lunar energy

Lunar System PV Installation and Troubleshooting Guide

Application Note

lunarenergy.com

Table of Contents

Purpose 2
Quick PV Install Checklist 3
Design Requirements 4
- PV Module Requirements 4
- Series String Requirements 4
- Parallel String Requirements 4

PV Troubleshooting Guide 5
- When System is in Rapid Shutdown 5
- Common PV Layouts Issues 6
- Maximizer Hub Installation and Troubleshooting 7
- Roof Doctor 8

FAQs 9
- Do you recommend 1 string of 20 Panels or 2 strings of 10 Panels? 9
- Is the Lunar Inverter grounded or ungrounded (aka functionally grounded)? 10
- Does an installer need to verify the voltage of each individual string? 10

Lunar Support 10
Revision History 10

Purpose

This application note outlines the PV stringing requirements and provides troubleshooting recommendations for the Lunar System, including the Lunar Maximizers (module-level DC converters) and the Lunar Maximizer Hub (PV junction box).

Quick PV Install Checklist

- ☐ Confirm continuity from each Maximizer mounting flange to the Hub's ground terminal
- ☐ Measure 20-30Vdc at each of these locations:
  - ☐ String 1 home run isolated
  - ☐ String 2 (if applicable) home run isolated
  - ☐ String 3 (if applicable) home run isolated
  - ☐ Hub DIN rail terminals with all parallel strings terminated
  - ☐ Inverter PV terminals
- ☐ If < 20Vdc is seen, verify stringing between Maximizers outputs, as well as verify a single solar panel is plugged in to each Maximizer input
- ☐ If > 30Vdc is seen, verify grounding of Maximizers, starting at both ends of the string

See below for the expected DC Voltage ranges for each measurement location.

Table 1. Voltage Reference Values

Multimeter + to - Measurement Location	Expected DC Voltage**
5-20 Maximizers (each individual string)*	20 - 30 Vdc (actual voltage may fluctuate)
Maximizer Hub DIN rail terminals*	20 - 30 Vdc
Inverter PV terminals*	20 - 30 Vdc
1 Maximizer (output measured with PV connected to input)	4.5 - 5.5 Vdc
2 Maximizers (2 units in series, each with PV connected to input)	9 - 11 Vdc
3 Maximizers	13.5 - 16.5 Vdc
4 Maximizers	18 - 22 Vdc
Line to Ground (at inverter or Maximizer Hub)	Positive to Ground: 9 - 18 Vdc Negative to Ground: 9 - 18 Vdc

* To verify at time of install per PV install checklist.

** Measure only when Rotary switch is OFF (Rapid Shutdown) or inverter is disconnected

Design Requirements

PV Module Requirements	650W Maximizer	420W Maximizer
Maximum Rated Power Output	650 W	420 W
Maximum Short Circuit Current (Isc)	20 A	
Maximum Open Circuit Voltage (Voc)	75 V	60 V

Series String Requirements	650W Maximizer	420W Maximizer
Maximum # of PV Modules per String	24 PV Modules	20 PV modules
Minimum # of PV Modules per String	9 PV Modules	
Minimum # of PV Modules within +/- 5° pitch and azimuth	7 PV Modules. Remaining PV modules of the same string can be on different planes and orientations	
Maximum Usable Power per String	6.5 kW	
Maximum DC Current per String	16 A	
Maximum STC Nameplate Power per String	8.4 kW. Based on site specific pitch, azimuth, shade, and weather conditions, Maximizers will curtail power if real world power exceeds 6.5kW per string.	

Parallel String Requirements	650W Maximizer	420W Maximizer
# of Parallel Strings Allowed	3 Strings	
Uneven String length Allowed	Yes, each string in parallel can have different number of PV Modules/Maximizers	
Maximum Total DC Current from PV to Inverter	37.5 A	
Maximum Total Usable Power	15 kW. The inverter will curtail power if real world power exceeds 15 kW for all strings combined. Note that curtailment is **unlikely** to occur at 15kW STC with Lunar 9.6kW inverter as the battery charge power plus the inverter output power is capable of handling 15kW.	

