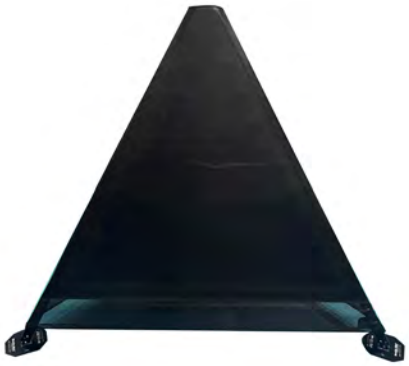
SOLAR STIK®

OPERATOR MANUAL

FOR

PGA TOUR POWER MODULE & SOLAR SKIRT



P/N 50-0000335

Part Number: 21-0202306

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Revision History

Section	Page(s)	Description	Date
		First Published	7 Oct 2023

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 mix different type batteries or mix new and old ones together.
- Do not open the battery module.
- Do not submit to excessive mechanical stress.
- Do not submerge the unit in water.
- Do not heat directly, solder, or throw into fire. Such unsuitable use can cause leakage or spout vaporized electrolyte fumes and may cause fire or explosion.
- Immediately disconnect the batteries if, during operation, they emit an unusual smell, feel hot, change shape, or appear abnormal in any other way.

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 CO_2 (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.

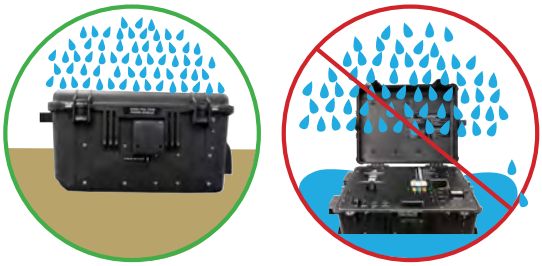
Risk of irritation occurs only if the cell is mechanically, thermally, or electrically abused to the point of compromising the integrity of the enclosure. If this occurs, irritation to the skin, eyes, and respiratory tract may occur.

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.

Water

If outdoor operation is necessary, the lids of all components should be closed and latched whenever possible. Lids should only be open to access operator controls and closed at all other times.

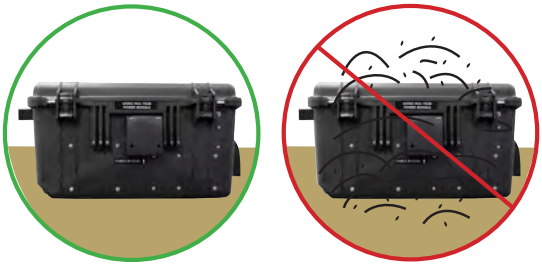


Impact

Equipment should not be dropped onto hard surfaces when transporting or during operation.

Dust

- Air intake filters should be cleaned once per month, or more frequently when conditions warrant.
- As a general rule, minimize exposure to high levels of particulates by exercising common-sense placement.



Heat

Heat and solar loading reduce efficiency, cause Power Module derating, and shorten life expectancy. **Shade the Power Module** to prevent the negative effects of heat.

GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

Introduction

The 24VDC PGA Power Module (Figure 1) and Solar Skirt combine power management and energy storage into a single, rugged, portable, and expandable power system for PGA applications.

The Power Module accepts power from DC generation sources including renewables and vehicles, and is universally compatible with single phase AC inputs (90-260 VAC) allowing connection to any generator or worldwide grid AC power source.

While designed as a fully-autonomous power system, the System 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 Power Module. Successful operation and maintenance depends on a complete understanding of how the Power Module works, and how to effectively integrate the Power Module into a given situation. **Please read this manual thoroughly before operating the Power Module.**

Equipment Description

Features and Specifications

Power Module Features:

- Provides power for PGA golf course operational loads
- 60 Ah (1.6 kWh) of energy storage capacity providing long periods of autonomous operation
- Lithium iron phosphate battery cell chemistry

P/N 16-0502101

Figure 1. 24VDC PGA Power Module

Adherence to operation and safety protocols will yield optimal performance from the Power Module for many years. Procedures for operation, preventive care and maintenance, and troubleshooting are all in this manual.

The Solar Skirt (Figure 2) 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.

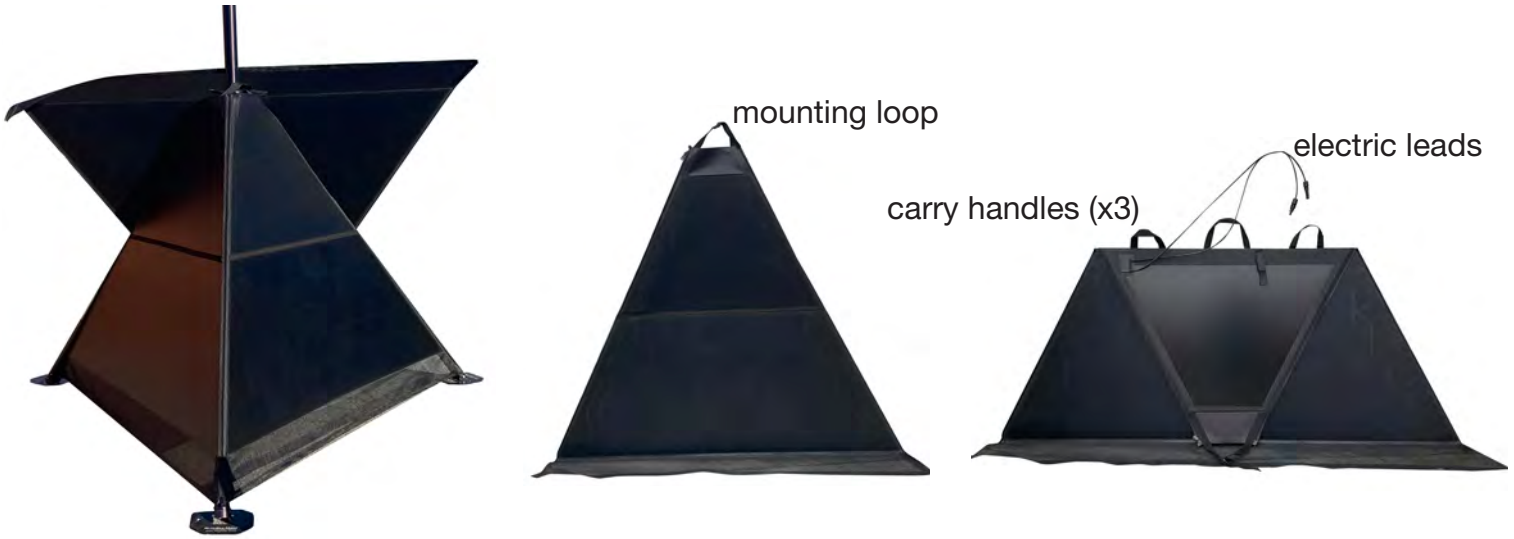


Figure 2. Solar Skirt P/N 11-1000092

Cables

Figure 3. Kit cables

Equipment Description

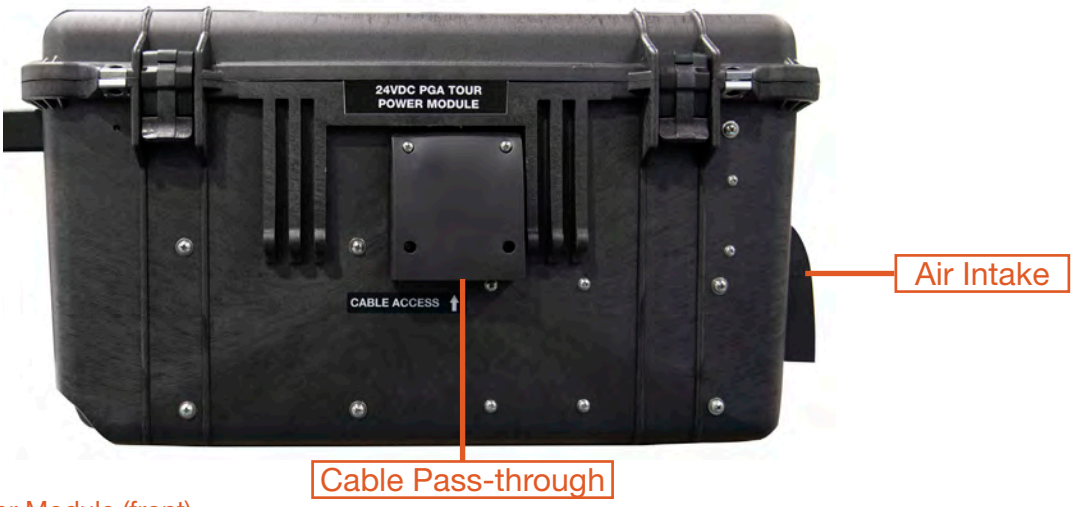


Figure 4. 24VDC PGA Power Module (front)

