



ECO-WORTHY

The background shows a large array of dark blue solar panels installed on a red-tiled roof. In the distance, there are green trees and rolling hills under a cloudy sky. A thick green diagonal stripe runs across the top and right side of the image.

1200W COMPLETE OFF GRID SOLAR PANEL KIT

SUPPORT

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

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1. General safety

1.1 CAUTION:

Please read the instruction manual carefully before attempting to carry out any installation or wiring. Contact Technical support for any questions concerning the installation.

CAUTION:

When solar panels are placed in sunlight or other light sources, they produce electrical energy and a voltage will appear on the output terminals. To avoid a shock hazard, keep the panel covered with a dark material during installation and avoid contact with the output terminals. Before handling the solar panel, test the voltage output of the solar panel with a voltmeter to confirm it is not outputting voltage.

1.2 Wiring & Installation

- Disconnect all power sources before carrying out the installation.
- Make sure the correct polarity is observed when making connections between the solar panel, charge controller, and battery. Damage due to reverse polarity connection is not covered by warranty.
- Wear appropriate clothing and safety gear including protective eyewear when performing any electrical installation.
- Wiring size and installation must comply with the National Electrical Code (NEC).
- Make sure all wire connections are tight and secure, loose connections may cause sparks and intermittent behavior.
- Do not perform installation in the presence of any flammable materials.
- Make sure you work in a well-ventilated area
- Use properly insulated tools and remove metal items such as rings, bracelets, and watches.

2.Product Introduction

2.1 Overview

ECO-WORTHY 1200W Off-Grid Kit, An electricity supply project, which is clean, quiet and compatible with RV, Trailer, Shed and House roof.

The complete kit contains multiple solar panels, hybrid inverter, lithium batteries and all necessary wires. The installation components also includes resistant aluminum Z shape brackets and bolts and nuts designed for plane installation.

2.2 Package Included

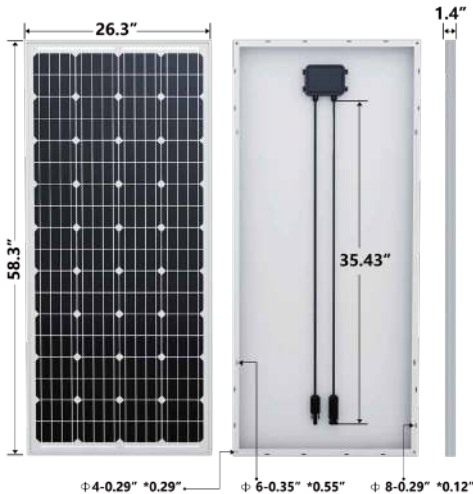
- 6 PCs 195W Monocrystalline Solar Panel
- 1 PC of 3000W 24V 80A MPPT Hybrid Charger Inverter
- 1 PC 25.6V 100Ah Lithium Battery
- 1 pair of 16ft 11AWG Solar Extension Cable
- 1 pair of 1ft 10AWG Lithium Battery Cable
- 1pc 16ft 8AWG Solar-Controller Cable
- 1 pair of 4.92ft 11AWG Battery-Controller Cable
- 2 pairs of Y-connector
- 6 sets of Z-bracket



3.Component Description

Solar Panel

The solar panel is a set of solar photovoltaic modules that generate electricity based on sunlight. This system contains 4 pieces of 195W panels with monocrystalline solar cells.



Electrical Data	
Maximum Power at STC* ^①	195W
Optimum Operating Voltage (Vmp)	19V
Optimum Operating Current (Imp)	10.27A
Open Circuit Voltage (Voc)	22.8V
Short Circuit Voltage (Isc)	12.28A
Module Efficiency	19.41%
Maximum System Voltage	1000v
Maximum Series Fuse Rating	8-10A

Junction Box	
IP Rating	IP68
Diode Type	blocking bypass diodes
Output Cables	12AWG (2.9 ft long)
Solar Cable Connectors	
Rated Current	30A
Maximum Voltage	1000V
Maximum AWG Size Range	10AWG ~ 14AWG
Temperature Range	-40 C ~ +85 C
IP Rating	IP67

All-in-One Inverter

The hybrid unit combines a 80A MPPT solar charger controller and a 3000W 24VDC - 120VAC pure-sine-wave inverter. With bypass function, it can be connected to utility power for battery charge, it can also be used as a UPS unit with batteries.



