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Tutorial
“Solar Power Station”
July 2017

The Playa is sunny and ideal for solar power. You can run off the sun!

A renewable energy station will help you Leave-No-Trace and it shows your camp is committed to good stewardship on your Placement application.

A solar station can be a weedy buggy jungle. But you don’t have to be an electrical engineer. It can be intimidating for a beginner, that’s why The Playalabs developed this tutorial for a simple playa-approved rig.

It’s not a cheap project but it’s not crazy-expensive either. You’ll be able to use the kit for other events and camping trips and possibly around the house too.

The solar rig described here is ideal for the [swamp cooler](#).

Preferred Shopping List:

There are a few ways to skin this cat, but ThePlayaLabs simplest, quickest kit involves this [short list of items](#):

- Deep Cycle Battery (or from your local store)
- Wire strippers (or from your local store)
- 100W Renova Kit
- Inverter w/ remote
- Extra Wire *Optional*
- Gator Clips *Optional*

Let's begin!

The solar system has 3 parts:

1. Storage Battery: yes you need a battery*
2. Panel: The sexiest part of the rig
3. Electronics: Various components and cables

*It's possible to run a solar panel directly to your electronics, but playa-testing reveals this method is unreliable. Sometimes it's cloudy right when you need power. The output from the panel is "choppy", which can actually damage your electronics. Also, the panel is most productive around high-noon and you might not be at camp. Most people need to power their gadgets at camp in the morning, afternoon, or at night (when the solar panel is not producing). Adding a storage battery allows you to capture solar energy when it's happening and use power later when you need it.

1. Battery:



The panel gets most of the glory, but the storage battery really is the heart of the operation.

You need a **12 volt "Deep Cycle Marine" battery**.

This is not a regular car battery! Look for the keywords **Deep Cycle** and/or **Marine** at auto parts stores, boating stores, camping stores, and some bigger hardware stores.

You can get [these ones online](#). These are fucking heavy so bake cookies for your delivery driver if you order online.

The 12V batteries are rated by "**Amp-Hours**" or **AH**. That's basically how much juice they hold. More amp hours = battery lasts longer. Get the largest Amp-Hour you can afford. This may be a time to buddy-up with campmates as the battery is not cheap. We don't recommend anything below 100 Amp-Hours for the Burn. 35 AH is just not enough to make it worthwhile.

A note on terminology, we use the Term "terminal".
That's the metal post on the battery. There is a positive and negative "terminal".
Get intimately familiar with which side is Positive and Negative.
Avoid touching the terminals. And don't let metal objects touch both at the same time or you might throw a spark.

2. Panel: Now the fun stuff



Make sure you get a panel compatible with a 12V system.

Panels may be rated 12V or up to 18V and that's still OK.

But **do not use a 120V** household panel (for example, sometimes people sell a leftover panel from a rooftop solar setup from a house. That panel would NOT work with our 12V setup and could actually be dangerous).

Don't worry we've put some links to the [correct panels on our links page](#). These panels are good, play-tested and known to work well with the rig:

Panels are rated by Wattage. Get the largest Wattage you can afford. Budget Bob, if you are weighing your costs on the Battery vs the Panel, it's better to get a larger AmpHour Battery and get a smaller panel. Spend more on the Battery if you have limited budget.

You want at least 20watts for light duty (it will run a swamp cooler a few hours a day, charge phones, and run a few LEDs sporadically). Upgrade to a 100W panel if you are hoping to charge many phones, or run more lights, gadgets, speakers etc.

It may sound amazing to get a 500W panel or some other ungodly amount of wattage. But at that point you are overwhelming the charge capacity of the battery. So if you have the budget and the desire, get ANOTHER battery and 100W panel and use 2 identical kits. This will get you more useful energy than simply getting a huge panel.

[These panel kits](#) come with adapters and charge controller included. If you buy the charge controller and adapters separately you may have to spend more. For simplicity and completeness, we like the kits.

If you really want a piecemeal kit (Bob), you will need to buy panel, charge controller, and cable adapters [separately](#):

3. Components: The Bullshit

Charge controller: With a ~20w panel and over, this little box is needed to regulate the flow of energy and protect your gear. Luckily the kits come with a panel and charge controller, or there is a charge controller sold separately.

12V wires. 10 gauge, at least 10 ft.

Gator clips. You need at least 2 but get a few backups.

Wire strippers

Inverter: A boxy device that makes this whole thing usable.

Inverters are confusing. Let's clear it up:

The inverter takes power from the battery and transforms it into a usable form for your devices. There are 2 types of inverters "Pure Sine" or "Modified Sine".

