Silent Power

AM Solar helps to harness the sun and re-energize coach batteries

BILL & JAN MOELLER

Solar power is a great way to recharge your RV's batteries. Although we've had a solar-charging system for more than 15 years, we're always on the lookout for equipment that improves the charging process. Recently we had the opportunity to test two new products from AM Solar that certainly meet that criterion: the Heliotrope HPV-22 charge controller and the AM100 solar panel.

PHOTO: BILL & JAN MOELLER

AM 100 panel has more cells (44) and better hot-weather performance.

Time	10 a.m.	11 a.m.	Noon	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	Total Ampere/ Hours*
Panel Array Amperage	2.8 A	3.0 A	3.1 A	3.3 A	4.3 A	4.2 A	3.4 A	2.6 A	26.7 Ahs
Charging Amperage	3.7 A	4.4 A	4.6 A	4.8 A	5.5 A	5.3 A	4.2 A	3.2 A	35.7 Ahs
MPPT Amperage Difference	0.9 A	1.4 A	1.5 A	1.5 A	1.2 A	1.1 A	0.8 A	0.6 A	9.0 Ahs Daily Increase
MPPT Gain Percentage	32.1	46.6	48.3	45.4	27.9	26.1	23.5	23.0	34.1 Average Percentage

During the day, the sun rays hit the panel at varying angles so the amperage output of the panel was not continuously at its maximum.

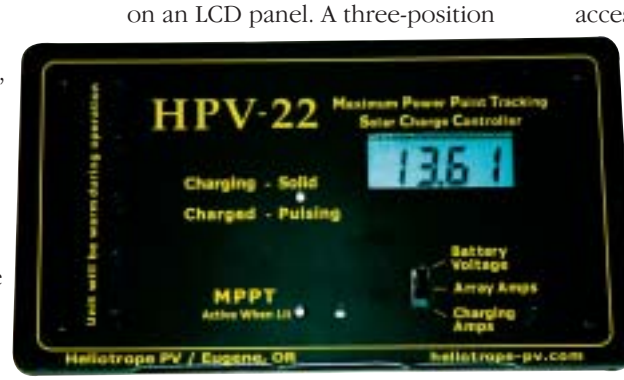
**Note: The total ampere/hours output from the actual charging amperage for the day was considerable for a single 100-watt panel; the average percentage of the MPPT gain also was impressive.*

HPV-22

The HPV-22 controller ($225 MSRP) provides a two-stage type of charge: a bulk stage of maximum amperage, plus an absorption stage which allows for a tapering of the amperage to give a full, gentle finish-charge. This is coupled with Maximum Power Point Tracking (MPPT) technology which, under certain conditions, can increase the amperage charge current by 25 to 50 percent or more.

Essentially, the controller senses and utilizes the wasted power to deliver more amperage to the discharged batteries. Once the controller determines peak power voltage, the panel operates at that voltage to provide the maximum charging amperage available. This action might be compared to that of an automatic transmission in a car that shifts to keep the engine at the best rpm. During the day, as lighting conditions change and affect the maximum power available, the HPV-22 adjusts many times a minute to keep the charging rate at the highest amperage output possible. This is called tracking the maximum power point. These current increases are highly variable and depend on the intensity of the light, the panel temperature and the discharged voltage level of the batteries. The colder the panel temperature and the greater the difference between the panel voltage and the battery voltage, the greater the boost, or gain, of the charging amperage.

The controller's readouts appear on an LCD panel. A three-position slider switch is used to select readings from the charging voltage, the amperage coming from the panel array and the total boosted amperage. A green LED is steadily lit when the system is charging; it blinks when the batteries reach a full charge. Another green LED is lit when the MPPT is active.



This controller monitors solar panel output, battery voltage and battery temperature to get the most out of available solar radiation.

An especially nice feature of the HPV-22 is the user's ability to adjust the MPPT for maximum amperage output from the front of the controller. Next to the MPPT LED is a small hole in the faceplate providing access to a trimmer (potentiometer) for making this adjustment. The only tool needed is a small jeweler's screwdriver, such as the type found in an eyeglass-repair kit. On many controllers, this trimmer access is on the back of the unit and the controller must be removed from its mounting before making adjustments. Once the MPPT is adjusted, however, it is not necessary to further fine-tune the trimmer unless you make changes to the equipment or wiring.

