Specifications

Listings:

- CSA22.2, No. 107.1-01 Ed.3 (R2006)
- California Rule 21 SRD
- IEEE 1547-2003
- IEEE 1547.1-2005

Certifications:

- HECO Rule 14 SRD
- IEEE 1547-2003
- IEEE 1547.1-2005

System Grounding and Bonding:

In this product, the PV, AC, and battery circuits are isolated from the enclosure. This product has been evaluated, listed and identified by UL to meet the requirements of 690.41 and 250.4(A) of the NEC.

- The PV system ground reference and protection is provided internal to the SkyBox, in accordance with NFPA 70 690.4(A)(6).
- The AC connections are not bonded to ground. The usual location for a neutral-ground bond is at the main AC service panel. Make sure to establish a neutral-ground bond when installing in an off-grid application.
- The battery connection is not bonded to ground. Make sure to establish a negative-ground bond for each battery system.

Equipment grounding is required by Section 250 of the National Electric Code (ANSI/NFPA 70) and Canadian Electrical Code (C22.1).

Overcurrent Protection:

- The battery disconnect device in the BOS does not provide overcurrent protection. The installer must provide protection for the battery circuit according to the following parameters.
  - Maximum 175 Adc
  - Minimum 10 kA AIC
  - AC overcurrent protection is provided in the BOS.

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Date and Revision

July 2016, Revision A

Quick Start Guide

Electrical Specifications

- Maximum continuous output: 5000 VA @ 45°C
- Nominal input and output voltage: 120/240 Vac
- Nominal frequency: 60 Hz
- Maximum continuous output current: 24 Aac
- Maximum grid input current: 48 Aac
- Maximum generator input current: 48 Aac
- Maximum PV source voltage: 600 Vdc
- Operating PV source voltage range: 200 to 600 Vdc
- Maximum PV input current: 20 Adc
- Maximum PV short-circuit current: 32 Adc
- Aux output: 0.6 A @ 12 Vdc
- Aux relay: 10 A @ 240 Vac, 5 A @ 30 Vdc
- Nominal battery voltage: 48 Vdc
- Maximum battery input current: 140 Adc
- Battery input voltage range: 42 to 60 Vdc
- Charging output voltage range: 42 to 60 Vdc
- Maximum battery charging current: 100 Adc

Supported Batteries

- Lead-acid
- Various lithium-ion models

Environmental Ratings:

- Environmental Category: Type 3R
- Maximum Altitude Rating: 10,000 feet
- Maximum Ambient Temperature: 60°C

Dimensions:

- Height 47.2” (119.9 cm)
- Width 21.0” (53.3 cm)
- Depth 9.4” (23.9 cm)

Mounting Bracket

Ensure the mounting surface is strong enough to handle three times the unit weight. Add plywood or other material as necessary to strengthen the surface.

- Locate this horizontal slat at about eye level for easier display viewing.
- Mark the placement of the bracket according to A and B, keeping in mind the dimensions in the second drawing. These dimensions show the SkyBox overlap (beyond the bracket) as well as the vertical measurements with respect to A. They also add the required minimum clearances of 6” (15.2 cm) to SkyBox top and sides.

- No lower clearance is shown. In outdoor installations a 36” minimum clearance above the ground or floor is required. The lower vertical measurement becomes 60” (153.9 cm) from A.

Weights:

- SkyBox: 87.7 lb (39.8 kg)
- BOS: 23.6 lb (10.7 kg)
- Mounting Bracket: 4.6 lb (2.1 kg)

Tools Needed:

- 13 mm socket (torque) wrench
- 6 mm Allen wrench
- #2 Phillips (torque) driver
- Digital multimeter (DMM)
- Flat blade (torque) driver

WARNING: Fire/Explosion Hazard

Do not place combustible or flammable materials within 12 feet (3.7 m) of the equipment. This unit employs mechanical relays and is not ignition-compatible. Combustible or flammable materials could be ignited by sparks.

WARNING: Personal Injury

Use safe lifting techniques and standard safety equipment when working with this equipment.

WARNING: Burn Hazard

This heat sink (at the top rear of the product) may reach temperatures greater than 70°C. Install this product so that casual contact does not occur.