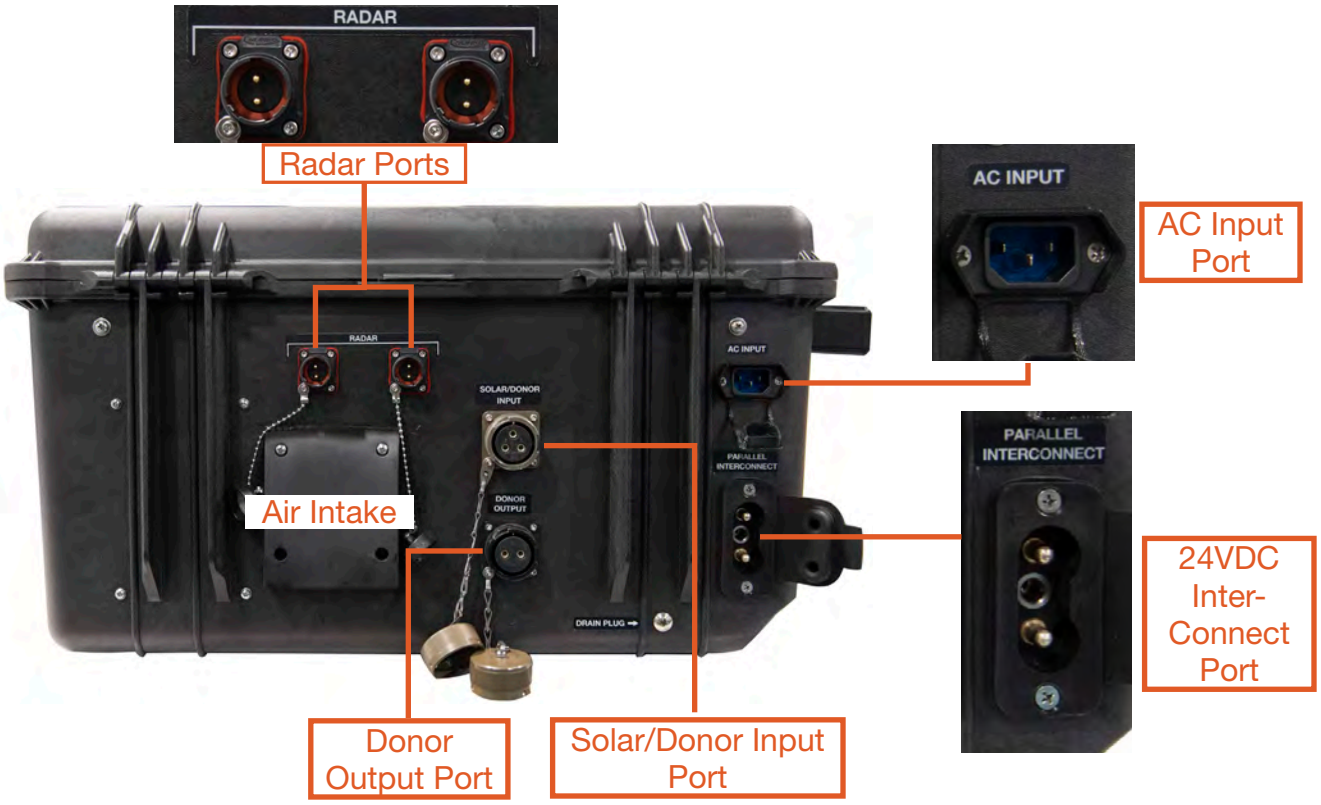


Figure 5. 24VDC PGA Power Module (back)

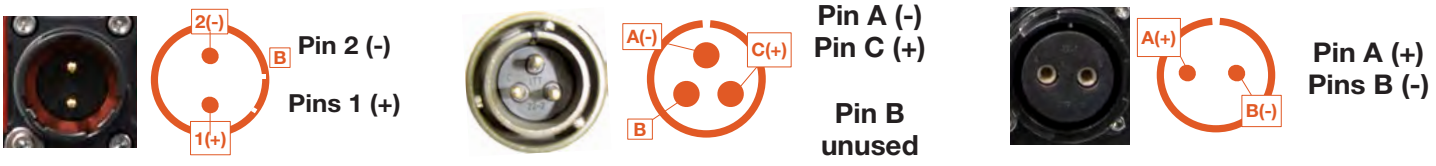


Figure 6. Radar connector on (left), Solar connector on Solar Leash (middle) and Donor connector (right)

Figure 8. 24VDC PGA Power Module (left side)

Figure 7. 24VDC PGA Power Module (right side)

Table 1. Power Module Port Specifications

Port/Connection	Type of Port	Nominal Voltage	Current Limit	Max Power
Inter-Connect (x1)	Input/Output	24 VDC	50	1200 W
Solar/Donor	Input	48 VDC	30	600 W
USB C (x1)	Output Only	5 VDC	3	15 W
Radars (x2)	Output Only	22 VDC	10	200 W
Camera ports (x3): Pan & Tilt Switch	Output Only	 22 VDC 52 VDC	 5 15	 110 W 240 W
Donor Output	Output Only	48 VDC	40	600 W

SOLAR SKIRT SETUP AND OPERATION

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 (Figure 9).

Figure 10. Solar Leash

Figure 11. Solar Skirt with half panel lifted

Faceplate

The Faceplate is found on the inside of the Power Module and provides information on the technical specifications and instructions for recharging, storage, and transport via a QR code. The Faceplate also provides access to the E Display, system breakers, and necessary ports for PGA connections including cameras and fiber optics.

