Build Your Own Solar Panels

Volts - is the change in electric potential (meaning potential energy per unit charge) between two positions. It can be thought of like water pressure.

Watts – this is the power that is produced by amps (which is the current) multiplied by the voltage.

Amps – The amount of electricity that is being transferred through the wire. Amps are commonly known as current.

Direct Current (DC) – It is called direct current simply because it keeps a specific route. DC current can be stored in a battery which is extremely important when generating your own energy.

Alternating Current (AC) – AC current constantly changes directions. AC is what most of us are accustomed to and is the most common form of electricity. DC can be converted into AC so that generated energy can be used practically with daily appliances.

Solar Power

Solar panels are actually quite simple. They are really a collector. They collect sunlight and then convert it into electricity. This is done with a PV (photvotaic) cell. This cell allows electrons to be released which in turns create electricity.

The electrons flow in one direction which is considered a direct current (DC).

Solar panels are made up of several cells which combine together the amount of electricity created. Cells come in a wide range of power from a fraction of a watt to several hundred watts.

Types of Solar Panels

There are 3 main types of solar panels on the market; Monocrystalline, Polycrystalline and Amorphous.

Monocrystalline: These are the most common solar panels from the past 20 years. They are one of the most expensive solar modules because of how they are manufactured. However, they are also the most efficient.

If you have limited space, this is the only correct choice. The also have a long life expectancy. Monocrystalline cells are very fragile and require that they be mounted on an extremely sturdy and rigid frame.

These will be what most of you will build because of the ease of finding this type of cell.

Polycrystalline: Polycrystalline cells are a great alternative to Monocrystalline cells because of their price. They are manufactured in a different manner making them less expensive.

They are less efficient but the difference is only slight. They also have the same life expectancy as their counterpart.

Amorphous: These are known as thin film panels. These panels may change the future of solar. They are flexible panels and can be applied to any surface. You can have them installed on your roof without much notice.

They absorb more light and therefore can be made thinner and cheaper. However, they are no where near as efficient at producing electricity. Actually, they are only about half as efficient as the other 2. This means you would need twice the space to create the same amount of electricity.

Building the solar panel

Building solar panels is actually a fairly simple process. There are some materials we will need.

Soldering Iron and Solder: You will use this to connect the wires to the solar cells. I recommend a pencil style soldering iron that is 25+ watts.

Plywood: This will serve as the backing of our solar panel. This is what the solar cells will be attached to. You will want it to be a decent amount of thickness so that is sturdy. About 2" is perfect. 2' x 4' is a fairly common size.

You will also need four pieces of wood to go around the edges to serve as a frame. These should be thick enough to put a small finishing nail through without cracking but not any thicker.

Tabbing wire: this is the wire that is used to attach the solar panels together. It will be silver, shiny and flat. Here is a pic from ebay where you can get tabbing wire inexpensively.

Plexiglass: This will serve as your solar panel cover and needs to be the same size as your plywood. You will want thickness between ½' – ¾".

Rosin Flux Pen: This will be used to help hold down wire to your solar cells. Here is a pic of one from ebay.

Silicone: You will use this to hold the solar cells to the plywood backing and hold the flexiglass to the frame. It will also be used to seal any holes.

UV Paint: This will be used to paint the plywood.

Finding Solar Cells: There are a lot of different ways to get solar cells. Some will tout free solar cells and this is a possibility. The popular methods of finding free (or almost free) solar cells are old construction signs and from dealers replacing cells on houses.

You can also get broken cells and "fix them up" and place all the shards on the plywood backing to make oddly shaped but working solar panels.

I prefer to find low cost cells. You can find them on Ebay for great prices. Some of them even come with the tabbing wire pre-attached. I am fond of the brand Evergreen.

