



## THE IMPORTANCE OF A GOOD SOLAR CONTROLLER

Maximizing efficiency means more onboard energy

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ore and more boaters in the Pacific Northwest are installing solar. Even a small solar array can be the perfect solution to add a few days at anchor or provide an extra day or two without running the generator. During the summer months, we have long days of sunshine that provide more than enough solar energy. Quite often, boaters wonder if their batteries can be overcharged by their solar panels? Or, if they can run the battery charger while the solar panels are charging the batteries? Or, even more common, can they run the engine (and alternator) while the solar array is recharging the batteries? Let's take a look at why choosing the right solar controller is so important.

Solar charge controllers are electronic devices that connect solar panels to batteries and regulate the voltage output of the solar panel array. For instance, some solar panels output 18 to 22-volt DC. Connecting those directly to a 12-volt DC battery bank would overcharge and damage the batteries. A solar controller ensures that the batteries are properly charged and yet not overcharged. A charge controller also makes sure that the solar panel is producing

the maximum amount of power for the given light conditions so that the panels will perform better. This is especially important for larger solar installations and low-light conditions. There are two types of solar charge controllers available, a Pulse Width Modulation (PWM) controller or a Maximum Power Point Tracking (MPPT) controller. A PWM controller applies short bursts of higher voltages; this type of charger has the effect of "cleaning" off unwanted buildup on the lead plates in the batteries, extending their life. However, the major downside of a PWM controller is its inefficiencies (i.e., 20 percent or more loss) at converting the solar panel's energy to a battery charging voltage. Another downside is that a PWM controller can also interfere with radio and television equipment as a result of the pulses that it creates.

The most popular type of charge controller and the only one we recommend is an MPPT controller, which is quite efficient (i.e., two to three percent loss) at solar power conversion. As its name suggests, the MPPT controller applies an appropriate resistance to obtain the maximum power output on the current/voltage curve for the sunshine available. Furthermore, many MPPT controllers can be customized to the exact charge curve: flooded lead acid, AGM or even lithium. MPPT controllers, unlike PWM, also allow a higher input voltage and will allow series connections for solar panels. We often recommend that clients who have older solar panels, which are permanently installed, try installing a newer MPPT controller before replacing the entire array. The controller technology has changed dramatically over the past few years, and many new controllers can get more energy from existing panels than the older PWM controllers. As well, newer MPPT controllers have an indicator light, either an LED or a digital meter to let you know they are working. Some MPPT controllers have an actual display on the controller or an option to



connect via Bluetooth to a smart device. If you are installing solar controllers with a battery monitor installed on the house batteries, remember to install the negative from the controller after the shunt (i.e., load side) and NOT directly to the batteries. Otherwise, you will be bypassing the battery monitor shunt, and therefore the solar amps will not be counted by the battery monitor. The next important step is to ensure that the solar controller is sized for the solar array's voltage and amps. The rule of thumb in sizing an MPPT controller is looking at the maximum wattage of the solar array and battery bank voltage.

Boaters often ask us if they should install a dedicated controller for each solar panel, or should they wire multiple panels in series to one single controller? In instances where the solar panels will encounter lots of varying shading (solar panels

installed on a dodger) we recommend a dedicated controller per panel to maximize the efficiency of the array. On my sailboat, each of the six solar panels has a dedicated solar controller. For boaters that have no shading issues, e.g., some biminis or a hardtop on powerboats, we will wire a few panels in series. When installing a solar panel, you need to install a solar controller so that the solar panel recharges the battery at the right battery voltage. When choosing a solar controller, make sure you choose an MPPT controller that is highly efficient so that most of the solar energy goes to the battery and is not lost in the controller (i.e., choose an MPPT controller and not a PWM controller). The positive and negative leads from the solar panel connect to the MPPT controller, and in turn, the controller connects to the battery positive and negative. Remember to always install a fuse on

any positive lead connected to a battery. Also, choose a controller that is tailored to your battery's chemistry and voltage (e.g., 12 or 24-volt DC, flooded lead acid, AGM or lithium).

Solar panels are useful to charge and maintain batteries in sunny conditions. They are a clean, renewable energy product since they don't use fuel. However, the amount of power they provide depends on the amount of light. Cloudy and short days will mean less power is available. As well, more power is delivered at midday when the sun is directly overhead than in the morning or late afternoon, so you will notice fluctuations in output throughout the day. A solar array is a perfect complement to boats in the Pacific Northwest. With long hours of sun in the summer and relatively low snowfall in the winter, solar panels offer another charging source for boaters. 

## GET EDUCATED NOT JUST INSURED

### When did you last read your insurance policy?

Your biggest decision was what boat to buy, your second most important decision should be your boat insurance. Don't be cavalier about your insurance, it's not "Just Insurance".

We are all guilty of getting our renewal, paying the invoice and then forgetting about the insurance until there is a claim, and then you hope there is coverage. When you buy insurance, you need to understand that what you pay is only part of the process. Not every boat insurance policy is the same, it is not Auto Insurance.

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