PowerPak Installation Manual

Version 3.0

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Parts

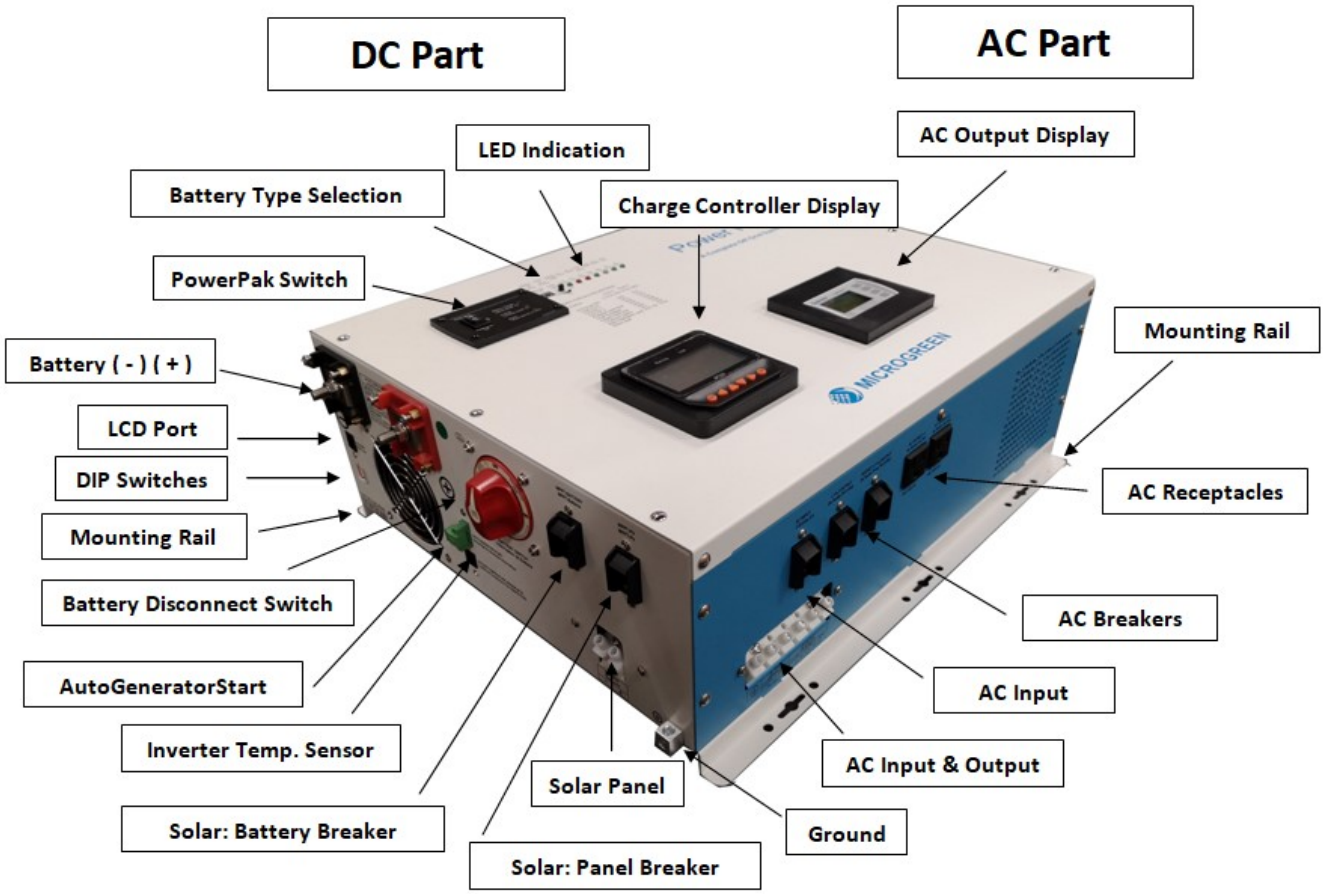
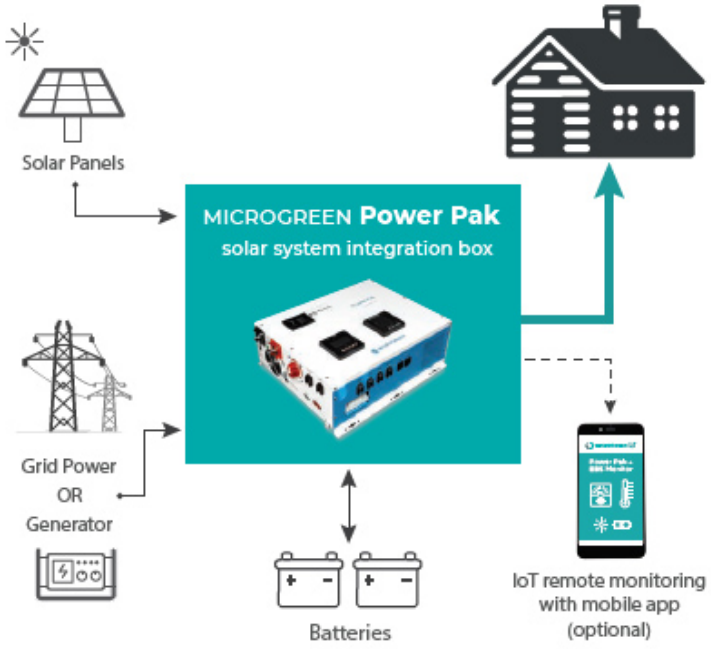


