

Lithium-Ion Charger II

044

In the December issue we'll describe a fancy Li-Ion charger based on a specially designed IC and boasting many bells and whistles. However, it can also be done in a much simpler way, provided you are prepared to work carefully. The latter is particularly important, because we will point out again that charging Li-ion batteries with a voltage that is too high can cause explosions! In this respect Li-ion batteries are not the least comparable with the much less critical NiCd- or NiMH-types.

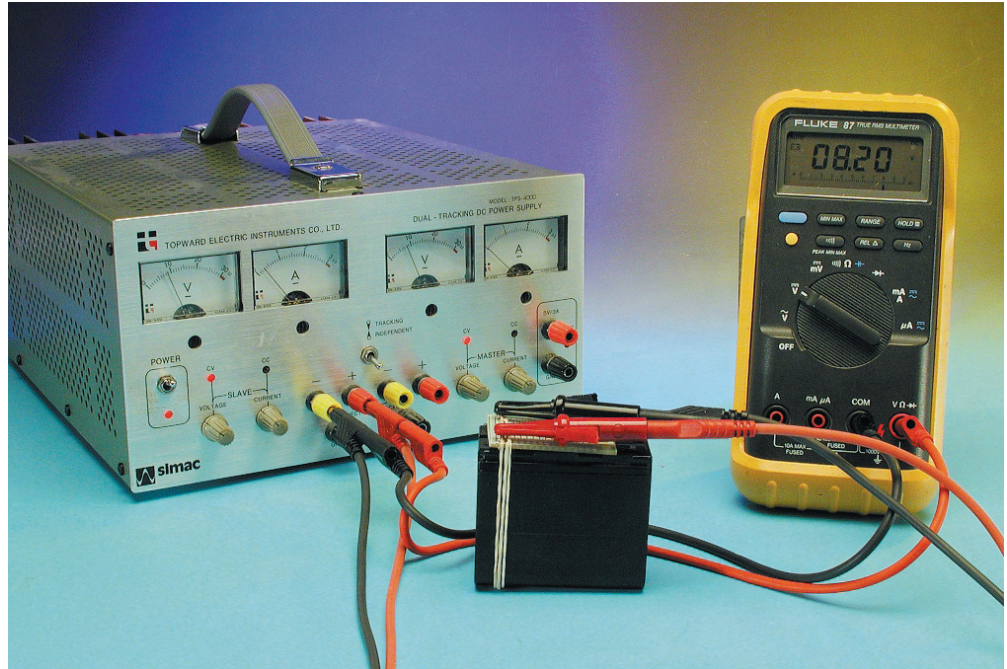
Li-ion batteries may, just like lead-acid batteries, be charged with a constant voltage. The charging voltage for a

3.6 V cell is 4.1 V **maximum**, and for 3.7 V cells this is 4.2 V. Higher voltages are **not permissible**; lower voltages are, but every 0.1 V results in a reduction of capacity of about 7%. As a consequence, great precision is required and it is therefore highly recommended to measure the output voltage with an accurate (less than 1% error) digital voltmeter. A good stabilised lab power supply is in principle perfectly suited as a Li-Ion charger. Adjust it to 4.1 V (or 8.2 V if you are charging two cells in series) and also adjust the current limiting to an appropriate value, 1 C for example (where C is the capacity, e.g., 1 A for a 1 Ah battery). A too low value

is preferred over one that is too high; when the value is a little low it will simply take a little longer to fully charge the battery, but it makes no difference otherwise. Li-Ion batteries are not suitable for high currents, so limiting the value to 1C is a safe maximum.

You can now connect the battery. If the battery is discharged, the power supply will deliver the maximum adjusted current at a voltage less than 4.1 V. As the battery is charging, the voltage will rise. Once the value of 4.1 V is reached, the voltage will cease to rise and the current will begin to fall. When the current is less than 0.2 of the adjusted value, the battery can be considered charged. It is not a disaster if the battery is connected for longer; overcharging is not possible provided the voltage is less than 4.1 V per cell.

Keep children, cleaning housewives, pets and other possible disturbances away to avoid an inadvertent change of the voltage knob. It may not be a silly idea to provide the adjustment knob of the power supply with some method of



mechanical locking.

Note. Although they can hardly be called new, Li-Ion batteries are still difficult to obtain as spare parts. It may be a useful hint to also look at replacement batteries for camcorders and laptops as in these applications Li-Ion batteries are very common.