



**ECO-WORTHY**

# **Solar Panel Installation Guide**

For 100w, 120w, 130w, 150w, 170w, 195w Modules



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# Safety Caution

## ***-Disclaimer***

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## ***-General safety***

Installing solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified personnel.

The installer should assume the risk of all injury that might occur during installation, including, without limitation, the risk of electric shock. One individual module may generate DC voltages greater than 30 volts when exposed to direct sunlight. Contact with a DC voltage of 30V or more is potentially hazardous. When disconnecting wires connected to a photovoltaic module that is exposed to sunlight, an electric arc may result. Such arcs may cause burns, may start fires and may otherwise create problems. Therefore, be extremely careful!

Solar module is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon. It is designed for outdoor uses. Solar module may be mounted on the ground, roof, vehicles, boats, etc. Proper design of support structures is the responsibility of the system designer and installer.

·Do not attempt to disassemble the module, and do not remove any attached nameplates or components.

·When installing the Solar panel, abide with all local, regional and national statutory regulations. Obtain a building permit when necessary. Abide with any local and national regulations when mounting on vehicles or boats.

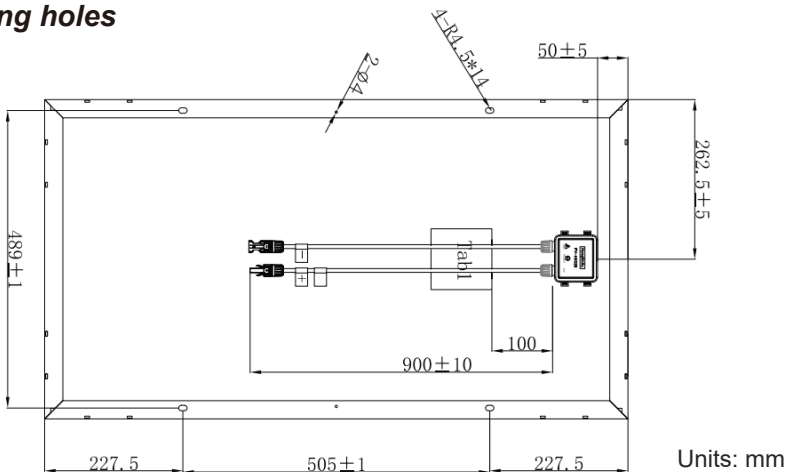
·Disconnect all power sources before carrying out the installation.

·Use properly insulated tools and remove metal items such as rings, bracelets, and watches.

·Make sure all wire connections are tight and secure, loose connections may cause sparks and intermittent behavior.

## Module Mounting

### -Mounting holes



ECO-WORTHY 100W Solar Panel Example

## ***-Brackets using***

When mounting a panel using Z-Brackets, a well-nut (also known as “expansion nut”) is often used on a pre-drilled hole. This procedure safely secures the panel on thin cabin roofs or RV roofs. Using a well-nut is recommended, as the rubber expansion prevents water leakage. (The Z-Bracket set does not include well nuts)

Step 1: Attach the Z-brackets to the panels

Attach the Z-Bracket to the solar panel by the pre-drilled mounting holes on the back of the solar panel. Solar Panels have two mounting holes on each side.



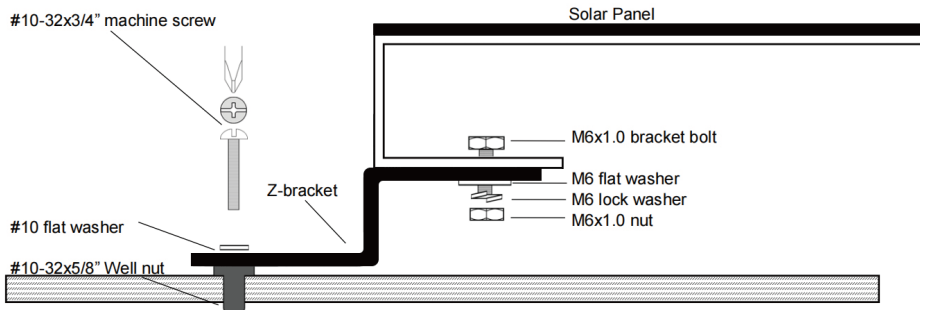
Step2: Mark and drill holes

With the Z-Brackets attached to the frame, the panel can be laid on a mounting surface, making it easier to mark the holes for the well-nut.

