# Power Optimizer and String Troubleshooting Guide – North America

## Revision history

Version 1.0, August 2024: Initial release

## Overview

This guide explains how to identify and troubleshoot non-functional Power Optimizers and Strings. This outlines the steps required to check remotely and on-site for equipment issues.

## Contents



**WARNING**

The following troubleshooting steps require you to work inside the inverter. Never install any hardware while the AC power is connected to the inverter. Failure to disconnect AC power can result in injury or death. Never open the inverter if it is raining or expose the inverter to moisture. Always follow OSHA guidelines and your company's workplace safety protocols when working inside the inverter.

# Safety Precautions

Before removing any covers, do the following:

1. Turn off the inverter by moving the P/1/0 switch to **0** (**OFF**) and wait for the $V_{DC}$ on the inverter to drop below 30V.
2. To verify that the $V_{DC}$ has dropped below 30V, check the following:

| Inverter Type | Description |
|---|---|
| With SetApp | Connect to SetApp > Inverter's Status page > **DC voltage field** |
| With LCD screen | The inverter displays a message that the $V_{DC}$ is lowering and do not disconnect it. After the $V_{DC}$ drops below 50V, the message no longer displays |

**NOTE**

- If the DC does not reach a safe level, turn **OFF** the DC Disconnect (DCD) switch. Then measure the voltage with a voltmeter.
- If any batteries are installed on-site, power down the battery as per the manufacturer's instructions

3. Turn **OFF** the AC circuit breaker before working inside the inverter.

**CAUTION**

If the inverter's AC circuit breaker trips on-site, you must turn the AC breaker **OFF** before checking for internal damage, such as thermal or debris.

# Power Optimizer Functionality

SolarEdge Power Optimizers work with the PV modules and inverters on-site to help maximize production and improve production efficiency from the PV modules. When connected to a PV module that is currently generating voltage and the inverter is not producing power, the Power Optimizer output is approximately $1V_{DC}$. After the strings are connected to the inverter, there is approximately $1V_{DC}$ per Power Optimizer in the string. For example, 10 modules + 10 Power Optimizers in one string approximately equals $10V_{DC}$. The voltage output can range from .8 to 1.2 per Power Optimizer.

When multiple strings combine at the inverter's DCD switch, they should measure the same voltage as the longest string connected to the inverter. For example, one string of 10 Power Optimizers and another string of 12 Power Optimizers measure approximately $12V_{DC}$ when both strings connect to the inverter).

When a Power Optimizer is not functioning properly, it can perform the following ways:

- Low or no production
- Intermittent or no communication from the Power Optimizer
- Power Optimizer is outside the 0.9-1.1V Safe DC threshold

**NOTE**

This guide helps to identify failed Power Optimizers only. Additional on-site maintenance may be required depending on the issue. This guide does not replace contacting SolarEdge Technical Support for troubleshooting and/or Return Merchandise Authorization (RMA) purposes.

## Remote Steps

If Power Optimizers have not communicated with the Monitoring portal for a 24-hour period, a No Communication alert is triggered for each optimizer that stopped communicating. In addition, Power Optimizers can continue to communicate without producing power or producing a reduced amount.

### To remotely pair the Power Optimizer:

1. From the **Monitoring** portal, go to your site > **Layout** tab and left click on the Power Optimizer under investigation.
2. Simultaneously, press and hold down the Ctrl key while clicking on a nearby functional Power Optimizer.
3. Then right click on one of the selected panels and choose **Module Voltage**.
4. Go to the **Analysis** tab to view the voltages between the two modules.
   Repeat the steps for the Power Optimizer Voltage

**NOTE**

- When the module voltage is lower than a verified module nearby, there can be an issue with the module.
- When the Power Optimizer displays a lower voltage than other Power Optimizers nearby, but the module voltage is not lower than the verified modules, there can be an issue with the Power Optimizers.

5. Go to the **Layout** tab on-site and select the inverter.
6. Right click the inverter icon and select **Choose Operation**, then select **Pair**.
   It takes approximately three minutes to pair the Power Optimizer.

**NOTE**

- Before pairing remotely, first check that there are good weather conditions and PV illumination on the modules.
- Pairing at night or with heavy cloud cover can cause the Power Optimizers to pair incorrectly.
- We recommend waiting 24 hours after remotely pairing to check the functionality for the compromised Power Optimizers.

If the Power Optimizer is still not pairing or in production after the remote pairing procedure, you need to inspect the Power Optimizer and PV module on-site.

## Onsite Steps

This explains how to check the Power Optimizer on-site.

### Before you begin:

- Bring a copy of the Power Optimizer's physical layout and serial number.
- Check the site map on the Monitoring portal to identify which Power Optimizer is not working correctly before going to the site. SolarEdge is unable to provide the exact Power Optimizer location beyond the physical layout tab in the Monitoring portal.

To check the Power Optimizer:

1. Turn the inverter P/1/0 switch **0** (**OFF**) to stop production and wait at least five minutes for $V_{DC}$ to drop below 30V.
2. Turn the DCD switch **OFF** and remove the DCD cover.
3. In a well-ventilated space, check the voltage on the string with the problematic Power Optimizer using a voltmeter and record it.
4. Locate the Power Optimizer in the string and then remove the Power Optimizer's output connections to isolate it from the rest of the string.
   a. With the Power Optimizer connected to the PV module(s), place the voltmeter's test probes in the negative (-) and positive (+) output leads from the Power Optimizer, and record the DC voltage.
   b. Remove all the PV module connections to the Power Optimizer and place your voltmeter's test probes in the negative (-) and positive (+) output leads from the PV module and record the DC voltage.

**NOTE**

If multiple PV modules are connected to one optimizer, test the voltage of each PV module individually.

