

## CHARGING A BATTERY

A battery will only make use of recharging current at a level which depends closely on the amount of recharge it needs. Current passed through a battery in excess of the value it can use will do nothing to speed up the recharge and will be wasted in creating heat and in gas generation. Rising battery temperature and vigorous gassing are clear indications of excessive charging currents which, if applied too long, will reduce battery life.

Constant current charges should not be used to deliver current to a battery at a rate above 1% of the Cold Crank Rating, unless you plan to deliberately step down the current to this value (or less) whenever the battery starts to gas vigorously. Usually, these constant current chargers are not built to provide the high currents which a discharged battery can absorb initially and so, recharging cannot be completed in the minimum time.

Other chargers, constant voltage or taper chargers, will progressively reduce the charge current rate as a battery becomes more fully charged. If the chargers are capable of initial currents of about 30 amperes, more rapid recharging is possible. But, these chargers may be harmful to a battery if the output voltage is too high or if the current taper pattern is not enough to reduce current to below 1% of Cold Crank Rating as the battery approaches the end-of-charge, and the charge time is long.

You should check constant voltage or taper chargers by observing the current going into a battery which is known to be fully charged, about 30 minutes after switch-on. If the current exceeds 1% of Cold Crank Rating it may be possible to have the charger adjusted to reduce output voltage.

The output voltage of a charger must always exceed the terminal voltage of the battery, which increases as it becomes more fully charged. An output voltage in the region of 14.4 to 14.8 for a nominal 12-volt battery is highly efficient and safe for end-of-charge current control. It may be a little too low if long connector leads are in use or to allow high initial currents if the battery is very cold or deeply sulfated. Higher output voltages may help slightly under these abnormal conditions but will normally do little to speed up any recharge, and may be harmful. The voltage range lies between 2.40 to 2.47 per cell, so the corresponding figures for a nominal 6-volt battery are 7.2 to 7.4 volts.

If a charger is built to recharge more than one battery simultaneously some practical considerations apply. A constant current charger with an output voltage suited to one battery should not be used to charge batteries connected to it in parallel. Constant current chargers built to charge more than one battery connected in series up to a stated limit will pass the same current through all batteries in the string. Therefore, if the string of batteries contains units in various states of charge, some will get considerably overcharged if they are not removed piece-meal from the line.

When using constant voltage chargers for multiple battery charging it will be possible to connect several batteries in parallel to the charger, but the total output current will be divided amongst the batteries roughly in proportion to their discharged states. Without an ammeter for each battery, the actual charge current will be unknown and it will not be possible to estimate recharge time in advance. If the constant voltage charger has an output voltage suited to more than one battery, then the correct number of batteries connected in series must be incorporated into each string that is parallel-connected to the charger. Otherwise, applied currents will go out of control.

So called FAST (high rate, boost) chargers should be used with caution. They are most useful for achieving some substantial recharge in deeply discharged batteries and must have steep current taper characteristics if gross overcharging is to be avoided with modestly discharged batteries, especially if the battery has non-removable vent caps and water loss through gassing it cannot be compensated. DO NOT use a fast charger for more than 30 minutes on any battery unless the open-circuit voltage before starting the charge was known to be less than 12.00 volts (or 6.00 volts for a nominal 6-volt battery) and only if the charger has good current taper characteristics.

**NOTE:** When charging Gel Cell batteries or other specialty batteries, follow manufacturer's charging recommendations.

**Certain precautions must be observed during the charging procedure:**

1. Never recharge batteries except in a clean, well ventilated space away from customer or employee walkways.
2. Never allow smoking, welding or open flames in or around the area. Batteries give off explosive gases when charging and serious injuries can occur.
3. Use only cables and clamps which are well insulated and in good condition to make connections between batteries and chargers. Keep wrenches/pliers/screwdrivers away from battery racks.
4. Make connections between batteries and the charger and disconnect only when the charger switch is in the OFF position and, preferably, when the charger main supply cable is withdrawn from the socket.
5. **Keep battery vent caps in position during the recharge.**
6. If batteries need water additions to re-level electrolyte, do not add water before starting the recharge unless level is below the plates. Electrolyte volume expands during recharge and excess may flood over battery covers, causing damage to cables, clamps, racks and floors. Add water 2 to 3 hours before terminating the recharge.
7. Read and understand the charger manufacturers operating instructions.
8. Some modern chargers incorporate electronic switches in the circuit which will not operate if the battery does not exceed the trigger voltage. This can create an appearance that a very deeply discharged battery will not accept charge. The manufacturers instructions will give the method of overriding the electronic switch.
9. Other chargers incorporate thermally operated fuses which might operate on-off if the battery initially accepts maximum output current for an extended period. The appearance of intermittent charge acceptance can be confusing.
10. Dry battery containers and covers, clean terminals and securely refit vent caps at the end of battery charge and testing, before returning batteries to stock or fitting to vehicles.