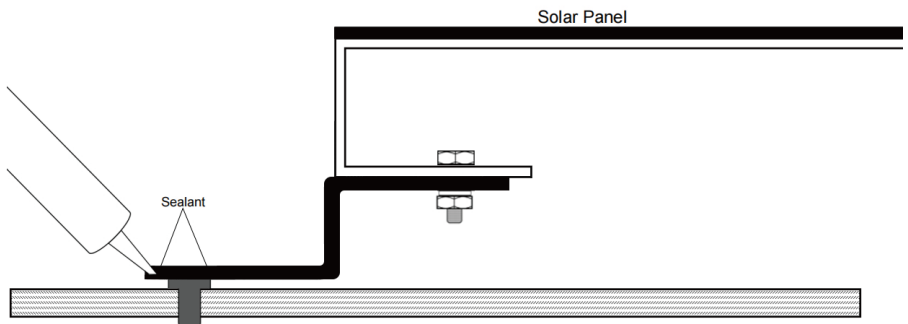


### Step 3: Install the panel on the roof

The picture below illustrates the correct way to use the well-nut. The rubber flange has to be flushed on the roofline. The Z-Bracket, along with the flat washer and lock washer, holds the well-nut in place when the screw is fastened.



Gently insert the well-nut into the drilled hole. Be careful not to push the well-nut flange completely into the holes. Make sure the flange is flushed on the roofline. Before attaching the panel to the roof, a film of caulk can be laid between the roof and the Z-Bracket. Even though the well-nut provides a watertight bond, this provides additional sealant.



# General Wiring

## ***-Panels connection***

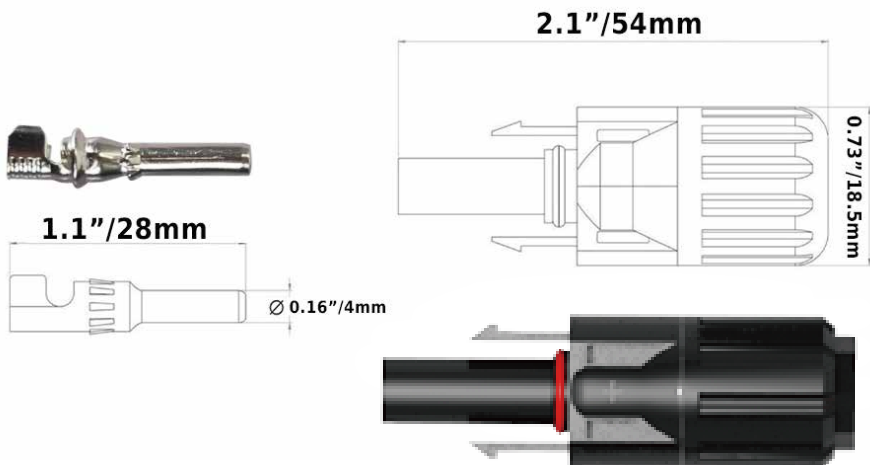
Each ECO-WORTHY Solar Panel has a pair of MC4 solar cable at the back of panel that consists of male and female connectors. This type of connector uses a “snap-in” type of safety locking clips to lock the two mating connectors, making it easy to install.

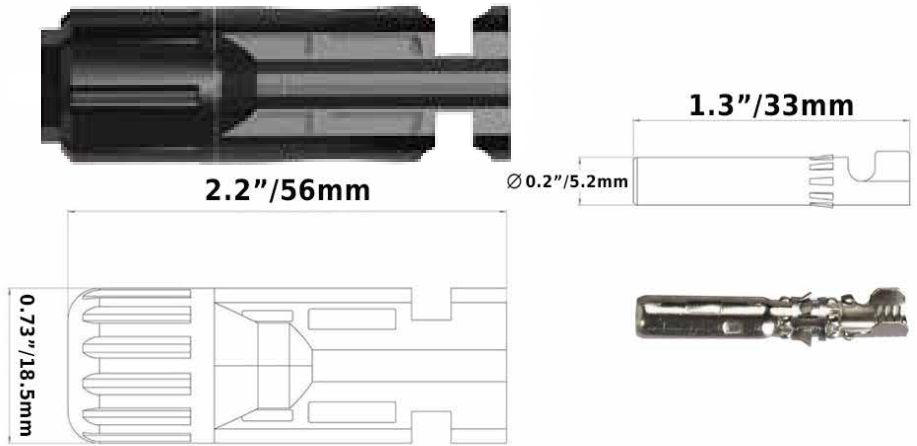
The "snap in" feature avoids unintentional disconnection. The mating connectors are sealed against the ingress of dust and water.