Figure 1: PowerPak Parts

Components in the PowerPak Package

System View



See the Power Pak in action

Installation of Microgreen Power Pak solar system integration box to go off-grid

Power Pak Version 3

Power Pak Version 3

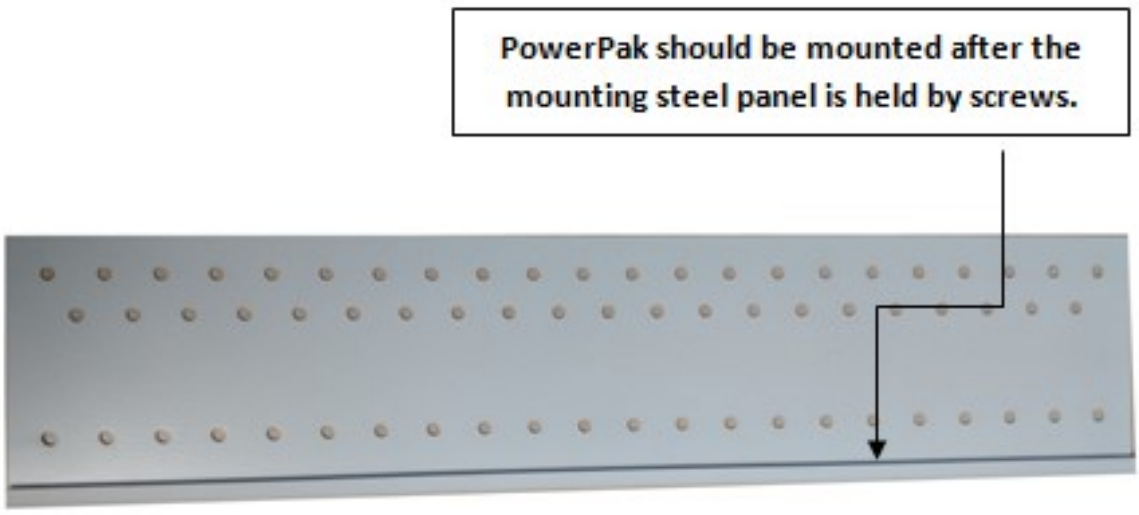
Installation

The section shows how to install PowerPak by wall-mounting. It is recommended there are at least 2 persons to install PowerPak.