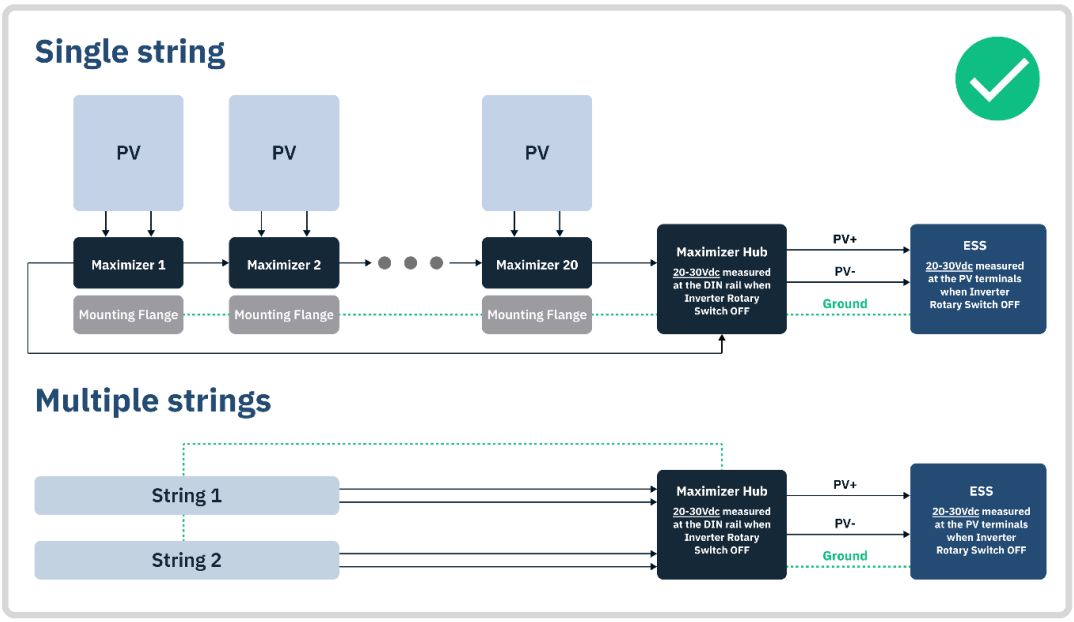
PV Troubleshooting Guide

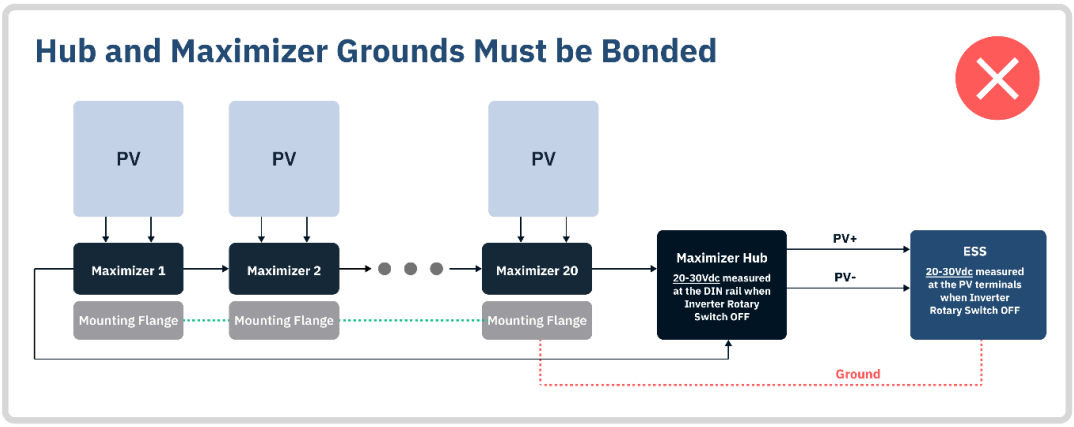
⚠️ **Caution**: Whenever working on the DC PV circuits (Maximizer Hub and Maximizers), ensure the inverter rotary switch is turned OFF. This isolates the batteries from the PV circuits. Failure to do so may result in exposure to the full current and voltage of the batteries, posing safety risks.