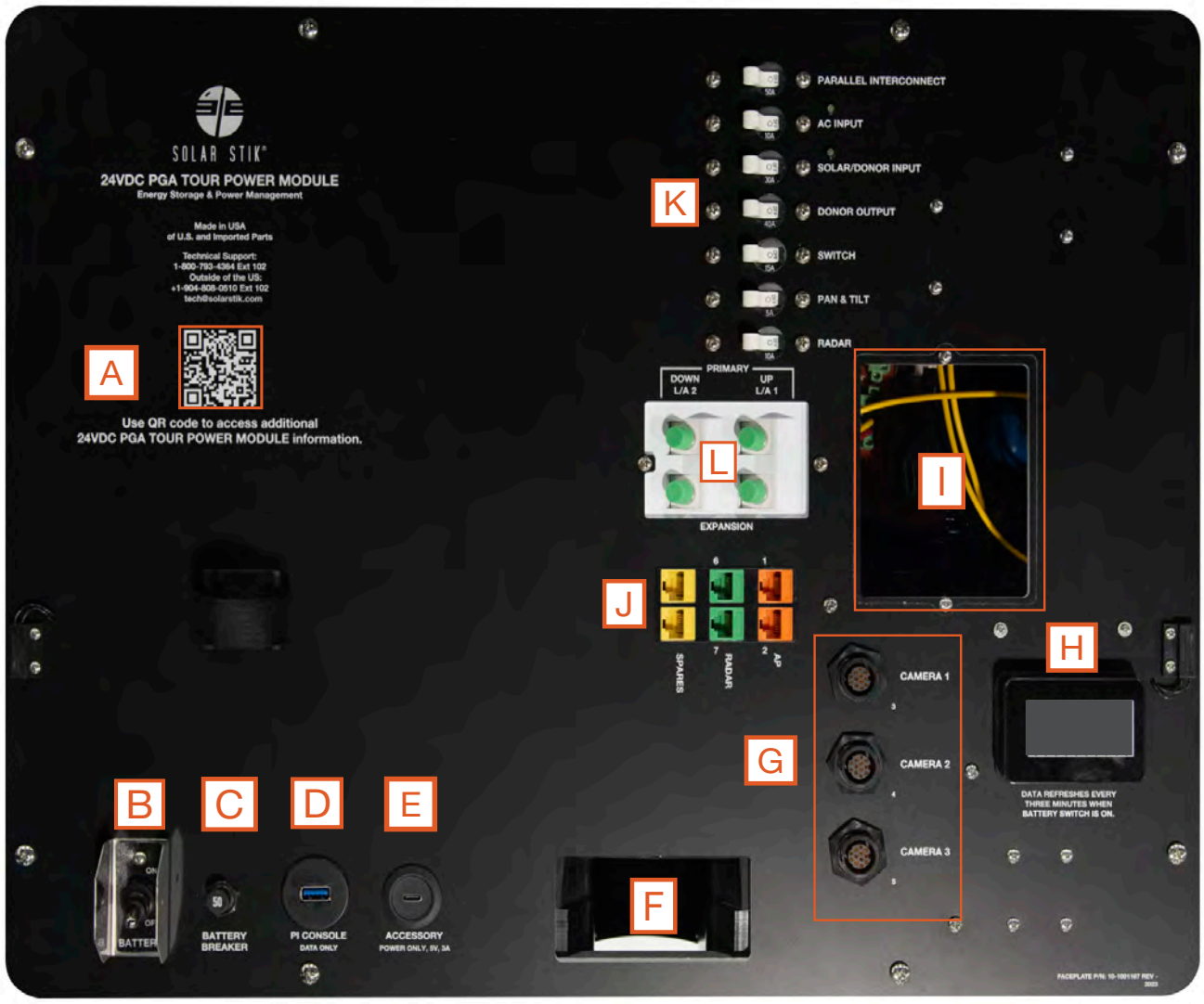


Figure 12. 24VDC PGA Tour Power Module Faceplate

A. Specifications Via QR Code
B. Battery Toggle Switch
C. Battery Breaker 50 A
D. USB A PI Console port exclusively used for data communication with Raspberry PI
E. USB C Accessory Power Only 5 V, 3 A
F. Cable Passthrough
G. Camera Connectors
H. E Display
I. Clear window for viewing internal communication operations
J. AP and Radar ports
K. Breaker Status LEDs
L. Fiber optic connectors

The Information Plate (I-Plate)

The Power Module I-Plate provides setup and a quick-start guide for modes of operation. This guide is located on the inside lid of the Power Module (Figure 11)

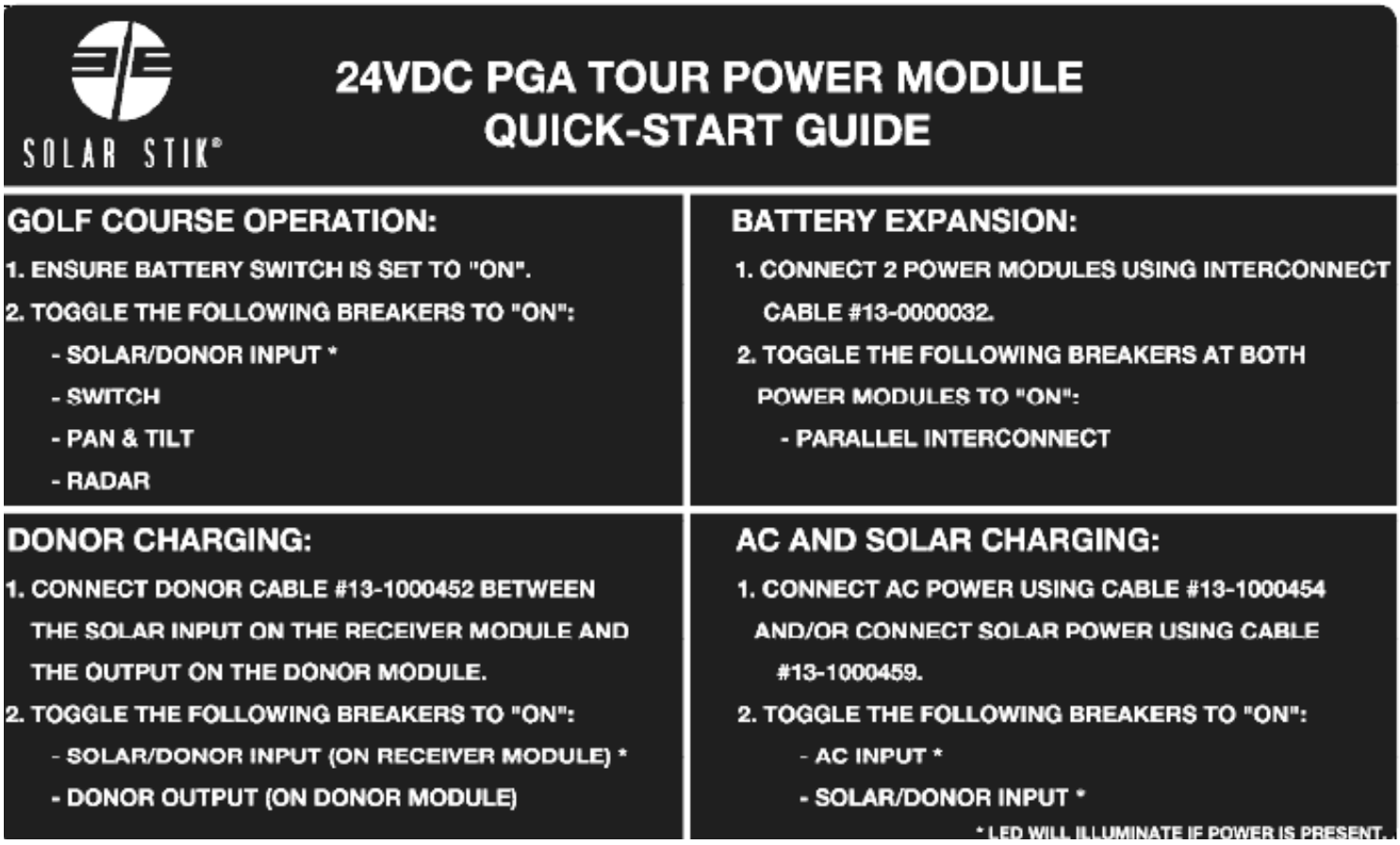


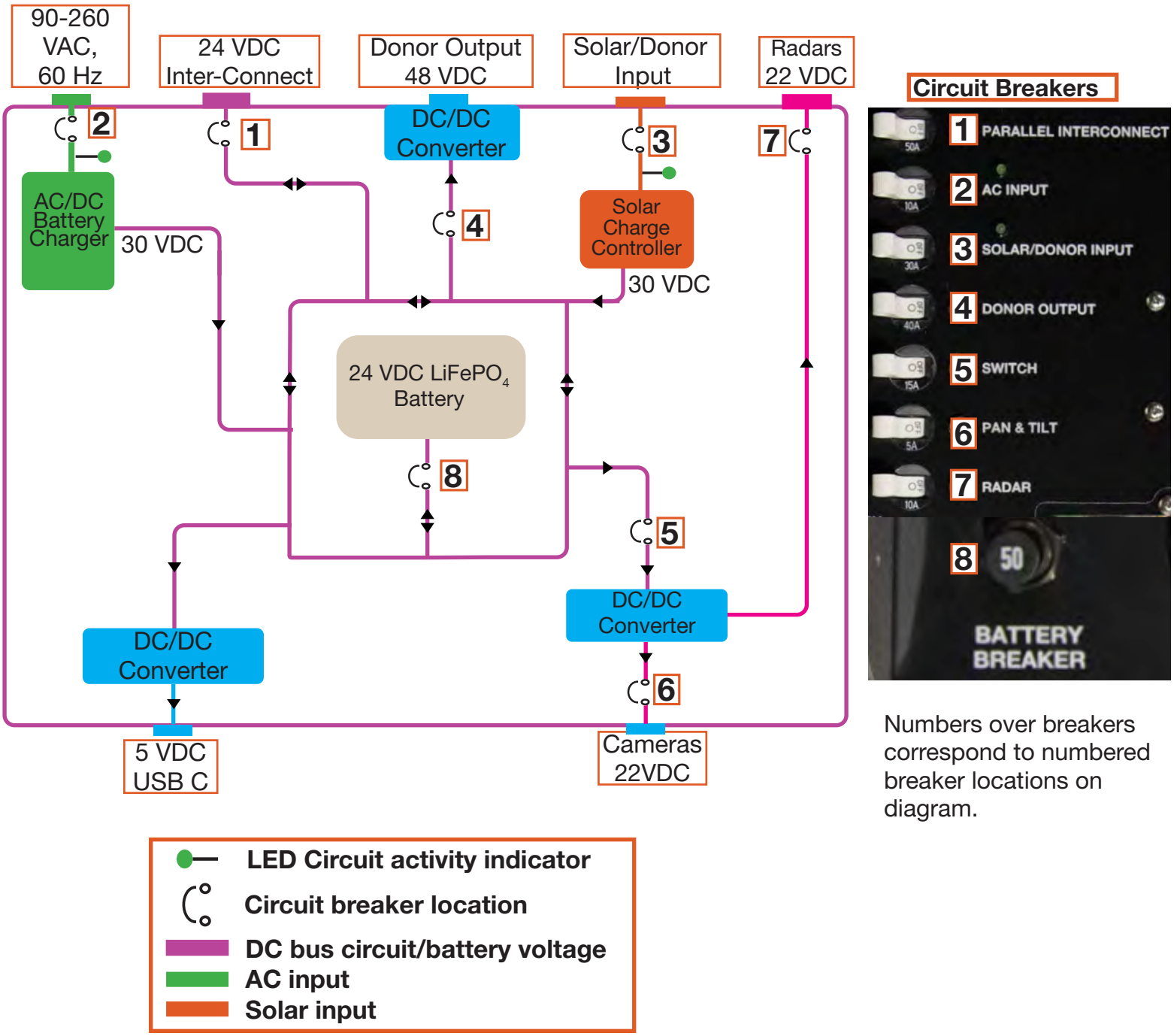
Figure 13. 24VDC PGA Tour Power Module I-Plate

Theory of Operation

The Power Module combines power management and energy storage into a single, multi-faceted platform for power. It employs a state-of-the-art lithium iron phosphate ($LiFePO_4$) battery that stores up to 1.6 kWh (60 Ah @ 26.4 V) of energy, and the battery is supported by distinct AC and DC circuits.

