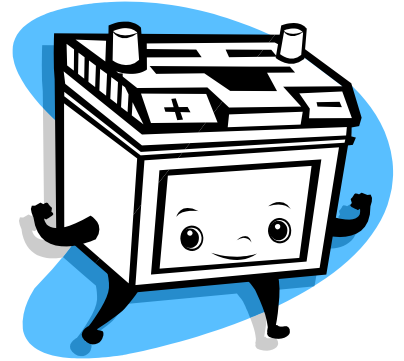


Powering a bat detector with 12 V external battery and solar

External battery with solar charge

C. Lausen

Battery storage



- Remember that the battery needs to be charged every few months, or kept on trickle charge. Batteries discharge slowly over time if they do not have a constant trickle from a wall charger or a solar charger.
- Remember that batteries kept in a low charge state for an extended period of time will usually be wrecked, and no longer take/keep a charge.

Battery storage

TAPED posts

- RED = positive (+)
- BLACK = negative (-)

If these posts touch, you will see sparks. This is something to avoid! So always keep the + and – poles/wires taped so that they don't touch.



TAPED ends

Testing Batteries

- A voltmeter is a handy tool! A 12 V battery is fully charged if it is reading a voltage of about 12.8 – 13.2 V. If it is much lower than 12.8 volts, the battery is weak. If it is close to 12V, or lower, the battery is dead. The lower a sealed lead-acid battery is drained, the more likely it will sustain damage.



Dead battery



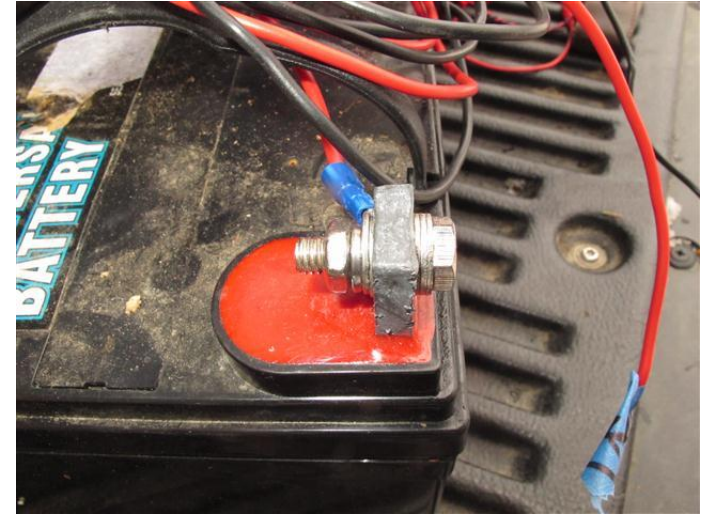
Charged battery

Wires from Batteries to Controller

Based on the shape of the posts, different wire ends are used:

‘donut’ hole types fit over nuts (top right)

‘sleeves’ fit over tab-posts (bottom right)



Charge controller basics

- LVD Charge controllers tend to cut off the 'load' at around 11.5 V so that the powered device can no longer draw from the battery. As long as there is solar charge, then the battery will be charged over time. Once the battery reaches 12.6 V, the power to the load will be reinstated.
- If however, you do not have the battery on solar charge, after the charge controller disconnects the load, it will continue to draw a small amount I the LED's that shine on the controller itself. Thus it is important that this battery be removed from the field and charged in a timely manner.
- I am using 2 basic types of charge controllers: Morningstar SunSaver (top right), and a 'no-name' brand that is basically the same thing (bottom right). The advantage to using the No Name (or older models of SunSaver) is that the charger has few LED lights. The more indicator lights it has, the more draw will continue on a battery after it is low. If there is solar charge into the battery, this is not big deal, but if there is not, then the battery has to be removed from the field sooner to prevent damage.
- You may also come across the old style Morningstar SunSaver (below).



Charge controller basics

- Notice these are both 10 Amp charge controllers. While Anabats can run on 6 AmpHour charge controllers, Sm2Bat detectors must have 10 Amp controllers. This is because the Sm2Bats, at start up can require a surge of power.
- Other than LEDs, notice that the No Name (bottom right) controller has a 'double tab' for flooded vs sealed batteries associated with the left-most screws (solar) vs. the Morningstar Sunsaver has this on the right-most, associated with the Load.
- Either way, as long as you are using Sealed Lead-Acid batteries (not flooded batteries -- the ones that can't be tipped) then you will use the 2 screws that right are next to each other. (see circles at right)



Hooking things together...

