



**L3HARRIS™**  
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# L3Harris NiCd, NiMH, and Li-Ion Battery User's Guide

Proper Care and Use of Rechargeable Batteries  
Maximizes Performance

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# L3Harris Battery User's Guide

This document provides information on the care and use of rechargeable battery packs for L3Harris portable land mobile radios. Typically, L3Harris portable radios use Lithium Ion (Li-Ion) or Lithium Ion Polymer (or Lithium Polymer) batteries. Unless otherwise specified in this document, the term "Li-Ion" will be used to refer to both types. Some Nickel-Cadmium (NiCd) batteries and Nickel Metal Hydride (NiMH) batteries are still available, but these are being phased out in favor of higher capacity Li-Ion batteries.

L3Harris battery packs are constructed from top quality materials to provide high performance and long life. Their best performance and useful life can be achieved through proper care and maintenance, as explained in this document.

## L3Harris Batteries and Chargers

### **Background Information on Batteries**

New batteries shipped from L3Harris require full charging before their first use. Nickel-based battery packs must be conditioned prior to their first use – please refer to the "Charging Guidelines" section herein for instructions on how to condition the battery pack. Li-Ion batteries do not require conditioning.

Batteries are chemical-based devices, and the active chemicals contained within the batteries will be depleted over time, even during storage. The life of the battery can be affected by

- Age of the battery
- Extreme cold or hot temperature exposure
- Number of times the battery is charged and discharged
- Extreme physical shock or damage that may have occurred during a battery's lifetime

For best results

- Use the batteries upon receipt and avoid storing batteries
- Avoid exposing batteries to high temperatures for extended periods
- Avoid subjecting batteries to physical abuse
- Replace batteries promptly after they have exceeded their recommended cycle life, even if they are still providing satisfactory performance. Refer to Table 1 for cycle life limits per battery chemistry.

### **WARNING**

**Do not use L3Harris batteries with non-L3Harris chargers.**

**Do not use non-L3Harris batteries with L3Harris chargers.**

**For a charger with an external power adapter, be sure to use the adapter that was supplied with the charger.**

**Incompatible battery-charger-power adapter combinations may cause a safety hazard and a possible fire hazard.**

## Using L3Harris Chargers

Use only the L3Harris-specified batteries and charger for each radio model. Li-Ion technology is rapidly advancing, and some of the changes may result in incompatibilities when using third-party batteries or chargers. These incompatibilities may impact radio performance and, in some cases, may introduce safety and/or fire hazards with the Li-Ion battery itself.

### **Charging Guidelines**

Observe the following guidelines when charging a battery pack:

- Only use L3Harris batteries and the specified L3Harris charger. Failure to do so may cause radio malfunction and may cause a battery safety and/or fire hazard. This is particularly important for Li-Ion batteries and chargers.
- L3Harris chargers have an indicator or LCD screen showing charge and error status. A label is included on the charger to help the user interpret the status of the battery charge. Further information can be found in the charger manual.
- Turn off the radio when it is in the charger.
- Avoid high temperatures during charging, particularly when using vehicular chargers, where it is easy to exceed battery temperature limits due to the wide range of outdoor environments. L3Harris chargers are designed to prevent battery charging when temperatures exceed safe limits, as indicated by a flashing LED (the actual LED that flashes depends on the charger model being used). For further information on the charger, refer to the charger's user manual.
- L3Harris chargers continually monitor battery temperature and are designed to discontinue charging if temperature limits are exceeded. Li-Ion battery packs may become slightly warm when charging. **If the Li-Ion battery pack becomes hot, immediately remove the pack from service.** Nickel-based battery packs normally become warm during charging.
- Do not leave batteries in the charger indefinitely. For best results remove the battery from the charger promptly upon charge completion. Then, place the battery pack on the radio and fully discharge it (as indicated by the radio "Low Batt" warning) before recharging.
- If any faults are encountered while charging the battery pack, consult the manual for the charger to determine the cause and possible corrective action.

### **Charger Starting Criteria**

When a battery pack is first placed in the charger, the charger checks the condition of the battery pack. During this period, the charger is checking the temperature and voltage of the battery, and the charger indicator may flash. By monitoring these parameters, the charger ensures that the battery pack is ready for charging. Batteries that are too cold or too hot will not charge properly until the temperature is within the acceptable limits (usually between 32 to 113°F (0 to 45°C)).

Next, the charger measures the voltage of the battery pack. If the voltage is below the rechargeable level, a trickle charge is applied to the battery to raise its voltage to an acceptable level. Reaching the rechargeable voltage level may require some time if the battery pack is severely drained. When the charger determines that the battery pack is ready, it begins the normal charge sequence.

Some L3Harris Li-Ion batteries that have been stored may be in a "sleep" state. When placed in a charger, these packs may not immediately start charging. If this is encountered, leave the battery in the charger for approximately 10 minutes to allow the charger to "wake" the battery pack. Normal charging will resume after the pack has "awakened".

### **Conditioning New Nickel Battery Packs**

All nickel-based packs must be conditioned before their first use. Conditioning enables a battery to reach its full performance capability. This process involves fully charging and fully discharging the battery using either a battery analyzer/conditioner (recommended) or through normal radio use (not recommended). (Please note: Some L3Harris chargers support initial conditioning. Refer to the manufacturer instructions for the CH-1045X0 series chargers.)

Conditioning of nickel-based packs is most easily accomplished by using a battery conditioner/analyzer/charger such as the Cadex® C7400 or the Intelligent Technologies iTECH® iQ<sup>five</sup>®. These units condition a battery pack by automatically charging and discharging (cycling) it 3 or more times. Note: The units can also be used to test and charge battery packs. Refer to the manufacturer's technical data for instructions on using the conditioner/analyzer/charger and any required accessories. Please contact L3Harris' Technical Assistance Center (TAC) for specific analyzer programming questions.

