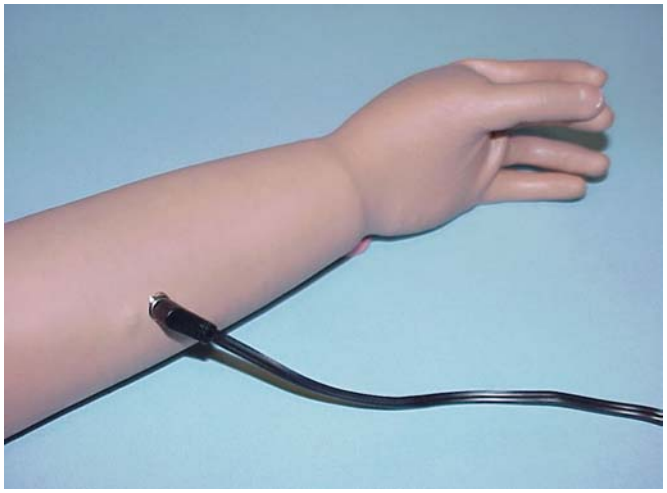
Batteries



Recharge connector for an LTI Built-in Battery

- **Built-in and removable styles**
- **Ni-Cd & Lithium-ion Chemistry**
- **Voltages: 5, 6, 6.7, 8.4, 10 and 12V**
- **Capacities from 120-1100 mAHr**
- **Various sizes, shapes & weights**
- **On/off switch – recharge connectors**
- **Connector cables for all terminal devices**
- **Fast Chargers for most batteries**

Choosing the Right Battery:

There is a lot of confusion about new battery technologies. The discussions below should help you to see whether new or old battery chemistry is best for your application. The older batteries have also improved over the past few years and they still have many advantages. The new battery chemistries offer greater capacity and lighter weight.

Battery Chemistry:

Rechargeable prosthetic batteries are available from LTI in two chemistries: Nickel-cadmium, and lithium-ion. Each has its advantages and disadvantages which is why we offer both. Nickel-cadmium is the traditional battery of choice for the prosthetics industry because it is rechargeable, safe, reliable, inexpensive and has a constant discharge voltage. Lithium ion and nickel metal hydride are relatively new to this field and their benefits include: light-weight, rechargeable, higher cell voltage, greater capacity, and better environmentally. The type of battery chosen will depend on the specific application which includes: user expectations, number and type of prosthetic device(s), weight/size constraints, user activity level, environmental considerations and cost. Once these parameters are known, it would be wise to discuss battery options with our customer service technicians. We offer suitable batteries for every prosthetic system and for each client's needs.

Lithium Ion Batteries. This new technology comes with good and bad features. On the plus side, there is more capacity and voltage for less weight. For instance, the most popular battery weighs 68g and has a capacity of 270mAHr. The Li-ion replacement weighs only 51.4g but has a 560 mAHr capacity. For the user, this represents a Battery with more than twice the capacity for only 76% of the weight. On the minus side for the Li-ion chemistry is variable voltage, 8.4V at full charge, only 5V at full discharge and the need for a discharge protection circuit. LTI has addressed these issues with a unique protection circuit. It limits the output voltage to 6.7V, about the same as a fully charged Ni-Cd battery. At the same time indicator lights have been added so users will know when the cells reach 30% of their capacity and need recharging. Most users will need about 50 or 60% of the capacity during a single day with very little change in speed. Then they can recharge or wait a while longer with a somewhat less responsive prosthesis.

Nickel Metal Hydride. This technology offers higher capacity with lower current carrying ability than the familiar nickel cadmium cells. Europe will be phasing out the use of Ni-Cd cells over the next 5-6 years because of environmental concerns. The US will surely follow, eventually. LTI will be gradually phasing in Ni-MH batteries. Some will fill new market niches.

Nickel Cadmium. This mature technology provides batteries with good capacity and excellent ability to deliver current. Over the past few years, these cells have improved significantly, and they now supply greater capacity. These batteries last over 1000 recharges, longer than most other chemistries. LTI built-in batteries address both of the negative aspects of Ni-Cd's, memory and discharge. LTI Fast Chargers will erase the memory problem, while a new protection circuit on the Recharge/On-Off Module prevents over-discharge, the most common cause of early failure in Ni-Cd batteries.

Batteries

Match the Battery to the User

Selecting the right voltage. Batteries are offered in several voltages and capacities. Generally the voltage is chosen to match the device motor being driven, 4.8 or 6 volt. For improved performance, if the control circuit permits, a higher voltage battery is sometimes preferred (e.g., 8.4 volt). The capacity should be matched to the user's needs. Since battery weight is directly related to capacity, it is best to select a battery that provides just enough power for a full day's use plus a modest safety factor (e.g., 10%). Excess capacity will probably never be needed and the user must carry this unnecessary weight. The real challenge is to determine what battery capacity is required to satisfy the user's needs initially. This depends on the number and type of prosthetic devices being driven (i.e. hand, wrist, etc.) and the frequency of use. Some wearers constantly operate their prostheses and others operate them less often. This affects battery consumption as does the efficiency of the prosthetic controller and the devices themselves. As a general rule, we find that typical users with one or two powered prosthetic devices can operate for a full day on about 250-350 mAHr of capacity. Heavy users might require an additional 200 mAHr and light users might be satisfied with 100 mAHr less capacity. Therefore, our removable batteries for adults are designed with 560 mAHr and our built-in batteries range from 225 to 650 mAHr. A trial fitting is good for testing how much capacity will be required.