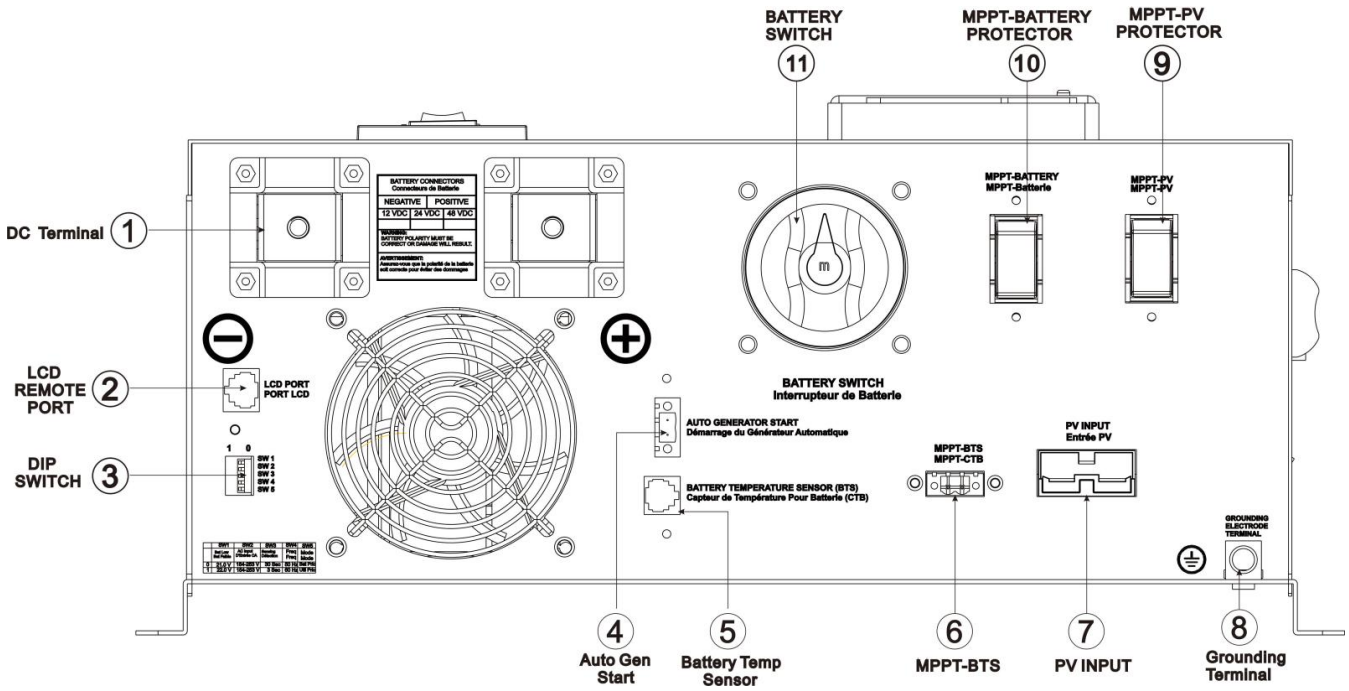
Before connecting batteries and solar panels, please make sure all the breakers and the battery switch on PowerPak are turned off.

1. Location
   PowerPak should be installed indoor. After the installation, there should be enough space around PowerPak for ventilation. It is recommended to install PowerPak near the electrical panel.

2. Install the Base Plate
   (1) Securely mount a piece of plywood on the wall for PowerPak to be installed upon.
   (2) Mount the Base Plate to the plywood. It will support the weight of PowerPak so that it should be securely mounted. Use at least 3 pieces of #12 pan head wood screws.



   (3) Hook the bottom rail of PowerPak on the Base Plate. Use 3 screws in the top rail to hold PowerPak to the wall.



3. Install and connect batteries (See the details at the **Battery Connection** section)
   (1) Make sure the battery switch [11] is off.
   (2) Connect the battery Positive (+) to the DC terminal Positive (+) and battery Negative (-) to the DC terminal negative (-).

4. Install and connect solar panels (See the details at the **Solar Panel Connection** section)
   (1) Make sure the MPPT-Battery [10] and the PPT-PV [9] breakers are off.
   (2) Connect the solar panel Positive (+) to the PV Positive (+) and the solar panel Negative to the PV Negative (-).
   (3) The polarity of solar cables must be connected correctly.

Battery Connection

4KW PowerPak uses 24V batteries. However, the battery in the package could be either 12V or 6V. To make a 24V bank, it is needed to connect them with AWG 2/0 cables in series. Note that the continuous current can be as high as 170A. Because of its high current, the batteries should be placed close to PowerPak to reduce the energy lost in the cable.

