

# User Manual



## READ THESE INSTRUCTIONS BEFORE USING THE CHARGER



This battery charger is only designed for indoor use and should not come into contact with water or dust. In order to avoid overheating, the charger should not be covered when it is in use.

Connecting it to the mains socket turns on the charger. Disconnecting it from the mains socket turns the charger off.



The mains socket should be easily accessible. If an operational error occurs, the plug should be immediately removed from the socket.

If the charger is equipped with a mains cord, verify that the cord has not been damaged. If the cord is damaged, the charger must not be used.



If the charger is marked with this symbol it is double insulated (class II).

In the event that the charger is labeled "EN60601-1", then it satisfies the requirements of electro medical equipment and can be used in hospital environments, etc. The charger must not be used in the vicinity of flammable anesthesia gases.



The charger contains dangerous voltages and the cover should not be removed. All service or maintenance work should be carried out by qualified personnel who can get assistance by contacting the manufacturer's agent.

If the product has a plastic casing, avoid it coming into contact with oils, greases, etc., as most types of plastic can be broken down by chemicals and solvents.

## CHARGER FUNCTIONALITY

This charger is a fast charger for NiCd/NiMH batteries. This version utilizes a method called -dV detection for charge termination when the batteries are fully charged. This method is based on the fact that the voltage drops over the NiCd/NiMH cells when batteries are fully charged. This voltage drop is detected when the voltage has dropped a certain percentage from the highest value. If this drop does not occur, the charger has a safety timer which will terminate charging after a given time period to avoid overcharging the batteries. A few cells may have a voltage drop in the first part of the charge cycle. This is especially true for battery cells, which have been idle for a longer period of time. Because of this, a start timer is built into the charger, which prevents -dV detection the first minutes of the charge cycle.

## CAUTION

- Make sure the batteries are connected with correct polarity.

## HOW TO USE THE CHARGER

Connecting the battery pack to the charger starts the Charger. The LED will be yellow before the fast charge start when the LED will change to orange. When the batteries are fully charged and the voltage drops because of the  $-dV$  signal from the batteries, the charger will go into a top-off charge mode before it goes over to trickle charge mode. During top-off charge the LED will be green with a short intermittent yellow light. When the top-off charge is completed the charger will go into trickle charge mode, and the LED will be green. The charge current is now reduced to a safe level, which allows the charger to stay connected to the NiCd batteries without damaging the batteries. NiMH batteries are not as well suited for trickle charge, and some battery manufacturers recommend that trickle charge does not exceed 24 hours.

If the safety timer disconnects before  $-dV$ , the top off charge will not be engaged. The charger will then go directly to trickle charge mode, and the LED will be green. If the battery voltage is far below normal, the charger will cut off the fast charge current and go to trickle charge mode. The LED will then indicate 'error' by a flickering green and orange light. If the mains are turned off, the charger will reset and start a new charge cycle if the mains are turned on again.

If new batteries are to be connected, the charger must idle for approximately 15 seconds to make sure all parameters in the microprocessor have been reset. The LED changing to yellow light shows this, and a new charge cycle can begin.

## SAFETY

The embedded charge program has numerous features for safe charge:

- The charger is made with a  $-dV$  level, which will adapt to the number of cells and will be equally sensitive across all cells.
- The safety timer will protect the batteries if the  $-dV$  signal fails to appear. It is normal to have a safety timer that is higher than the maximum charge time.
- Some battery cells may have a voltage drop in the first part of the charge cycle. Because of this, a start timer that prevents  $-dV$  detection during the first minutes of the charger cycle is built into the charger.
- The charger has been programmed to disregard large voltage fluctuations due to connection of external loads. Such false  $-dV$  signals will be detected by the software and disregarded.
- Top-off charge after  $-dV$  secures full battery capacity prior to trickle charge.
- The charger is protected against reverse polarity by an automatically resettable polyswitch fuse on output.
- The unit is constructed for the lowest possible leakage current from the battery with mains disconnected ( $<1\text{mA}$ ). It is still recommended that the batteries be disconnected when the mains are not connected.

## CHARGE CYCLE AND LED INDICATIONS

LED	MODE
Orange	Battery not connected
Orange	Battery initialization & analysis
Red	Fast charge
Green with intermittent orange flash	Top-off charge
Green	Trickle charge
Alternating orange-green	Charging error

With mains connected the LED will be orange the first 5-7 seconds and be orange when the initialization and analysis starts. If a battery is connected, the actual charging will start a few seconds later when the LED changes to red.

After the start timer period has run out (the first few minutes of the charge cycle when the  $-dV$  is undetected), the LED will be green in approximately 4 seconds. This is only a signaling for testing and service.

When  $-dV$  has been detected, the start of the top-off charge is indicated with a green LED with intermittent orange flashes as described under the "how to use the charger" section. The LED is green during trickle charge.