The Power Module can be charged by both conventional AC and DC sources, including renewable energy, in order to maintain usable power on demand. Currently only DC loads are supported by the Power Module.

Figure 14 illustrates the flow of power in the Power Module and the characteristics of the connector ports.



Numbers over breakers correspond to numbered breaker locations on diagram.

Figure 14. Power flow from a top-down view of the interior of the Power Module

Modes of Operation

Autonomous Mode

- Supports PGA sanctioned equipment including cameras and communications.
- Allows the Solar Skirt to serve as the primary power generation source. Requires abundant and stable sunlight.

Figure 15. Using the Power Module in Autonomous Mode

AC Power Harvesting

- Allows flexible AC charging as necessary during periods of storage or when PV generation is inadequate.

Figure 16. Using the Power Module in Solar and AC Power Harvesting Mode

Uninterruptible Power Supply (UPS) Mode

- When PV generation is not an option.
- Allows connection of a generator or grid source for load support. Battery will serve as back-up power for critical loads during interruptions in AC source supply.

Figure 17. Using the Power Module in UPS Mode

Balanced Operation

When a load is connected to the Power Module, power is supplied immediately from the battery to support it. The battery can store 1600 Wh of energy. Therefore, by itself, it can support a continuous load for only a finite amount of time before needing to recharge.

There's a simple rule that applies to using a battery as the primary source of power:

> **Power generated into the Power Module must be equal to or greater than the power consumed by the load.**

When the Power Module is connected to a power source, it should both recharge the battery AND continue to power the load over a period of time.

Cycling the Battery

A battery cycle is defined as one complete discharge and recharge of the battery over a specific period of time. In a cycling application, a proper balance between power generated and power consumed over a 24-hour period will cycle the battery 1–2 times (on average).

The Power Module battery will cycle when it is used in Hybrid and Autonomous modes.

AC Circuits

Input/Charging

The Power Module battery can be charged using 90-260 VAC input. While the System can accept a certain range of power, the universal input cable provided by Solar Stik is a 120 VAC locking cable and is compatible with North American 120 V, 60 hz power.

DC Circuits

The Power Module has the following DC circuits:

- One (1) 24 VDC Inter-Connect port, 50 A: This port is used to connect to Power Modules together to increase battery capacity.
- One (1) 48 VDC Donor Output, 40 A: This port provides connection between two Power Modules for charging from the donor Power Module to the receiving Power Module.
- One (1) Solar/Donor Input, 100 VDC, 30 A: This port allows charging from the Solar Skirt or the donor Power Module.
- Two (2) Radar cable ports, 22 VDC, 10 A: These ports supply power to PGA radars.
- Three (3) Camera connectors, 22 VDC, 5 A; 52 VDC 15 A: These connectors are located on the Faceplate and are used to power PGA cameras.
- One (1) USB C port, 5 VDC, 3 A: This port is located on the Faceplate and supports small DC loads to small devices

The Photovoltaic (PV) Charging Circuit

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 480 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 18. 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 8.4 A up to 57.7 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.

Battery Management System (BMS)

The 24VDC PGA Power Module consists of $LiFePO_4$ cells and an advanced BMS that performs, in very general terms, two vital functions:

1. The BMS manages all battery functions and promotes healthy cycling at the individual cell level.
2. BMS protection circuits protect the battery and the operator from dangerous conditions related to cell voltages, temperatures, and current flowing in or out of the battery.

When all operating conditions are satisfactory, current can flow in/out of the battery cells (cycling). If temperature, voltage, or current is outside of programmed limits, the BMS protection circuits engage and remove the cells from service, disabling the battery at its terminals until proper operating conditions are restored.

Information from the BMS such as State of Charge, State of Health and Faults are reported on the E Display.

OPERATOR INSTRUCTIONS

Charge Power Module battery fully before use.

How To Know When the Battery Is Charged Fully

No matter which charging method is used, the E Display will report an increase in voltage and a decrease in the net positive current over time as it charges. The battery is charged fully when the voltage reported by the E Display stabilizes at the float voltage (28.8) and the net current approaches zero (0) amps.

Select Charging Method for System

- **AC-power charging:** Connect the Power Module to AC grid power or a fuel-driven generator via the AC INPUT port. Toggle on the AC INPUT breaker located on the Faceplate.
- **Solar power charging:** Connect the Solar Skirt to the Solar/Donor INPUT port. Place System in a location that provides optimum exposure to sun.
- **Donor power charging**: Connect a Donor Power Module using a bayonet cable between the 24 VDC Donor OUTPUT port of the Donor Module and the Solar/Donor INPUT port on a separate receiver PGA Power Module.

Figure 19. Power Module charging options

Connect loads to the Power Module.

Toggle off the Power Module Main Power switch and the Solar/Donor, Switch, Pan & Tilt, and Radar breakers. Connect load(s). After the loads are connected, toggle on the Main Power switch and the Solar/Donor, Switch, Pan & Tilt, and Radar breakers on the Faceplate. Check the activity of the load(s) to ensure they are functioning properly.

> **Note:** The cooling fans will produce an audible sound when the power switch is turned on and will draw ~0.9 A of current from the battery.

Output Port Load Limits

Eight (8) ports may be used to support loads. Each output port has limitations in the amount of power it can supply and is protected either by a system-level breaker and/or a port-specific breaker.

Table 2. Port and Load Limits

Port/Connection	Nominal Voltage	Current Limit	Max Power
Inter-Connect (x1)	24 VDC	50 A	1200 W
Donor Output (x1)	48 VDC	20 A	600 W
USB C (x1)	5 VDC	3 A	15 W
Pan & Tilt (Cameras)	22 VDC	5 A	110 W
Switch (Cameras)	52 VDC	5 A (max)	240 W
Radars (x2)	22 VDC	10 A	200 W

> **Note:** The Inter-Connect and Donor Output ports are designed primarily to function as charging and System expansion ports. Loads can be connected to these ports but the must not exceed 250 W.

Monitor the Power Module System status.

The E Display monitors and reports the status and functions of the Power Module. The Power Module should be charged fully prior to supporting loads. The E display reports Battery SOC, SOH, Voltage, net current, date, time and the battery serial number. The E display is programmed to auto refresh every three minutes.

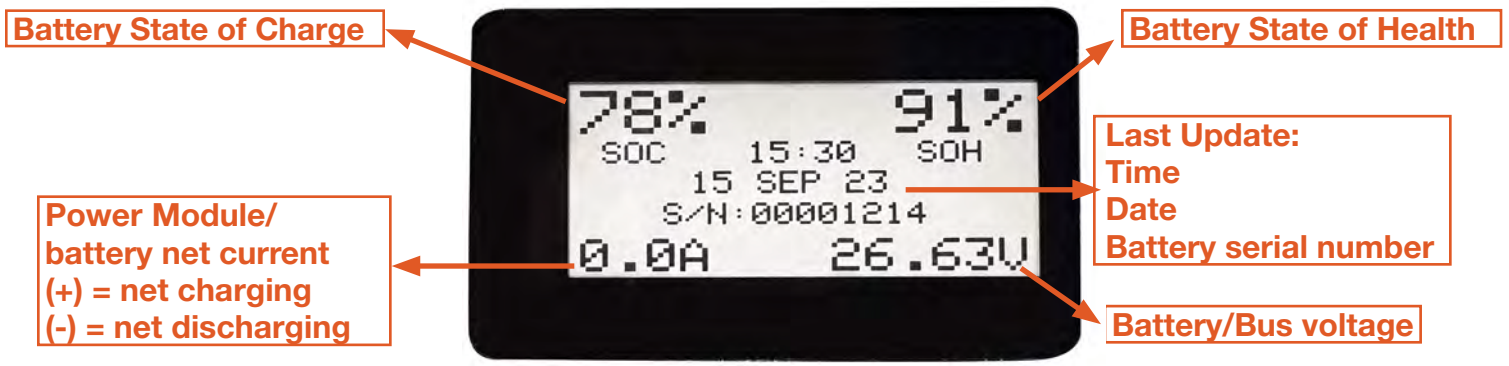


Figure 20. E Display

Monitoring Battery Status with the E Display

Monitoring System “Health”

The Power Module’s E Display will report the battery SOC after the system has been calibrated and amp hour counting has started. Regular monitoring of the SOC while the Power Module is in service will provide the operator with a good sense of System performance.