- With the new style Sunsafer, you can hook everything up in whatever order you'd like.
- With the old style Sunsafer (not pictured), and with the No Name brand charge controller (bottom right), follow the numbers to hook things up in the right order.
- Bottom line – if there are numbers showing what order to hook things up, follow them. Sometimes it won't matter, sometimes it will. Sometimes you can hook these things up in any order and not have any problems, but not always. If you have problems, always disconnect everything and start again, hooking them up in the right order.
- What order?
 1. Battery (black-, then red+)
 2. Solar panel (black-, then red/white+)
 3. Load (ie detector) (black-, then red+)



Hooking things together...

- Note the pictures!

Solar is the picture of the ***SUN*** (in Morningstar controller), and a 'grid' (in No Name controller).

Load (ie. Bat detector) is a picture of a ***Lightbulb*** on all controllers.

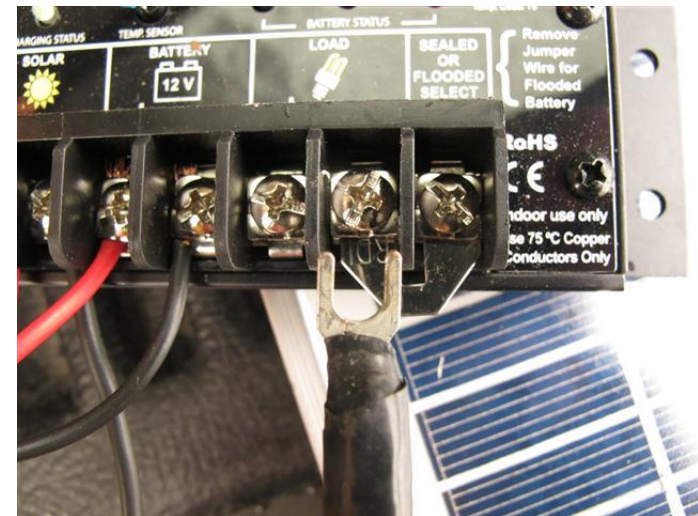


Hooking things together...

- Wires to hook into charge controller:

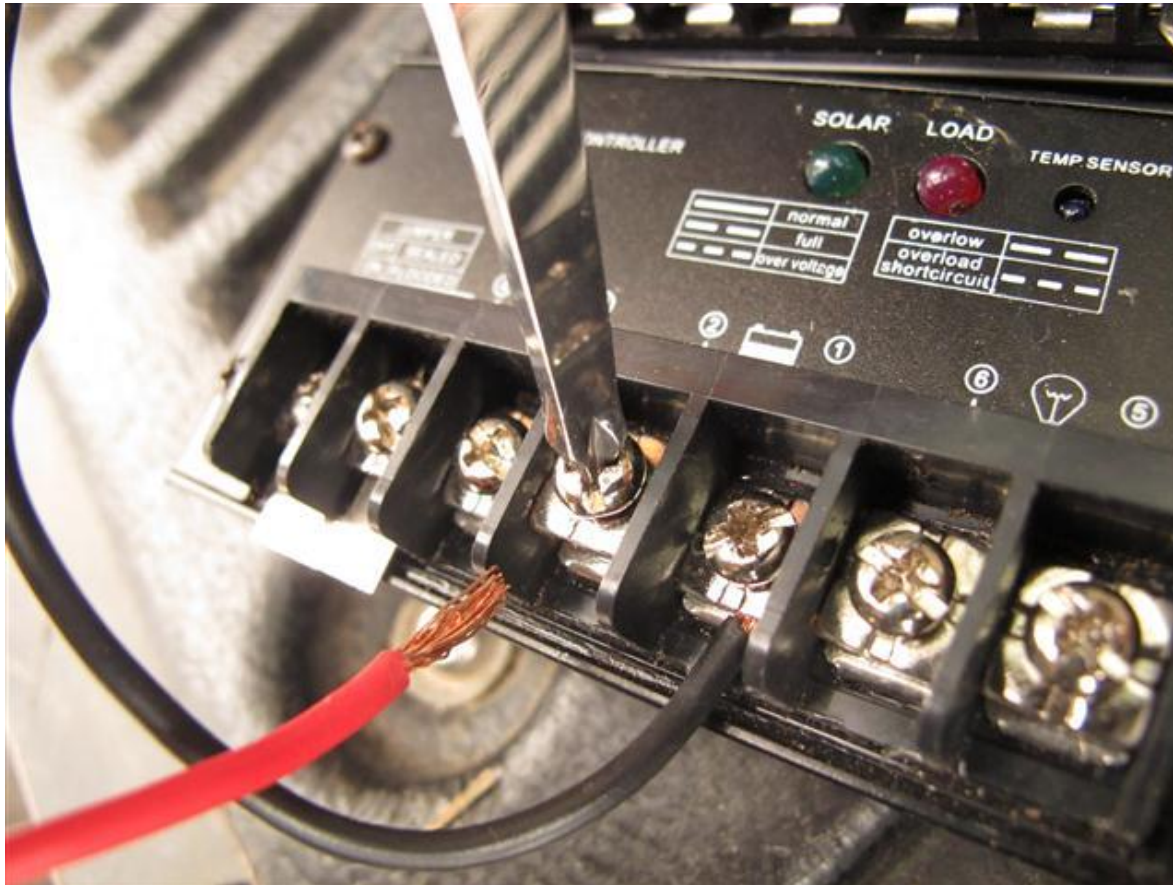
You really need none. A bared wire is all you need (top right).

