

[Solar \(renate-designs.us\)](http://renate-designs.us)

Solar Power

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

The Breaker Box

Your main service panel, also known as a breaker box or just a panel box, is an important part of your solar system. Essentially, all the electricity your solar system is producing will be going through this panel. The amperage of your main breaker switch inside this panel box is critical.

Charge controller

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan and may pose a safety risk. It may also prevent completely draining a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery charger.

Solar inverter

A solar inverter or PV inverter is a type of electrical converter which converts the variable direct current output of a photovoltaic solar panel into a utility frequency alternating current that can be fed into a commercial electrical grid or used by a local, off-grid electrical network. It is a critical balance of system–component in a photovoltaic system, allowing the use of ordinary AC-powered equipment. Solar power inverters have special functions adapted for use with photovoltaic arrays, including maximum power point tracking and anti-islanding protection

Make sure to get the Pure Sine Wave instead the modified Sine since pure Sine is best for your home appliances.

There are many **differences between pure and modified [sine wave](#)**, but the most important is **pure sine** resembles an actual sine wave, whereas the modified ones abruptly change

polarities. In simple terms, **pure sine** is more efficient and also more expensive. **Modified sine** wave is simpler and costs less.

What is pure sine?

Pure sine is a **direct replica of the power in your house**, and it's what all 110 Volt electronic devices are made to run on (i.e. anything with a 2 or 3 prong plug). The more sensitive (read "fancy") the device, the less likely it will work well on a Modified Sine.

Battery

A battery is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode, and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells; however, the usage has evolved to include devices composed of a single cell.

The two types are:

- Gel batteries (or "gel cell") use a semi-solid electrolyte.
- Absorbed Glass Mat (AGM) batteries absorb the electrolyte in a special fiberglass matting.

The four main types of solar batteries are **lead acid, lithium ion, nickel cadmium, and flow batteries**. Lead acid batteries have been around for the longest and are known for their low prices and reliability, but they require regular maintenance.

Absorbed Glass Mat (AGM) batteries absorb the electrolyte in a special fiberglass matting, no maintenance.

Read more about Batteries Below:

[What are the Different Types of Solar Batteries? \(solarreviews.com\)](http://solarreviews.com)

What kind of battery cable do I Need?

Custom made battery cables feature pure copper conductors with copper connectors such as ring terminal cable lugs and top post style battery terminals. We offer many sizes and configurations of battery cables which you can custom design here on a site. The battery cables are organized by wire gauge. Click below to view.

Solar panel

A solar panel, or photo-voltaic module, is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of PV panels is called an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

How to clean those dusty, dirty solar panels

1. Be sure to check your panel manufacturer instructions for shutting down the system before cleaning, if necessary. Try not to go on the roof to clean your system. ...
2. Brushing any loose dirt off before spraying them with water will make the squeegeeing process quicker and easier.
3. A good nozzle attachment on your garden hose might work just fine. ...

When and how should I clean my solar panels?

Clean your **solar panels** on an overcast day, early in the morning or in the evening. If the sun is beating down on the **panels**, any water used can quickly evaporate and dirt will become smeared. Early morning can be a particularly good time for **cleaning** as dew that has settled on the **panels** overnight will likely have softened grime.

Do I really need to clean my solar panels?

Solar panels, especially the modern PV **panels**, don't usually **need** to be **cleaned**. However, over time dust, bird droppings, and other debris can build up, which can have a negative effect on **solar panel** efficiency if you don't deal with it, so occasionally your **solar panels** will **need** cleaning.

What is the best cleaner for solar panels?

The ideal way to clean a solar panel is with **dish soap mixed with warm water** and applied with a soft sponge. That would be safe and easy. Another option could be to use a good quality soft brush and cloth covered sponge on another side.

Homeowners and DIY (Do It Yourself) enthusiasts often wonder how to wire solar panels to produce the maximum energy output.

One of the effective and simple ways to increase your capabilities of solar power is to wire solar panels together.