Additional System health information is found in the first two menus (General and Advanced Information) of the user interface.

1. Toggle the power switch to the “ON” position.

2. Check the battery status. The Power Module Battery Status is displayed on the E Display. The E Display is programmed to auto refresh every three minutes.

Figure 21. Battery Switch

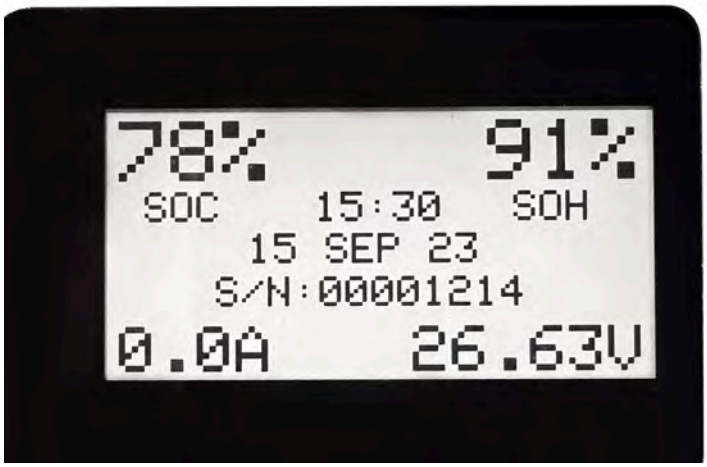


Figure 22. E Display

Connecting Additional Battery Capacity to the Power Module

NOTE: Do not connect lead-acid batteries to the Power Module. Connect only PGA Power Modules to expand the battery capacity of the Power Module.

Connecting an additional Power Module provides the following benefits:

1. Reduced depth of discharge as power is taken in and out of the battery bank
2. Additional operation time between recharges

Two Power Modules can be connected directly to the Inter-Connect ports of the Power Module using Inter-Connect cables.

Inter-Connect to Inter-Connect

Figure 23. Methods for connecting additional storage capacity to the Power Module

Monitoring Connected Power Modules

If a Power Module is “expanded” by adding another 24VDC PGA Power Module, both Power Modules will display accurate information in regards to their individual System.

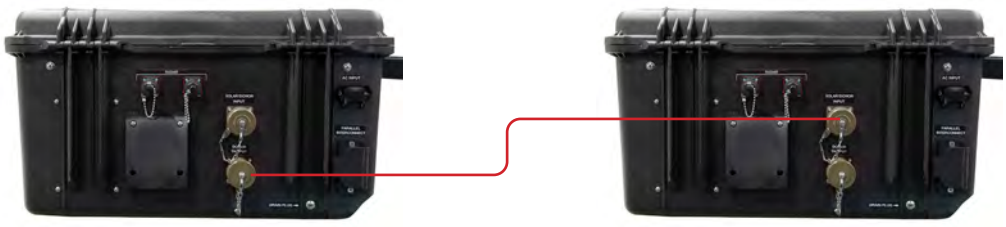
When two (2) Power Modules are connected at the Inter-Connect port, the batteries should behave as a single battery.

Donor Charging of Deployed Power Modules

Donor charging Power Modules provides the following benefits:

1. A fully charged Power Module can be connected via the Donor Output port to transfer energy to a receiver module with low state of charge. This transfer process requires a minimum of three hours.
2. Use this mode of charging when a remote and portable charging option is desirable and PGA System equipment is in a location where grid power is unavailable.

24VDC PGA Power Modules can be connected using a bayonet cable to provide power from a Donor Power Module to a Receiving Power Module (Figure 23).



Donor Ouput to Solar/Donor Input only

Figure 24. Method for connecting two Li Power Modules

Simple Steps to Optimize Power Module Performance

Do Not Exceed Recommended Load Limits

The amount of power supplied to the Power Module must be greater than or equal to the amount of power drawn from the Power Module by all loads.

Uising the Power Module in **autonomous mode** provides an opportunity for imbalance in this equation (e.g., PV charging is absent for too long due to weather). Plan for inclement weather and monitor the System and application appropriately. Maximize charging from PV and/or other renewable power sources.

Efficiency Loss during Donor Charging

When transferring energy from one Power Module to another using Donor Charging there will be an approximate 7% loss in efficiency.

Heat-related Derating

Keep it cool.

The Power Module solar charge controller will deliver full output in an ambient temperature of up to 104 °F (40°C). If an overtemperature condition exists, the charge controller will cycle on/off, reducing average power delivery to within safe limits, allowing the controller to cool. The hotter the temperature, the greater the derating. During thermal shutdown, the charge status indicator will display an OFF condition.

- Shade the Power Module from exposure to direct sunlight to minimize solar loading and the resulting derating of power.
- Keep the air intake/cooling fan filters clean to maximize airflow. Check/clean the filters more frequently when the operating environment is dusty.

Handling the Power Module and Solar Skirt

The Power Module weighs 95 lbs and is a two-man lift. The Solar Skirt weighs 39 lbs and 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.

Replace connector caps when not in use

Use wheels for transport only on solid surfaces, not in grass or sand/ dirt.

The vent can scoop up detritus which restricts airflow and increases internal heat.

Case Stacking Guidelines

Stack no more than three boxes high during long distance transport. Must be strapped adequately.

Stack no more than two high during on-course transport. Must be strapped adequately.

Do not stack on either end for any type of transport or storage.

Sliding case across ground

- Use only case handles to slide the case across ground or other surfaces.
- Do not drag case by pulling on connected cables or vent shrouds.

Storage

Operation and/or storage in hot environments is unavoidable at times. The Power Module has a low self-discharge rate at 77 ºF (25 ºC) and can be stored for up to six (6) months before it needs to be recharged. However, the self-discharge rate increases as the storage temperature increases. See the In-storage Preventive Maintenance Checks and Services section for complete charging instructions.

⚠ CAUTION

If the Power Module is stored at temperatures above 77 ºF (25 ºC), then the time between maintenance checks and/or charges must be reduced to one (1) month.

An overdischarged Power Module can fail permanently.
Allowing a Power Module to become overdischarged, especially in a high-temperature environment, can cause permanent damage to and failure of the Power Module.

1. **Charge the Power Module fully before placing it in storage.**
2. Toggle the power switch to the OFF position. This puts the Power Module into sleep mode to reduce the quiescent load and thereby the self-discharge rate during storage and transport.
3. Disconnect the Power Module from all loads and power sources.
4. Examine and clean the exterior and ports. Close port covers.

Transportation

The Power Module has an energy capacity of 1.6 kWh and categorized as a large-form lithium-ion rechargeable battery. The air, sea, and surface classification of the Power Module is UN 3481, Lithium-ion Batteries Contained in Equipment.

The Power Module is classified and regulated as Class 9 hazardous materials or dangerous goods by the International Civil Aviation Organization (ICAO), International Air Transport Association (IATA), International Maritime Organization (IMO) and many government agencies such as the U.S. Department of Transportation (DOT). These organizations and agencies publish regulations that contain detailed packaging, marking, labeling, documentation, and training requirements that must be followed when packing and shipping lithium-ion batteries, such as the ones contained in the Power Module. The regulations are based on the UN Recommendation on the Transport of Dangerous Goods Model Regulations and the UN Manual of Tests and Criteria. Please check with your preferred small package shipper to see what their weight and dangerous goods limitations are. Several have their own requirements for specialized accounts for shipping dangerous goods and some might not accept small package shipment of the Power Module. Most carriers will likely ship the Power Module as freight cargo since it is under the maximum battery net weight limit for all transportation modes.

All DoD personnel participating In the movement of the Power Module must comply with the rules of regulatory bodies governing the safe transportation of regulated HAZMAT for modes of transportation. For non-national security movements, the labeling, placarding, marking, compatibility, emergency response guidance, and other Hazardous Materials Regulations (HMR) requirements of 49 CFR are applicable to DoD regulated HAZMAT cargo transported by military or commercially operated conveyances. The Saft Excelion 6T battery in the Power Module has been tested to Section 38.3 of the UN Manual of Tests and Criteria and passed T1 through T8. The proper shipping name for the Power Module is Lithium-ion Batteries Contained in Equipment.