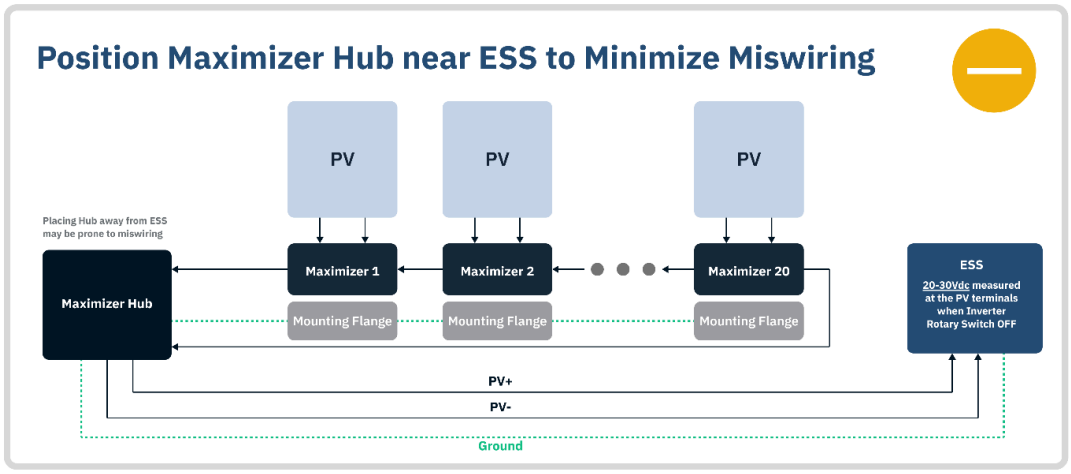
When System is in Rapid Shutdown

- If the string measured voltage < 20Vdc, it is likely that one or more Maximizers are unplugged on the inputs, unplugged on the outputs, or a subset of Maximizers are installed with reverse polarity.
- If the string measured voltage > 30Vdc, it is likely one or more Maximizers are not properly bonded together and bonded to the Maximizer Hub.
    - Grounding and bonding are an important part of Maximizer installation and operation.
    - During the roof installation, the Hub and Maximizer grounds should be bonded together but are unlikely to be grounded. This is acceptable for verifying voltages when in Rapid Shutdown. However, once the system is energized and operating, proper grounding from the roof to the inverter is critical for proper product functionality.
- If string measured voltage is negative, check polarity of Multimeter probes. If the probes are correct, the Maximizer string is likely installed with reverse polarity.

Common PV Layouts Issues

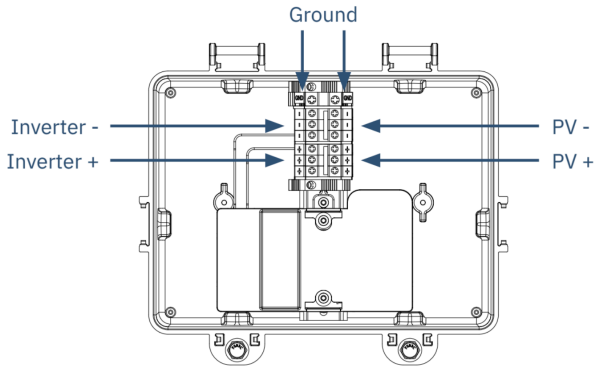






Maximizer Hub Installation and Troubleshooting

The Maximizer Hub should always be installed between the Inverter and all Maximizer output strings. The positive (+) and negative (-) wires of the inverter circuit, and all Maximizer strings (including ground), should terminate in the Maximizer Hub.



When the system is installed correctly, the measured voltage on the Maximizer Hub terminals should match the voltage on the inverter's PV terminals. This applies both when the system is in Rapid Shutdown and when it is active.

Roof Doctor



Roof Doctor is an optional PV commissioning tool that ensures solar panels and Maximizers are correctly wired early on the day of install, before the ESS is operational.

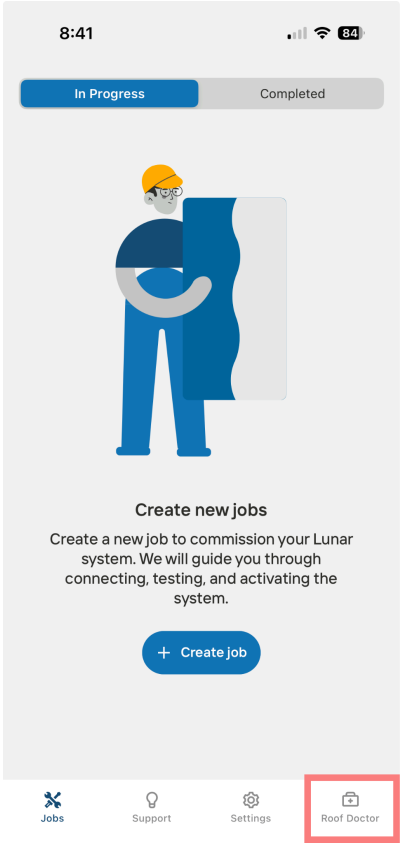
The Roof Doctor Hub is a palm-sized, USB-powered device that enables phone to Maximizer communication. The Hub and the commissioning phone can remain on the ground while communicating wirelessly with Maximizers located over 100 feet away on the roof. Communication can begin as soon as a Maximizer receives input power from a solar panel.

