



User Manual

Solar Panel Kits

Add: 4120 Valley Blvd, #D, Pomona, CA 91789, USA
Tel: +1-909-321 4455 Email: Team@PowerECO.com Web: www.powereco.com



Safety Instructions



Please save these instructions

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

⚠ WARNING: Indicates a potentially dangerous condition. Use extreme caution when performing this task.

CAUTION: Indicates a critical procedure for safe and proper operation.

NOTE: Indicates a procedure or function that is important to the safe and proper operation.

Installation and wiring compliance

Installation and wiring must comply with the local and National Electrical Codes and must be done by a certified electrician. Please follow these four steps:

1. Read all of the instructions and cautions in the manual before beginning the installation.
2. It is HIGHLY recommended to install a charge controller in order to charge your batteries. It is dangerous for unregulated panels to be connected to battery banks.
3. Make sure all wire connections are secured; loose connections may cause sparks.
4. Wear appropriate clothing and safety gear including protective eyewear when performing any electrical installation.

Preventing fire and explosion hazards

Working with electronic/electrical equipment may produce arcs or sparks. Thus, such equipment should not be used in areas where there are flammable materials or gases requiring ignition protected equipment. These areas may include spaces containing gasoline-powered machinery, fuel tanks, and battery compartments.

Precautions when working with batteries

- Batteries contain very corrosive diluted sulfuric acid as electrolyte. Precautions should be taken to prevent contact with skin, eyes, or clothing.
- Batteries generate hydrogen and oxygen during charging, resulting in the evolution of an explosive gas mixture.

- Care should be taken to ventilate the battery area and follow the battery manufacturer's recommendations. Never smoke or allow a spark or flame near the batteries.
- Use caution to reduce the risk of dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
- Remove metal items such as rings, bracelets, and watches when working with batteries. The batteries can produce a short circuit current high enough to weld a ring or similar object to the metal, causing a severe burn.
- If you need to remove a battery, always remove the ground terminal from the battery first. Make sure that all the accessories are off so that you do not cause a spark.
- Only use properly insulated tools when making battery connections.

Precautions when working with solar panels

With the incidence of sunlight or other light sources on all solar panels, a voltage appears at the output terminals of the solar panel turning it into a source of electricity. To avoid a shock hazard, make sure the solar panel is covered with an opaque (dark) material such as paper or cloth during the installation. Do not make contact with the terminals when the panel is exposed to sunlight or any other light source.

Routine maintenance

- 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.

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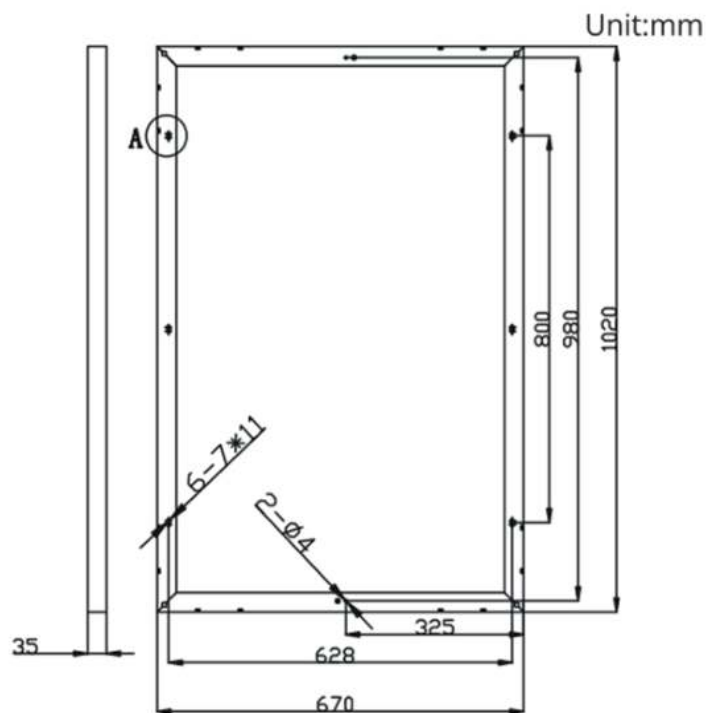
General Information

A new POWERECO Off-Grid Solar Kit will provide you with a clean, silent, and sustainable way of ensuring that batteries are fully charged and capable of providing a continuous supply of electricity. Each kit comes equipped with a high quality solar panel that features highly efficient silicon solar cells. If you have purchased an POWERECO Off-Grid Solar Kit, a MPPT Solar Charge Controller is also included in the package. This controller will serve as a connector between the solar panel and the batteries. The solar charge controller will ensure that the battery is charged with the appropriate amount of solar power as per the battery manufacturer's recommendations. The solar charge controller 'charging states' are optimized to meet the requirements of most standard lead acid batteries as well as flooded batteries. The POWERECO Off-Grid Solar Kit also includes a mounting system comprised of sturdy aluminum Z-Brackets as well as the nuts and bolts required to flat mount a solar panel onto a roof or any other flat surface.