All personnel involved with the preparation and shipment of the Power Module must receive basic HAZMAT training IAW 49 CFR 172.704. Military personnel should also receive training IAW the Defense Transportation Regulation (DTR). More detailed training is required for handlers, packers, inspectors, and certifying officials. Military personnel who certify HAZMAT on shipping papers required for the transport of the Power Module, with the exception of technical specialists, must successfully complete an initial 80-hour classroom certification course from a DoD-approved school. A list of DOT approved schools is contained in the DTR. Refresher training IAW Service/Agency policy is required for all levels of HAZMAT training.

For detailed information on all aspects of Transport for the Power Module, see the “Packaging, Handling, Storage & Transportation (PHS&T) and Disposal Information Sheet for the 24VDC Li Power Module 2400”.

Power Module Transport

Air

The following information is a summary of the conditions that apply to the 24VDC PGA Tour Power Module for air transport:

- **Designated for air cargo transport only; shipping in passenger aircraft prohibited.**
- **Dangerous Goods Training.** The international and U.S. transportation regulations require personnel involved in shipping the Power Module to complete the appropriate level of HAZMAT training.
- **Classification.** The Power Module is classified as Class 9 hazardous material.
- **Testing.** The $LiFePO_4$ cells of the Saft Excelion 6T and the battery itself have passed UN T1 – T8 tests.
- **Short Circuit Protection**. The Saft Excelion 6T contained in the Power Module is protected against short circuit and unintended movement.
- **Accidental Activation.** The Power Module is protected against accidental activation.
- **Net Weight Limit.** The net weight of the lithium batteries in the Power Module is 20.7 kg and is below the maximum of 35 kg net weight limit.
- **Marking and Labeling.** The Power Module must bear the following labels: Class 9 hazard and Cargo Aircraft Only labels. Packages must also be marked with Proper Shipping Name (UN3481 Lithium Ion Batteries Contained in Equipment) and Shipper and Consignee addresses.
- **Shipper's Declaration for Dangerous Goods.** A Shipper's Declaration for Dangerous Goods must be filled out and accompany the Power Module for air transport. The certifying official must have the requisite training.
- **Master Air Waybill.** The Master Air Waybill or Bill of Lading (BOL) is the document that describes the shipment.

Ground

The following information is a summary of the conditions that apply to the 24VDC PGA Tour Power Module for ground transport:

- **Dangerous Goods Training.** The international and U.S. transportation regulations require personnel involved in shipping the Power Module to complete the appropriate level of HAZMAT training.
- **Classification.** The Power Module is classified as Class 9 hazardous material.
- **Testing.** The $LiFePO_4$ cells of the Saft Excelion 6T and the battery itself have passed UN T1 – T8 tests.
- **Short Circuit Protection.** The Saft Excelion 6T contained in the Power Module is protected against short circuit and unintended movement.
- **Accidental Activation.** The Power Module is protected against accidental activation.
- **Marking and Labeling.** The Power Module must bear the following labels: Class 9 Hazard label, "Cargo Aircraft Only" label. Packages must also be marked with Proper Shipping Name (UN3481 Lithium Ion Batteries Contained in Equipment) and Shipper and Consignee addresses.
- **Shipper's Declaration for Dangerous Goods.** Not required, but may be requested by your shipper.

MAINTENANCE INSTRUCTIONS

Preventive Care and Maintenance

> **Note:** The function and efficiency of all electronic equipment is related to and dependent upon the temperature at which it is operating. It performs optimally within a narrow temperature range and less so as the temperature falls outside of that range.

Heat will cause the Power Module to derate. Please use the following measures to mitigate against heat derating and other environmental effects:

- The Power Module should be shaded from direct sun exposure and sheltered from the elements as much as possible during operation.
- Keep the case lid and Inter-Connect covers closed to prevent water and dust intrusion.
- Check the integrity of electrical connectors on a monthly basis.

Water Intrusion Remediation

It is critical that the interior of the Power Module remains dry. Water may enter the Power Module by submersion or condensation.

Inspect the Power Module if it has been exposed to standing or blowing water as soon as possible. If water has pooled in the interior, keep the Power Module on a flat surface to prevent water from deep pooling at the low end of the tilt. This could cause submersion and damage to internal parts.

To inspect for water intrusion, toggle off the main breaker of each affected unit and disconnect it from the circuit to prevent the potential for electric shock. Remove the drain plug (Figure 25) and let any water drain until it stops. Then **slowly and carefully** tilt the Power Module toward the drain hole until the water is removed.

Next, open the Power Module and remove the faceplate by unscrewing the screws from the faceplate of the Power Module. If water has condensed on any surface, carefully dry the water with a nonconductive cloth. Let any remaining water evaporate until the interior is dry.

Toggle on the main power switch only after the interior of the Power Module is completely dry.

Figure 25. Power Module drain plug location

If dew is present on a regular basis in the service environment, check for moisture in the interior of the Power Module at least once each month. If water is condensing in the interior, open the Power Module and dry the interior. Increase the frequency of inspection to the point necessary to prevent the accumulation of water in the interior.

If dew is infrequent in the service environment, check the interior of the Power Module every third month and dry the interior as necessary. If water has condensed on interior parts, dry them completely before returning them to service.

In-storage Preventive Maintenance Checks and Services

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

Table 3. In-storage Preventive Maintenance Checks and Services

Item #	Item to be Inspected	Interval* at 91-140 ºF (33-60 ºC) Storage Temp	Interval* at 77-90 ºF (≤ 25-32 ºC) Storage Temp	Procedures	Non-mission Capable
1	Visual inspection of Power Module	Each time unit is packed up for transport or storage	Each time unit is packed up for transport or storage	1. Inspect case for visible damage and missing items. 2. Clean excessive dust or dirt accumulation from the exterior and ports. 3. Close all unused port covers.	If the case is broken or split or if ports are damaged, contact Solar Stik Technical Support for advice on how to proceed.
2	In-storage maintenance charging	Weekly	Monthly	1. Toggle BATTERY switch to ON. 2. Wait for Battery Status Meter to refresh. 3. Note SOC%. If approaching 20% SOC, recharge immediately to 100%. 4. Keep a written record that states date of last full charge for each Power Box.	If the Power Module E Display indicates zero net charge after 48 hours of charging, contact Solar Stik Technical Support.
3	Check Vent Shrouds and FIlters	Each time unit is packed up for transport or storage	Each time unit is packed up for transport or storage	Visually examine vent shrouds to ensure they are properly seated and that they are not clogged with grass, dirt or other obstructive material. Remove vent shroud from air intakes, examine filters. If dirty, clean or replace. Filter part number 14-1000071	If vent shroud and filter assembly are missing, the unit is NMC. Exposed fan blades pose a hazard to personnel; an unprotected vent may “inhale” debris that can damage the Power Module.
4	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 microfiber cloth or similar to wipe dust and debris from the panels taking car not to scratch the surface. Do not use cleaning agens 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.

Power Module Air Intake Vent Filter Maintenance

Maintaining maximum airflow in the Power Module is critical for normal operation. Reduced airflow increases internal heat and subsequent reduced performance of all internal components.

There are two (2) air intake vents and filters on the Power Module. Use a #2 cross-tip screwdriver to remove four (4) fasteners from the vent shroud-filter assembly. The provided replacement filter can be pressed and snapped into place. Ensure it is oriented properly as shown below. The filter can also be cleaned if necessary. After exposing the filter, lift them from the vent and wash thoroughly with water, dry thoroughly and reinstall the filters and louvered vent covers. Ensure that the leading edge of the louvers are facing downward. Re-attach the fan shroud by securing with the original four screws.

Figure 26. Replacing (or cleaning) the PGA Power Module air filters

- These filters must be checked and cleaned on a monthly basis under normal operating conditions. Replacement filters will be shipped in bulk with the Power Module.
- These filters must be checked and cleaned more frequently when operating in windy, dusty environments.
- Replace the filters immediately when they become degraded, cannot be cleaned or restrict airflow in any way.