3000W 24V DC-120V AC hybrid inverter	
Rated output power(W):	3000W
Rated output voltage(Vac):	120V AC
Frequency:	60HZ
Efficiency:	>95%
Rated battery input voltage:	24V
PV operating voltage range:	30-100Vdc
Maximum PV input power :	1400W

Batteries

The complete system includes 1PC 25.6V 100Ah rechargeable lithium battery. The voltage of the battery meets the 24V input voltage required by the inverter. The total capacity of the battery is about 2560Wh.



25.6V 100Ah LiFePO4 Battery	
Battery Capacity	100ah
Battery Power	2560W ·h
Battery Voltage	25.6V
Maximum Charge/ Discharge Current	80A/100A
Charge Temperature Range	32°F~131°F / 0°C~55°C
Discharge Temperature Range	4°F~131°F / -20°C~55°C
Screw size	M8

16.4ft Solar-Controller Cable

8 AWG cable for combiner box - hybrid inverter connection

16.4ft Extension Cable

11 AWG MC4-copper cable with double MC4 connectors for solar array - combiner box connection



16.4ft Extension Cable



16.4ft Solar-Controller Cable

1.14ft Ring Cable

5AWG cable for battery connection



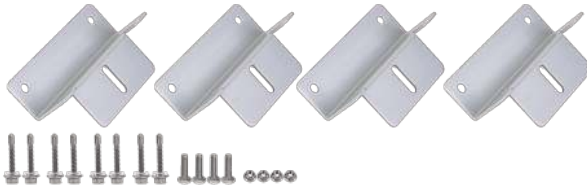
4.92ft Battery-Controller Cable

11AWG cable is used for battery-hybrid inverter charger connection



Z Mounting Brackets

Mounting brackets for fixing panel to a flat surface. There are 4 brackets for each solar panel



4. Inverter Charger Installation

4.1 Mounting location

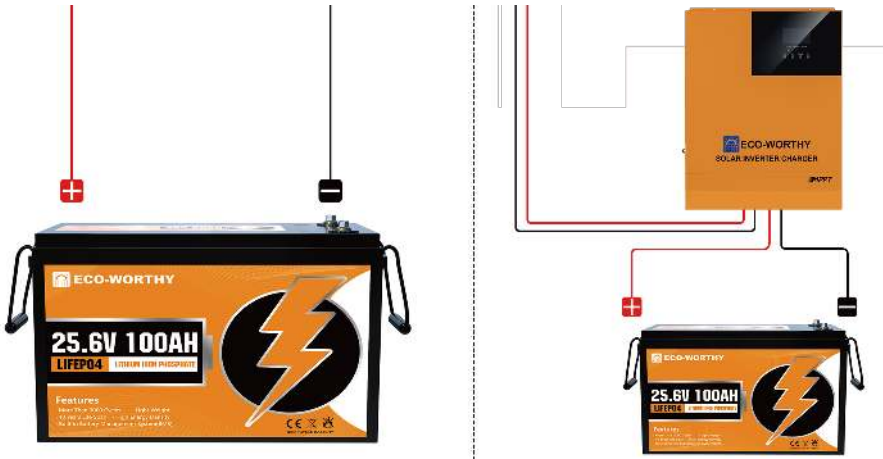
Insure all terminating connections are clean and tight to prevent arcing and overheating. The unit must be installed in an area that satisfies all of the following conditions:

1. Dry: Avoid any location where water can contact the inverter charger
2. Cool: Ambient air temperature between 30°F and 105°F (0°C and 40°C)



4.2 Connect Inverter to battery

Connect the 25.6v 100AH battery to the hybrid inverter



Caution: The battery must firstly be connected to the inverter charger before proceeding to any other connections.