However, in some cases there might be a “U-shaped” electrical end that can fit under the screws (bottom right). This fits nicer and likely makes better contact, but is one more ‘weak point’ should that connection loosen.



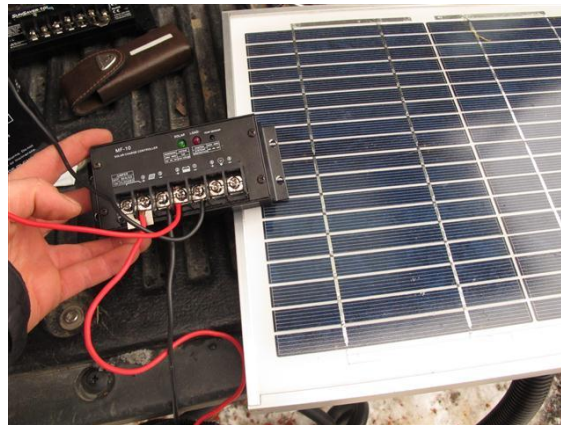
Hooking things together...

- Hook up the battery first. Neg. (black) then positive (red).



Hooking things together...

- Hook up the solar panel next (second step). Neg. (black) then positive (usually this is a white wire). If the solar panel has sun shining on it the **Green LED light will illuminate** to show the battery is receiving charge
 - and it doesn't take much – even at sunset there should be enough light
 - If this does not light up, check connections, make sure it is not dusk and thus too late for solar illumination, and check that the battery isn't completely charged (ie. 13 V or greater).

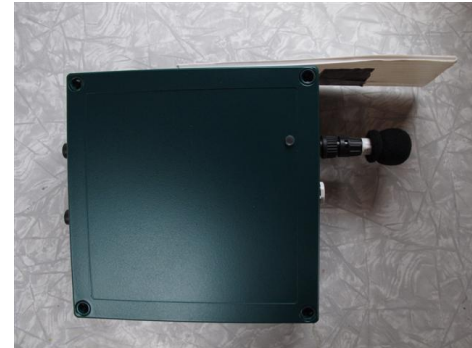


Side note about Solar Panels:

Like batteries, you need to tape the + and - wire ends so they don't come in contact with each other when the panel is exposed to sunlight. Some solar panels are equipped to not short circuit, but not all, so avoid the risk.

