THE POWER PEOPLE

Battery Charger Fact Sheet

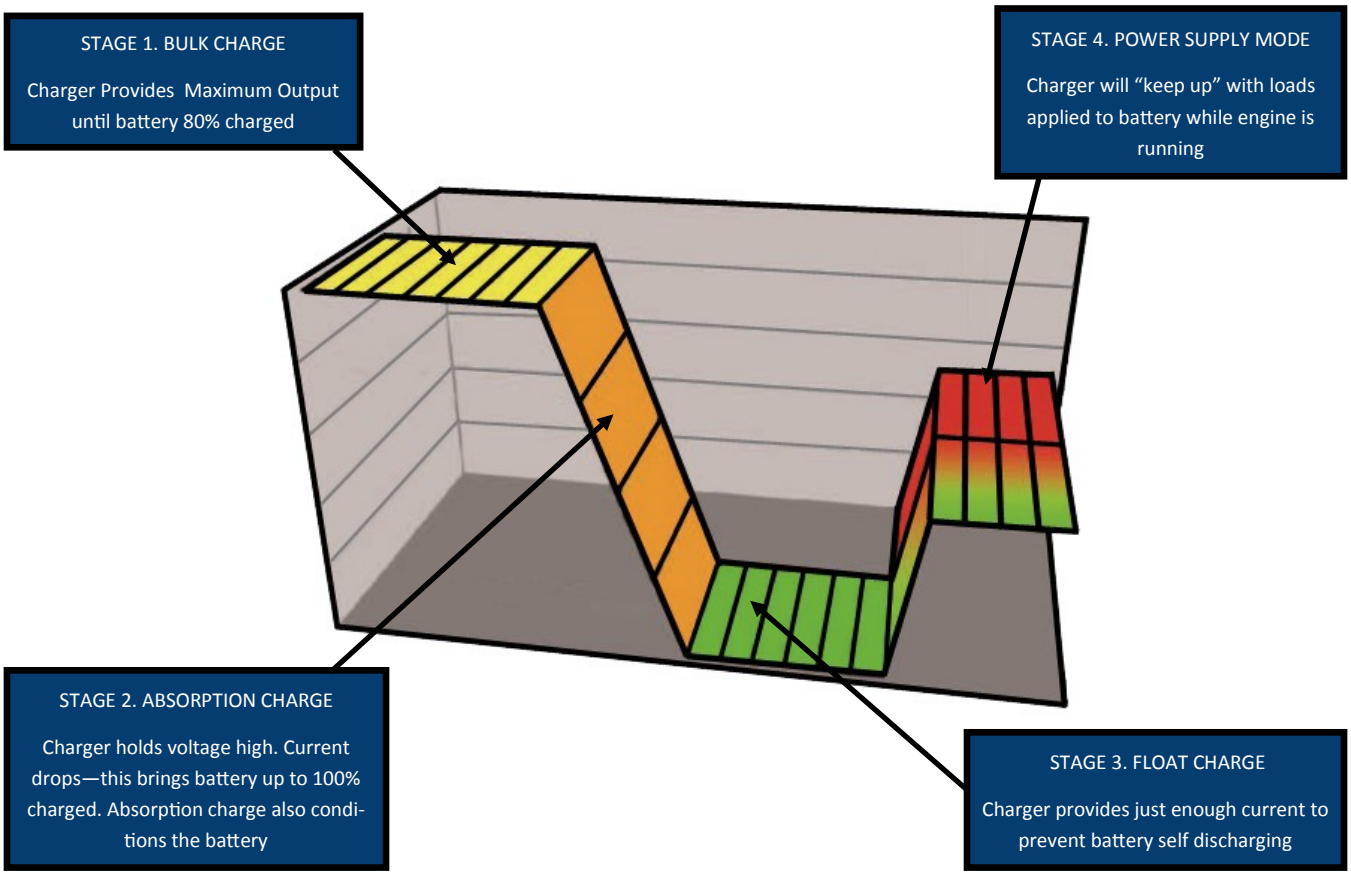
Why do I need a multistage battery charger?

Multi-stage battery chargers are a key part to any modern power system. Charging large or specialist battery types while at the same time 'keeping up' with onboard loads (while vehicles/boats are plugged in) is a complex and commonly misunderstood requirement.

Multi-stage chargers are becoming commonplace. However, there is a huge difference between an 'off the shelf' unit you can buy in your local car parts store and a highly advanced battery charger. Conventional single stage and 'off the shelf multistage units lack the regulation, charging method and adjustability required for complex and larger installations – damage to batteries and compromising of vehicle/boat reliability is often the result.