First, connect the negative cable to the negative (-) battery post. The best way to secure the battery cable to the battery post is by using a ring terminal. A bolt is sufficient to secure the ring terminal onto the battery post; allowing for better electrical contact. Next, connect the bare stranded portion of the cable to the negative (-) battery input terminal on the inverter charger.



5.Solar Panel Installation

5.1 Location

Determine a location for the solar panel that is in direct sunlight and clear of any shading by adjacent obstacles such as trees, roof overhangs, etc. Ideally, the panels will be positioned to minimize the wiring distance between the solar panel and the inverter charger.

For Northern Hemisphere installations, the solar panels should be mounted at angle facing true south (true north for Southern Hemisphere installations).

The mounting angle should be equal to the latitude location of where you are installing the solar panels.

For example, the latitude of Miami, Florida, USA is 25 degrees. Therefore, solar panels installed in this area should ideally be facing true south at a tilt angle of 25 degrees.

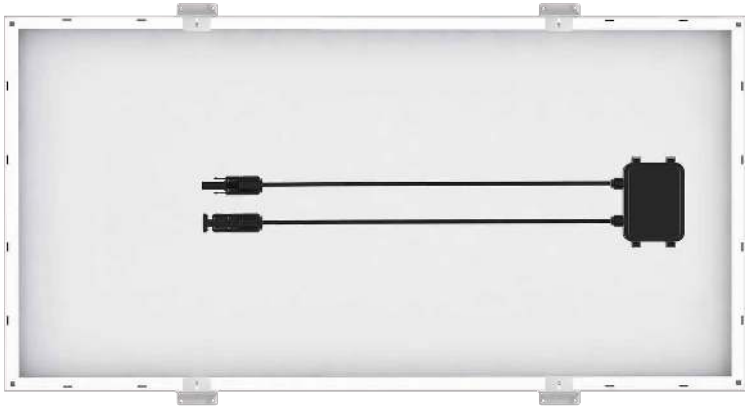
It's hard to get a perfect installation angle due to limit of installation space.



5.1.1 Use Z-Brackets on an rv roof: “Flat Mount”

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)

Step1: Attaching the Z-Bracket to a solar panel Locate the mounting holes on the solar panel. Solar Panels have four mounting holes on each side.



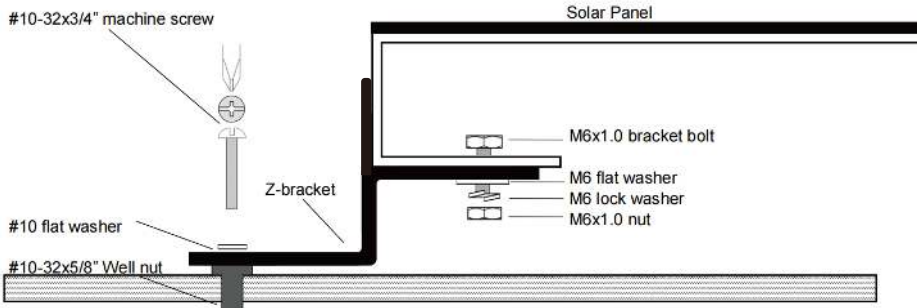
Step2 : Mark and drill holes

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.

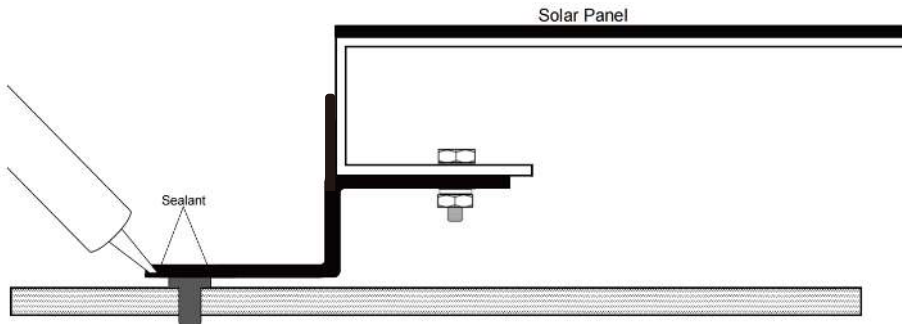


Step 3: Attaching the panel to the roof

Figure 4.6 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, hold the well-nut in place when the screw is fastened.