This manual will provide you with instructions on how to assemble the various components of an POWERECO Off-Grid Solar Kit. Please refer to the separate POWERECO Solar Charge Controller Manual for detailed information about the installation, operation, and programming of the solar charge controller.

100W Solar Panel Specification

- Peak Power (Pmax):100W
- Peak Circuit Voltage(Voc):22V
- Max Power Voltage(Vmp):17.48V
- Short Circuit Current(Isc): 6.14A
- Max Power Current(Imp):5.71A
- Wind resistance:2400pa
- Weight:20.94 lb
- Dimension: 40.2*26.4*1.4Inch
(1020*670*35mm)
- Application Class:Class A



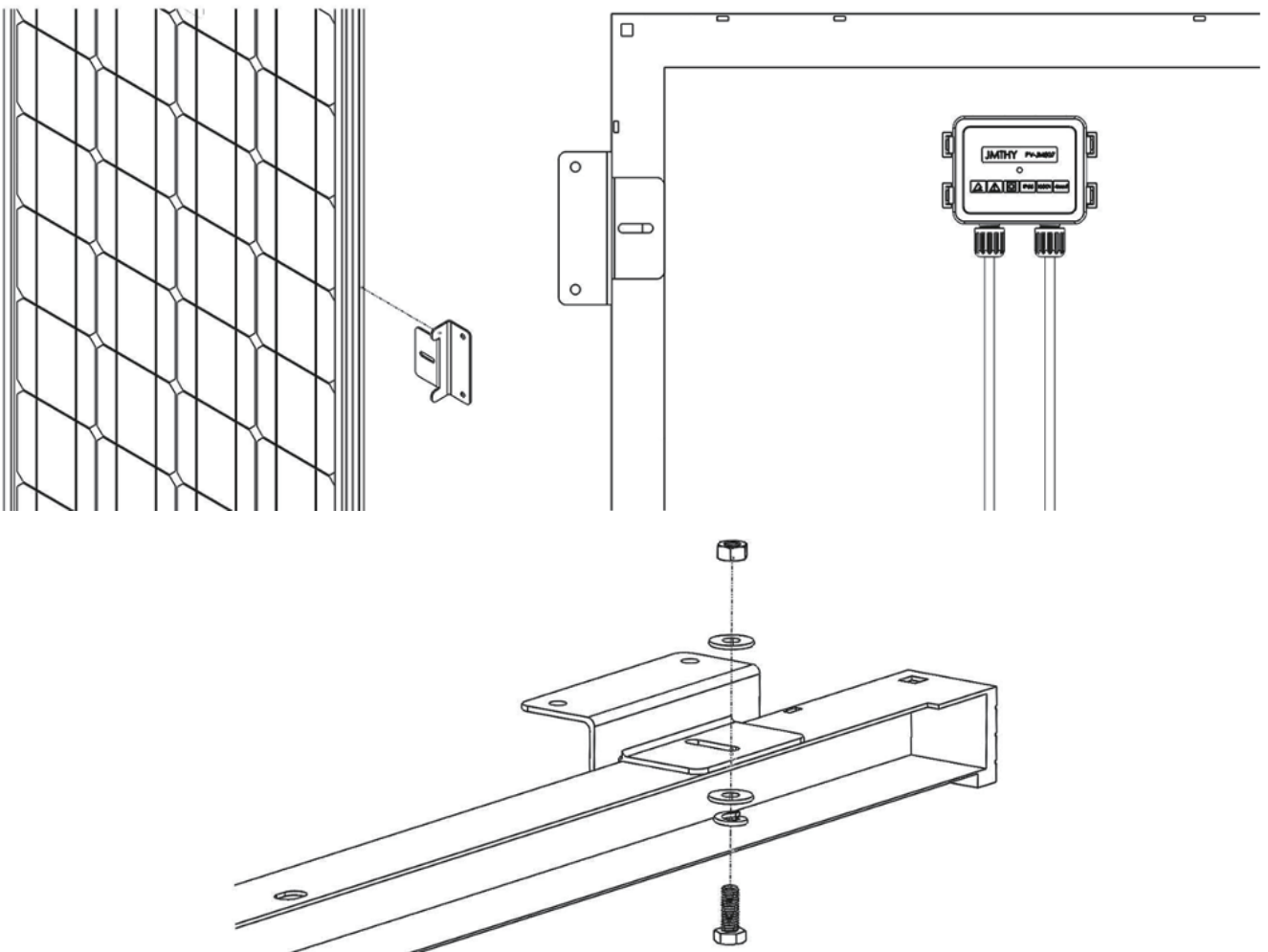
Z-Bracket Mounting