4 Stage Battery Charging

4 Stage charging is the Industry Accepted 'Best Practice' for charging. Conventional car chargers will only replenish up to 80% of battery capacity and take a long time to do so. Furthermore, problems like battery sulphation and electrolyte stratification are not rectified which results in deterioration of heavily cycled batteries.



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Adaptive Battery Charging

While 4 stage charging reduces charge time, conditions the batteries and brings batteries to 100% recharged, if executed poorly, it can introduce other problems.

Some chargers provide 4 stage charging on a timed basis where the charger will develop a Bulk/Absorption/Float charge for a fixed period of time (typically 6/8/Continuous basis for each stage respectively). But what happens if the battery isn't fully flat (and doesn't need say 40A continuously for 6 hours)? The answer is overcharged batteries. This is exacerbated if AC power to the vehicle/boat is temporarily disconnected because the charger reverts back to the start when power is reconnected. Some chargers try to overcome this by testing batteries and will 'jump' to the most appropriate mode; This will prevent most overcharge problems, but only if the charger is carefully and accurately sized.

Fully Adaptive Chargers have the ability to jump between modes and vary the time that it is in each mode for. This prevents any over/under charge problems and also allows you to significantly reduce charge time (by increasing the size of the charger) without worry of overcharge. Quality Adaptive chargers also don't get fooled between a very flat battery or an intermittent high load (for an intermittent high load, its desirable for the charger to stay in Power Supply mode and not jump back to Bulk/Absorption).

Simultaneous Charging Of Multiple Batteries

The majority of boats and vehicles have multiple battery banks. Many battery chargers are available with 2 or 3 separate outputs. Some thought and consideration is required to ensure that batteries are charged correctly and again are not subjected to incorrect charge voltages etc.

Diode Type Outputs: Most chargers use a 'blocking diode' type arrangement to split charge between two or three independent battery banks. The amount of current that flows to each is governed by the battery's internal resistance. If using a charger in conjunction with a very large auxiliary battery bank and a very small engine start battery, the engine battery will charge very quickly. Once charged it needs a low float voltage – if the auxiliary continues to charge at bulk current and voltage for say, 8 hours, the engine battery will be overcharged. If this is the case (and you already own the charger), it may make sense to only use one of the charger's outputs (direct to the auxiliary battery) and use your existing split charging system to administer charging of smaller banks (like a VSR or Merlin SmartBank).

Consider also that if using different types of batteries (most installations use a standard lead/acid for the engine/chassis and gel/AGM for auxiliary) you must set the charge voltage lower to prevent overcharge of the gel/AGM battery. This means that the chassis battery gets a lower voltage than it really needs to fully recharge.

Slave Outputs: To overcome the issues with Diode type outputs, some chargers have a Main and Secondary output. The first output will provide 100% of the charger's output, full regulation etc. The secondary 'slave' output is usually limited to a few amps. Suitable for basic installations but are limited where simultaneous charging of multiple larger batteries is needed (again, consider using the Split Charge System to administer the charge)

Prioritised Charging: Prioritised charging is a new feature that simultaneously charges all batteries or charges them in order of priority. Certain units allow you to limit current, set temperature and limit voltage. This overcomes the main problems with charging multiple battery banks at the same time (preventing overcharging of smaller batteries and also using different chemistries on different outputs).

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Chemistry & Temperature Adjustment

A cold standard lead/acid battery requires an Absorption charge voltage of 14.8V. An AGM battery requires 14.2V. When hot these batteries need 14.0V and 13.8V respectively. It doesn't sound like much but it's the difference between batteries lasting for years and not. Batteries are expensive items – avoid costly replacement by selecting a charger with both temperature and battery type adjustment. Prioritised charging outputs (if fitted) allow independent temperature selection for different batteries (useful if you have batteries located in a hot engine room and a cold exterior locker).

AC Ripple, PFC, Universal Input And Other Considerations

AC ripple refers to any ripples of Alternating Current finding its way into your DC system. High AC ripple (usually from low cost power converters inside chargers) shortens battery life, increases interference on radios, GPS etc and can affect the performance of electronic items.

Power Factor Correction (PFC) reduces the amount of AC power that your charger requires. A 40A charger with and without PFC will draw ~600 watts and ~1200 watts respectively – an important consideration if you hope to run off a small portable generator or keep electricity bills down.

If running from a generator or marina, check the input power requirements of the charger and think about what happens if the AC voltage drops by 25% (this is not uncommon on generators under load or at the end of a long pontoon berth). Some chargers will reduce their charging output, others may stop working altogether. A large input voltage window is an important feature. If cruising overseas or if your vehicle needs to plug into workshop supplies (110V), you may need a Universal Input Charger which works at both 110V and 230V input.

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