Failure to properly condition NiMH battery packs will result in initial short shift-life performance of the radio.

### **Using L3Harris Batteries**

The radio playtime (the length of time a battery lasts before recharging is required) available for a given L3Harris battery pack is affected by many factors, the most important of which is battery capacity. The rated capacity is listed on the battery label and is found in L3Harris literature.

The second most important factor affecting battery life is the duty cycle or ratio of time the radio is transmitting, receiving, or in standby. Most two-way radio battery shift-life specifications assume a 5%-5%-90% duty cycle. This is further specified as transmitting for 3 seconds, receiving for 3 seconds, and in standby for 54 seconds. Adding extra receive time (actively receiving a signal) or transmit time changes the duty cycle and will reduce the playtime of the battery pack. Time spent transmitting particularly impacts playtime.

As previously mentioned, batteries rely on a chemical reaction, and battery capacity is reduced as the chemistry is consumed by time, use, and environmental factors. The user may notice this as reduced playtime as the battery ages. Generally, reduced playtime will lead to the need to replace the battery. Even if the battery is providing satisfactory playtime, other factors such as cycle life and environmental and physical exposure must also be considered valid reasons to replace batteries.

### **Battery Usage Guidelines**

- Only use the specified L3Harris chargers to charge L3Harris batteries. Failure to do so can damage batteries, lead to premature battery failure, and in the case of Li-Ion batteries, may cause a safety and/or fire hazard.
- Remove batteries from the charger as soon as possible after the charge indicator shows the battery has completed charging.
- Do not store batteries in hot environments (above 86°F (30°C)) such as the glove compartment of a car – even for short periods. Exposure to high temperatures will reduce the battery life and for Li-Polymer batteries, may lead to premature swelling of the battery pack.
- Immediately remove from service and dispose of batteries that
  - Have physical damage
  - Have been exposed to severe shock
  - Experience swelling or other deformity

This is true even if the battery still appears to function properly.

- Monitor and promptly replace batteries that have exceeded the recommended cycle life. Generally, cycle life may be estimated by the number of working days the battery has been used. Replace the battery even if it still appears to function properly. Continued service beyond the recommended cycle life increases the risk of unexpected failure during service. For Li-Polymer batteries, the risk of battery swelling also increases. (For further information, refer to Table 1 for cycle life limits.)
- Promptly replace batteries that no longer provide satisfactory playtime under normal operating conditions in which they previously functioned properly.
- Fully discharge nickel batteries (as indicated by the radio “Low Batt” warning) before recharging to avoid memory effect.

|                             | NiCd       | NiMH       | Li-Ion     | Li-Poly    |
|-----------------------------|------------|------------|------------|------------|
| Charge/Discharge Cycle Life | 500 cycles | 300 cycles | 300 cycles | 300 cycles |

Table 1. NiCd, NiMH, Li-Ion, and Li-Polymer Battery Cycle Life Limits

### Battery Charge Indicator on Radio

Many L3Harris radios, including the XL and some XG series models, use a battery pack with management circuitry that reports actual battery capacity available.

Some L3Harris radios use the battery pack voltage level to estimate remaining battery life, but the accuracy of this method is limited. Accuracy may be further impacted if a battery is being used at extreme temperatures, is worn out, or if a nickel battery has not been properly conditioned.

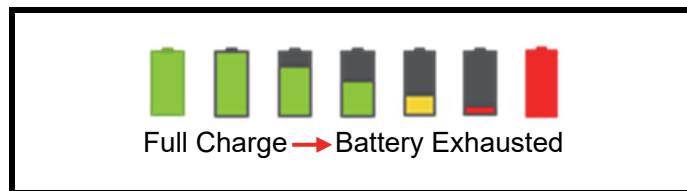


Figure 1. Battery Charge Indicator

Generally, the user should view the charge indicator as a relative measurement. The type of indicator display depends on the radio (the image above is an example and may differ with radio models). When the battery charge reaches the critical level, the radio will initiate the low-battery warning (flashing battery icon and audible alarm). At this time, the battery must be recharged.

### Servicing and Storing L3Harris Batteries

Storing battery packs is not recommended because the chemicals in the battery degrade over time, and this affects the functionality of the battery.

#### Servicing L3Harris Battery Packs

To ensure that battery packs are readily available for radio operators (i.e., the user has a fully charged, long-running battery pack at the beginning of the work shift), L3Harris recommends setting up a battery service program. The program should monitor battery performance including service date, cycle life, capacity, playtime or other user complaints, and other factors as deemed necessary by the using agency. This information can be used to help guide decisions on battery replacement schedules.

### ***Discarding Batteries***

All rechargeable batteries have a limited useful lifetime after which they must be properly discarded.

NiCd batteries that fail to meet service requirements should be recycled. Disposal of NiCd batteries in the municipal waste system is prohibited by most state and municipality laws. Check with local solid waste officials for details concerning recycling options and proper disposal. In the United States, call toll free **1-800-8-BATTERY** for information and procedures for properly disposing of rechargeable batteries. Information regarding local NiCd drop-off locations may also be found on the Rechargeable Battery Recycling Corporation web site (<http://www.rbrc.com>).

Currently there are no specific disposal requirements for NiMH or Li-Ion batteries in the U.S. However, the Rechargeable Battery Recycling Corporation web site may be able to offer alternate disposal recommendations.

The rules for disposal of battery packs in other countries may vary from U.S. regulations. Please consult your local regulatory agency for proper disposal methods.