To note however, is to select the connection method that will have a configuration that is the most energy-efficient depending on the size and equipment, as well as your needs. Wiring solar panels shouldn't be so difficult. With a little tweak, it's quite doable.

The energy production capacity of a **solar panel** is measured in watts, which is achieved by multiplying the amps of current and its voltage. It is critical for you to find an appropriate balance of amps and voltage for the system to perform well. Then you get a better return on investment.

The main difference between **wiring solar panels in series vs. parallel** is that the voltage and amperage of the circuit will be affected.

1. Wiring Solar Panels in Series

This method is used to specifically increase the voltage of the total solar panel system. The current travels along only one path. This means that all the circuit current must pass through all loads.

Since the series circuit flows in a single line, any damage to one point of the string will affect the entire circuit.

For example, most old Christmas lights are of the series circuit. If one bulb is affected, the rest of the string lights go off. Modern Christmas lights use parallel wiring, fortunately.

The series wiring is normally used when charging a controller that needs more than 24 volts or an inverter that is connected to a grid.

Steps for Connecting Solar Panels in Series

The series circuit is achieved by connecting the positive (+) terminal to the negative (-) one for each panel.

This will then leave you with one available negative (-) terminal and one available positive (+) terminal, that will be connected to the **charge controller** or inverter.

Advantages of Solar Panels in Series

- Each solar panel's voltage is summed together while the amperage remains the same. For instance, if you have 4 solar panels and each panel has 12 volts and 5 amps, then the entire system will have 48 volts and 5 amps.

- Since the current remains unchanged, you can save up on installation costs as you can get away with smaller wiring.
- You can have long wire runs without necessarily having to lose out on electricity. That's why most solar panels for home use are partially wired in series.

Disadvantages of Solar Panel Series Wiring

- The amperage remains constant.
- There's reduced efficiency when connected to solar panels with different power ratings as the panel with the lowest amperage will dictate the total current output.
- If one solar panel is damaged or has a connection problem, the rest of the system collapses as well.