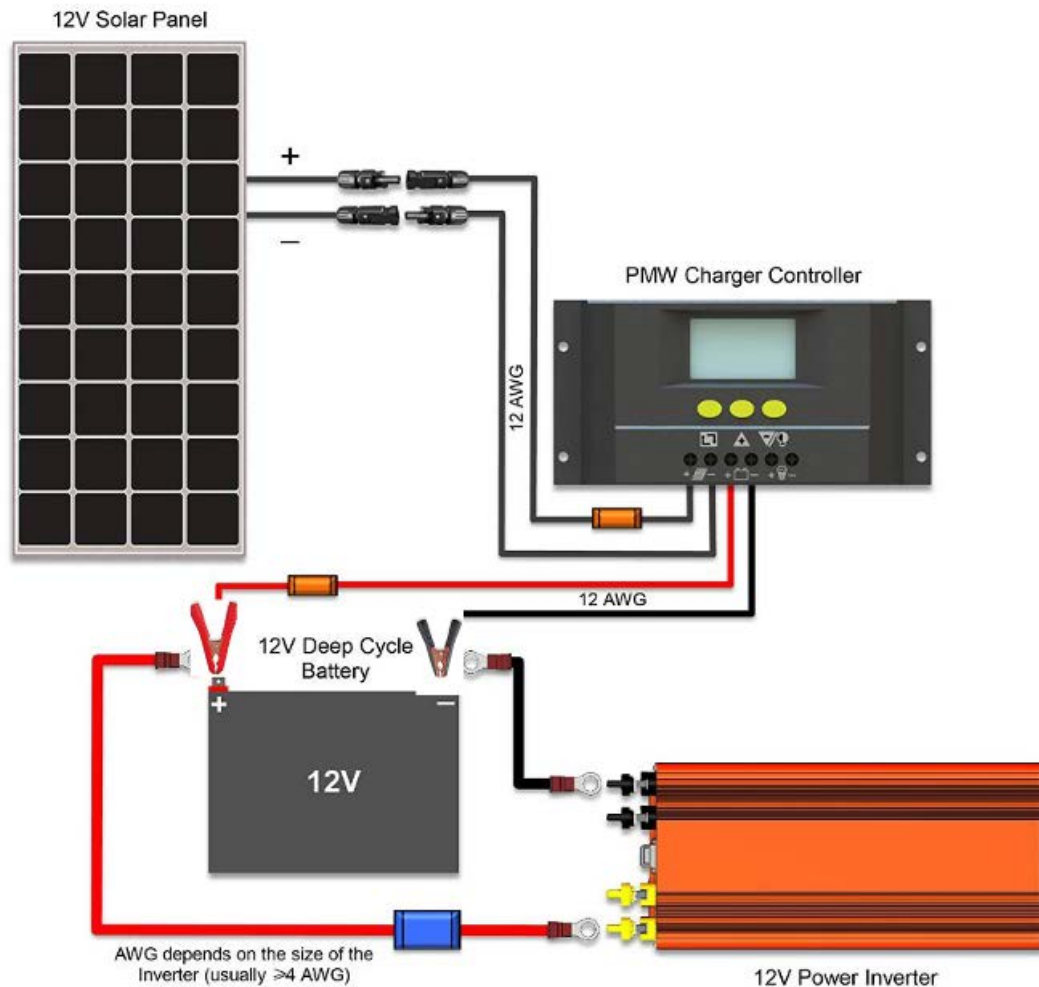
The "Pure Sine" has smoother power delivery. The "Modified Sine" is a little more "choppy". For most electronics, the Modified Sine is fine. Your LEDs and USB devices will be alright. If you have advance audio equipment, medical devices, laptops, or high tech custom gadgetry, you may want to spend extra and get a Pure Sine inverter.

The PlayaLabs have [linked to a 3 different inverter models](#) for various budgets. They all have safety-features that some other cheap inverters are missing.

4. Let's Connect!

Anytime the solar panel is in the sun, its collecting energy. Don't leave the panel exposed while you do this project, the wires will be live!

Flip the panel face-down ass-up so it's not in the sun. There are +Pos and -Neg wires leading from the back of the panel.



If you bought a complete panel w/ charge controller kit, follow the instructions on connecting the panel and charge controller. It will involve connecting the adapter cables to from the back of the panel into the charge controller INPUT. Then connect the second set of cables from the charge controller OUTPUT to the battery terminals. The panel kits come with pretty good instructions and it's not hard.

For a DIY rig, purchase the parts separately.

Go to your panel and find the +Pos and –Neg wires. Depending on your panel, you may need cable adapters. Run the +Pos and –Neg wires from the panel into the INPUT +Pos -Neg on the charge controller (labelled with a grid Panel icon).



