

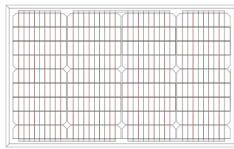
STAR PANEL SERIES

Off-grid Photovoltaic Module

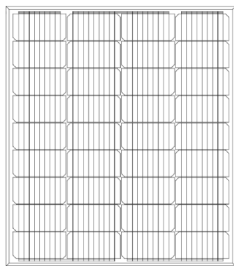
Quick Connect Guide

This Grape Solar[®] STAR-series PV panel is a sturdy 36-cell power-producer for off-grid systems. We hope that you enjoy collecting solar energy for your personal electrical needs.

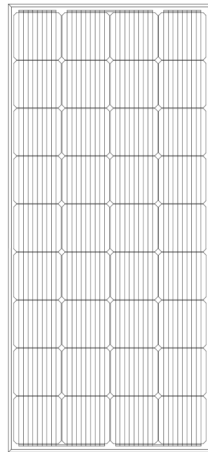
In this guide, we will help you with some basic suggestions for establishing your solar power system with the PV panel. Since every system is unique, the information may not be comprehensive, but it will introduce you to some basic knowledge about your panel and the connections of a solar power system. For more detailed information about your panel, including specification sheets:



GS-STAR-50W-MONO



GS-STAR-100W-MONO



GS-STAR-190W/200W

visit www.GrapeSolar.com/Products.html

For additional information about Grape Solar products:
email Support@GrapeSolar.com, or

MOUNTING:

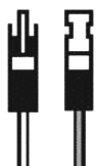
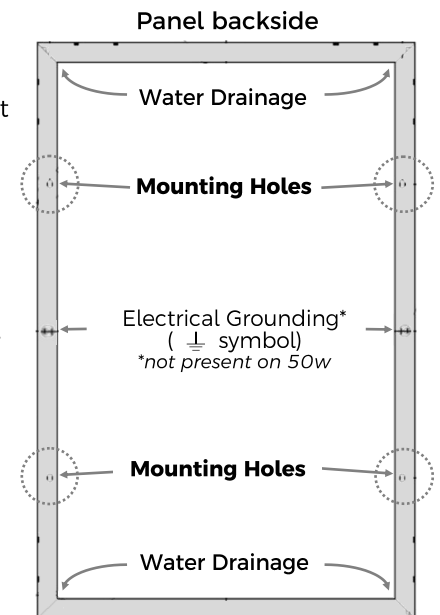
There is a wide variety of user applications with our solar panels. If adhered properly, panels can be mounted to rooftops, to campers, to vehicles, to poles, and to portable stands. The dual-layered aluminum frame contains mounting holes that can be used to bolt the panel to a mounting system. Please note-- panels perform best when cool; provide a 1.5-inch gap under the panel for air flow.

ORIENTATION:

Your panel will produce the most energy when facing directly toward the Sun. However, the sun is a moving target. In the Northern Hemisphere, orient your panel to face South at an angle that is the same as your latitude. This will give you the most consistent year-round power output. Because of Earth's tilt, average panel power production in the summer can be x2 to x4 as much as winter production.

GROUNDING:

Some panels have grounding terminals, but grounding is not required for systems with proper fuses/ breakers. Grounding does not affect performance. Do not use positive grounding with Grape Solar[®] systems.

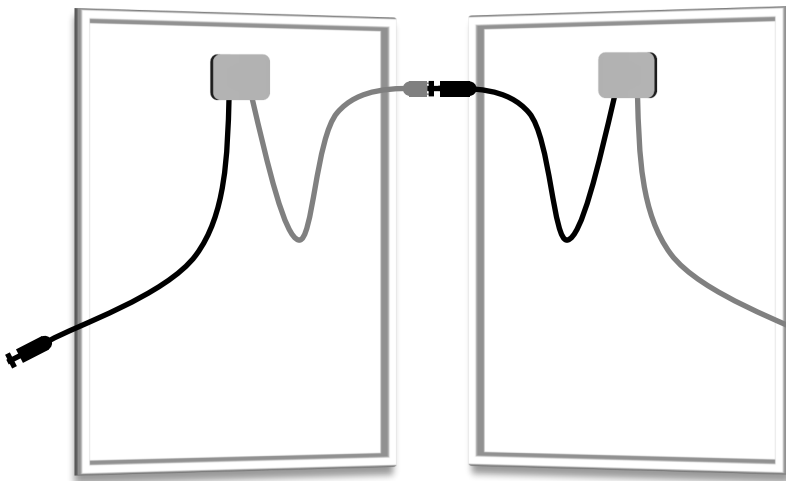


CABLE CONNECTONS:

This panel has MC4-comparable cable connectors. The male end represents the positive charge. The female end represents the negative charge. Whether you are using one or more panels in your solar power system, always ensure that there is compatible polarity, amperage, and voltage with the other system components before making any cable connections.