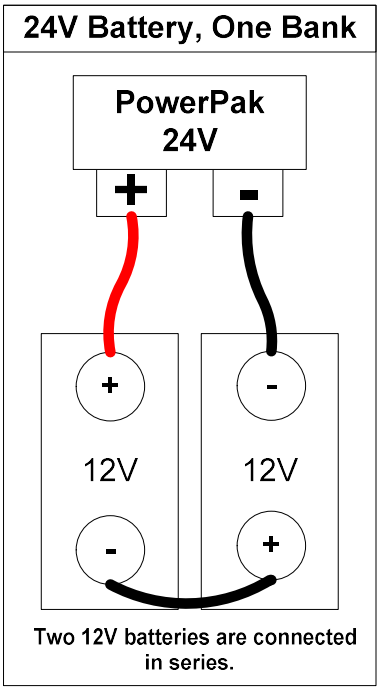
If 12V batteries are used, connect 2 pieces in series to form a 24V battery bank. If 6V batteries are used, connect 4 pieces in series.

To increase the battery capacity, multiple banks can be connected in parallel.

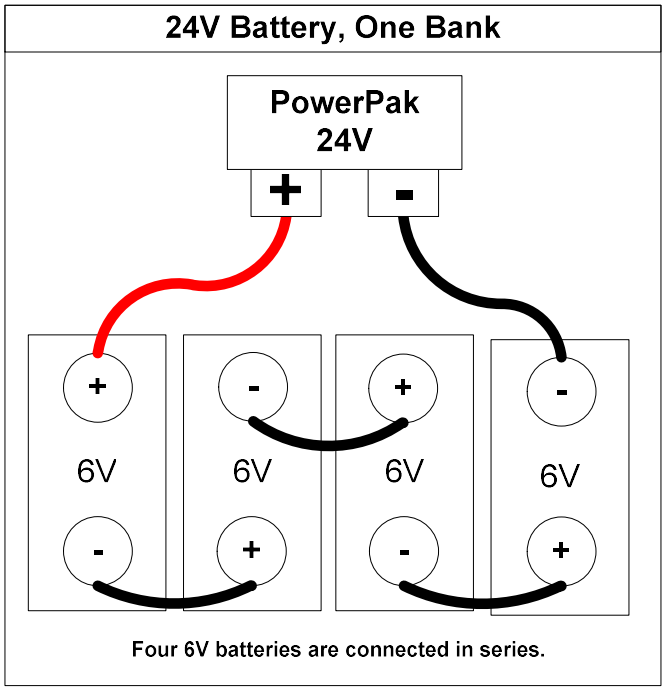
Batteries should be placed on Styrofoam for insulation if placed on the concrete floor. If batteries are made cold on the concrete floor, it will affect the efficiency of the batteries where the batteries may appear to be full, but can only deliver 50 % of its capacity at 0°C.

WARNING) Do not let the black and red cable ends touch each other at all times. Otherwise, it will produce a large spark and damage the batteries.

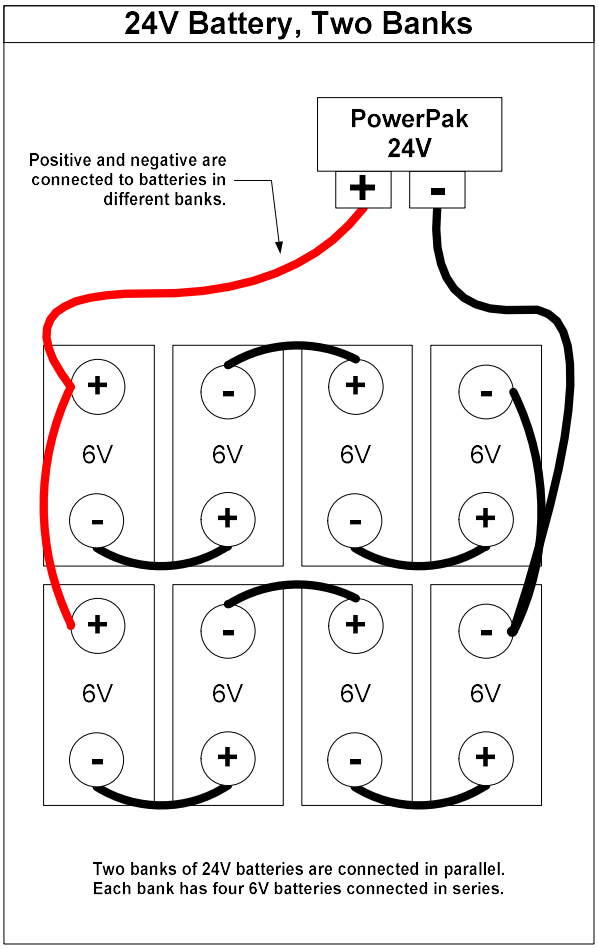
WARNING) Make sure polarities are connected correctly. Do not let any metal object fall across the terminals during the installation.