Other features include a battery-temperature sensor and an adjustable voltage set point. The temperature sensor allows the controller to adjust the voltage set point to compensate for battery temperature to prevent excessive water loss and sulfation. The voltage set point can be adjusted with a trimmer over a wide range of voltages to accommodate different battery types.

If you already have a controller, you may be able to replace it with an HPV-22 without incurring a new installation. The HPV-22, which measures 7.5 × 4.25 inches, is the same size as many other controllers; hence, it may fit into the same mounting. It also has the standard four-wire hookup, so connecting it should be easy. You'll

also have to hook up a few wires for the battery-temperature sensor.

AM100

The AM100 solar panel, meanwhile, contains 44 cells (as opposed to typical 36-cell panels); the larger number of cells means that the panel delivers a higher voltage than panels with a smaller number of cells. The AM100 panel ($500 MSRP, including mounting brackets) is rated at approximately 100 watts and has an open-circuit voltage of 27 volts; 36-cell panels, on the other hand, carry open-circuit voltage ratings of 21.0 volts or less. The difference is important: A higher-voltage panel will perform better in hot weather than will a panel with a lower voltage.

The AM100 panel has a rated voltage at maximum power of 21.5 volts and a rated ampere output at maximum power of 4.54 amps. Unlike many panels, the AM100 also has sizable terminals — the heavy-gauge wire needed to hook them up can easily be attached. The panel measures 21.125 × 57.25 inches.

On paper, the system sounds impressive. As we've all learned, though, not all technology translates well into real-world situations. Therefore, we ran a series of tests to find out how fast the controller charged the batteries and how well the controller adapted the higher voltage of the panel to produce a large MPPT amperage gain.

For the tests, we set the solar panel flat on a picnic table. The reason we laid it flat is because most RVers don't bother to adjust their panels so they are perpendicular to the sun's rays unless they are setting up camp for a long period of time. From the panel, we ran a short length of 10/2-gauge cable to the location of our existing solar controller (which we disconnected) and connected both the panel wiring and battery wiring to the HPV-22, which also was set on a table for the tests; we used boat cable because it has superior properties and is easy to work with.

The batteries used for the test were two Group 27 12-volt wet cells with the electrolyte level full, as it should be for any battery charging. After the batteries were given a full charge with a multi-stage charger, we discharged them until the reading on our amp-hour meter showed that they had been discharged 30 ampere-hours. We later found, however, that the single 100-watt panel could not recharge that many ampere-hours in a day because of the varying lighting conditions that existed throughout all the tests. Therefore, for subsequent tests, we discharged the batteries only 20 ampere-hours; the single panel adequately handled this amount of recharging.

Before starting the tests, it was

necessary to adjust the MPPT charge amperage to its maximum output. For the initial test, the controller showed an array reading of 4.1 amperes; after selecting the charge-ampere setting and adjusting the charge-amperage reading to its highest amperes, it showed 5.2 amperes — a 26 percent increase. During the adjusting, the outside temperature was 93°F and full sunlight was directly overhead. Since solar panels are far more efficient in cool rather than hot temperatures, this was a fairly good gain for the MPPT.

Later, during other tests, the reading on the array setting was 3.1 amperes, and 4.6 amperes on the charge-amperage setting, resulting in an impressive boost of 48.3 percent — the equivalent of adding the amperage output of another half-panel (see chart).

It is possible to have even higher gains because with readings taken on other occasions, one LCD readout showed a charge amperage as high as 6.6 amperes. The readings varied widely due to temperature and sunlight conditions. For the actual tests, we had several false starts because of changing weather conditions, but persistence paid off; we had one good day with clear skies from sunrise until the batteries were fully charged.

MPPT technology, which was developed by NASA, was quite an improvement to RV solar charging when it was introduced several years ago. The people at AM Solar have refined the technology so it provides even more amperage output than in the past — and designed the controller especially for RV use. The products can be purchased together in the SunRunner-MPPT System ($795 MSRP), which includes the HPV-22 Controller, AM100 Solar Panel and all necessary hardware, including mounting brackets, a combiner box, a wiring harness and fuses. Together, they demonstrate how solar charging can be better than ever. ▮

For More Info

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