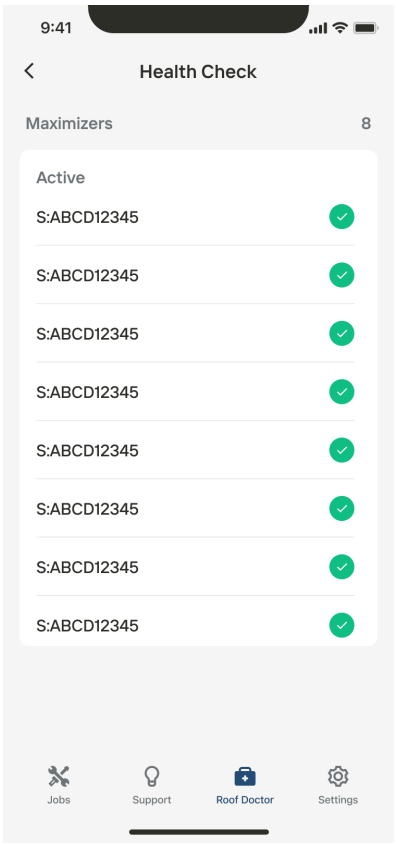
Installers can use the following Roof Doctor features on the Lunar Installer App:

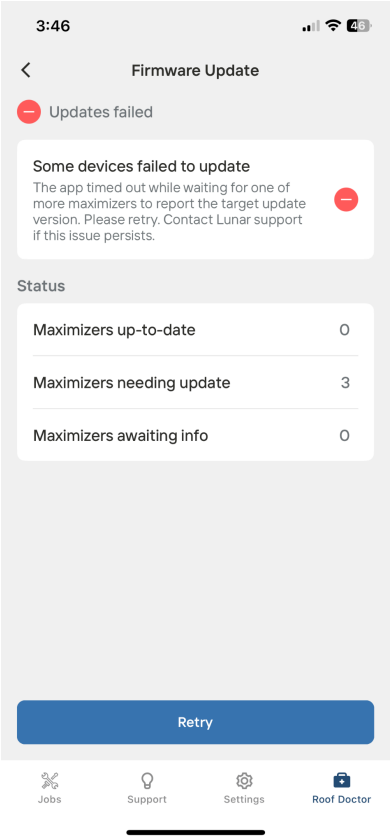
- Update Maximizer firmware
- Verify Maximizer power, communication, and state
- Send a 1V signal to the Maximizer
- When a Maximizer is updated to the latest firmware and is actively communicating with Roof Doctor, it outputs approximately 1V. This functionality allows the installer to use a multimeter to verify PV strings by comparing the measured string voltage to the expected voltage based on the number of Maximizers in that string.

Getting Started on Roof Doctor

1. Disconnect the Maximizer Hub.
2. Power the Roof Doctor Hub with a USB-C cable with a phone (iPhone 15 or higher) or other external power source.Two blue LED lights should be on.
3. Log in the Installer App, click “Roof Doctor” in the bottom right corner.
4. Join the Roof Doctor wifi network. No QR scanning or text entry is needed.
5. Scan Maximizer QR codes.
6. Confirm all Maximizers communicating using the Health Check feature. It takes ~30 seconds to update.
7. Push Firmware update
8. Confirm all have healthy state as instructed by the Installer App







NOTE: Issues may occur if multiple Roof Doctor Hubs are powered simultaneously and within range of a phone. Use only 1 Roof Doctor Hub at a time.

NOTE: A Maximizer cannot communicate with a Roof Doctor Hub and Maximizer Hub simultaneously.

- For a Maximizer fresh out the box, it will connect to Roof Doctor as soon as the QR code is scanned.
- For a Maximizer previously commissioned and communicating with a Maximizer Hub:
  - Turn the Inverter rotary switch to the OFF position
  - Unplug home runs from Maximizer Hub to de-energize the Maximizer Hub
  - Wait up to 5 minutes before the Maximizer will connect to Roof Doctor

FAQs

Do you recommend 1 string of 20 Panels or 2 strings of 10 Panels?

1 string of 20 panels is recommended over 2 strings of 10.

Is the Lunar Inverter grounded or ungrounded (aka functionally grounded)?

The Lunar inverter is an ungrounded (aka functionally grounded) inverter. Therefore the PV ground wire must remain isolated from both the positive and negative DC circuits.

Does an installer need to verify the voltage of each individual string?

Yes, we strongly recommend verifying the voltage of each individual string. It is possible that one series string is wired correctly, but a second series string is wired incorrectly. After the strings are combined in parallel at the Maximizer Hub, voltage at the Maximizer Hub DIN rail terminals may still read 20-30Vdc. This could falsely indicate that wiring is correct.

Lunar Support

Email: installersupport@lunarenergy.com
Hotline: (650) 535-1969 or contact us directly in the Lunar Installer App
Support Hours: 8:00 a.m. to 7:00 p.m., Pacific Standard Time, Mon-Fri.

Revision History

Revision	Description of Change	Effective Date
1	Initial Release	12/13/2024
2	Allow 2 PV Strings	01/07/2025
3	Allow 9 modules per string	02/25/2025
4	Allow 3 PV Strings	03/17/2025
5	Table 1. Voltage Reference Values Updated	03/26/2025
6	Maximizer Expected DC Voltage Updated	04/10/2025
7	650W Maximizer	09/24/2025
8	Roof Doctor	11/25/2025