



**Batteries are an integral part of a generator set.** Starter batteries are used to crank most emergency generator sets. The prime mover uses either a 12- or 24- volt starter motor. **Battery failure is one of the most common reasons emergency generator sets fail to start.**

Gen sets with engine mounted alternators cannot be relied upon to recharge batteries in standby situations. **Charging systems must be used to maintain batteries** while the unit is on standby, and fully recharge batteries if gen set cycle times are short.

**Battery System**

The main role of an emergency generator batteries is to provide power to the generator engine starter with power when a facility power outage occurs. Depending on the configuration of the generator system setup, batteries can also provide:

- Power to the digital control panel.
- During generator operation, battery power can provide power to ancillary panes, small motors that operate on DC current and any DC supplied device within the enclosure.
- If a secondary or redundant battery set is used in an enclosure, the primary battery source can provide backup power to the secondary or redundant set.
- Automatic louvers and vents are powered by an AC source. When the system automatic transfer switch allows power to the grid, power is routed to vents and louvers.

There are two types of batteries available:

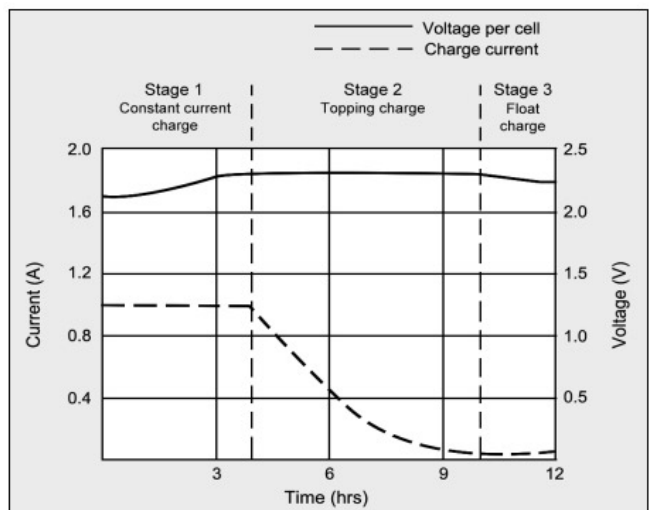
- **Maintenance Free** – Often referred to as a sealed battery. Cannot add electrolyte or check specific gravity of battery.
- **Conventional** – Cells have individual caps for filling and testing electrolyte.

**Generator sets are most commonly supplied with lead-acid batteries.** They are more economical, have lower self discharge and are rugged. Nickel cadmium batteries are chosen for longer life, a high discharge rate, faster charge rate and when there is an extended temperature range. Both have three stages of charge from discharged state to maintenance of charge in a fully charged battery. (See Diagram 1 for a lead acid battery)

**First Stage Constant Current** - For a discharged battery, the charger applies a higher current and charges the battery to 70% of full charge.

**Second Stage Topping Charge** - After reaching 70% of capacity, the charger switches to topping charge mode to bring the battery to 100% of charge.

**Third Stage Float Charge** - Both lead-acid and NiCad batteries will self discharge over time, with NiCad discharging the fastest. Float charge is applied when the battery is fully charged. Just enough current and voltage is applied to maintain the battery in a fully charged condition without excessively charging the battery. Float charge can be supplied for an unlimited time.