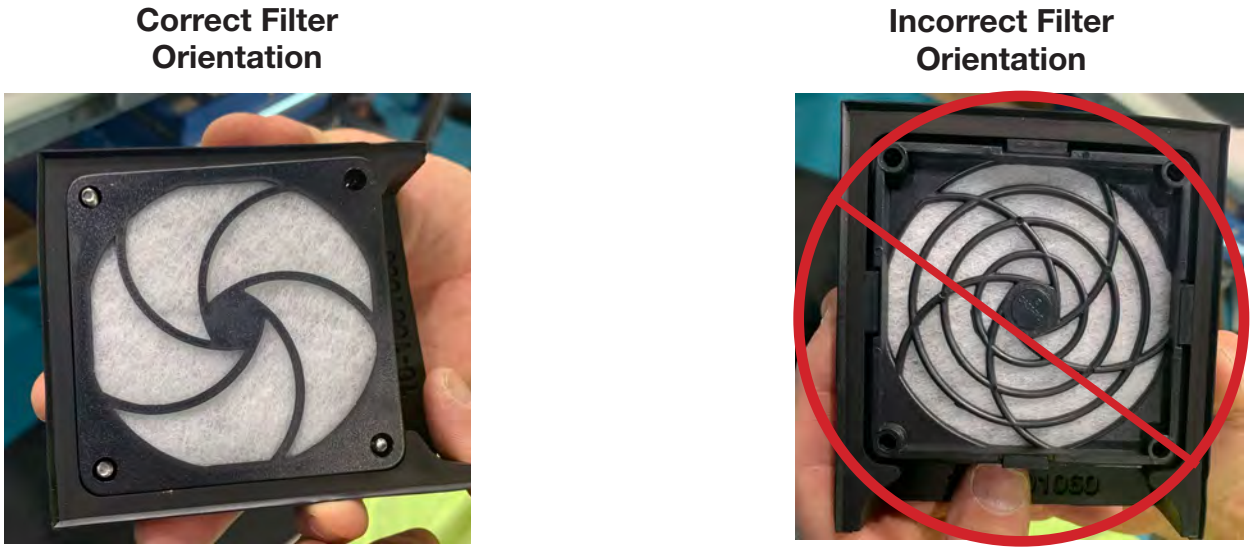


Figure 27. Proper orientation of replacement filter cassette.

Technical Specifications

Power Module

General	
Battery	One (1) 24 VDC LiFePO4 battery
Input Battery Voltage Range	24.0–28.8 VDC
Capacity	60 Ah
Energy Storage	1.6 kWh
Energy Density	69.5 Wh/kg
Max Charge Rate (DC)	13 A continuous
Max Discharge Rate (DC)	50 A continuous
Self-discharge Rate	< 5% per month
Cycle Life*	≥ 3000 Cycles to 80% State of Health
Shelf Life*	5.6 years to 80% State of Health 7.0 years to 75% State of Health
Internal Cooling	Forced convection with (3) internal fans
User Interface	E display with 3 min auto-refresh
Case	Pelican 1620
Warranty	1-year materials and workmanship

*Under standard laboratory testing conditions. Actual lifespan will vary depending on use conditions.

Connections	
Input(s)	(1) AC Input 90 to 260 VAC, 10 A (C14 90-125) (1) PV Input, 30 A (Amphenol bayonet CB2-22-2SC)
Output(s)	(1) Donor Output 48 VDC, 2.1 A (Cannon bayonet CA3102E22-LSBF80) (2) Radar Connectors 22 VDC, 10 A (CN Linko YM20) (3) Camera Connectors (customer supplied) (1) USB C 5 V, 3 A total
Inputs/ Output(s)	(1) In/Out Inter-connect Port 24 VDC, 50 A (Deltran 224-0061-BK)
Data	(1) USB A 5 V, 2.1 A total Raspberry Pi

Power Module

Solar Charge Controller

Maximum PV Input Voltage	100 VDC
Maximum Output Current	30 A
Maximum PV Power	880 W
Efficiency	98% (typical)
Charging Stages	Bulk, absorb
Charge Control Method	Maximum Power Point Tracking (MPPT)

AC Charger

Charging Stages	2 stage
Continuous Output Current	13.5 A
Charging Efficiency	93% (typical)
Input AC Voltage	90-260 VAC
Input Frequency Range	47-63 Hz
DC Output Voltage	28.8 V (factory programmable)
Compatible Battery Chemistries	LiFePO4
Input AC Current	3.2-3.75 A/115 VAC (Typical) 4.5 A (MAX) (High Temp Environments) 2.2 A/230 VAC
Inrush Current (typical)	50 A/230 VAC

DC/DC Converter 24>48, 600 W

Breaker(s)	(1) VDC Solar/Donor Input 30 A, (1) VDC Donor Output 40 A,
Recommended Input Voltage	20 V to 30 V
Efficiency	93%
Standby Current - No Load at 24 V in:	0.1414 A
Regulation	1.70%
Operating Temperature Range	-40 °F to 140 °F(-40 °C to + 60 °C)
Input Current Internally limited to:	29 A
Output Voltage Setpoint (adjustable)	43 V to 53 V
Output Power Rating	600 W
Output Current	12.5 A
Output Fuse	15 A
Max Output Ripple	0.25 Vrms
Switching Freguency	54 KHz

Solar Skirt

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

Important Specifications	
AC Input (Typical Operating Conditions)	3.2 A - 3.75 A (@115 VAC)
AC Input (Extreme Operating Conditions)	4.5 A (MAX @115 VAC; High Temp Environments)
Battery Undervoltage Protection	Low Voltage Cut Off (LVCO, 20% SOC) recharge modules within 48 hrs to prevent battery from entering LBCO Low Battery Cut Off (LBCO, approx 10% SOC) recharge modules within 24 hrs to prevent potential battery damage
Parallel Inter-Connect	Designed to connect two batteries together to double the capacity available to the System. Connection is intended between two modules at the same State of Charge (SOC). Connection can be made between two modules as long as the SOC difference between those two modules is not greater than 25%.

Power Module Weights and Dimensions (L x W x H)	
Weight	95 lb. (43 kg)
Dimensions	26 x 20 x 14 in (66 x 50.8 x 35.5 cm)

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)

Safety	
Breaker(s)	(1) VAC Input 10 A, (1) VDC Solar/Donor Input 30 A, (1) VDC Switch 15 A, (1) VDC Donor Output 40 A, (1) VDC Pan & Tilt Output 5 A, (1) VDC Radar Output 10 A, (1) Main Disconnect Battery Breaker VDC Input/Output 50 A, VDC Inter-Connect Input/Output 50 A
Fuse(s)	2 A USB Fuse
Overvoltage Protection	AC Charger, Charge Controller (voltage transients)
Undervoltage Protection	Battery LVCO 20% SOC; LBCO 10% SOC
Overcurrent Protection	AC Charger, Charge Controller, Battery
Overtemperature Protection	AC Charger, Charge Controller
Reverse Polarity	Solar Input
Transient Voltage Surges	Solar Input
Certifications	Internal battery has passed UNDOT 38.3 testing and is certified to ship globally.

Environmental	
Operating Temperature	-40 °F to +140 °F (-40 °C to +60 °C)
Charge Temperature	-40 °F to +140 °F (-40 °C to +60 °C), derated outside this range
Storage Temperature	-46 °F to 160 °F (-50.8 °C to + 71 °C)
Operating Humidity	10 to 90% RH non-condensing

Saft Excelion 6T Battery	
Nominal Capacity	60 Ah
Nominal Voltage	26.4 V
Voltage at full state of charge	30.4 VDC
Voltage at zero state of charge	20.0 VDC
Energy	2.1 kWh
Maximum discharge current continuous	120 A
Maximum charge current continuous	120 A
Weight	45 lb (20.7 kg)
Operating temp discharge	-40 °C to + 60 °C
Storage and transportation temperature	-46 °C to + 71 °C

Material/Product Safety Data Sheet
(MSDS-PSDS)

MP / VL products Revision 8 Date 02/2009	Lithium-Ion single cells and multi-cell battery pack

1. Identification of the Substance or Preparation and Company		
Product	**Rechargeable lithium-ion single cells and multi-cell battery packs**	
Production sites	Saft America Inc. 313 Crescent Street Valdese North Carolina 28690 USA Tel. No. +1 (828) 874 4111 Fax No. +1 (828) 874 2431	Saft Rue Georges Leclanché BP 1039 86060 Poitiers cedex 9 FRANCE +33 (0)5 49 55 48 48 +33 (0)5 49 55 48 50
www.saftbatteries.com (section "Contact")		
Emergency contacts	+1 (703) 527 3887 (CHEMTREC U.S. Service Center) within the USA : 800 424 9300	

2. Composition and Information on Ingredients

Each cell consists of a hermetically sealed metallic container containing a number of chemicals and materials of construction of which the following could potentially be hazardous upon release.

There is no potential for exposure to these ingredients unless the cell leaks, or opens, following high temperature, mechanical or electrical abuse.

