Typical solar power system diagram

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The purpose of the information on this page to provide a basic understanding of the major components in a basic solar power system, and to help you identify and select the correct size components for your system.

The following diagram shows the major components in a typical basic solar power system.

The solar panel converts sunlight into DC electricity to charge the battery. This DC electricity is fed to the battery via a solar regulator which ensures the battery is charged properly and not damaged. DC appliances can be powered directly from the battery, but AC appliances require an inverter to convert the DC electricity into 240 Volt AC power. Some DC appliances can be connected to the regulator to take advantage of the Low Voltage Disconnect and protect your battery.

Solar panels are classified according to their rated power output in Watts. This rating is the amount of power the solar panel would be expected to produce in 1 peak sun hour. Different geographical locations receive different quantities of average peak sun hours per day. In Australia, the figures range from as low as 3 in Tasmania to over 6 in areas of QLD, NT and WA.

As an example, in areas of the Hunter Valley in NSW, the yearly average is around 5.6. The monthly figures for this area range from below 4.0 in June to above 6.5 in December. This means that an 80W solar panel would ideally produce around 320W per day in June and around 520W per day in December, but based on the average figure of 5.6, it would produce a yearly average of around 450W per day....withouttaking losses into account.

Solar panels can be wired in series or in parallel to increase voltage or current respectively. The rated terminal voltage of a 12 Voltsolar panel is usually around 17.0 Volts, but through the use of a regulator, this voltage is reduced to around 13 to 15 Volts as required for battery charging.

Solar panel output is affected by the cell operating temperature. Panels are rated at a nominal temperature of 25 degrees Celcius. The output of a typical solar panel can be expected to vary by 2.5% for every 5 degrees variation in temperature. As the temperature increases, the output decreases. With this in mind, it is worth noting that, if the panels are very cool due to cloud cover, and the sun bursts through the cloud, it is possible to exceed the rated output of the panel. Keep this in mind when sizing your solar regulator.

The purpose of solar regulators, or charge controllers as they are also called, is to regulate the current from the solar panels to prevent the batteries from overcharging. Overcharging causes gassing and loss of electrolyte resulting in damage to the batteries.

A solar regulator is used to sense when the batteries are fully charged and to stop, or decrease, the amount of current flowing to the battery.

Most solar regulators also include a Low Voltage Disconnect feature, which will switch off the supply to the load if the battery voltage falls below the cut-off voltage. This prevents the battery from permanent damage and reduced life expectancy.

A solar regulator also prevents the battery from backfeeding into the solar panel at night and, hence, flattening the battery.

Solar regulators are rated by the amount of current they can receive from the solar panels.

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