kept away from any kind of ignition source.

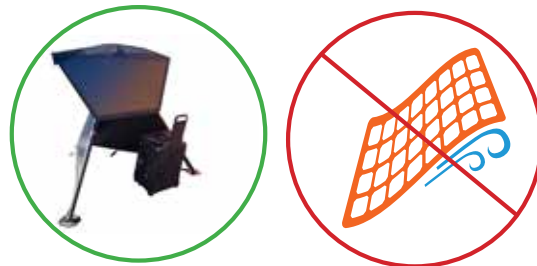
Risk of irritation occurs only if the cell is mechanically, thermally, or electrically abused to the point of compromising the integrity of the enclosure. If this occurs, irritation to the skin, eyes, and respiratory tract may occur.

Environmental and Handling Precautions

All Solar Stik components are ruggedized, yet there are a few things the operator can do to prevent failures and prolong the operational life of the product.

Wind

It is imperative that the Expedition Arrays are properly secured to the ground so that they do not become dangerous projectiles in high winds.



WARNING

Failure to properly secure the Solar Skirt to the surface with could result in PV panel damage, injury, or death in high winds. Wind damage can render panels nonfunctional or significantly reduce their functional life expectancy.

The Solar Skirt must be properly secured to the Blue Sky Mast even in low-wind environments. The methods used for ground securing are determined by two factors:

1. The type of terrain upon which the Solar Skirt is to be operated—“hard” surface (such as pavement) or “soft” surface (such as dirt or sand).
2. The environmental conditions—wind conditions that the Solar Skirt might encounter.

GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

Introduction

The Solar Skirt provides power generation using a uniquely designed light weight and portable solar array.

The Solar Skirt provides renewable power generation for systems requiring DC power. While designed to be incorporated into a fully-autonomous power system, the Solar Skirt offers unique capabilities that allows flexibility for the operator.

This manual is crafted to provide the user with a comprehensive understanding of the principles of operation, proper setup and use, operational tips, and safety procedures for the Solar Skirt. Successful operation and maintenance depends on a complete understanding of how the Solar Skirt works, and how to effectively integrate the Solar Skirt into a given situation. **Please read this manual thoroughly before operating the Solar Skirt.**

Equipment Description

Features and Specifications

The Solar Skirt (Figure 1) has been specifically tailored to provide a portable and silent DC power generation source. The unique pyramidal design offers an innovative way of harvesting sunlight throughout the day while working in tandem with PGA equipment.

Solar Skirt Features:

- Thin-film, folding solar PV panels deliver maximum power generation with minimum weight
- Each panel is rated at 180 W, 5.7 A, 31.8 V at standard test conditions (STC). Total power generation is dependent on orientation with respect to the sun.
- Hook and Loop straps for easy attachment to Blue Sky Mast