The POWERECO Z-Bracket Mount System is designed to support the installation of single panel units, generally in off-grid installations. These units are ideal for installation on RV roofs and uninhabited dwellings such as sheds or garages. It is also suited as attachment to a user made structure such as a wooden frame. The system comes complete with all fasteners to secure the system to the installation surface. This system makes the installation of small solar systems easy, affordable and quick.

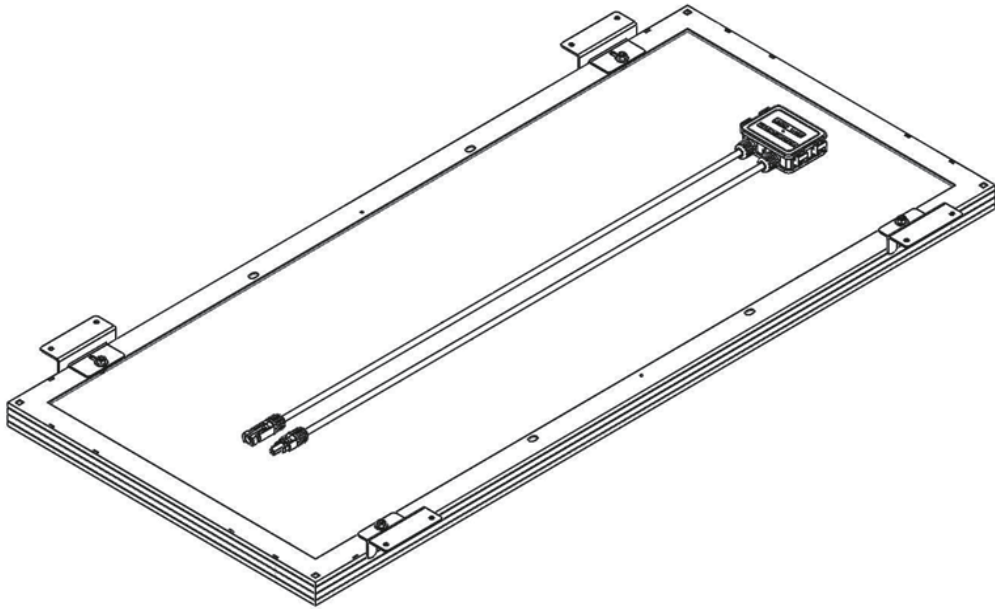


POWERECO Z-Bracket Mounting

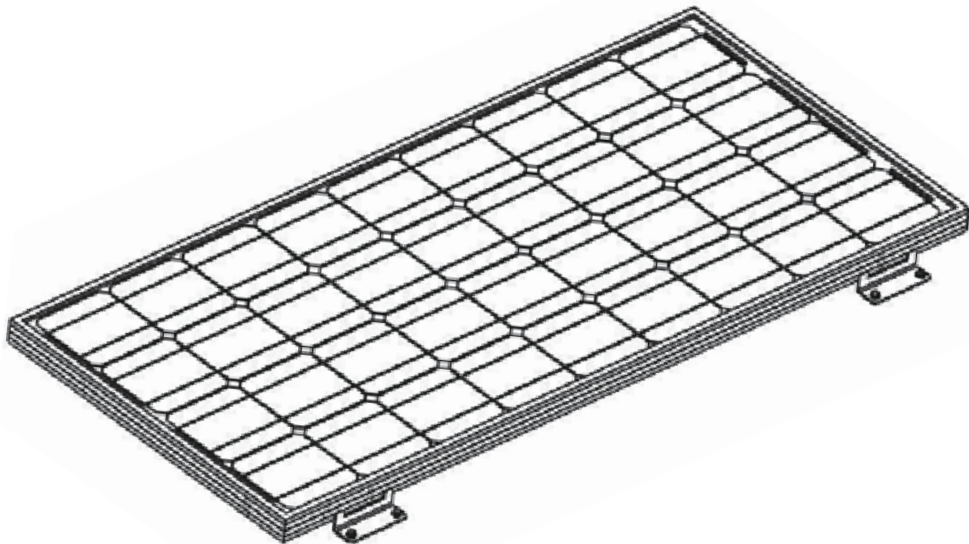
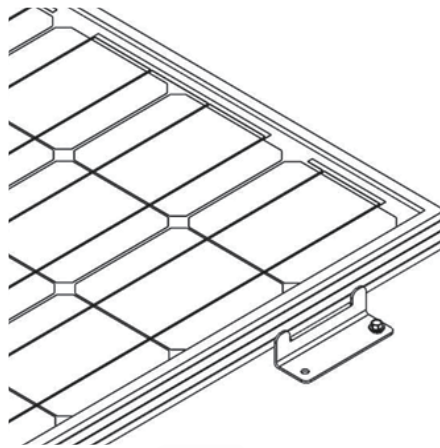
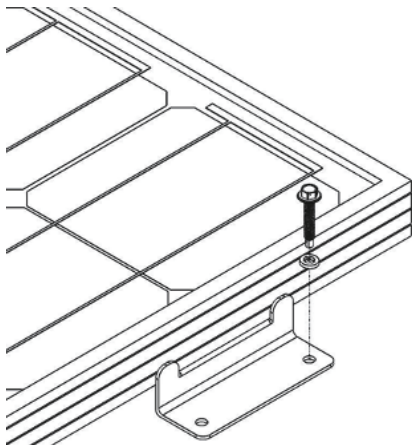
Making Brackets to Panel Frame