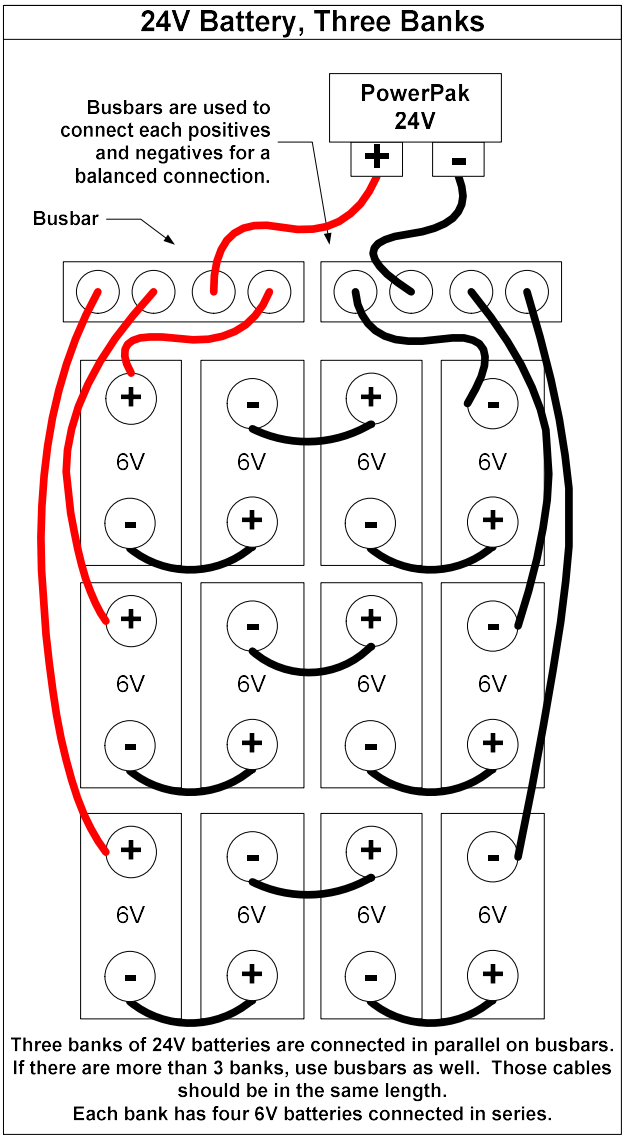


Two 12V batteries are connected in series.



Four 6V batteries are connected in series.