Figure 1. Solar Skirt

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Solar
13-1000459



Figure 2. Solar Skirt Kit cables



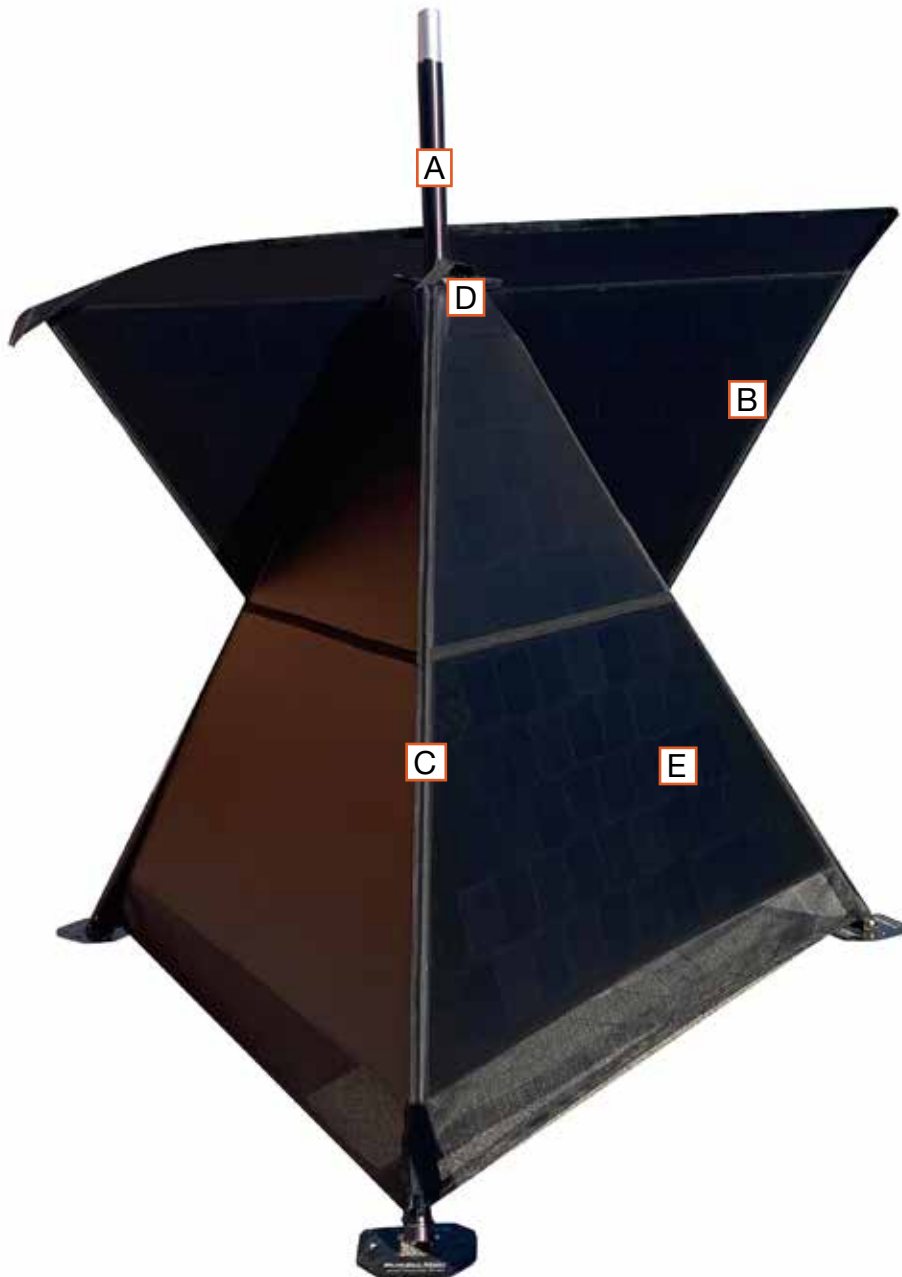
Figure 3. Solar Skirt panel with Hook and Loop strap



Figure 4. Solar Skirt folding panel with Hook and Loop straps and cables

SOLAR SKIRT SETUP

It is recommended that the Solar Skirt be erected using two or more people. The Solar Skirt should be placed in an area that provides optimal sunlight throughout the day. The Blue Sky Mast tripod is the frame on which to attach the Solar Skirt. Follow PGA guidelines for erecting the Blue Sky Mast. Attach each individual panel to the mast using the Hook and Loop strap located on each panel. Continue to attach the Solar Skirt by zipping the three panels together. Connect the panel cables to the Solar Leash.



- A** Blue Sky Mast
- B** Folding Solar Skirt Panel
- C** Zippers
- D** Hook and loop attachment
- E** Panel cells

NOTICE

The setup location should have good exposure to sunlight and be away from other structures or potential hazards such as moving-vehicle thoroughfares.