CONNECTING:

A combination of multiple panels is called an array. There are two types of panel connections: series and parallel. The connection type will alter the resulting voltage or amperage of the array. Some systems may require a combination of the two types to achieve the desired voltage and amperage. Do not connect panels of different specifications without consulting an electrician or experienced solar professional.



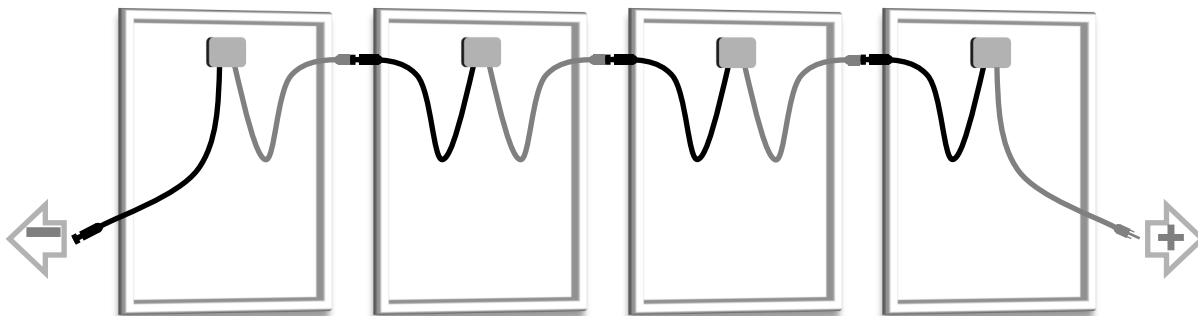
SERIES CONNECTIONS:

- Typically used with MPPT-type charge controllers
- Male cable end clips to female cable end
- Voltage increases
- Amperage stays consistent
- Advantages: easy connection, lower line loss
- Disadvantage: often higher charge controller cost

Series connections are also referred to as a “string” or a “daisy chain.” They are most common with MPPT-type charge controllers. The male-to-female connection will maintain a consistent amperage, but the voltage will increase according to the formula:

$$\text{Input Voltage} = (\text{Number of Panels in Series}) \times (V_{\text{mpp}} \text{ of one panel})$$

When connecting panels in series, be careful that the charge controller can handle the *Input Voltage*. Also, if you place your panels in series on a PWM charge controller, and your battery bank voltage is ½ or less of your *Input Voltage*— then you are losing over half of the power you could be storing. With MPPT charge controllers, however, extra voltage can be translated into power toward your battery.

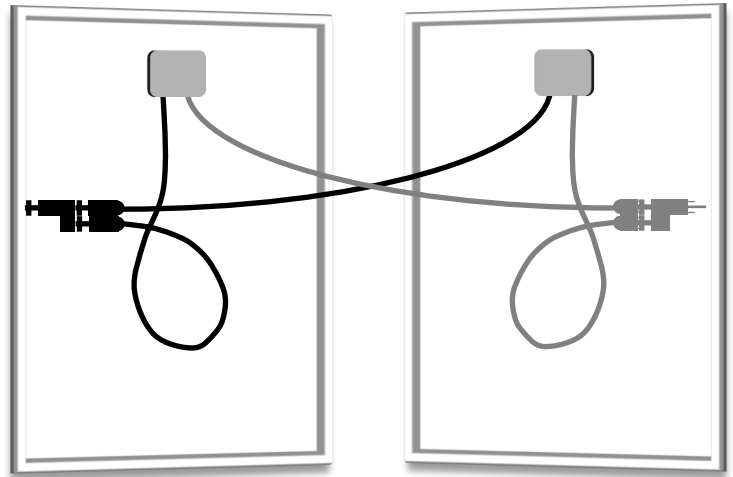


4 Panels in Series

$$V_{\text{input}} = 4 \times V_{\text{mpp}}$$

PARALLEL CONNECTIONS:

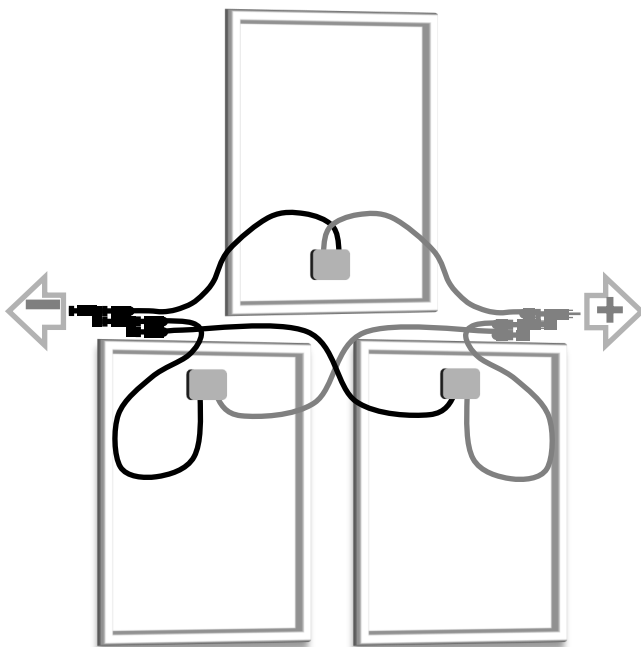
- Typically used with PWM-type charge controllers
- Male ends and female ends connect with branch connector
- Voltage stays consistent
- Amperage increases
- Advantage: lower charge controller cost
- Disadvantage: difficult connections, more line loss



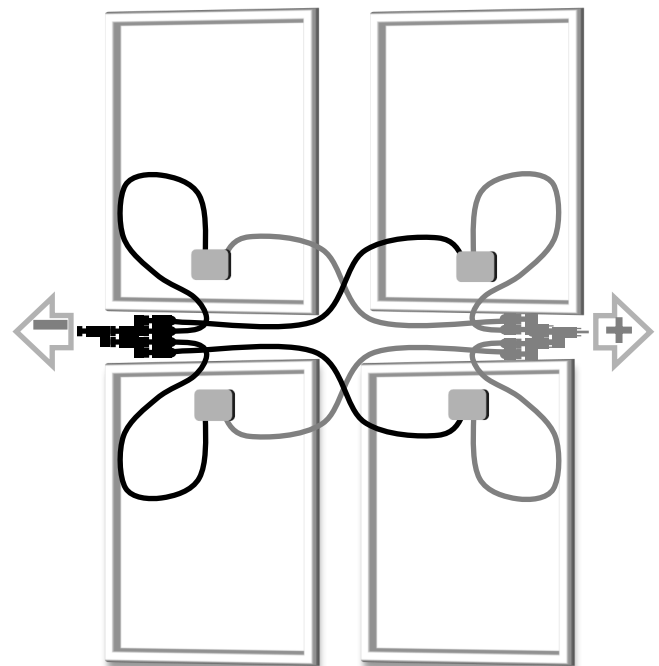
Parallel connections are most common with PWM-type charge controllers. A “branch connector set” or a combiner box is used to make weatherproof connections between the male-male and female-female leads. Voltage is consistent, but the amperage increases according to the formula:

$$\text{Input Amperage} = (\text{Number of Panels in Parallel}) \times (I_{\text{mpp}} \text{ of one panel})$$

This Input Amperage is different than a charge controller’s Output Amperage. The Input Amps coming from the panels is important when considering Voltage Drop—a phenomenon caused by high amperage and/or long wire distances. If you plan to design a system with several panels connected in parallel, or, if the distance to your charge controller is greater than 15 feet, calculate the system’s Voltage Drop. A voltage drop within 3% is acceptable. You may need to use thicker cables (lower gauge) for the long portions of your wire span.



3 Panels in Parallel
(2 x branch connector sets)



4 Panels in Parallel
(3 x branch connector sets)



GRAPE SOLAR[®] LIMITED WARRANTY FOR STAR SERIE PV MODULES

The following modules are covered under this warranty:

GS-STAR-*nnn*W series, whereas "*nnn*" is a number between 50 and 240;

Limited Product Warranty – Five (5) Year Repair, Replacement or Refund Remedy

Grape Solar Corporation with offices at 2635 W 7th Pl, Eugene, OR 97402 ("Grape Solar") warrants that for five (5) years from the date of delivery, its Photovoltaic modules ("PV modules") shall be free from defects in materials and workmanship under normal application, installation, use and service conditions. If the PV modules fail to conform to this warranty, then for a period ending five (5) years from date of delivery to the original end-customer ("the Customer"), Grape Solar will, at its option, either repair or replace the product, or refund the purchase price as paid by the Customer ("Purchase Price"). The repair, replacement or refund remedy shall be the sole and exclusive remedy provided under the Limited Product Warranty and shall not extend beyond the five (5) year period set forth herein. This Limited Product Warranty does not warrant a specific power output, which shall be exclusively covered under Limited Power Warranty.