You can follow this link to find solar cells on ebay.
http://shop.ebay.com/items/?_nkw=solar+cells&_sacat=0&_trksid=p3286.m270.l1313&_odkw=solar+cells&_osacat=0

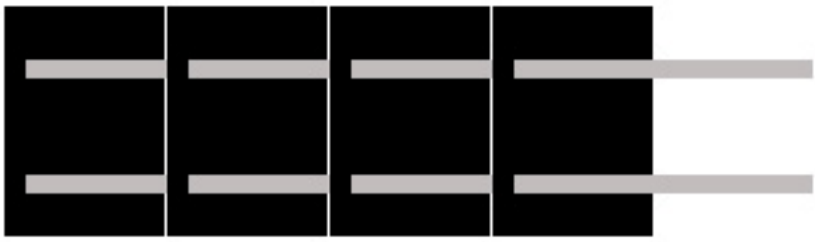
Building the solar Panel:

First you will want to put the tabbing wire on your solar cells (unless you purchased cells that already had tabbing attached). Before attaching, you will want to arrange all of the cells face down on the ground.

On the back of each panel, you will see little tabs. You will want to drop a small amount of solder in each of these. This will make it easier to solder down the wire later.

Now solder the wire along the front of the cells. The wire should be twice as long as the cell so that it can be attached to the back of the next cell.

Next the extended piece of wiring is soldered to the back of the next cell as shown below.



Once you have your rows connected together like above, it is time to connect the rows together. I suggest using 9 panels per row and a total of 4 rows. 36 cell panels are very common.

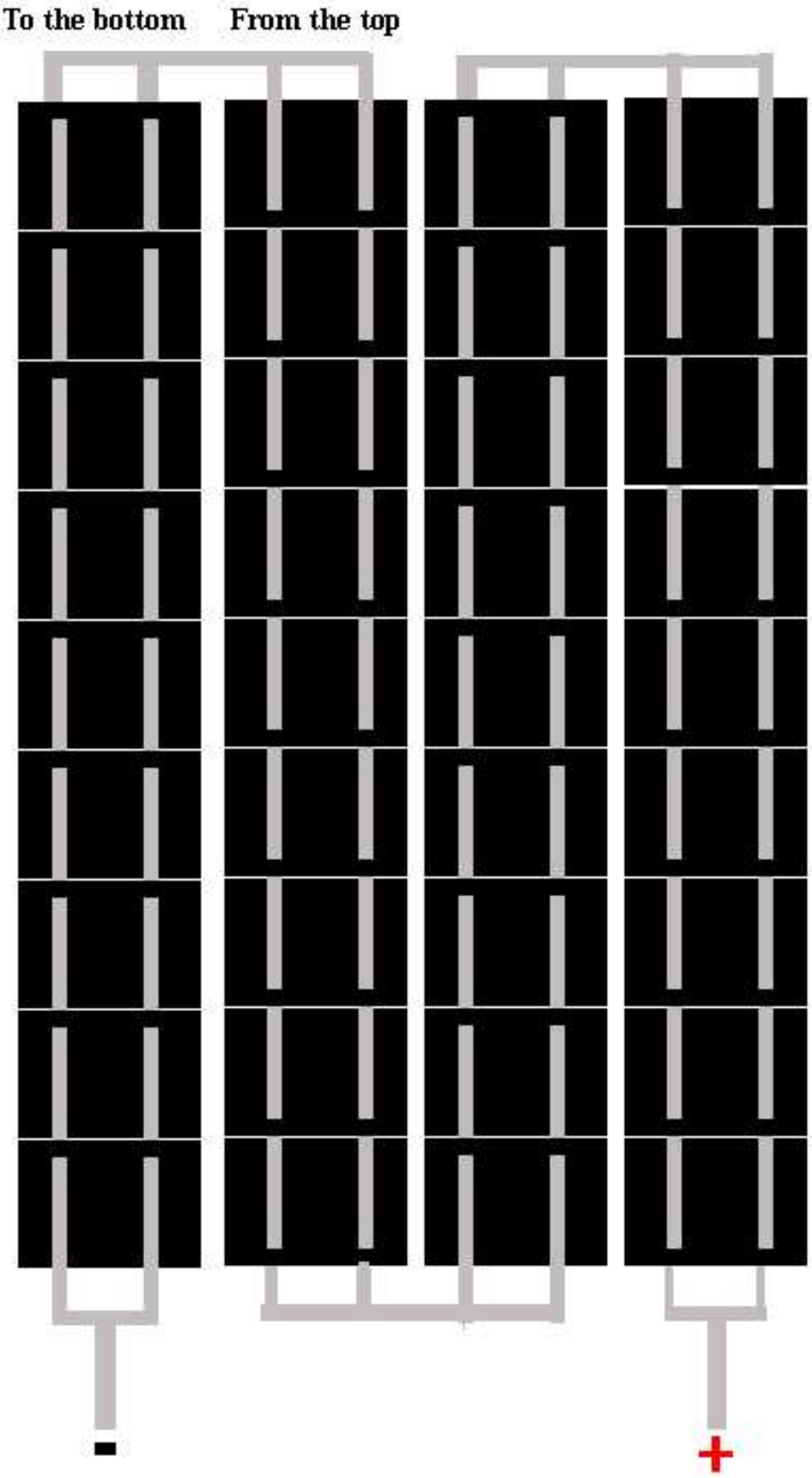
You will connect the last two tabbed wires in each row together then attach them to the next rows opposite side. (so if it is coming out of the bottom (+) it would connect to the top (-) on the next row).