Ingredient	Content* (wt. %)	CAS #	ACGIH (TLV)	OSHA (PEL)
Lithium metal	0 *(in spite of their name, these batteries do not contain lithium metal)*			
$LiCoO_2$ *(Lithium cobalt oxide)*	19-35 %	12190-79-3	0.02 mg/m^3 8 hours as dust and fumes	5 mg/m^3 as dust and fumes
Organic solvents	12-15 % EA (*Ethyl Acetate*) EC *(Ethylene Carbonate)* DMC *(Di Methyl Carbonate)*	141-78-6 96-49-1 616-38-6	None established	None established
$LiPF_6$ *(Lithium Hexafluoro phosphate)*	≈ 3 %	21324-40-3	None established	None established

PVDF	< 1 %	24937-79-9	None established	None established
Copper *(Cu)*	9-18 %	7440-50-8	0.2 mg/m^3 as fume 1.0 mg/m^3 as dust and mist	0.1 mg/m^3 as fume 1.0 mg/m^3 as dust and mist
Aluminium *(Al)*	17-27 %	7429-50-5	10.0 mg/m^3, as dust	2.0 mg/m^3, as soluble salt
Graphite and Carbon	13-18%	7782-42-5 1333-86-4	3.5 mg/m^3, TWA for carbon	2.0 mg/m^3, as dust
Steel, Nickel, and inert components	Balance		Balance	

* Quantities may vary a little with cell model
ACGIH : American Council of Governmental Industrial Hygienists
TLV : Threshold Limit Value is personal exposure limit, determined y ACGIH.

3. Hazards Identification

The rechargeable lithium-ion batteries described in this Product Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer and as long as their integrity is maintained.

Do not short circuit, puncture, incinerate, crush, immerse in water, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.

Under normal conditions of use, the active materials and liquid electrolyte contained in the cells and batteries are not exposed to the outside, provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

4. First Aid Measures (in case of leaking or accidentally opened cells)

In case of accumulator breakage or burst, please evacuate employees from the contaminated area and ensure maximal ventilation in order to break-up corrosive gas, smoke and unpleasant odors.

If it occurs, by accident, following measures must be taken:

Inhalation	Not anticipated under normal use. Remove from exposure. Remove to fresh air. Rest and keep warm. In severe cases obtain medical attention.
Skin contact	Not anticipated under normal use. Wash off skin thoroughly with water. Remove contaminated clothing and wash before reuse. In severe cases obtain medical attention.
Eye contact	Not anticipated under normal use. Irrigate thoroughly with water for at least 15 minutes. Obtain medical attention.
Ingestion	Not anticipated under normal use. Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical attention.
Further treatment	All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or been affected by breathing its vapours should be seen by a doctor.

5. Fire Fighting Measures

Dry chemical type or CO_2 extinguishers, Halon, or copious quantities of water or water-based foam can be used to cool down burning Li-ion cells and batteries. During water application, caution should be exercised as burning pieces of flammable particles may be ejected from the fire.

In case of fire, it is recommended to wear self-contained breathing apparatus, to avoid contact with irritant fumes. Evacuate all persons from immediate area of fire.

Do not re-enter the area until it has been adequately purged of the fire vapour and extinguishing agent.

6. Accidental Release Measures

In case of electrolyte leakage from a cell or battery, do not inhale the gas as possible.
Remove personnel from area.

If the skin has come into contact with the electrolyte, it should be washed thoroughly with water.

Using protective glasses and gloves, sand or earth should be used to absorb any exuded material.

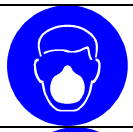
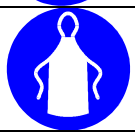
Seal leaking battery (unless hot) and contaminated absorbent material in plastic bag and dispose of as Special Waste in accordance with local regulations.

7. Handling and Storage

Handling	Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods, which would end up into excessive heating. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non conductive (i.e. plastic) trays. Do not disassemble, mutilate or mechanically abuse cells and batteries.
Storage	Store in a cool (preferably below 30°C) and ventilated area, away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 70°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not jumble them.
Other	Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range. Applying pressure on deforming the battery may lead to disassembly followed by eye, skin and throat irritation. Do not immerse in water. The Li-ion cells and batteries are not designed to be recharged from external power sources besides specific Li-ion charger models approved by Saft. Connecting to inappropriate power supplies can result in fire or explosion.

8. Exposure Controls & Personal Protection

Occupational exposure standard	See section 2

	**Respiratory protection**	In all fire situations, use self-contained breathing apparatus.
	**Hand protection**	In the event of leaking or ruptured cells, wear gloves.
	**Eye protection**	Safety glasses are recommended in case of leaking or ruptured cells
	**Other**	In the event of leakage or ruptured cells, wear chemical apron.

9. Physical and Chemical Properties	
Note: The following points are not applicable unless in case of leaking or damaged batteries with internal components sipping out.	
Appearance	Solid object with cylindrical or prismatic shape
Odour	Odourless (unless in case of damaged product with leaking electrolyte)
pH	Not applicable
Flash point	Not applicable
Flammability	Not applicable
Relative density	> 2 g/cm^3
Solubility (water)	Not applicable, unless inner components are exposed
Solubility (other)	Not applicable

10. Stability and Reactivity	
The product is stable under conditions described in Section 7.	
Conditions to avoid.	Heating above 70°C or incinerate. Deformation. Mutilation. Crushing. Piercing. Disassembly. Short circuiting. Exposition over a long period to humid conditions.
Materials to avoid	Strong mineral acids, alkali solutions, strong oxidising materials and conductive materials
Hazardous decomposition Products	HF, CO, CO_2

11. Toxicological Information	
Signs & symptoms	None, unless battery ruptures. In the event of exposure to internal contents, corrosive fumes will be very irritating to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation.
Inhalation	Lung irritant.
Skin contact	Skin irritant
Eye contact	Eye irritant.
Ingestion	Tissue damage to throat and gastro-respiratory tract if swallowed.
Medical conditions generally aggravated by exposure	In the event of exposure to internal contents, eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.

12. Ecological Information	
Mammalian effects	None known if used/disposed of correctly.
Eco-toxicity	None known if used/disposed of correctly.
Bioaccumulation potential	None known if used/disposed of correctly.
Environmental fate	None known if used/disposed of correctly.

13. Disposal Considerations

Do not incinerate, or subject cells to temperatures in excess of 70°C. Such abuse can result in loss of seal, leakage, and/or cell explosion. Dispose of or recycle in accordance with appropriate local regulations.

14. Transport Information

Note: when manufacturing a new battery pack, one must assure that it is tested in accordance with the UN Model Regulations, Manual of Tests and Criteria, Part III, subsection 38.3

Label for conveyance	For the single cell batteries and multi-cell battery packs that are non-restricted to transport, use lithium-ion batteries inside label. For the single cell batteries and multicell battery packs which are restricted to transport (assigned to the Miscellaneous Class 9), use Class 9 Miscellaneous Dangerous Goods and UN Identification Number labels. In all cases, refer to the product transport certificate issued by the Manufacturer.
UN number	UN 3480, for Li-ion batteries transported in bulk UN 3481, for Li-ion batteries contained in equipment or packed with it
Shipping name	Lithium-ion batteries
Hazard classification	Depending on their nominal energy, some single cells and small multi-cell battery packs may be non- assigned to Class 9 (Refer to Transport Certificate)
Packing group	II
IMDG Code	9033
CAS	
EmS No.	4.1-06
Marine pollutant	No
ADR Class	Class 9

15. Regulatory Information

Regulations specifically applicable to the product:

- ACGIH and OSHA: see exposure limits of the internal ingredients of the battery in section 2.
- IATA/ICAO (air transportation): UN 3480 or UN 3481
- IMDG (sea transportation) : UN 3480 or UN 3481
- Transportation within the US-DOT, 49 Code of Federal Regulations

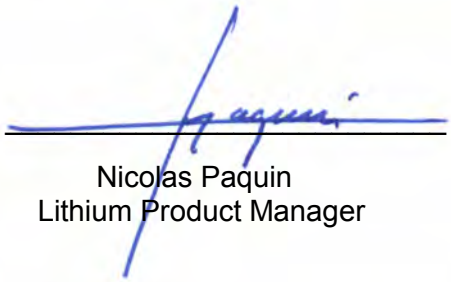
16. Other information

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable as of the date compiled.

This information relates to the specific materials designated and may not be valid for such material used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of this information for his particular use.

Saft does not accept liability for any loss or damage that may occur, whether direct, indirect, incidental or consequential, from the use of this information. Saft does not offer warranty against patent infringement.

Edition 8 – February 2009

Signature 

Nicolas Paquin
Lithium Product Manager

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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Solar Stik, Inc.
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Saint Augustine, Florida 32084

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