Limited Power Warranty

If, within five (5) years from date of purchase to the Customer any PV module(s) exhibits a power output less than 90% of the Minimum Peak Power as specified at the date of purchase in Grape Solar's Product datasheet, provided that such loss in power is determined by Grape Solar (at its sole and absolute discretion) to be due to defects in material or workmanship Grape Solar will replace such loss in power by either providing to the Customer additional PV modules to make up such loss in power or by providing monetary compensation equivalent to the cost of additional PV modules required to make up such loss in power or by repairing or replacing the defective PV modules.

If, within twenty five (25) years from date of purchase to the Customer any PV module(s) exhibit a power output less than 80% of the Minimum Peak Power as specified at the date of purchase in Grape Solar's Product datasheet, provided that such loss in power is determined by Grape Solar (at its sole and absolute discretion) to be due to defects in material or workmanship Grape Solar will replace such loss in power by either providing to the Customer additional PV modules to make up such loss in power or by providing monetary compensation equivalent to the cost of additional PV modules required to make up such loss in power or by repairing or replacing the defective PV modules

Exclusions and Limitations

Warranty claims must be filed within the applicable Warranty period with proof of purchase.

The Limited Warranties do not apply to any of the following:

PV modules that have been subjected to: misuse, abuse, neglect or accident; alteration, improper installation, application or removal; repair or modifications by someone other than an approved service technician; power failure surges, lightning, flood, fire, accidental breakage or other events outside Grape Solar's control.

Cosmetic defects stemming from normal wear and tear of PV module materials.

PV modules installed in locations which may be subject to direct contact with salt water.

The Limited Warranty does not cover transportation cost for return of the PV modules; reshipment of any repaired or replaced PV Modules to the applicable location. It does not cover the cost associated with installation, removal or reinstallation of the PV modules.

Warranty claims will not apply if the type or serial number of the PV modules is altered, re-moved or made illegible.

Limitation of Warranty

THE LIMITED WARRANTY SET FORTH HEREIN IS EXPRESSLY IN LIEU OF AND EXCLUDES ALL OTHER EXPRESSED OR IMPLIED WARRANTIES INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF GRAPE SOLAR, UNLESS SUCH OTHER WARRANTIES, OBLIGATIONS OR LIABILITIES ARE EXPRESSLY AGREED TO IN WRITING BY GRAPE SOLAR. GRAPE SOLAR SHALL HAVE NO RESPONSIBILITY OR LIABILITY WHATSOEVER FOR DAMAGES OR INJURY TO PERSONS OR PROPERTY, OR FOR OTHER LOSS OR INJURY RESULTING FROM ANY CAUSE WHATSOEVER ARISING OUT OF OR RELATING TO THE PV MODULE(S) INCLUDING, WITHOUT LIMITATION, ANY DEFECTS AND/OR FAILURES IN THE PV MODULE(S) OR FROM USE OR INSTALLATION. GRAPE SOLAR'S AGGREGATE LIABILITY SHALL NOT EXCEED THE PURCHASE PRICE PAID TO GRAPE SOLAR BY THE CUSTOMER, FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH GAVE RISE TO THE WARRANTY CLAIM. SOME JURISDICTIONS DO NOT ALLOW LIMITATIONS ON WARRANTIES OR EXCLUSIONS OR LIMITATION OF DAMAGES. ACCORDINGLY, THE ABOVE EXCLUSIONS OR LIMITATIONS MAY NOT APPLY. THESE WARRANTIES GIVE A CUSTOMER SPECIFIC LEGAL RIGHTS, AND A CUSTOMER MAY HAVE OTHER RIGHTS THAT VARY FROM JURISDICTION TO JURISDICTION.

Obtaining Warranty Performance

If you feel you have a justified claim covered by this Limited Warranty, immediately notify the (a) Installer who sold the PV-modules, or (b) any authorized Grape Solar distributor of the claim in writing, or (c) send such notification to 2635 W 7th Pl, Eugene, OR 97402, directly. In addition, please enclose evidence of the date of purchase of the PV module. If applicable, your installer or distributor will give advice on handling the claim. If further assistance is required, please write to Grape Solar for instructions. The return of any PV-modules will not be accepted unless prior written authorization has been given by Grape Solar.