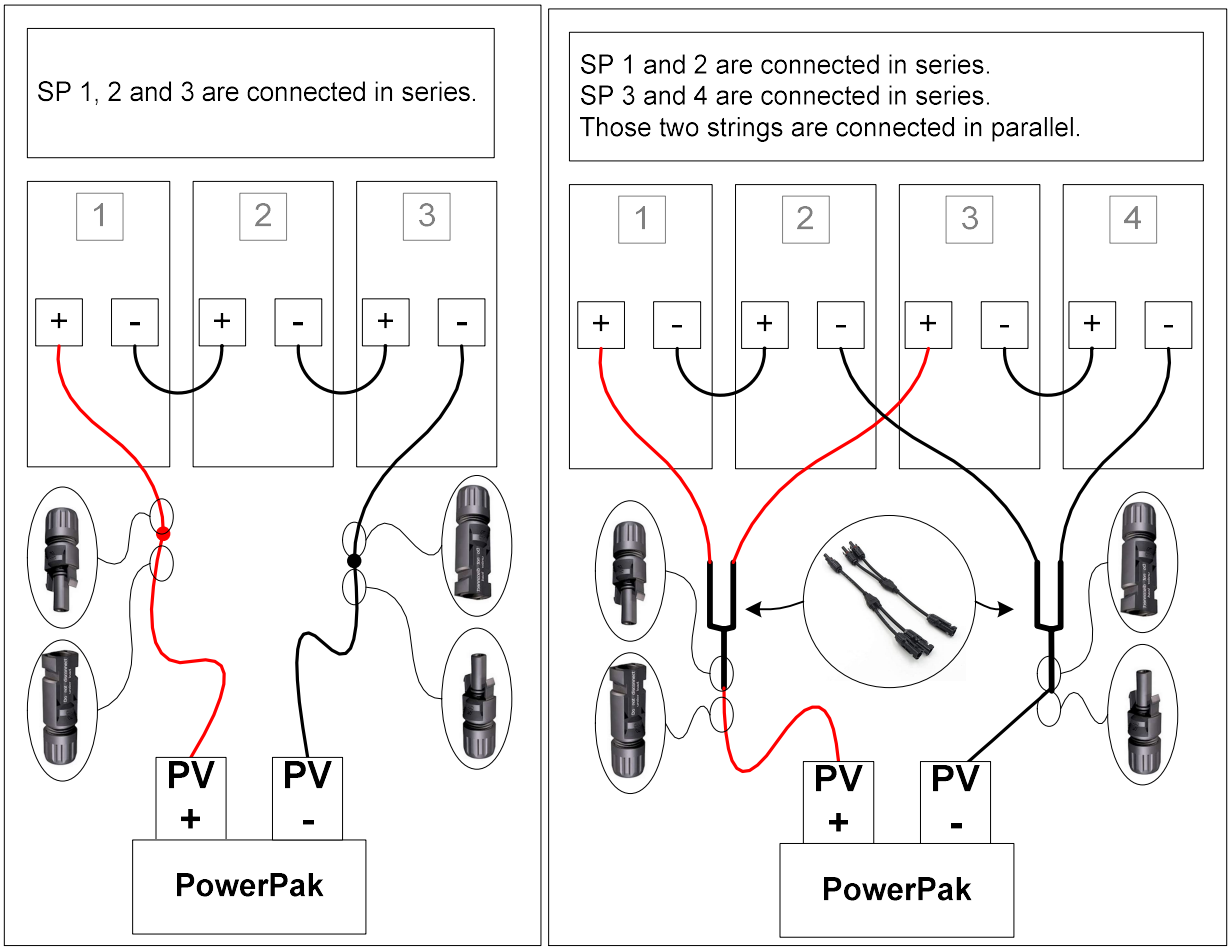


1. Connect the batteries as shown above. Make sure each bank of batteries is at 24V.
2. There is a limit of up to 5 banks of batteries that can be connected to one unit of PowerPak.
3. Connect the temperature sensor. Connect one end of the temperature sensor to PowerPak and place the other end next to the batteries. Note that the colder the batteries get, the higher the charging voltage will be required. It is very important if the charge controller is left on during the winter.
4. Select the battery type for PowerPak. There is a Battery Type Selector switch beside the On/Off switch. Choose 1 for Gel, 2 for AGM and 4 for flooded. Section 2.5.2 of the manual has a full explanation of your choices.

Solar Panel Connection

The built–in charge controller in PowerPak can handle a maximum of 150V DC input and 40A battery charge current. Solar panels can be connected up to 1040W. To install additional solar panels, additional charge controllers are required to be installed.

Solar panels should face South for the best. Alternatively, they can face South–East or South–West.