Repeat for each Z-Bracket in the set at each corner.

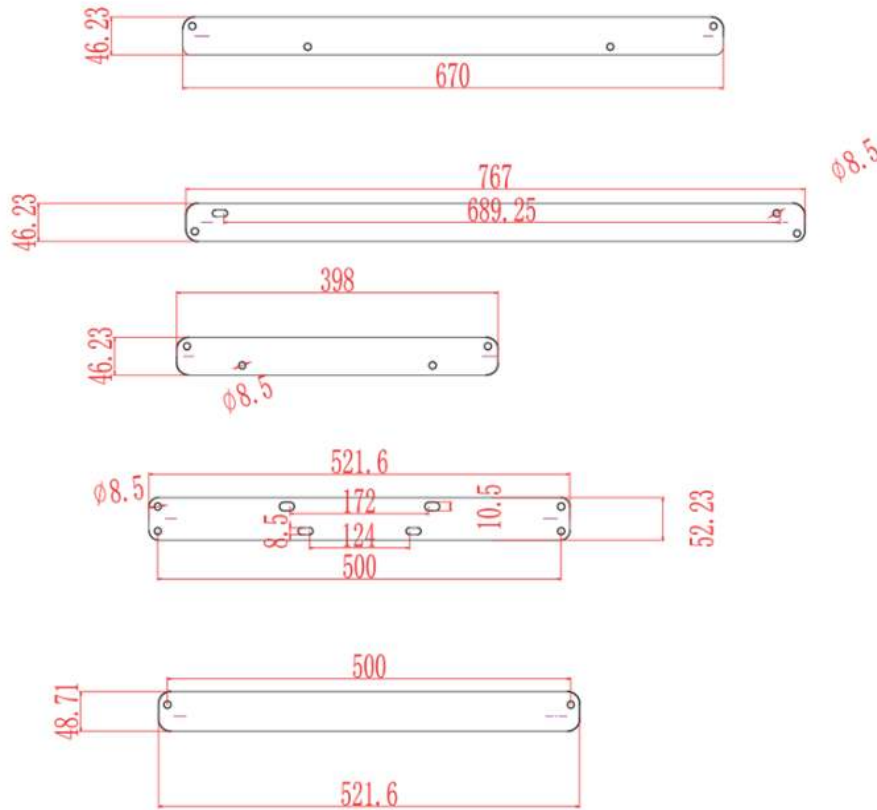


Making Brackets to Panel Frame



Adjustable Angle Triangle Bracket

If you need to install in other places, such as pole, walls, trees, etc., it is recommended that you choose the triangle bracket with adjustable Angle, and the Angle adjustment range is 30°35°40°45°. This bracket is sold separately, not as a supporting product.



Mounting Brackets

Assemble left and right triangle supports
 Extend the triangle bracket and tighten the fixing bolts.



Install back support angle

All angle steel fixing frames are fixed with M8 * 50 bolts.