Cut a length of your black and red 12v power wires about 10 feet (you can always shorten it later but best to start with a nice long piece).

Strip an inch of the coating from one end of the black and red wires, and crimp the wires onto gator clips. Label these Gator Clips with tape and Sharpee: PANEL TO BATTERY



http://www.metaldetectingworld.com/basic_electrical_wiring_p12.shtml

On the opposite end of the power wires, strip a half inch of insulation, twist the fibers, and connect the red and black to the +Pos -Neg OUTPUT slots of the Charge Controller. (The output slots labeled with a square Battery icon).



Clamp the gator clips labeled (PANEL TO BATTERY) onto the 12v battery terminals. Make sure everything is lined up Red = +Positive; Black = -Negative.

Flip your panel back over and let the sun hit it. The indicator lights on the charge controller should light up indicating the flow of energy.

Congratulations! You just made renewable energy.

5. Inverters

Chose the inverter that meets your needs (read above yo!).

The inverter comes with red and black cables and clips. Label these clips "INVERTER". I know we're labelling a lot but as we start adding more and more wires you'll see why.

Attach the included cables to the inverter (each inverter is a little different, read their instructions how and where to attach).

Clip the INVERTER clips to the battery terminals matching +Pos and -Neg.

So now you have 4 cables total and 2 attached to each battery terminal. Make sure they are secure.

On playa, you can use an upside-down crate over the battery station to keep it shaded and make sure drunks don't kick it or run over it.

The inverter is a sensitive piece of equipment. It has a built in fan, and needs to be kept out of the sun and dust with some fresh air circulating. You should consider customizing a plastic storage tub or crate to house all the cables and inverter. Something like these:



At the very least, make sure the inverter is in the shade and not sitting in a pile of dust.

6. Ready!

Now you can plug your electronic devices into the inverter. Some of the inverters have USB ports and regular AC outlets.

Just because it has an outlet does not mean you can plug anything you want into this! It has limitations and it won't run a microwave, massive sound system, etc. It will run LED lights, small

speakers, and it works well to charge phones and batteries. Understand that your rig has limitations.

7. Shut Down

Unclip the solar panel and put the towel back over it!

Unclip the inverter (or turn off via the remote) when not in use to preserve battery life.

Tell your campmates how to turn off the battery station when not in use!

8. Final Tips

Set up your whole system at home once before the burn. Make sure you know how it runs and connects. Label stuff. Make sure it works.

The items linked here all carry warranties so if something doesn't work, return it.

Start your week off with a fully-charged battery. Everything will run better if you start fresh. We linked to an inexpensive [little charger](#) that is a great help and it will prolong the life of your battery. Worth the investment.

9. Troubleshooting

Wipe down the solar panel every day with a rag to get rid of the dust! This is very important.

Inverter: The Playa-Tested inverters have auto-shutoff features that will turn off when the battery power gets too low. This is to prevent damaging the battery. If this happens, you have to wait for a sunny day. Unclip the inverter, make sure the solar panel and charge controller are connected properly and clipped to the battery. Let it sit in the sun for a day and recharge without any usage.

Turn stuff off when you leave camp. The inverter pulls a little power any time it is connected, so unclip the inverter when you're not using it. The \$85 model has a built in control switch to turn it off without unclipping (very nice).

If you end up running out of power, you can always re-charge the battery the old fashioned way: using a set of jumper cables (you should have this anyway, right?), attach to your vehicle battery and the Deep Cycle battery, and idle your vehicle for a few hours. This is inconvenient and less-than-ideal, but it's a suitable backup plan.

Inverter: Overheating: Your inverter beeps and shuts down. It is probably clogged with dust. Unclip it, blow the dust out of the fan, and put it in the shade to cool down for a few hours. Make sure your battery and inverter setup is in the shade and protected from dust drifts, and gets fresh air.

You may have a blown fuse. Each inverter has a different fuse setup, check the instructions.

You may have too many devices plugged into your inverter. Campmates may have tried to charge massive devices. Unplug everything and slap your campmates.

The playa has a way of making wires come undone. Flip the panel over (or cover with a towel), then trace all the wires and make sure everything is still well-attached and where it should be. Drunk campmates have a habit of knocking wires loose, then reattaching in the wrong location.

You can damage your nice new battery if you run it down too much. So don't leave things plugged into the inverter or running off the battery all night. Don't be a bug, unplug.

10. SWAMP COOLER INTEGRATION

The solar rig described here is ideal for the [swamp cooler](#).

If you built a swamp cooler, it will run better directly from the battery terminal (bypassing the inverter) so there's a special tutorial coming on that connection soon.