

CUCC EXPO Top Camp Solar Charging system 2024

The solar charging system uses two large solar panels to charge a large battery, storing energy for the evening when we generally want to actually use the energy.

The battery

The battery is a very heavy sealed lead acid leisure battery in a wooden crate.

BE CAREFUL - DO NOT DROP IT.

The battery contains very strong sulphuric acid and when carrying it out of storage if it splits and splashes on someone you may not have enough water to wash the acid off your skin.

For splashes quickly remove affected clothes and wash your skin with lots of water.

The Solar charge controller

Connecting the solar panels to the battery is the charge controller. In our case a MakeSkyBlue S3-30A MPPT. This takes the solar power and makes sure we do not cook the battery when it is sunny, or discharge the battery too much at night.

The solar charge controller is in the grey GRP plastic box, previously this has been stored in the upper left corner of the stone bridge, next to the steps.

The two 2m leads with car battery post connectors are for the battery. Connect the black lead first, to the – lead terminal. Then connect the red wire to the + terminal. (The order is not that important, in this case more convention) However connect up the battery before the solar panels.

If you have a voltage meter please read the battery voltage at this point and record it, or/and record the voltage displayed on the charge controller (Press the up and down arrows to display this). This is useful for determining how knackered the battery is, and then determining its future lifetime. Less than 11.5V is bad.



The charge controller box is new and has been calculated to naturally cool the charge controller without being open, however if the marketing department's efficiency claims are very wrong the controller may overheat when under high load. Like when first charging the battery after the winter. Please monitor it, no more than 50degC inside (This is nearly too hot to touch). If there is a thermal problem I will have to rethink the cooling...

The solar panels

There are two large heavy solar panels, both are connected together in parallel. I believe they were 500W each when new.

Remove the solar panels from their suspension storage rack carefully. The intention of hanging the panels is to reduce the change of them getting crushed if the cave fills with ice. (We know it fills with snow and gets buried.)

Install the solar panels on the flat slab of rock next to the stone bridge. Use the installed bolts to tie them down in case the wind moves and damages them. It is also reasonably important that they are not shadowed by anything. Be careful the front panel is glass, as should be obvious with the cracked one (It still works just much less efficiently).

Run the long cable with black connector, in through the Animal hole and plug it into the charge controller.

If it is daylight the charge controller should indicate that it is charging, the solar panels are quite large and the battery less so, so on a sunny day the battery charges in a few hours.

Connect up the Clear Boxes

You can then connect the two clear boxes, these distribute the battery power to a multitude of sockets. The red and black cables with the red plugs connect to the charge controller.



Previously the charging equipment lived in the brown plastic square boxes, this keeps the worst of the weather off electrickamy stuff.

Charging stuff,

There are lots of the lights on the clear boxes, if there are no lights there is probably no power. Everything is 12V, or USB.

Everyone has a mobile phone so there will not be enough USB chargers when you need to charge yours, get a high power car cigarette USB converter. (high power is 2A or more for USB)

The XH-W1411 are temperature controllers which are no longer used or connected up.

Inverters (Convert Solar to mains voltage)

Inverters convert the 12V battery voltage to 240VAC so that you can use UK mains equipment. These are very inefficient and every effort should be made to get 12V car chargers or USB chargers, they are cheap and available even for laptops.

The more important issue is top camp can be damp and even wet, mains voltage and water do not mix well. This could lead to someone getting an electric shock.

If you get a mains voltage electric shock you might be lucky, but if you're not you will need a defibrillator in the next few minutes, we do not have one of these at top camp.

This risk is easily avoidable by simply not using an inverter.

Packing the solar system away at the end of expo

The solar panels have in the past been put at the bottom of the pile, obviously this makes building a pile of all the other stuff easier because they are flat. This is how the glass front of the solar panel got smashed. Remember the whole area gets buried under meters of snow in the winter.

There is a hanging system which allows the solar panels to be suspended in the storage area. The intention is that nothing presses against them. It has worked for two years so far.

Please be careful carrying the solar panels, they are made of glass and fragile.

The flexible solar panels used at Garlic cave

These solar panels are fragile although they don't look it. Carefully roll them up and put them inside a large plastic drum. Fill the drum with light stuff like noodles and toilet rolls. It is pointy things which damage them.

The charge controller and distribution boxes

There is some silica gel in the drums at top camp, please collect this together and seal it in a Darren drum so it can be reused.

Put a bag of silica gel into each of the electronic boxes

Realistically the the boxes are too large to seal in a drum, this would be best however a second best option is making sure they do not get crushed too much, so put the electronics on the top of the pile of drums.

Disconnect the cables and coil up neatly.

Building the pile of stuff, in the past the storage area has still been full of snow and sheet ice, this partially buried the pile of stuff, putting the old tarps and air burst air mattresses over this pile greatly assisted in digging it all out.

Stuff still to do,

- Determine if the solar charge controller is actually 'not working properly' and remove the link on the big relay. Someone who has a meter and knows what they are doing needs to look at this. Be careful when using spanners in there it is easy to short something out! Disconnect the battery and the solar panels.
- Carrying cases for the solar panels, the supplied ones were not water resistant, we need two new ones. Preferable made of water resistant wood and then varnished.
- Build a second charge controller, as second battery and a second thinner solar panel cable. This will give us a second redundant power source. Perhaps consider a more expensive Lithium Ion Phosphate battery, the battery will cope better with the cold, however the build in electronics might not... We need to think hard.
- Make better sealed and smaller distribution boxes, There is not a lot to go wrong in these so it will happen but it is a low priority.