Figure 5. Solar Skirt features

Measuring Maximum Power and Open Circuit Voltages

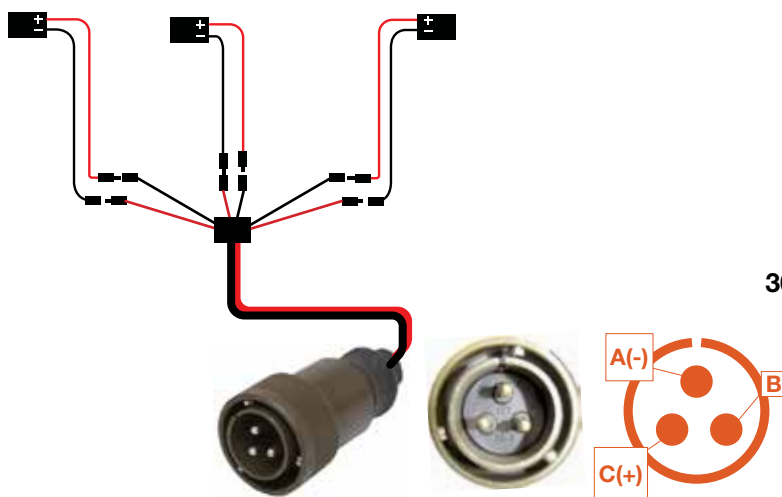
Introduction

Voltage “open circuit” (V_{oc}) is unregulated panel voltage and measured directly from the leads of a panel or an array when not connected to a “load” such as a charge controller (Power Hub or Power Module). Voltage “maximum power” (V_{mp}) is the voltage at which the maximum power of a panel or array is produced when connected to a charge control, or when the panel is considered “under load”.

The V_{oc} of a single panel is approximately 38.3 V under standard test conditions (STC). Three (3) panels are connected in parallel in the Solar Skirt; therefore, the V_{oc} for the three (3) panels should theoretically be the same 38.3 V. Once the panels are connected to the Power Hub or Power Module (i.e., the panels are connected to a “load”), it is more likely that the operator will see voltages around $31.8 V_{mp}$ reported on the user interface.

The V_{oc} and V_{mp} should be measured for each Solar Skirt or panel under “ideal solar conditions” if possible. This means that the panels should be oriented directly at the sun and unshaded on a clear day in order to identify the maximum V_{mp} and V_{oc} .

Procedure to Measure V_{oc} of a Solar Skirt

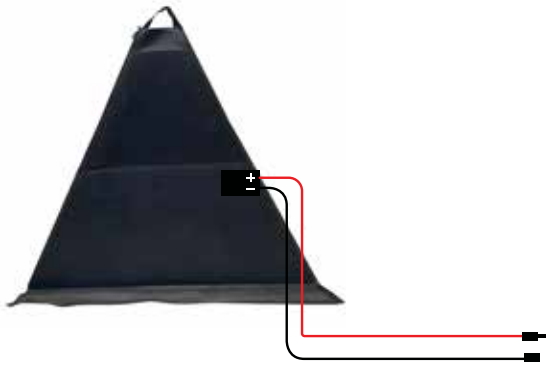


In the Solar Skirt, three (3) panels are connected in parallel. The rated V_{oc} for the array in this configuration is 38.3; however, the voltage may vary.

30' Solar Leash

To measure V_{oc} from a single Solar Skirt panel, carefully place the leads of the voltmeter on pins A and C in the bayonet connector at the end of the Solar Leash. Pin B is unused. Under ideal conditions, the reading should be 38.3 V or more in full sun.

Procedure to Measure V_{oc} of a Single Solar Skirt Panel



The voltage measurement across the terminals of the Solar Skirt panel leads is the V_{oc} of the panel. The reading should be ~ 38.3 V under ideal conditions.

The Photovoltaic (PV) Charging Circuit example of Solar Skirt used in a System with A Power Module

The Maximum Power Point Tracking (MPPT) PV charge controller allows the Power Module to manage incoming power from a solar array. It is limited up to 30 A charge current output. The PV array used in this System provides a maximum power of 181.0 W. The unit is fully protected against voltage transients, overtemperature, overcurrent, reverse battery and reverse PV connections. An automatic current limit allows use of the full 30-amp capability without worrying about overload from excessive input PV current. An environmentally-sealed, high-current, high-reliability relay automatically disconnects the PV array at night to prevent current drain from the Power Module battery by the PV array.



Figure 7. Connecting the Solar Skirt to the Power Module

Solar Skirt shown connected to the Power Module using the Solar Leash between the panels and the Solar/Donor port.

Solar Panel Limitations

The PV array will provide 5.7 A up to 31.8 V under standard operating testing conditions. This assumes the Solar Skirt is positioned to harvest maximum sunlight and exposed to ideal temperatures that allow the MPPT charger to perform at maximum efficiency.