This is exactly what you just did in each row. You are just going to next row rather than making row longer.

The outer rows will supply the out wires that will direct the electricity.

You want to make sure to use your flux pen along the tabbed wires to ensure they stick down before you put the rows together.

You can look at the diagram on the next page to see how this should look. It might look complicated but it is just continuing the flow you had already been working on.


To the bottom
From the top
-
+

Preparing the plywood:

I recommend completing this step before working on the solar panels.

You will want to paint your plywood with UV paint. 2-3 coats will work best.

You will also want to put your border of wood around the edge of the plywood to form a frame (will look like a shallow box). Use silicon to hold these down and then screw them into place from the outside of the plywood.

Attach cells to backing:

You will want to use silicon to attach the cells to the plywood. You just want to use enough to hold the cells in place.

You also need to drill 2 holes in the plywood to run your down wires through.

Make sure to silicon around these holes and any other area that needs it.

Putting on the plexiglass:

It is now time to put your cover on. You will once again use silicon to attach the cover to the border/frame that you built onto the plywood.

You will want to take your cells into the sun and use a volt meter to check how well your panel is working before gluing everything down.

Once the cover is fixed to the border, you will want to screw it down. Drill first so that you do not damage the plexiglass.

<u>Hook Up</u>

The hook up is as follows. Make sure to use the correct amp wiring. It is always best to get one rated more than what you need.