• 2. Wiring Solar Panels in Parallel

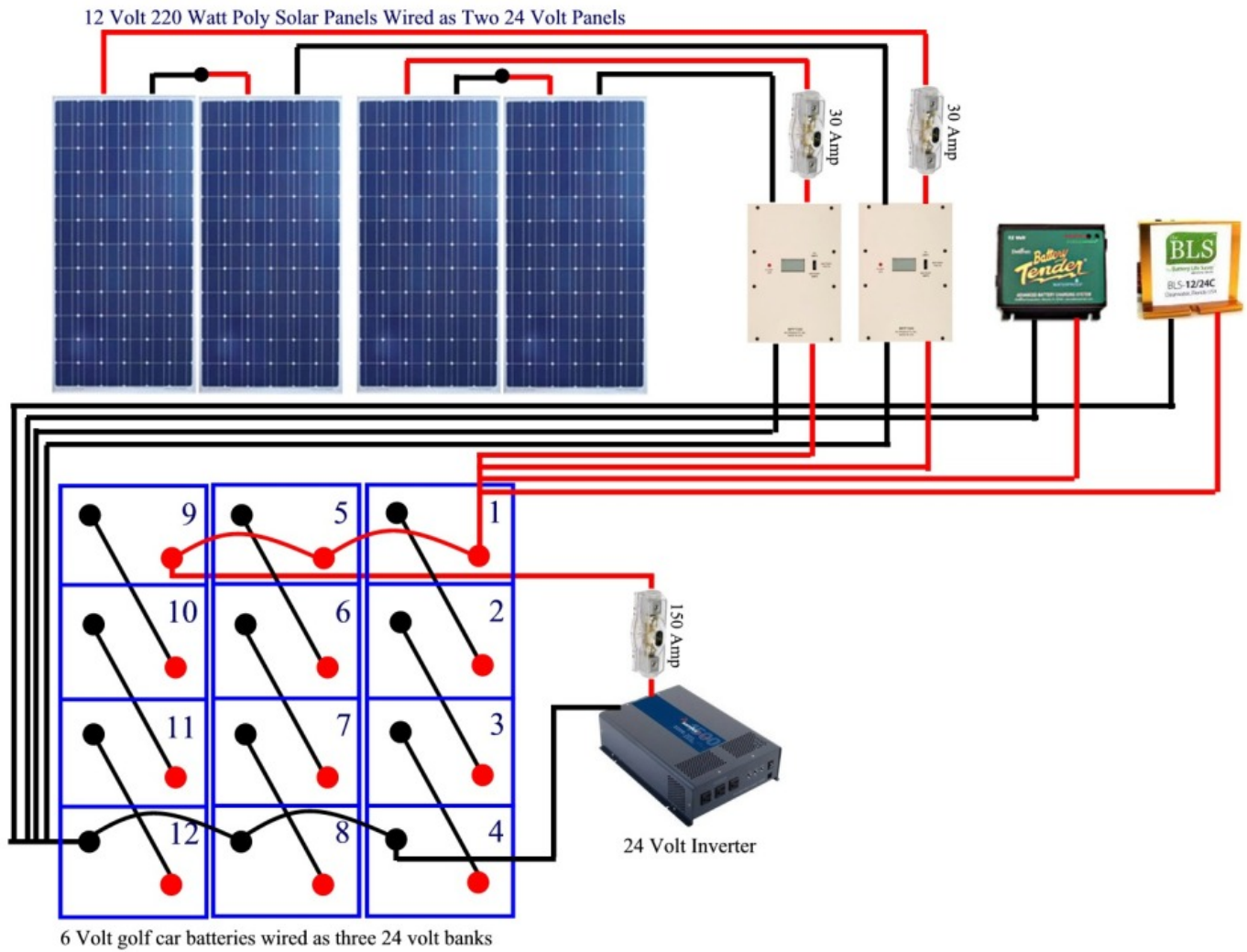
- The parallel circuit is slightly complex when compared to the series circuit. It has multiple paths as opposed to only one. It is the reverse of the series circuit as it is ideal for boosting the system's current (amperage).
- The voltage in parallel solar panels remains the same while the current is additive. For instance, if you have 4 solar panels with 15 volts and 6 amps each, the total system will have 15 volts and 24amps.
- **Steps for Connecting Solar Panels in Parallel**
- This method involves connecting the negative (-) terminals together and the positive (+) terminals together leaving you with a free negative (-) and positive (+) terminal to connect to your **batteries**.

Advantages of Solar Panel Parallel Wiring

- It is considered best for household wiring. Most household circuits use parallel wiring as the multiple paths allow for current to flow irrespective of one broken component.
- Damage on one panel does not affect the rest the solar power system.
- Amperage is increased.
- It offers more flexibility when it comes to off-grid systems. For example, your 12V battery can be charged by a 12V solar power system.

Disadvantages of Solar Panel Parallel Wiring

- Wiring panels in parallel can be quite costly as it requires more wire to facilitate the multiple connections and heavier wire that can handle the additional current.
- The voltage remains constant.
- Can be a bit complex and time consuming to install.
- Parallel wiring may require additional equipment like a combiner box or branch connectors.



Go to my website to learn more about The Solar of Grid and you will find many links to stores and to videos that will help you in setting up your system!

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How to Easily Calculate the Conversion of Volts – Amps & Watts

Basic electric theory states that:

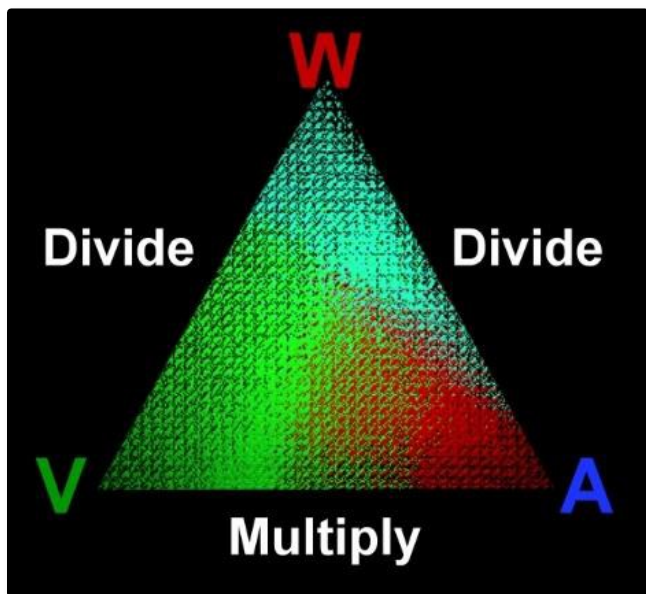
Volts are a measure of the force or pressure under which electricity flows.

Amps are a measurement of the current flow rate of electrons.

Watts is a measurement of electrical power created. 1 watt is equal to one joule of energy per second.

In the solar Industry, the ability to easily convert volts, watts and amps is necessary for every part of the business from system sizing to procurement of solar panels, inverters, and balance of system components like connectors and wiring.

To use this conversion chart, you will need at least two of the three desired electric values from a specific load requirement. From there, you can calculate the third. Simply draw a triangle, then place a W for watts at the top. Then place a V for volts at one of the bottom corners and an A for amps at the remaining corner.



For an example of how the conversion chart works, let's assume a solar panel rated at 60Watts, 12Volts and 5Amps.

The formula for **Watts is Volts times Amps**. To use the chart, cover the **W** in the chart with a finger and use the remaining visible chart calculation of **V** multiplied by **A**. Using our sample panel data, 12 Volts multiplied by 5 Amps equals 60 Watts.

The formula for **Volts is Watts divided by Amps**. To use the chart, cover up the **V** with your finger and use the remaining chart calculation of **W** divided by **A**. Using our sample panel data, 60 watts divided 5 Amps equals 12 Volts.

The formula for Amps is **Watts divided by Volts**. To use the chart, cover up the **A** with your finger and use the remaining chart calculation of **W** divided by **V**. Using our sample panel data, 60 watts divided by 12 volts equals 5 amps.

1 - Determine the voltage. North American wall outlets operate at 110 to 120 volts.

2 - Convert watts to amps using the proper equation: Amps equals watts divided by volts. For example, a typical 60-watt light bulb on a standard 110-volt circuit operates at 0.55 amp (60/110).

3 - Convert amps to watts by reversing the equation: Amps multiplied by volts equals' watts. A device operating on 3 amps at 110 volts consumes 330 watts (3 x 110).