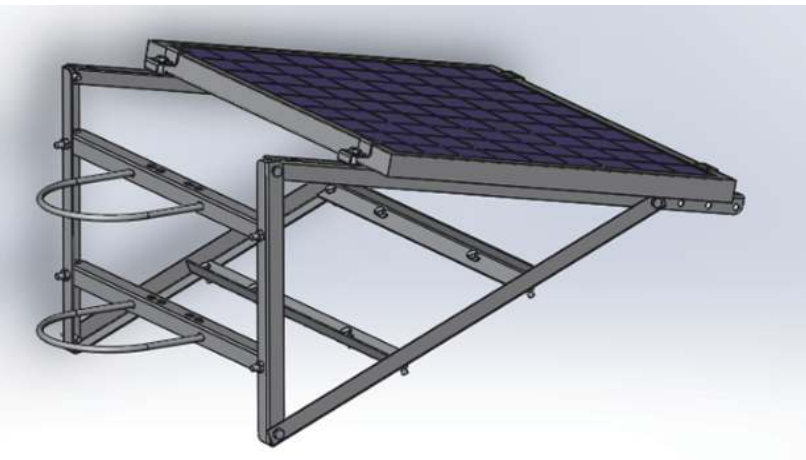


Install solar panel fixing blocks and install photovoltaic panels.

Place the photovoltaic panel on the support, and then fasten the pressing block to fix the photovoltaic panel.



U-bolt mounting



Overall rendering



Battery to Charge Controller

The battery(s) must first be connected to the charge controller before proceeding to any other connections. Most MPPT Controllers have automatic battery voltage detection, and the controller must detect what voltage level it will be charging at.

Use a screwdriver to rotate and unscrew the "o" port of the MPPT controller, so that the positive red line of the battery line is connected to the positive pole of the MPPT charging controller, and the negative black line of the battery line is connected to the negative pole of the MPPT charging controller. Put the metal wafer lasso of the red line of the positive electrode of the battery on the positive electrode of the battery, and the metal wafer lasso of the black line of the negative electrode of the battery on the negative electrode of the battery. At this point, the connection between the battery and the MPPT charging controller is completed, and the screen of the MPPT charging controller will display the battery voltage information.



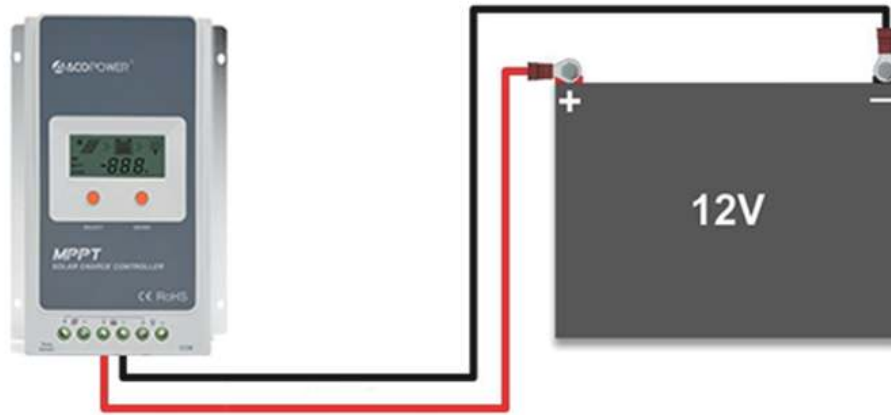


Figure 1 Charge controller connected to a 12V battery

Before starting the connection, keep in mind the following:

- The charge controller should be as close as possible to the batteries. This helps keep line loss to a minimum level.
- Remember to always use the recommended gauge size based on the PV system and charge controller.



The battery must first be wired to the charge controller before the solar panel is connected to the charge controller.

Extending the output wires of the solar panel



Fig.2. MC4 Adapter Kit

The adapter kits have different lengths, and the basic size is No. 12 AWG. It is suitable for parallel connection of 100W / 200W / 300W / 400W / 500W solar panels.



The typical connection for 12V panels using a MPPT Controller is a parallel connection. This connection increases the current, but keeps the voltage level the same. When placing multiple panels in parallel, it is necessary to size the wire.

Please refer to Figure 3. This figure shows the extending of the output wires of the POWERECO-100W Solar Panel using the adapter kit. The polarity labeled on the panel's leads should be the only ones to follow. When adapting the leads, mark the positive (+) cable; doing so will avoid reverse polarity when connecting the panel(s) to the controller.