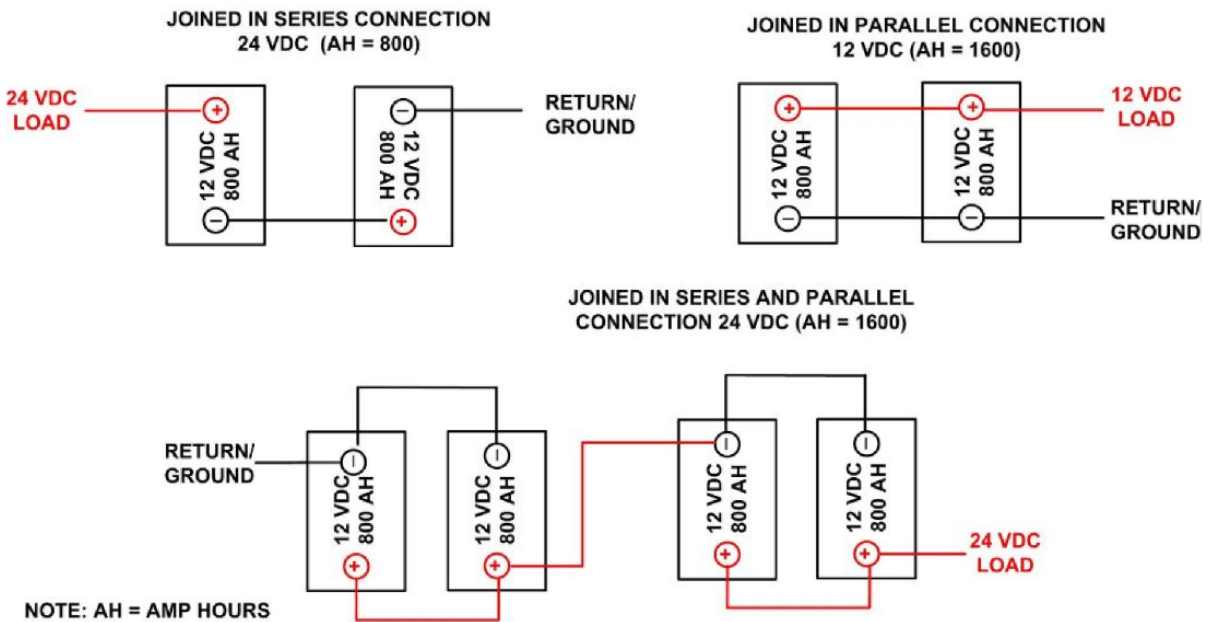
**Stage 1**  
Voltage rises at constant current

**Stage 2**  
Voltage peaks, current decreases

**Stage 3**  
Float charge compensates for self-discharge. Voltage is lowered



The size of the battery is dictated by generator size and configuration the battery is connected in. Two or more 12 VDC (depending on current requirements) are connected in a series. Smaller configurations require 12 VDC and can use one or more batteries. If a second set of batteries are require they are connected in parallel. For common battery connection configurations, refer to figure below.



Many things contribute to **maximizing the life span of a battery**. Below is a list to consider when purchasing and maintaining the battery:

- Purchase the correct size battery for the application.
- When determining battery, consider application the battery is used for.
- Maintain the battery, steps to include:
  - o Maintain a log of purchase date, determines when battery lifespan is approaching end.
  - o Check specific gravity of electrolyte for each cell (must be to manufacturer specification).
  - o Add appropriate mixture of electrolyte and distilled water to reach manufacturer specification.
- Monitor battery according to manufacturer guidelines, including:
  - o **Insure a trickle charge is available at all times.**
  - o Test battery voltage with a multimeter at appropriate intervals.
  - o Perform load test on battery at appropriate intervals.

When maintained properly the common lifespan of a quality battery can be up to three years or 32-5 depending on usage, charging setup and application.



**Battery Charger**

Whatever the battery used, achieving a full charge and maximum battery life requires the charger to be able to transition through the three stages of charge.

**An automatic battery charger is the preferred type of charger** - An auto-charger can be supplied as a part of control panel or even installed in the transfer switch. 12V and 24V static automatic battery chargers operate from the AC utility supply. Automatic float/equalizer type systems are strongly recommended for the most reliable and consistent performance. The multistage charger will automatically switch among the three stages of charge to maximize charge time and keep the battery fully charged.

**Equalize Charge for Reconditioning a Battery**, After the top off stage, the battery cell voltage will be at the float level, (2.28 volts for a lead-acid). A higher equalize voltage at 2.43 volts is used to restore all the plates to an equal voltage. If the auto charger detects float voltage has fallen below the required level it will switch to equalize charge. Temporarily elevating charging voltage above the normal float voltage for equalization is acceptable for short periods if the battery has sufficient electrolyte.

**Recharging a Discharged Battery**, a drained battery should be recharged as soon as possible. When a battery remains in a uncharged state, the plates are subject to sulfating buildup, which will degrade performance and longevity. If the battery remains uncharged too long, it can become damaged beyond repair.

***Battery charger  
is a standard  
accessory of an  
AKSA Genset.***



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