Gently insert the well nut into the drill 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 RV roof and the Z-Bracket. Even though the well-nut provides a watertight bond, this provides additional sealant.



5.1.2 Well-nuts and blind holes

The well-nut does not only work for thin RV roofs, but also works in blind holes. Tightening a well-nut in a blind hole will cause the body to expand and apply pressure against the walls of the hole. This also creates a secure hold of the solar module.

Using the Z-Brackets on a house roof

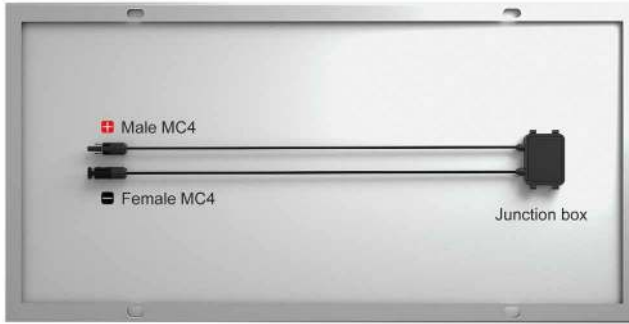
The Z-Brackets can also be used on a house roof if the proper roof penetration sealant is used between the roof and the Z-Bracket. A roof penetration sealant is necessary, as water might leak into the house if the holes are not properly sealed.



5.2 solar panel connection

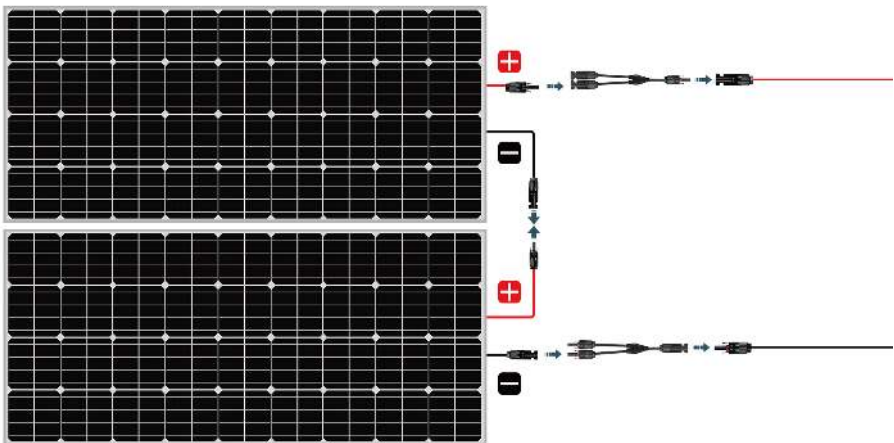
Do NOT connect the solar panels to the solar inverter charger until the solar inverter charger has been completely connected to the 24 volt batteries

Each ECO-WORTHY Solar Panel will have an MC4 Connector System that consists of male and female connectors. This type of connector system is easy to install and uses a “snap-in” type of safety locking clips to lock the two mating connectors.