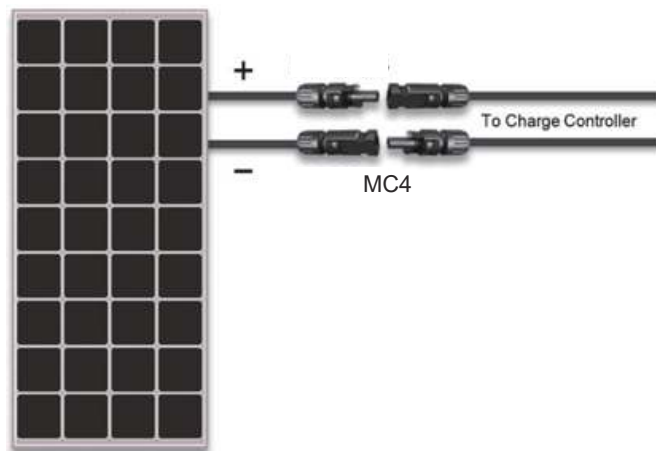


Figure 3 Solar panel and adapter kit

Solar Panel to Charge Controller

Use a screwdriver to connect the bare end of the red positive pole line of the MC4 extension cord to PV+ "o" of the MPPT charging controller, and the bare end of the black negative pole line of the MC4 extension cord to pv-" o "of the MPPT charging controller.



Once the battery is connected to the charge controller and the panel(s) are positioned and mounted in the desired location, we are ready to connect the panel(s) to the charge controller.

Panels should be mounted in a place that is free from shading by neighboring obstacles such as vents, air-conditioners, TV antennas, etc.

Please refer to **Figure 4** when completing the following connections:

1. First, mate the “Male” MC4 Connector from the solar panel that has the negative (-) label with the “Female” MC4 Connector of your adapter kit as shown in Figure 4. Then connect the bare stranded portion of the cable to the negative (-) solar input terminal on the charge controller.
2. Next, mate the “Female” MC4 connector from the panel that has the positive (+) label with the “Male” MC4 connector of your adapter kit as show in Figure 4.
3. Connect the bare stranded portion of the adapter cable to the positive (+) solar input terminal on the charge controller. Remove the protective cloth. If there is enough sunlight present, the controller’s solar indicator/icon on the LCD display should show that it is now charging your battery(s).

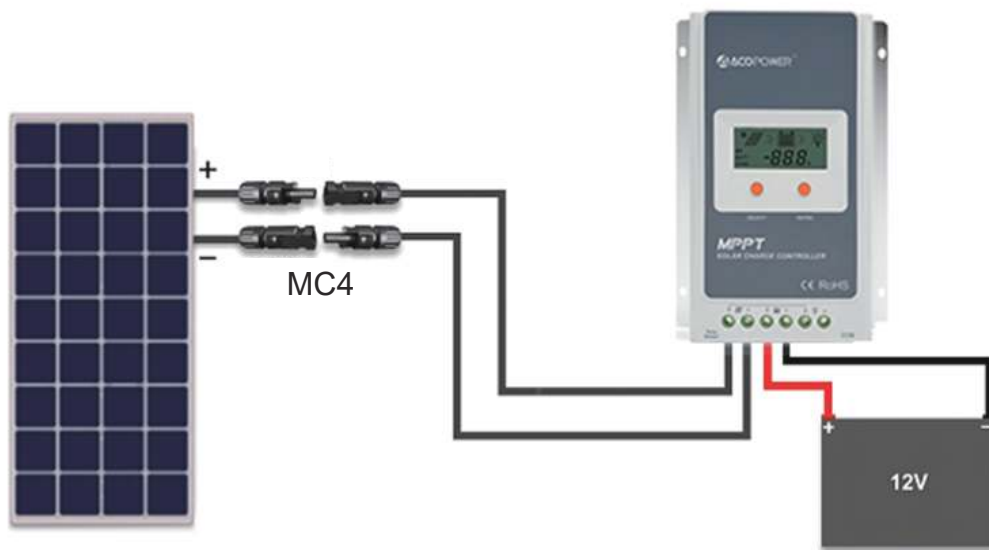


Figure 4 Completed 12V off-grid system



The panel MUST be covered with a dark cloth to prevent the solar cells from producing energy; this will prevent and reduce shock hazard, which can be life threatening.

Multiple Panels/Strings in Parallel

A parallel connection is achieved by joining all of the positive (+) and negative (-) nodes together. When placing panels in parallel, it is recommended that the voltage levels are within specification. In other words, the V_{mp} (maximum power voltage) of the panels must all be within 10% of each other. Typically, connecting panels in parallel is achieved through using identical panels. A simple way to place panels/strings in parallel is by using a branch connector, shown in Figure 5.



Figure 5 Pair of MC4Y- Branch Connectors



Remember to always use the recommended gauge size based on the total array current. Sizing the cable incorrectly may result in melting wires and/or fire.