1. Connect the solar panels as illustrated above. For 2 or 3 panels, connected them in series. For 4 panels, connect them in serial and parallel.
2. Before connecting the solar cable to the PowerPak, measure to ensure the polarities are correct. The red cable is positive and should show 60-80V DC if two panels are connected in series. It should be 90-120V if three panels are connected in series. If it is cloudy, the measurement could be lower.
3. Connect the solar cables to the PV input of the PowerPak.
4. After the battery and solar panels are connected, turn on the battery switch, MPPT-PV breaker and MPPT-battery breaker. The MT50 meter will be on, and it will show the solar energy information. Multiplying the solar panel voltage and solar panel current shown in the meter will give you the power generated by the solar panel in Watts.

WARNING) You can connect up to a maximum of 3 panels in series. Do not connect 4 in series which will exceed 150V of the controller limit.

WARNING) It is required to install Arc Fault device and rapid shutdown for protection. Contact Microgreen for more information.

Grounding

The system comes with a bare ground wire and a ground plate if required. If you have an existing ground for your existing electrical panel, do not install the second ground. You are not allowed by ESA to have 2 ground plates unless the first one is under another building at least 100 feet away, which prevents a ground loop.

Ground Plate

1. If there is an existing ground system in the building, connect PowerPak to the ground connector (normally in the electrical distribution panel) using the ground wire.
2. If there is no existing ground for the building, install the ground plate outside. To do so, dig a hole 1.5 feet deep, and place the ground plate horizontally in the hole. Attach the bare ground wire to the ground plate with the brass lug at one end of the ground plate. Fill in and tamper the dirt over the ground plate.
3. Run the ground wire up to PowerPak, and connect it to the grounding terminal on the base of PowerPak right below the solar breakers.

AC Connection

WARNING) Turn off PowerPak before connecting AC power.

WARNING) Please refer to your local laws and regulations as well as guidelines when connecting to the electrical panel.

1. AC output should be connected to the electrical panel.
2. Connect PowerPack AC Output (L1, L2, and Neutral) to the electrical panel with 3 pieces of AWG 8 wires. Distinguish L1, L2, and Neutral spots when wiring.
3. Wiring connection should be protected by a 50A double breaker.
4. Neutral should be connected to the Neutral busbar in the electrical panel.
5. AC input should come from an external power source and be used to charge the batteries.
6. AC Input L1 and L2 should be connected to 240V AC only where the terminal strips are labelled accordingly.
7. There are two AC receptacles in PowerPak and they are accessible without being connected to the electrical panel. Each receptacle can operate up to 15A at 120V AC.
8. Install the AC Cover after wiring.

Main Operation

After the connections, PowerPak can be turned on.

Operation – PowerSaver Off

1. Turn the battery switch on.
2. Turn the inverter switch on by pushing down to activate the unit (Position PowerSaver Off).
3. Check that the green LED is on.
4. Check that the front AC meter is on and shows 120V AC after 5 seconds. Make sure that the AC breakers are on.
5. The AC output of the PowerPak is live now.

Operation – PowerSaver On

PowerPak has PowerSaver Mode operation. When PowerSaver Mode is off, PowerPak consumes about 1000W in a day. This will be greatly reduced if PowerSaver Mode is on. To operate PowerPak with PowerSaver, turn on the inverter switch with PowerSaver Mode. In this mode, PowerPak will wake up and operate when there is a constant draw in the AC load. Otherwise, it goes to sleep. Theoretically, PowerSaver Mode will save approximately 800W a day as used properly. It takes approximately 40W of loads to wake up PowerPak from sleeping.

Charging Batteries

If AC input is connected and powered, PowerPak will bypass the AC input to the AC output and at the same time, and it will charge the battery. AC input can be from either a generator or the grid power. PowerPak indicates the battery charging with the yellow LED on the front panel. Auto Generator Start (AGS) in the PowerPak is a dry-loop switch. It is off and becomes activated if the voltage of the batteries drops below 23V. If it is connected to a generator's auto start connection, it will start the generator.

Summary

	4KW PowerPak
DC input	24Vdc
Charge Controller Type	40A MPPT
AC output	120/240Vac
Generator Output	240Vac
Solar Panel Capacity	1KW = 1000W
Solar Panel Size and Connection	285W 4 pieces: (2 in series) x 2 in parallel
Battery Connection	6V/415Ah: 4 pieces in series
Dimension	63 X 53 X 27 cm
Weight	45Kg