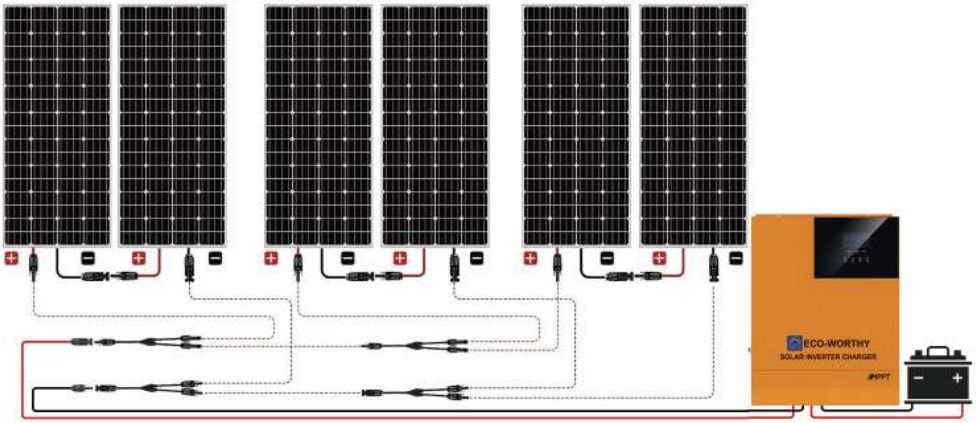
5.2.1 Connect every 2 solar panels in series

To build a 24v DC solar panel kit with 6 pcs panels, wire them in 3 groups of 2 pcs in series first, and then connect the 3 groups in parallel with Y branch connectors.



5.2.2 Connect solar panels to controller

Wire the panels' positive and negative posts comes from the Y branches separately to the P&N posts of the inverter charger with 1 pair of MC4- copper cable.



-Inverter to appliances

Before booting the inverter, the AC OUT ports should be wired with the home socket or appliances first.

Same as the AC IN wiring, you need to prepare one pair of appropriate cable for the ports connection, and just wire the ports with the socket.

-Turn on the inverter

When all wirings are done, the final step is to boot the hybrid inverter by pressing the switch on its bottom.

(Note: the inverter only works when 24V battery bank connected)

There are various icons on the screen, check if the PV, mains, battery, load icons appear. If one icon does not light up, it means this connection to the inverter is not available, so you can have a check on specific item. It's able to change the settings when the display lights on. For more settings detail, you could watch the guide video on Youtube:

<https://youtu.be/juzuTVcrnx8>

<https://youtu.be/4MdEIXspTU>

6. 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.

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.

7.QA

Q1. Why doesn't my photovoltaic panel display charging after it is connected?

A1. Check whether the photovoltaic panel wiring is correct, whether there is reverse connection, whether the photovoltaic panel voltage is higher than the battery voltage, whether the photovoltaic panel has obstructions that cause the voltage to drop, under normal circumstances, please use a photovoltaic panel with a rated voltage of 18V for a 12V battery.

Q2. Why is my charging current low?

A2. The greater the power of the photovoltaic panel, the stronger the sun, and the greater the charging current. On the contrary, incorrect photovoltaic panel voltage, foreign object blocking, shadow blocking, etc. will cause the current to decrease. In addition, when the battery voltage is high, it will enter the floating charge. State, the charging current will also become smaller and smaller at this time.

Q3. Why doesn't my load light up?

A3. The reasons for the load not turning on may include incorrect setting of the load working mode, such as setting the light control but asking why the load is not turned on during the day, the controller cuts off the load due to insufficient battery power, or the load wire is not connected and disconnected , The load burns out, etc.

Q4. What should I do if my electricity time is not long enough?

A4. If the daily power generation of the photovoltaic panel is less than the power consumption of the load, it will cause a situation of making ends meet. It is recommended to increase the photovoltaic panel to cope with the extreme rainy weather. In addition, the battery capacity can be increased, or the load wattage can be reduced or Work time to balance the entire system.

8.Maintenance

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

- 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 maintain the battery electrolyte levels at regular intervals as per the battery manufacturer's recommendations if flooded wet cell lead acid batteries are used.

- Check and replace damaged components if necessary

9.Support

For the use of this manual and the conditions or methods of installation, operation, use, and maintenance of photovoltaic (PV) product are beyond ECO-WORTHY's control, ECO-WORTHY does not accept responsibility and expressly disclaims liability for any loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance.

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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.

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