Two adjacent panels in parallel (12V systems) 200W

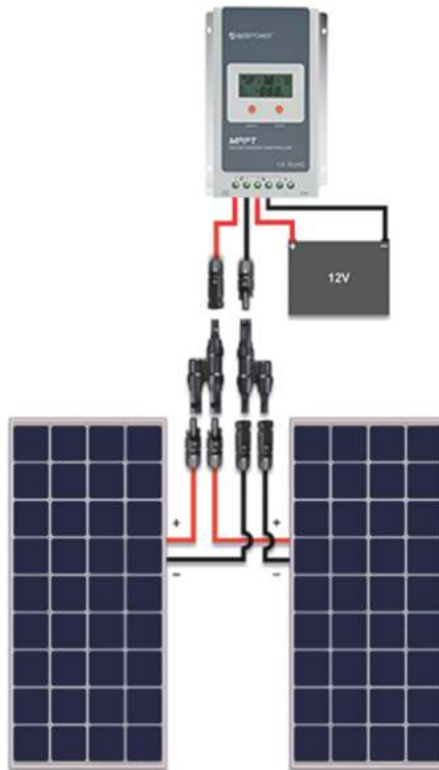


Figure 6 Two 100W Panels in parallel

One of the most basic solar configurations involves wiring two solar panels in parallel. This parallel configuration will increase the current output while the output voltage remains the same. Fig.6 above shows the arrangement for connecting two solar panels in parallel with one pair of MC4 Y-Branch Connectors. This arrangement is applicable if two solar panels will be mounted adjacent to one another. This connection requires one (1) pair of MC4 Branch Connectors. When the panels are mounted at different locations- that is, separated by a distance, the panels must be extended with MC4 Extension Cables (sold separately).

Three adjacent panels in parallel (12V systems) 300W

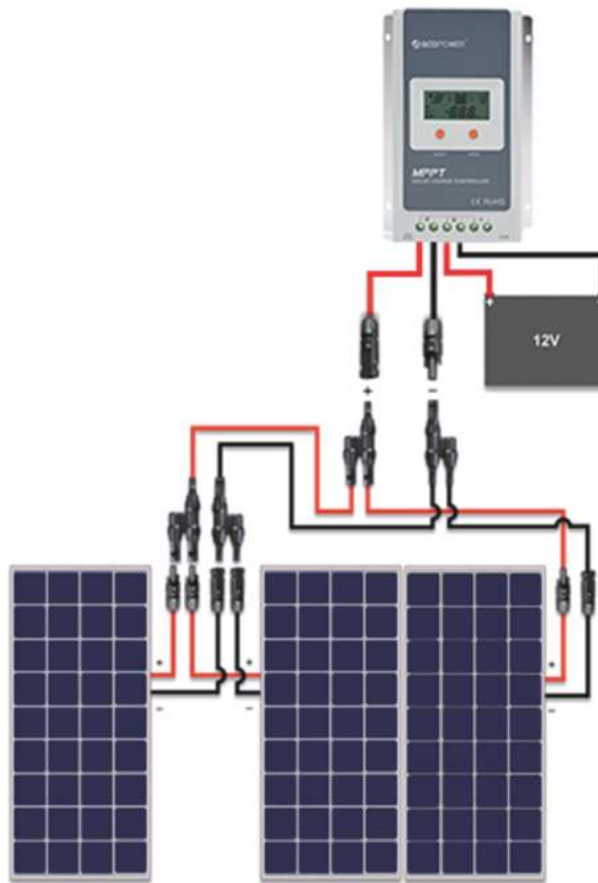


Figure 7 Three 100W Panels in parallel

Three solar panels is the maximum amount of panels that can be connected in parallel if they are adjacent to one another, without using extra cabling. Fig. 7 above shows the arrangement for connecting three solar panels in parallel. Remember that this arrangement is applicable if the three solar panels are to be mounted adjacent to one another. This connection requires two (2) pairs of MC4 Y-Branch Connectors. When one or multiple panels are mounted at different locations- that is, separated by a distance, the panels need to be extended with MC4 Extension Cables (sold separately).

