



Solar Panels for Recreation and Small-Scale Installations.  
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## Deep Cycle Battery Charging.

### Battery Charging Do's and Don'ts / Lead Acid Batteries.



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IMPORTANT – Ensure the correct Personal Protection Equipment is used whenever handling, using or charging Lead Acid Batteries. Staff that perform battery charging or testing MUST have completed the charging and safety training and have undertaken the competency test.

#### Why is charging correctly so important?

To maximise the life and performance of batteries and get the best possible life span and the most optimised performance.

This information will help to achieve that, and will enable the battery to deliver the best value for money.

#### General Charging Advice - Do's

- Batteries will self-discharge over a period of months even without a load. Many GEL, AGM and Calcium's are better than regular lead-acid batteries but even so you should charge them back up regularly, or better still use a trickle charger (or solar panel) to keep them in top condition and extend their life.
- Use the right charger for the battery Chemistry e.g., GEL cells require a lower charging voltage, while Calcium cells need a much higher "stratification" charge from time to time. Ideally use a charger with temperature compensation and a temperature sensor which can be attached to the batteries being charged.
- Make sure your charging current is big enough to cope (the rule of thumb is 10% of the amp-hour rating of the battery / battery bank as a minimum: i.e., a 10A charger for a 100Amp-Hour battery).
- Automatic, multi-stage chargers are worth using to extend battery life. Most Vehicle alternators, especially in modern ISS vehicles will never properly and fully charge up a battery so

invest in a good charger or a solar arrangement with a charge controller/regulator with at least a three-stage charging control (many chargers are now 6 or 7 stage affairs).

- In an automatic 3 stage charger typically you get Bulk, Absorption & Float phases.
- Bulk charging puts in the rated maximum current while maintaining a constant voltage.
- Absorption charging then "tops up" the battery to 100% with a constant (elevated) voltage while monitoring the reducing current.
- When the battery is fully charged Float Mode is a reduced voltage which avoids overcharging the battery but just maintains the battery in a non-sulphating state.
  - Some chargers periodically also "trickle" or pulse current into the battery to counter self-discharge.

### **General Discharging info**

- Don't flatten the battery, as you may strip active material off the battery plates. Deep Cycle does not mean "100% Discharge", and flattening drastically reduces their useful life (i.e you'll get 3 - 10 times fewer cycles from the battery than if you only discharged to the 50% level).
- A rule of thumb is to recharge when there is 40% - 50% or more capacity left in the battery.
- You can estimate the battery charge level by first taking any surface charge off the plates (e.g., switch on any load for 20sec) then disconnect any chargers. Measure the voltage across the battery terminals. For a guide, at normal temperatures:
  1. Standard lead-acid battery: 12.6V = 100% charged (For AGM or GEL battery: 12.8V = 100%)
  2. For all types 10.5 = 0% (i.e., battery fully discharged)
  3. Always try to keep above 12 Volts minimum (=20% capacity approximately when battery is not loaded).
- If you do flatten the battery, get it back onto charge as soon as possible to avoid sulphation.

### **Use the Right Charger**

- The rule of thumb is 10% of the amp-hour rating of the battery / battery bank as a minimum: i.e., a 10A charger for a 100Amp-Hour battery).
- Flooded batteries often cannot accept high currents for sustained periods and using too large a charger can damage them (strip the plates and boil off the acid!).
- Good quality AGM and GEL batteries can often accept much higher currents for rapid charging but they can often be charged in an hour or so if the right charger is available and battery temperature is monitored.
- Ideally check the specification sheet for the battery and use the correct settings (AGM/GEL/Flooded) which will set up the Bulk, Absorption and Float voltages appropriately.
- Ideally monitor the battery temperature. Warm is ok, hot is not!
- Most GEL batteries need 14.2V maximum for bulk charge.
- Most AGM batteries and flooded are ok up to 14.4 - 14.6V
- Calcium batteries can require 16V for short periods.
- All should be maintained at a lower "float" voltage (13.1V typical). Keeping them at levels above this can over-charge them.