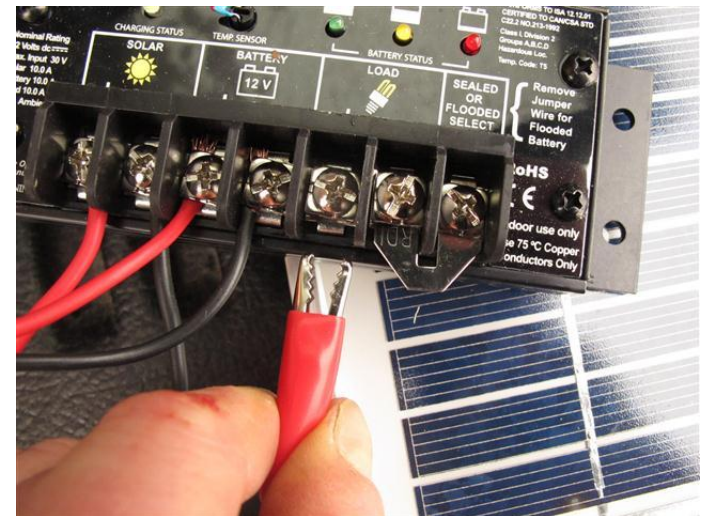
The final step... the LOAD

- If you are using a charge controller that is not numbered, you do not need to hook up the solar and battery in a particular order.
- However, it is STILL a very good idea to leave the LOAD (the bat detector) until the very last step. This is to avoid any potential surge of electricity or short circuit that may damage your detector, or blow a fuse.
- You can have the wires that lead to the detector attached to the charge controller at any time, but do not plug in the detector until the last step in the process.



The final step... the LOAD

- Alternate wires.
 - The load needs to attach to the charge controller. The easiest way is through bare wires.
 - If the load has small alligator clips though, then they can be attached under the screws. In fact, any wire (solar, battery) can be attached to the controller with alligator clips.



Red Lights

- A red light on these charge controllers indicates:
 - A battery that is dead.
 - A load disconnect. (ie. The power to the detector has been cut off).



In this case, you should replace the battery. If hooked to a solar panel the battery may eventually charge, but this will take a long time and will mean lost data, so it is best to replace the battery.

In this situation, it means that the solar panel was not able to keep up with the power demand of the detector. If possible, also add another solar panel to the system. For example if you have just one 10W panel attached to the controller, add another 10W for a total of 20W.

Alternatively you can just wire a 20W panel into the controller instead of the 20 W if you have such a panel available.

How to wire 2 solar panels into one charge controller?

It is simple! Just put the 2 positive wires under the + screw and the 2 negative wires under the – screw. In this way you will have 2 wires under each solar panel screw of the charge controller.

Increasing battery power

- If you'd like to have more battery power available to the detector, you can use more than one battery.
 - Eg., Two 12 AmpHour batteries wired together would provide 24 AmpHours of power.

This will let you run the detector for twice as long, but remember that this will require twice as long for solar to charge.

Increasing battery power

- If you double up your batteries, remember that they need to be of equal size.
 - E.g. a 12 AmpHour battery must be paired with another 12 AmpHour battery. You cannot pair a 12 AmpHour battery with a 32 AmpHour battery!
- How do you attach two batteries to the charge controller?
 - It is simple! Just put both sets of wires under the appropriate screw of the charge controller. This is what is called wiring 2 batteries in parallel. In this way the voltage remains at 12 V, but the amperage doubles.

Running 2 detectors off one charge controller?

- If you need to run 2 pieces of equipment off of one charge controller, no problem.
 - E.g. ZCAIM and AnabatII.
Each needs power to make a complete bat detector unit.



Just hook the 2 wires (one from each detector) to the charge controller, such that you have 2 wires under each of the + and – screws of the controller, as seen in photo.

A few other tidbits about solar panels

- These come generally with holes in the back of them, but with no real obvious way to mount them.
- You can get fancy, but it is not necessary.
- You can simply use wire and hose clamps to attach them to steel electrical conduit, or use Zip-ties (get the ones that are UV resistant).
- The 2 conduit can then be supported on the ground using some rebar pounded into the ground.
 - In the summer, you likely want to angle them so that the solar panel faces up off the horizon for better solar incidence.
 - In winter when the sun is low, keep them rather vertical as this will also keep the snow from building up on them.
 - Multiple small solar panels is generally better than one larger panel, as it is less likely to be stolen.