WARNING: Maximum input current: 48 Aac

Fuses are not to exceed maximum output rating.

When installed outdoors, use only UL514B compliant wet location or rain tight conduit hubs for entry into the enclosure.

Consult local electric code to confirm clearance and access requirements for the specific location. If this product is installed or used in a manner other than specified, the protection it provides may be impaired.

IMPORTANT:

This document is for use by qualified personnel familiar with photovoltaic (PV) systems and maximum power point tracking (MPPT) technology as well as basic inverter functionality. Users of this document should meet all local and governmental code requirements for licensing and training for the installation of electrical power systems with AC and DC voltage up to 600 volts. This product is only serviceable by qualified personnel.

Tools Needed:

- 13 mm socket (torque) wrench
- 6 mm Allen wrench
- #2 Phillips (torque) driver
- Digital multimeter (DMM)
- Flat blade (torque) driver

WARNING: Personal Injury

Use safe lifting techniques and standard safety equipment when working with this equipment.

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Mounting

Attach the wall bracket. Center the mounting holes on wall studs. Six ½ - 20 x 1 ½” lag screws and washers are provided. Any of the mounting holes can be used. Observe all mounting considerations (page 1), including the display location (A).

Place the rear brackets on the BOS studs (B). Attach the rear brackets to the BOS assembly using the four M6 nuts provided (C). Ensure that the pegs on each bracket (D) face inward (toward the opposite bracket).

Install the SkyBox onto the wall bracket by lifting it into position. The SkyBox is equipped with rear brackets which are already attached (G).

NOTE: Two holes are available at the top of the SkyBox (H). A metal pipe, rod, or bar can be inserted across the top to assist with handling and lifting.

Place the BOS assembly on the wall bracket by seating the pegs (D) in the slots (E).

Insert the rear brackets into the designated slots (I) on the wall bracket. Once the SkyBox is seated, the lifting bar can be removed.

The wall bracket has securing holes for the SkyBox (J). Secure the SkyBox in place by inserting an M6 x 40 mm screw on each side.

Mounting is complete. See the Commissioning section.

Wiring Access

Two areas house the system wiring. The BOS compartment opens with a latch. It connects to external wiring (battery, AC, PV, etc.) and conduit. These connections extend from the BOS into the SkyBox compartment, which opens with two Allen screws (K). If the SkyBox must be removed for service, the BOS and its wiring can remain. Some connections, such as communications, pass through the BOS to be made directly in the SkyBox.

Battery Cable Connections

NOTE: The spring lock washer used in these connections must be installed with the rounded (convex) side facing outward. Installing in any other orientation will result in inadequate compression which may be hazardous. See the CAUTION to the far right.

Table 1: Wires and Conductors

<table>
<thead>
<tr>
<th>Permitted Sizes</th>
<th>Torque Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>AWG</td>
</tr>
<tr>
<td>2/0 to 4/0</td>
<td>70 to 120</td>
</tr>
<tr>
<td>6 to 75 in-lb</td>
<td>7.3 to 8.5 Nm</td>
</tr>
<tr>
<td>AC</td>
<td>#8 to #3</td>
</tr>
<tr>
<td>6 to 25</td>
<td>18 to 22 in-lb</td>
</tr>
<tr>
<td>PV</td>
<td>#18 to #4</td>
</tr>
<tr>
<td>1.5 to 25</td>
<td>11 to 16 in-lb</td>
</tr>
<tr>
<td>Aux</td>
<td>#24 to #16</td>
</tr>
<tr>
<td>0.25 to 1.5</td>
<td>N/A</td>
</tr>
<tr>
<td>#14 to #10</td>
<td>2.5 to 4</td>
</tr>
<tr>
<td>20</td>
<td>2.3</td>
</tr>
<tr>
<td>#8</td>
<td>6 to 10</td>
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<tr>
<td>25</td>
<td>2.8</td>
</tr>
<tr>
<td>#5 to #3</td>
<td>16 to 25</td>
</tr>
<tr>
<td>35</td>
<td>4.0</td>
</tr>
<tr>
<td>#2</td>
<td>35</td>
</tr>
<tr>
<td>40</td>
<td>4.5</td>
</tr>
<tr>
<td>#1 to #10</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>5.7</td>
</tr>
</tbody>
</table>

CAUTION: Equipment Damage

When connecting to the battery terminals, make sure to observe the proper polarity. Connecting the cables incorrectly can damage or destroy the equipment and void the product warranty.