Instructions

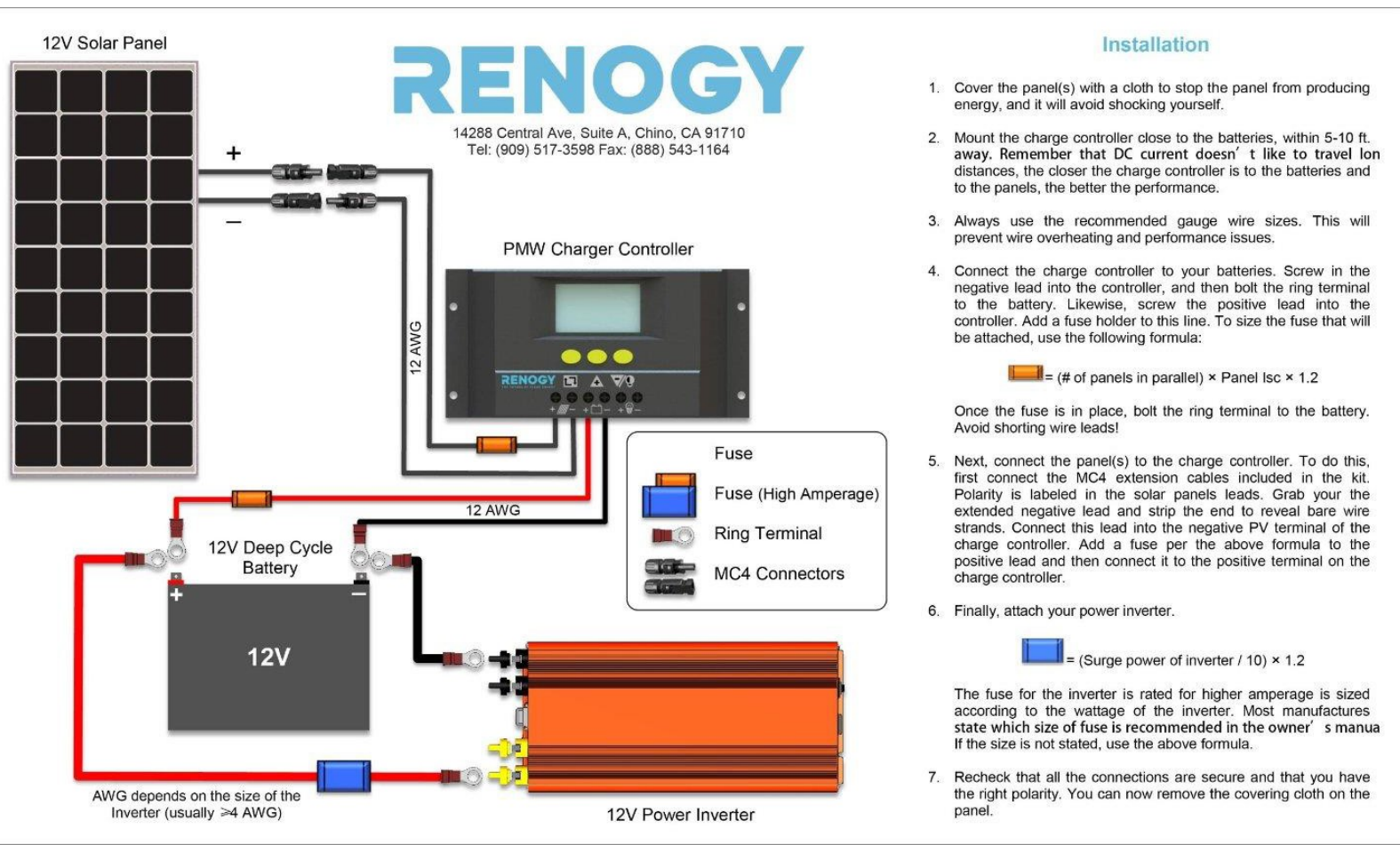
1 - Multiply the number of watts by the number of hours to calculate watt-hours. As an example, if you know your laptop computer uses 30 watts of power and you want a battery to power it for four hours, you need 120 watt-hours of stored energy.

2 - Divide this figure by the energy efficiency of the battery to compensate for the lost energy. The

battery's efficiency is listed in its specifications. In the example, if the battery has an 85 percent efficiency, you divide 120 by 0.85 to derive a required 141 watt-hours. If you wish to calculate only theoretical values, you can skip this step.

3 - Divide this figure by the voltage to calculate amp-hours. Voltage is also listed in the battery's specifications. In the example, if the battery is rated at 19 volts, divide 141 watt- hours by 19 volts. This tells you your new battery needs at least 7.42 amp-hours to run yourlaptop for four hours.

A Simple Layout of a Solar Setup



Several Links that sell Solar Products & Lessons on Solar:

<u>Watts to Amps Calculator Online</u>		<u>Electric Bill Calculator</u>	
<u>Morningstar Corp</u>			<u>Renogy</u>
<u>Solar Biz since 1969</u>	<u>altE Store</u>	<u>Ramsond</u>	
<u>Solar Panels</u>	<u>Solar Inverters</u>	<u>Solar Batteries</u>	<u>Solar Charge Controllers</u>
<u>Solar Cables & Connectors</u>	<u>Grid Tie Inverters</u>	<u>All About Solar</u>	
<u>Solar Penny Video Lessons on Solar</u>			