## Topping up Levels

- "Flooded" or Wet Lead-Acid batteries have removeable caps on the cell tops to allow topping up with distilled water as required.
- Keep the plates covered in electrolyte at all times!
- The impurities in tap-water etc do not help the battery, but may be better than nothing in an emergency, and do not top up with battery acid. Battery acid is only used when the battery is first filled.
- Sealed batteries (AGM AND Gel) are sealed at the top, and thus won't leak acid when tipped over or give off gas while charging under normal conditions.
- Note some Sealed "Maintenance Free" types still use wet electrolyte, but simply have a sealed top. Their performance is similar to standard "Flooded" lead-acid batteries however they can't be topped up with water.
- The little "magic-eye" indicators can often be useful, but remember they only tell you the condition of 1 cell (out of 6) so don't completely rely on them.

REMEMBER – SAFETY FIRST!!

Lead Acid Batteries that are being charged except sealed (AGM and Gel) generate very flammable and explosive gasses ensure that no flammable materials are nearby and ensure no sparking occurs. Chargers MUST be turned off during connecting or disconnecting leads.

### **Acknowledgements: Federal Batteries.**

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## How to extend a UPS battery life

If you have a UPS set up in the home, chances are that you want to extend the battery life for as long and possible and here's how.



The majority of UPS systems on the market at the moment are those that do not run on a lithium-ion battery and because of this, they have a limited lifespan on the battery that these systems rely on. Not only does constant load shedding put a drain on the battery but also the fact that we experience so many breaks in power throughout the day. Before the UPS battery has time to fully charge, the unit switches on again due to load shedding.

This constant drain soon results in the battery charge decreasing until it eventually holds no charge whatsoever.

So, how do you extend the life of a battery for a UPS?

## **What is a UPS?**

A UPS, or Uninterrupted Power Supply, operates on a battery that stores electricity for use when the power goes out. The UPS unit charges the battery when there is electrical supply, and this is then dispensed to selected appliances to keep them running when the power is off.

There are all different brands and models of UPS available locally and your decision on what to buy should be based on the wattage you need to run devices such as a router, laptop, low-wattage lights, TV, or any other small appliance.

## **Locate the UPS in a cool, dry place.**

No matter what battery your UPS uses, any battery needs to operate within the optimal temperature range. For NiCAD (nickel-cadmium) this is around 15 to 35°C while for lead acid it is 20 to 25°C. Lead-acid batteries are more temperamental than others and any rise in temperature can affect the life of the battery cells resulting in the ability to charge. Setting up the UPS in a cool area that is free from direct sunlight will work towards extending the lifespan of the battery.

Air circulation is also important for extending battery life. Airflow will help towards keeping a constant temperature and will prevent any overheating.

Ensure plenty of space around the battery or UPS unit when in use.

## **Switch off when you don't need it.**

Battery manufacturers will often state how many 'cycles' a battery will last or, how many times a battery can be charged and discharged.

Keep in mind that every battery, no matter the type, will eventually fail.

The only way to extend the life of a battery is to use it less.

Lithium-ion batteries have the longest lifespan due in the main to the fact that these batteries do not have what is known as the 'memory effect' which essentially means that they can be charged and discharged far more often than other battery types.

With our load shedding being so frequent - sometimes up to 3 to 4 times a day, the best method is to select those times when power is essential and then disconnect the UPS from the power source.

You will be without some appliances for a time, but this will extend the life of the battery. For those working and with children, the best would be to have power in the mornings for breakfast, disconnect the UPS and connect again for loading shedding in the early evening.

## **Reduce the load**

### **• Lighting**

Wherever possible, invest in power-saving devices that will reduce the load on the UPS system.

Chargeable light bulbs last up to 3 hours on charge and will provide instant light when the power goes out. LED lights have the least wattage and put out the brightest amount of light, so changing out the lighting in your home will cut down on wattage requirements.

### **• Cooking**

Check the wattage on essential appliances such as a microwave, kettle, or toaster. The lower the wattage on these the better the chance of being able to run them on a higher capacity UPS.

