



## What is a Voltage Regulator (aka Charge Controller) and why did we design one for our systems?

A voltage regulator is used to control the amount of voltage entering the battery. When too much voltage is going into a sealed lead acid (SLA) battery, the battery starts to produce get warm and bulge, and/or it “gasses off” through small valves near the battery poles (terminals). This destroys the battery life, and the sulfuric acid in the gas ruins the battery poles.

Our field experience showed us that the SLA batteries needed to be protected from the 22 to 24 volts coming off the 5 watt solar panel during maximum sunlight. Yet commercial charge controllers were too expensive and complicated for our purposes. We do not need “trickle charging” for these systems. Therefore, we designed an inexpensive regulator that would take a voltage of 24 volts coming off the panel and drop it to 13.8 volts (+/- 0.01v.)

Since using these regulators on our systems, we have not seen any more bulging batteries or damaged battery poles. The CSB batteries that we use have been lasting 4-5 years in the field.

Another bad experience we had in the field, during our earlier years when we were not using voltage regulators, was that some panels were hooked up in reverse to their batteries (ie. positive to negative, negative to positive). All of the batteries were “reverse charged” and destroyed. To prevent this problem, we incorporated a reverse polarity diode in the voltage regulator. Now, if someone connects the wires backwards, the battery will simply not charge. Over 3-4 days, if the people are using the lamps, the battery will run down and the lamps will not turn on. In that case, the technician can be called to go out, correct the situation, and get the battery charging properly again.

Note that the reverse polarity diode also prevents the theoretical problem of “back leakage” of current from the battery up towards the panel at night.

Add Your Light’s voltage regulators are inexpensive, and designed simply to suit the context of their use. The circuit board is “conformal-coated” (ie. sprayed with a plasticizing spray to waterproof it) and then is covered in a rubber heatshrink material.