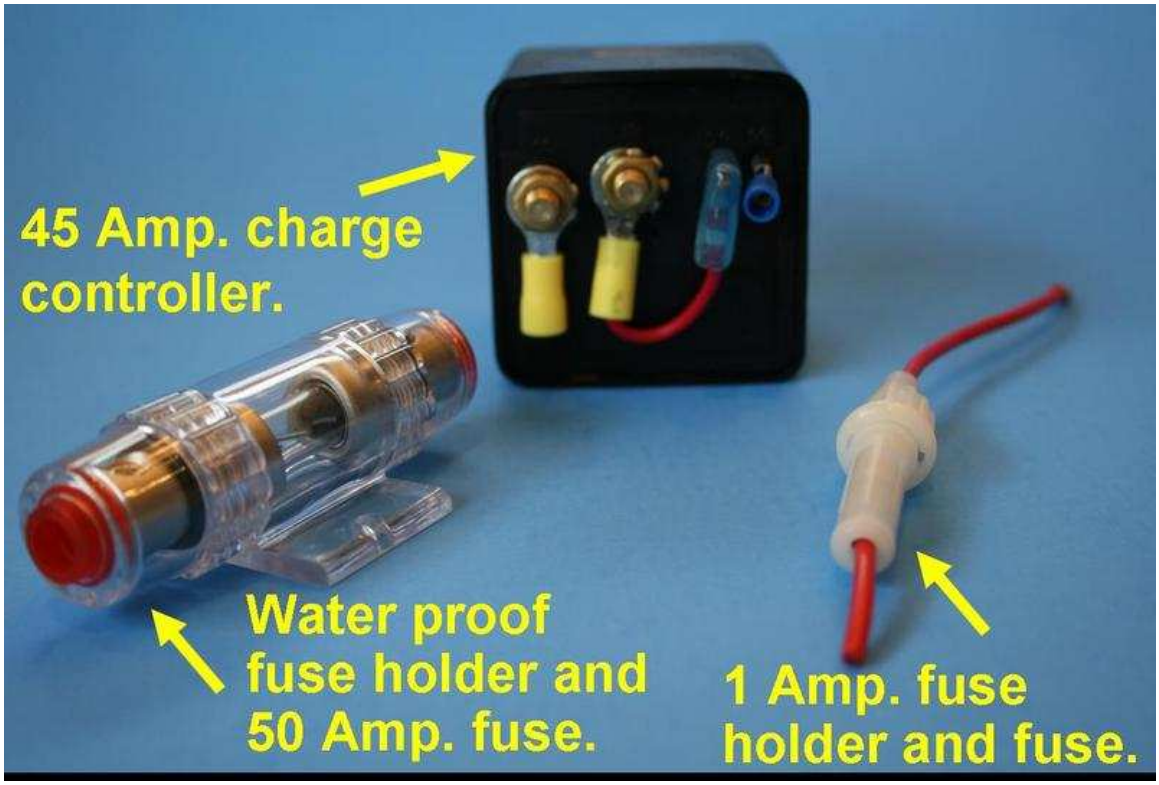
Solar Panel – Charge controller – Battery – Inverter – appliance

Charge Controller

A charge controller monitors the battery and either sends the energy to the battery or diverts in when the battery is already fully charged. If you overcharge a battery, it can destroy it.

You will set your charge controller to turn on when the battery charge drops below a certain point and to turn off when it reaches a certain level. 11.7 and 14.3 works the best for these levels.

Once again, you can pick these up on ebay. Here is an example of a kit that will work great.



Inverter

You will use a voltage inverter to convert the stored DC energy to AC. You will then be able to power day to day appliances. These are available many places online but I typically go through ebay. Here is an example of an inverter.

Hook Up

The hook up is as follows.

Wind Turbine – Charge controller – Battery – Inverter – appliance

Additional Power:

You can get additional power by hooking more than one solar panel together. You just connect the "+" to the "+" and "-" to the "-". This will create one large solar powered system as apposed to just the solar panel.

Batteries

WARNING: Batteries can be very dangerous and every precaution should be taken when working with them. If you are ever in doubt, you should consult a professional.

First, you need to use a deep cycle battery. Batteries can be very expensive if bought new. However, there are many ways that you can acquire batteries.

The two most popular methods of finding free deep cycle batteries are at golf courses and industrial plants. Golf cart batteries are deep cycle and are perfect for use. Fork lift batteries are also deep cycle and are great. Fork lift batteries can last up to 20 years but most industrial plants replace them long before that.

You can also find batteries at the dump or a junk yard. Be careful at either and ensure that you are getting a deep cycle battery.

Most batteries that are "dead" really are not dead. I am not going to go into 5 pages of technical knowledge about hoe a battery works and how they can be brought back to life. If you want the info, you can find it on the internet with a quick search.

You can bring these batteries back to life with a simple device known as a Desulfator. You can find them for very reasonable prices on ebay. These can save you a ton of money on batteries for this project and many others.

Here is an example.

When hooking up your battery, you want to make sure that you use wire that will handle outside conditions. The size of the wire is also important.