·Keep connectors dry and clean and make sure that the caps are tightly sealed before connecting modules.

·Faulty connections can result in electrical shock so make sure to fasten all connections securely.

·ECO-WORTHY modules can be installed in landscape or portrait orientation. Make sure that the proper distance between the panels and the surface to allow for air circulation.

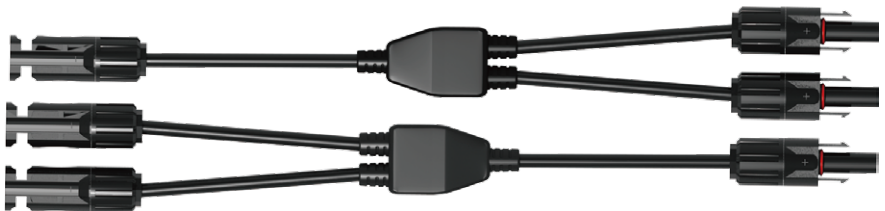




For series connections, just plug the male and female MC4 connectors together.



For parallel connections, a pair of MC4 Y-branch connectors is required for centralizing positive and all negative poles.





## ***-Wiring to solar charge controller***

For charging the batteries safely, a solar charge controller usually be placed in between the solar panels array and the battery bank.

When connecting the solar panel(s) to the controller, a pair of MC4-copper wire is required (Not included in the solar panel package). Plug the MC4 connectors with panel's cables, and the bare wire end to controller input ports.



## **Testing and Troubleshooting**

### ***-Testing***

Test all electrical and electronic components of your system before commissioning it. Follow the instructions in the guides supplied with the components and equipment.

·Test modules connected in series before they are connected to the system.

·To determine  $V_{oc}$  and  $I_{sc}$  in the following tests, the module(s) must be exposed to the sun and not connected to a load. Observe personal safety when making these measurements.

·Check the open-circuit voltage ( $V_{oc}$ ) of every series module using a digital multimeter. The measured system  $V_{oc}$  should correspond to the sum of the  $V_{ocs}$  of the individual module. You will find the rated voltage in the technical specifications of the specific module. If the measured value is significantly lower than the expected value, proceed as described under “Troubleshooting an low voltage”.

·Determine the short-circuit current ( $I_{sc}$ ) of every series circuit. It can be measured directly by connecting the digital multimeter to the two terminals of the series circuit or module. Attention, the rated scale of the ammeter or the rated current of load should be more than 1.25 times of the rated short-circuit current of the series module. You will find the rated current data in the technical specifications sheet. The measured value can vary significantly, depending on weather conditions, the time of day, and the shading of the module.

### ***Troubleshooting a low voltage***

To identify the commonly low voltage and excessively low voltage, the commonly low voltage mentioned here is the decrease of open-circuit voltage of the module, which is caused by the temperature rising of solar cells or lower irradiance. Excessively low voltage is typically caused by improper connections of the terminals or defective bypass diodes.

·First, check all wiring connections to see if it is not open-circuit or is not connected well.

·Check the open-circuit voltage of each module

·Disconnect the wiring at both terminals of the modules.

·If the measured voltage is only half of the rate, this indicates a defective bypass diode. By replacing or remove the diode, the issue may be sorted. Removing the bypass diodes should only be done by a competent PV technician and the module has to be disconnected from the system.

In the case of fine irradiance, if the voltage across the terminals differs from the rated value by more than 15%, this indicates a bad electrical connection.

## Maintenance

The following maintenance is recommended to ensure optimum performance and longevity of the solar panel:

- Clean the glass surface of the solar panel when necessary. Always use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used to remove dirt.
- Check the electrical and mechanical connections every six months to verify that they are clean, secure and undamaged.
- Inspect the solar panels and make sure the surfaces are free from dust, dirt, and other debris; clean with a wet cloth or glass cleaner if necessary.
- Check to make sure all structural components, mechanical fasteners, and electrical connections are secure, clean, and corrosion-free.
- Check and replace damaged components if necessary

## Support

This product is covered by a 1 year warranty provided by ECO-WORTHY Ltd. We will refund or partial refund or replace any products with defects due to our imprudence.

If you are experiencing technical problems and cannot find a solution in this manual, please contact ECO-WORTHY for further assistance.

Contact number:

US 1-866-939-8222

UK +44 20 7570 0328

Email: [customer.service@eco-worthy.com](mailto:customer.service@eco-worthy.com)