Simple Steps to Optimize Solar Skirt Performance

Position the Solar Skirt for optimal access to direct sunlight.

For maximum stability, place the Solar Skirt on a level surface whenever possible.

Do not use abrasive materials when cleaning panels.

Avoid sharp objects as they may damage the panels.

Ensure the Solar Skirt is securely fastened to the mast.

Ensure the zippers that are used to connect panels together are not unduly stressed. Zipping and unzipping should be easy. Lift solar skirt/panels to reduce stress while zipping if erecting becomes difficult.



Figure 8. Solar Skirt panel lifted for access to the Power Module

Handling the Solar Skirt

The Solar Skirt weighs 36 lbs (each panel is ~12 lbs) and is one person lift. Optimal setup should be performed by two or more people.

Avoid these hazards to improve the performance, prevent failures, and prolong the operational life of the Power Module.

Stack and Assemble the Solar Skirt Panels with Care.

The semi flexible material used in the construction of the Solar Skirt makes it resistant to external conditions, but it must be handled carefully to prevent damage to the panels. Efficiency of the panels will be reduced if the panels are scratched or cells are broken.

Transportation and Storage

Individual solar skirt panels must be stacked, hung or racked in a manner that protects them from being bent, scratched or broken.

Panels should be cleaned before storage or transport.

MAINTENANCE INSTRUCTIONS

In-storage Preventive Maintenance Checks and Services

Failure to follow these instructions may result in permanent equipment failure and/or personal injury.

Table 1. In-storage Preventive Maintenance Checks and Services

Item #	Item to be Inspected	Interval* at 91-140 °F (33-60 °C) Storage Temp	Interval* at 77-90 °F (≤ 25-32 °C) Storage Temp	Procedures	Non-mission Capable
1	Visual inspection of Solar Skirt	Each time unit is packed up for transport or storage	Each time unit is packed up for transport or storage	<ol style="list-style-type: none"> 1. Inspect array for visible damage and missing items. 2. Clean excessive dust or dirt accumulation from the exterior and panels. 3. Gather all cables. 	If the array is broken or split or if cables are damaged, contact Solar Stik Technical Support for advice on how to proceed.
2	Clean Solar Panels	Each time unit is packed up for transport or storage	Each time unit is packed up for transport or storage	Use a water-dampened micro fiber cloth or similar to wipe dust and debris from the panels taking care not to scratch the surface. Do not use cleaning agents such as soap, Windex, vinegar or other organic solvents.	If a clean panel has no measurable output when exposed to full sun, the panel is NMC.

Specifications

Solar Skirt	
Power (W) Minimum	181.0 W (+/- 5 W)
Optimum Power Voltage	31.8 V
Optimum Operating Current	5.7 A
Open Circuit Voltage	38.3 V
Short Circuit Current	6.0 A
Solar Cell Efficiency (%)	>24.30%
Number of Solar Cells / Panel	54 per panel 162 total
Nominal Operating Protection	43 +/-2 °C

Solar Skirt Weights and Dimensions	
Weight	34 lb. (15.4 kg)
Dimensions	72.25 in base x 60.0 in height (184 x 152 cm)

ABOUT SOLAR STIK, INC.



SOLAR STIK®

Mission Statement

Saving lives across the globe through innovative power solutions.

STIKopedia

[STIKopedia](#) is a compilation of everything you would ever want to know about portable Hybrid Power Systems, including the philosophy and mechanics of high-efficiency circuits, and the individual technologies used to create them.

Solar Stik Training and Education

- **Solar School (St. Augustine, FL)** provides an introduction to the design and support of small-scale, renewable-energy, power generation systems, with detailed explanation of system components. Advanced configuration options with hands-on deployment of actual systems will enhance student understanding.
- **Solar Stik New Equipment Training (on site)** teaches Hybrid System configuration options with hands-on deployment of actual systems to enhance student understanding.

Solar Stik Training Courses are tailored to the specific needs of the students. To schedule Solar Stik Training or to learn more about the curriculum, please contact us.

Contact

Technical Support Line

800-793-4364 Ext. 102

(24 hours a day, 365 days a year)

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