Four panels in parallel (12V systems) 400W

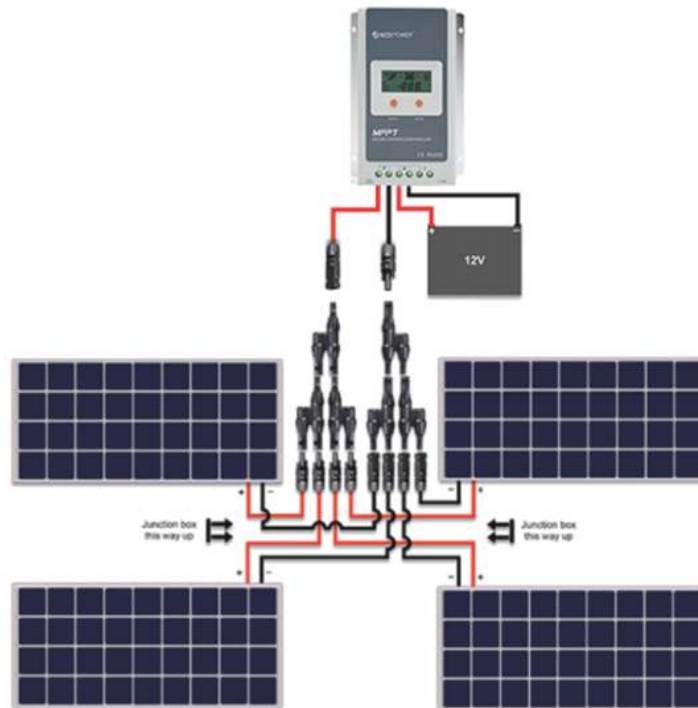


Figure 8 Four 100W Panels in parallel

Fig. 8 shows the arrangement for connecting four solar panels in parallel. This arrangement is applicable if the solar panels are to be mounted in a 2x2 configuration as shown above. Please note that the positioning of the junction boxes must be followed for the cables to reach the MC4 Branch Connectors. This connection requires three (3) pairs of MC4 Y-Branch Connectors. When one or multiple panels are mounted at different locations- that is, separated by a distance, the panels must be extended with MC4 Extension Cables (sold separately).

Five adjacent panels in parallel (12V systems)500W

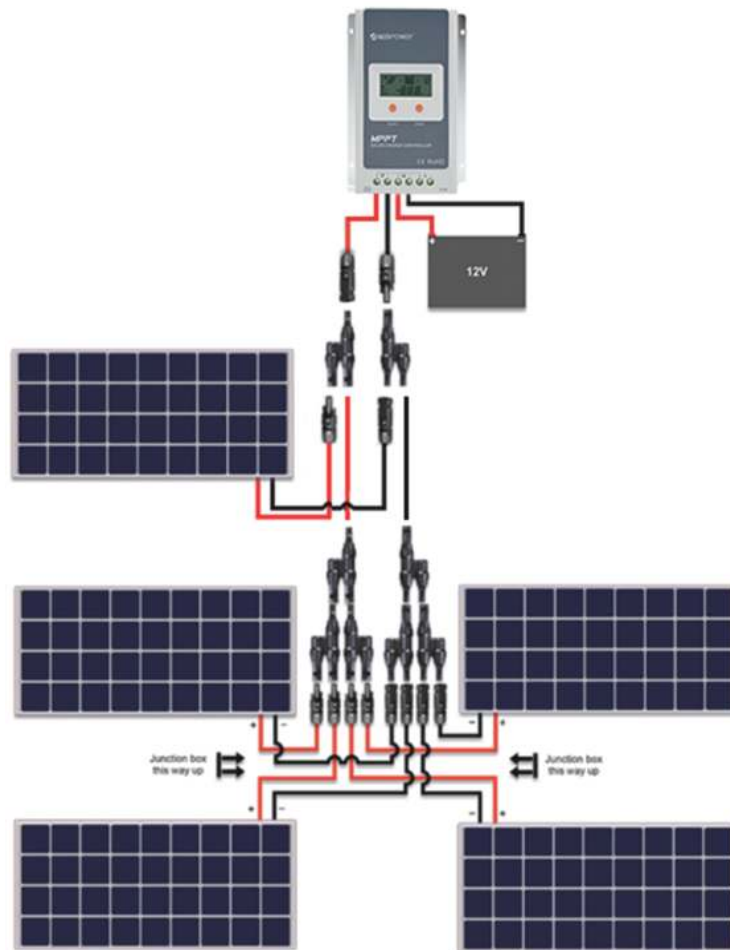


Figure 9 Five 100W Panels in parallel

Five solar panels is the maximum amount of panels that can be connected in parallel if they are adjacent to one another, without using extra cabling. Fig. 9 above shows the arrangement for connecting five solar panels in parallel. Remember that this arrangement is applicable if the five solar panels are to be mounted adjacent to one another. This connection requires four (4) pairs of MC4 Y- Branch Connectors. When one or multiple panels are mounted at different locations- that is, separated by a distance, the panels need to be extended with MC4 Extension Cables (sold separately).