

EELA AUDIO S25 REPORTOPHONE® TECHNICAL INFO

Charging NiMH batteries

The Eela Audio S25 Reportophone is used with metal hydride, NiMH, batteries. There are advantages of using these batteries but special care has to be taken when charging these.

The main benefits of NiMH batteries over NiCad are that they do not suffer from the memory effect and the extended capacity. And there is also the advantage that NiMH batteries are more environmental friendly.

The charging efficiency of NiMH batteries is approx. 50%, meaning that you must put in double energy of what you get out. This also depends on temperature and charging current. The faster you charge the worse this gets. A safe fast charging current is approx. half the rated capacity per hour.

A safe way to charge the batteries without damaging them by overcharging is a charge rate of max. 10%. Empty cells with a capacity of 2000 mAh will have to charge for 25 hours. This is not acceptable for a professional user.

NiMH batteries discharge over time. Unfortunately this self-discharging is not equal for all batteries and there are considerable differences in discharging between cells even in the same package. This is the main reason these batteries are not charged out of the package.

Make sure new or batteries that are not use over a longer period of time are discharged before you start using them in order to prevent individual cells getting not completely charged or overcharged. A few charging and discharging cycles will smoothen out these differences in cells. This will also improve maximum capacity of new cells. Typically new batteries will charge the first time until approx 60% of the capacity. Discharging and charging again will bring the capacity to approx 80% as they will reach near 100% the third time.

Fast charging of new or deep discharged batteries will damage the batteries thus shortening the lifetime. The charging process starts with about 10% of the rated capacity per hour until the voltage exceeds 0.95 Volt per cell. On the S25 a blinking green LED indicates this state. This slow start can take up to one hour for new batteries.

To detect if the batteries are fully charged a combination of 2 methods is used.

If batteries are near full a voltage drop can be detected known as the 'minus delta V bump'.

Unfortunately the minus delta V bump that is indicative of end-of-charge is much less pronounced in NiMH than NiCad, and it is very temperature dependent. To make matters worse, new NiMH batteries can exhibit bumps in the curve early in the cycle, particularly when cold.

This is the reason in rare cases charging can stop unexpectedly at the beginning of the fast charging. Unplugging and connecting the power supply will restart the charging mode.

We have chosen to switch the unit off when the power supply is plugged in. Variable current consumption of a unit in use will make it too difficult to detect the delta V bump. Take special care when charging the S25 in low or high temperatures. The unit will stop charging outside a temperature range of approx. 0° to + 40 °C.

NiMH are sensitive to damage on overcharge when the charge rate is over 10%.

As the battery reaches end-of-charge oxygen starts to form at the electrodes. The built-in catalyst in the cells recombines this oxygen. This chemical reaction creates heat, which is measured with a temperature sensor. In the S25 a temperature increase of a few degrees in a relative short time (T / t) will also end the charging process.

As a precaution there is also a time limit. Charging time is limited but of course this is only valid if you are charging empty batteries.

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Display remaining capacity:

The easiest way to have an accurate display of the remaining capacity is to use dedicated battery packs or built-in batteries as many manufacturers of household appliances, cameras or cell phones do. With the S25 we have chosen to use standard rechargeable batteries that can be exchanged for non-rechargeable in an emergency.

Taking the above into consideration and the fact that the voltage of the cells are temperature dependant it is not easy to built a reliable display to indicate the remaining operating time. The indication of the display of the S25 is adjusted to the type of cells it is initially shipped with. The indication will be slightly inaccurate if the batteries will be replaced with another than the rated capacity.

Summary / practical information:

The S25 that comes with batteries in the unit are pre-charged. We have charged / discharged the batteries twice before shipment and these have there standard capacity.

Units that come with batteries packed separately have been in stock over a longer period and are shipped with empty batteries for reasons explained above. Put the batteries in the unit and first of all start the discharge / charge cycle by pushing the discharge switch (hole on the left side of the unit closest to the front) New batteries will typically charge up to 60% (3 blue LED's) the first time. They will charge 80% to 90% the second time (4 or all 5 blue LED's).

If you have not used the unit for several weeks batteries are discharged to a certain extend always start the discharge / charge cycle first!