

# Battery Management and Safety Practices

## Mobile Devices Using Li-ion Batteries

---



### About this Guide

Lithium-ion (Li-Ion) technology provides state-of-the-art DC energy storage and has been widely adopted to meet user demand for more power and longer operating times. No other battery technology available at this time allows Zebra to meet market and competitive requirements for mobile device operating times.

It is crucial to understand and follow proper and safe practices for the use, storage, disposal, handling, and charging of Li-Ion batteries. While battery manufacturers have made advancements in the design and manufacturing process, we strongly recommend that users implement the battery management practices described in the guide.

### Definitions

Terms used in the guide are defined as follows.

**Battery**

Li-Ion battery that stores energy.

**Charger**

Equipment capable of charging a battery but not powered by a battery.

**Device**

Equipment that can both charge and discharge a battery.

**Cradle**

Equipment capable of providing power to a device to enable it to charge a battery. Cradles do not directly charge batteries.

### Use and Handling of Batteries

- Batteries are consumable and have a limited lifetime. Degradation in performance may increase with battery service life due to the stresses of daily usage conditions, including:
  - Number of charge or discharge cycles to which they have been subjected.
  - Long-term average state of charge.
  - Temperature in which they are used and stored.
  - Demands to which they are subjected.
- Batteries are designed to be charged and discharged regularly at room temperature. Avoid maintaining batteries in a fully charged or depleted state for optimal battery lifetime. This includes continuously keeping batteries and/or devices in chargers or cradles, accelerating capacity degradation, and increasing the risk of swelling.
- Swollen batteries do not present a safety issue but should be removed from service as they may no longer meet the performance criteria of the device and/or operating conditions, including accessories compatible with a normal battery.
- Batteries that exhibit visible swelling, deformation, discoloration, or physical damage should be replaced.
- Use only genuine Zebra batteries in Zebra devices.
- Dropping, crushing, or other mistreatment of a battery, or a device containing a battery, may result in a fire or chemical exposure hazard.



- 
- Keep batteries away from water, combustible materials, and children.
  - Avoid **shorting** a battery across the battery contacts. This includes carrying batteries in a pocket with loose change, paper clips, or other conductive materials.
  - Do not incinerate batteries, expose batteries to temperatures above 60C, or place batteries or devices in microwave ovens.
  - Do not attempt to disassemble, pierce, or remove a battery from a device using a tool or sharp object.
  - Use caution when handling a damaged or leaking battery. Personal injury may result from the mishandling of a damaged battery.

## Battery Storage

- Batteries that will not be charged or discharged for a month or more should be stored in a cool, dry environment at less than 70% relative humidity non-condensing and within temperature ranges of 5°C to 30°C (41°F to 86°F).
- Do not store batteries in direct sunlight.
- Batteries should not be stored in a fully charged or depleted state. The optimal state of charge for storage is between 30% and 70%.



**NOTE:** Battery state of charge can be determined when installed in a Device.

- Batteries should not be stored in devices. This increases the rate of self-discharge and may result in an over-discharge condition. Over-discharging batteries may result in permanent deterioration of capacity and an increased risk of swelling.
- Batteries should not be stored on external power (**in a charger or in a device in a cradle**). This increases the average state of charge of the battery, causing accelerated degradation and increased risk of swelling.
- Batteries in storage should be visually inspected and checked for the state of charge every three to six months. Batteries below 30% should be recharged to between 30% and 70%. Batteries that exhibit visible swelling, deformation, discoloration, or physical damage should be replaced.

## Battery Charging

- Follow all safety and regulatory guidelines supplied with a device and charger.
- For optimal life, charge batteries in a well-ventilated room that does not exceed room temperature of 30°C/86°F. For specific charge ranges, reference the device user guide.
- For optimal performance, ensure Zebra devices have installed the latest operating system and BIOS updates, if applicable. Some Zebra devices have battery management features that optimize the charging algorithm for use cases involving shallow discharge or extended use of external power. Contact Zebra customer service for more information.
- Charge Zebra batteries only with a genuine Zebra Charger.
- Do not attempt to charge other types of batteries in the Charger.
- Do not charge batteries near combustible or conductive (metal) materials.
- Do not charge batteries in direct sunlight.

As with any electrical device, if overheating or burning odors are noticed during charging, leave the area immediately and contact safety personnel to handle the situation.

---

## Replacement and Disposal of Batteries

- For optimal performance, batteries should be replaced when any of the following conditions occur:
  - Significant reduction in device operating time.
  - Significant increase in battery charge time.
  - Charge or discharge cycle count is above 500.
  - Remaining capacity or state of health is below 80%.
  - Visibility of swelling, deformation, discoloration, or physical damage to the battery.
- Promptly and properly dispose of used batteries according to local regulations for the disposal of batteries. Before disposal, you should insulate the battery terminals with tape. Please follow local battery recycling guidelines.