5. The Power Optimizer **output voltage acceptable range is 0.9$V_{DC}$ to 1.1$V_{DC}$.**
   According to the voltage output reading, do the following:

| Voltage Output Results | Procedure |
|---|---|
| Unacceptable range | Contact SolarEdge Technical Support with this form |
| Acceptable range | ▪ Verify there are no issues in the connections between the module and the Power Optimizer<br>▪ Verify there are no issues between the Power Optimizer and the rest of the string |
| Acceptable range without connection issues | ▪ Reconnect the Power Optimizer to the module or<br>▪ Swap it with a neighboring Power Optimizer in the same string |

6. After you reconnect all component within the string, replace the covers for the inverter and the DCD switch.
7. Turn **ON** the DCD switch, and initiate pairing.

If the Power Optimizer hasn't paired with the inverter and there are no issues with Power Optimizer voltage or connections, fill out and submit the Power Optimizer replacement form to SolarEdge Technical Support .

# String Troubleshooting

Occasionally, one or more strings in the system can malfunction. When a single string malfunctions among multiple installed strings, this is usually due to an issue within the malfunctioning string. String issues can be caused by poor connections within the string, or one or more Power Optimizers malfunctioning.

## All Strings Not Operating

When strings are not operating correctly, it may indicate an issue with the connection of the inverter to the end of the string. For any production issues, check the connection between the inverter and the strings.

To identify an issue with the inverter or the string, check the following:

| Issue | Description | Troubleshooting |
|---|---|---|
| System design | Designed according to specification | Refer to:<br>▰ SolarEdge Inverter and Power Optimizer datasheets<br>▰ SolarEdge Designer |
| Inverter error codes | Check that the inverter does not display error codes | Strings are unable to produce<br>Refer to: SolarEdge Support Center. |
| String voltage | ▰ Should be approximately 1V per Power Optimizer.<br>▰ For example,10 Power Optimizers should measure 10$V_{DC}$ | Turn OFF the inverter P/1/0 switch.<br>Measure the string voltage in the open air with a voltmeter |
| String voltage | If the voltage is lower than expected | Can indicate the following:<br>▰ Problem with the string<br>▰ Poor connection with the Power Optimizer<br>▰ Failed Power Optimizer |
| Single string | Not operating | Refer to:<br>Single String Not Operating |
| Multiple strings | Not operating | Connect one string at a time to see if the production issue is related to one string or all of them |
| DCD switch | Has fuses for each string | Perform a Continuity test on each fuse to test for functionality |
| Connection | Includes strings, junction boxes, combiner boxes, and any other connection points within the strings | ▰ Verify there are no connection issues<br>▰ Verify the polarity is correct for all the connections along the DC part of the system |

If no issuers are found within the connections in the strings, record all your troubleshooting steps, and contact SolarEdge Technical Support.

## Single String Not Operating – Other Strings Operate

A single string not operating out of multiple strings installed to the inverter usually indicates an issue within the string itself and not an issue with the inverter. When this occurs, check the string for any issues with the connection or the Power Optimizer(s).

**NOTE**

We recommend you check continuity on the DC fuses.

To identify an issue with single string, check the following:

| Issue | Description | Troubleshooting |
|---|---|---|
| System design | Designed according to specification | Refer to:<br>▰ SolarEdge Inverter and Power Optimizer datasheets<br>▰ SolarEdge Designer |
| String voltage | ▰ Should be approximately 1V per Power Optimizer<br>▰ For example, 10 Power Optimizers should measure $10V_{DC}$ | Measure the string voltage in the open air with a voltmeter |
| String voltage | If the voltage is lower than expected | Can indicate the following:<br>▰ Problem with the string<br>▰ Poor connection with the Power Optimizer<br>▰ Failed Power Optimizer |
| DCD switch | Has fuses for each string | Perform a Continuity test on each fuse to test for functionality |
| Connection | Includes the string, junction boxes, combiner boxes, and any other connection points within the string | ▰ Verify there are no connection issues<br>▰ Verify the polarity is correct for all the connections along the DC part of the system |

If no apparent issues are found with the connections in the string, document all your troubleshooting steps and contact SolarEdge Technical Support.

# Power Optimizer Replacement Request Form

If a Power Optimizer is malfunctioning, fill out and submit the following form to SolarEdge Technical Support. If you are requesting a replacement for three or more Power Optimizers on the same inverter, attach any line diagrams for the site. Filling out this form does not guarantee an RMA, and further on-site troubleshooting may be required.

| | |
|---|---|
| Date | |
| Company Name | |
| Technician Name | |
| Site Name<br>(If monitored) | |
| Inverter SN | |
| Number of strings | |
| Number of modules in each string | |
| $V_{DC}$ of string in open air | |
| Faulty Optimizer SN | |
| New Optimizer SN<br>(If replaced while on-site) | |
| Module make and model | |
| $V_{DC}$ Measured on Optimizer | |
| $V_{DC}$ Measured on Module | |

# Submit to Support

After you have entered all the requested details on the form, submit it using one of the following options:

| Option | Description |
|---|---|
| **SolarEdge Support Portal** | ▰ If you have registered, sign in and create a new case<br>▰ Attach the filled out form including any photos<br>▰ After you create the case, reference the case number provided when speaking with SolarEdge support |
| **Chat** | ▰ Located at the bottom of the Support Portal page, initiate a chat with a live agent to open a case<br>▰ The agent can assist you in getting a case created and reviewing the supplied documentation |
| **Phone** | ▰ When contacting support by phone, notify the agent that you have this form and details to send in<br>▰ The agent can assist you in submitting the attachments |

Depending on the issue, further information and troubleshooting may be required on-site. Be prepared to perform additional troubleshooting and provide information as required by SolarEdge support.