IMPORTANT

All PV, AC, and battery conductors must be copper-only and rated at 75°C.
Commissioning

Pre-startup Procedures:
1. Double-check all wiring connections. Using a digital multimeter (DMM), test for continuity between terminals L1 and L2. Ensure a neutral-ground bond is installed in the system.
2. Inspect the enclosure. Ensure no debris or tools were left inside.
3. Ensure all AC loads at the backup (or protected) load panel are disconnected.
4. Ensure all AC input feeds to the BOS are disconnected at each source.
5. Using a DMM, verify the inverted polarity is lit, the polarity is reversed. Do NOT turn on the circuit breaker.
6. Energize the system as below. Follow the procedures which are applicable to the system. If any elements are not present (including batteries, PV, or a generator), ignore those procedures.

To energize the Skybox:
1. Double-check all wiring connections. Using a digital multimeter (DMM), test for continuity between terminals L1 and L2. Ensure a neutral-ground bond is installed in the system.
2. Double-check all wiring connections. Using a digital multimeter (DMM), test for continuity between terminals L1 and L2. Ensure a neutral-ground bond is installed in the system.
3. From the Home screen, turn on the SkyBox with the On/Off key.
4. From the Home screen, turn on the SkyBox with the On/Off key.
5. Confirm the correct battery voltage and polarity. If the red LED indicator is lit, the polarity is reversed. Do NOT turn on the circuit breaker.
6. Confirm the correct battery voltage and polarity. If the red LED indicator is lit, the polarity is reversed. Do NOT turn on the circuit breaker.
7. Turn on (close) the circuit breaker.
8. Turn on (close) the circuit breaker.
9. Turn on (close) the load circuit breaker.
10. Turn on (close) the load circuit breaker.
11. Turn on (close) the load circuit breaker.
12. Turn on (close) the load circuit breaker.
13. Turn on (close) the load circuit breaker.
14. Turn on (close) the grid circuit breaker. The Wizard will appear for the first time if no batteries are installed. (Perform steps 3 through 10 if this is the case.) The SkyBox transfer relay should click and the G R I D tile should read PASS THROUGH.
15. Using a DMM, test the pass-through (transferred) L1 output voltage at (L1) and (L2). Test the L2 voltage at (L2) and (L2).
16. If PV is present: Verify that the input is in the correct range of open-circuit voltage. Confirm polarity by measuring with a DVM from (PV1) to (PV2) (referred to as PV1 in the legend above). Confirm polarity from (PV1) to (PV2). If PV2 is present.
17. Check the green LED indicators and . If a single PV input is installed, one indicator should light. If two strings are installed, both should light. Any other behavior means the polarity may be reversed. Do NOT turn on the switch. Review all PV connections.
18. Turn on (close) the PV switch . Check indicators and again. Both indicators should light. Any other behavior means the polarity at the top of the PV switch may be reversed.
19. On the Home screen, check the B O L A R tile (as shown to the right) and ensure it is operating normally. The SkyBox will connect to the PV source if the voltage is above 250 Vdc. (See the Overview Guide for more information.)
20. If a generator is present: Turn off (open) the G n o d t circuit breaker .
21. Start the generator. Do not turn on (close) the Gen circuit breaker . Repeat steps 12 and 13 using (L1) and (L1).
22. Turn on (close) the G n o d t circuit breaker . Repeat step 14. The LOAD circuit breaker may remain on (closed).
23. Stop the generator.
24. Turn on (close) the G n o d t circuit breaker . Wait for the programmed connection delay to elapse. Test any grid-interactive functions.
25. To de-energize or shut down the system:

There is no required shutdown order. It is common to de-energize circuits in the reverse order from which they were energized.

WARNING: Shock Hazard
Before performing maintenance, all sources (battery, PV, and AC) must be completely de-energized. All the unit to rest for at least five minutes.