

An Introduction to Battery Chargers

With the proliferation of multiple battery banks, exotic battery technologies and ever larger battery capacities, careful recharging is essential to maximise battery run times and longevity. Conventional battery charges (including alternators and other charging devices) produce a fixed voltage output. As batteries recharge, current reduces steadily. This method of charging will never fully recharge a deep cycle or specialist battery type. These battery chargers provide a 4 Stage Charge. The 4 Stage Technique ensures rapid, safe and full recharging- typically, a 4 stage charger will out-perform a conventional unit three times its output rating.

Stage 1: Bulk Charging

Voltage steadily increases to around 14.8V (dependent on settings). This allows the charger to develop its full output continuously. This brings batteries up to 80% very quickly (useful if charge time is limited (e.g. vehicles on standby or if running the charger from a generator))

Stage 2: Absorption Charging

When the batteries have reached 80%, the charger drops into Absorption Mode. During this phase the voltage is held high (but very carefully controlled) to just below the battery's gassing voltage. This stirs up electrolyte and reverses the damaging effects of sulphation. Absorption Charging returns the battery to 100% charged.

Stage 3: Float Charging

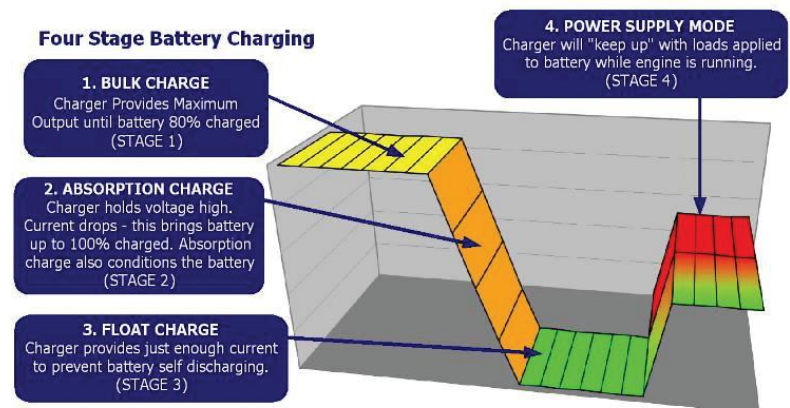
The charger then drops output voltage to around 13.2V (depending on settings). This maintains batteries in top condition. These equipment chargers are designed to be left for very long periods of time (months)

without any supervision- perfect for leaving vehicles on standby, emergency battery pack for charging and for boats left in the marina over the winter season.

Stage 4: Power Supply Mode

Conventional chargers are not able to "keep up" with loads being drawn from the battery while charging. This means that you could be discharging batteries, even though the charger is running at its maximum output. These equipment chargers aren't affected by this- their specialist Power Supply Mode allows the charger to develop up to their maximum output continuously. This means you can run lights, fridges, communication equipment etc 24 hours a day, 365 days a year. No additional wiring is needed. Imagine the battery as a water tank, if you pull say, 10 litres an

them. Most 3 and 4 Stage Battery Chargers use a basic method of calculating when to switch between Bulk/Absorption/Float modes. This is based on a simple voltage measurement and then running each charge mode for a set period of time. This means that they will provide around 3 hours of bulk charge as soon as they are plugged in, and then around 8 hours of absorption charging. This means that overcharging can be a problem, especially if the charger could be switched on/off half way through charging. Power chargers use software driven programme to calculate when each charge mode can be entered. No timer is involved, meaning that the unit can be safely turned on/off regardless of the battery state. It will prevent over/undercharging and makes



hour from it, our charger would add 10 litres an hour to the tank. Net result is that the tank of water stays full.

Timed VS Adaptive Charging

Multi Stage charging has been around for many years now and is widely available. Without doubt, it's the best method of charging. However, there are some drawbacks. But these chargers are designed to overcome

battery banks last longer. This method of charging is known as Adaptive Charging.

Other Battery Considerations

Batteries and the way they charge is dependent on many factors, including how they are connected in a system, their chemistry, temperature etc. All Power Chargers can provide power for up to 3 independent banks. Importantly, the charger will not allow

to flow from one battery bank to the other during discharge. Most mobile applications use either (or a mix of), standard lead/acid, sealed lead/acid, Gel and AGM batteries. It's important that you set the charger to the right battery type to ensure that correct charging voltage is delivered. Damage can occur if you charge a Gel battery at Lead/Acid voltages.

Temperature is a consideration to most users. A hot lead/acid battery should be charged at a maximum of 14.1V, a cold one at 14.8V. This is enough of a difference to cause overcharge in summer and undercharge in winter. Where temperature is likely to be an issue, we recommend using a temperature sensor.

Sizing a Charger

A good rule of thumb is to size the charger's output to 10% of the total battery capacity. This fits well for timer based chargers. For Adaptive Chargers, we recommend working out the required recharge time and then sizing the charger appropriately to your needs. Use the following calculation:

Take the battery capacity and divide by 2 (as batteries should only ever be discharged to 50% of their capacity). This gives a total number of Amp hours to be replaced. Then take 80% of that figure-divide that by the output of the charger you want to use to provide a recharge time to 80%. The final 20% of charge takes approximately half the time of the first 80%.

Example:

250 Ah battery bank. Divide by 2= 125Ah, 80%= 100Ah. A 20A charger would take 5 hours to get to 80%, and then 2.5 hours to 100% (total 7.5 hours). You should also ensure that the charger output is higher than any loading you may want to also run during charge.

Recommendations for Power Chargers

Battery Bank Size	Load Size	Charger Size	Approx Recharge Time*
100 Ah	5A	20 amps	3 hours
150 Ah	10A	20 amps	4.5 hours
200 Ah	10A	20 amps	6 hours
250 Ah	20A	40 amps	3.75 hours
300 Ah	20A	40 amps	4.5 hours
400 Ah	20A	40 amps	6 hours
500 Ah	30A	60 amps	5 hours
600 Ah	40A	60 amps	6 hours
700 Ah	40A	60 amps	7 hours
800 Ah	40A	60 amps	8 hours
900 Ah	40A	60 amps	9 hours
1000 Ah	50A	60 amps	10 hours

*assuming no loads being run at the same time as charging

Typical Installations

The following guide gives a rough guide to our recommendations of which Power Charger to specify:

Application	Battery Size	Load Size	Charger
Small Van	100Ah	5A	M-Power 20
Motorhome	150Ah	15A	M-Power 20
30' boat	200Ah	10A	M-Power 20
40' Boat	300Ah	12A	M-Power 40
50' Boat	500Ah	18A	M-Power 60
Ambulance	250Ah	25A	M-Power 60