

A White Paper from Datalogic Mobile

Mobile computers have revolutionized warehouse and logistics operations by allowing employees to automatically collect data at the point of activity, access warehouse management applications, and transmit tracking and inventory data in real time. But the benefits of mobile computing -- improved accuracy, efficiency, and productivity - are only possible if workers are able to operate their mobile devices for a full shift without interruption. If the battery in the device can't maintain a charge, productivity will suffer.

Batteries are an unglamorous component in a mobile computing solution, and most end users don't think about them unless there is some kind of a problem: they fail to charge, or the charge doesn't last the length of a shift, or the batteries require frequent (and costly) replacement.

End users should think carefully about their battery management strategy during the early stages of a mobile computing deployment. Batteries for these rugged devices don't last forever, but they should allow mobile employees to work throughout the length of a typical shift, and withstand enough charging cycles to provide at least a year of service before needing replaced.

By selecting the right battery for the application, storing and charging them properly, and implementing smart power management strategies at the device level, users can maximize the life of their mobile device batteries, boost productivity, and save money in the process.

The Life of a Battery

Rechargeable batteries for mobile devices have gone through a significant evolution over the past several years. In the past, most devices used Nickel-Cadmium (NiCad) batteries. NiCad batteries were relatively costly and sometimes suffered from what was known as the "memory effect" which could result in reduced charge capacity if the batteries were overcharged.

NiCad batteries have largely given way to Nickel-metal hydride (NiMH) and Lithium-ion (Li-ion) batteries. NiMH batteries are a lower-cost alternative that are often used in high-drain devices. Li-ion batteries, on the other hand, have an excellent energy-to-weight ratio, making them a good choice for mobile devices. They also have a relatively low self-discharge rate compared to other battery types. Li-ion batteries have fast become the standard in most mobile computers and data collection devices.

While batteries have evolved to offer higher capacities in smaller form factors, the devices they power continue to add new features and functions that increase their overall energy footprint. Bar code scanners, color displays, cameras, wireless communications and other peripherals all put a strain on the battery, as do the general operation of the CPU, memory and hard drive motor.

A typical battery for a hand-held computer or bar code scanner can last for a full shift (eight to 12 hours) in most applications, but this is highly dependent on a number of factors, including the use



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of wireless communications. Batteries are also available in a variety of sizes and capacities, and end users should evaluate their application requirements to determine if they need a standard or high-capacity battery for their mobile computers.

Mobile computer manufacturers provide general guidance on the life of the standard batteries that come with their devices, but end users should evaluate their power requirements within the context of their own unique application. How the computers will be used, and what capabilities will be required during a shift, will impact the type of battery selected and the frequency of recharging.

By evaluating the requirements of the application, it's easy to determine if you will need a higher capacity battery. For batch applications that don't involve real-time, wireless communication, a lower capacity battery can usually handle a full shift while reducing the cost of the mobile device. Applications involving wireless communication, though, will almost always require a high-capacity battery.

The capacity of a battery is measured in milli-Ampere hours (mAh) and voltage; while these numbers are useful, they can be confusing for some end users, and the differences in these numbers among different batteries can make them difficult to compare. The mAh figure is a unit of electrical charge, and represents the amount of power the battery can store; the larger the number, the more power it can hold. Watt hours can also be a useful comparison. You can measure watt hours by multiplying the milli-Ampere hour rating by the voltage.

Most suppliers offer a range of batteries. Datalogic, for example, provides batteries for its devices that range from 1000 mAh to 5000 mAh ratings, depending on the device and hardware options available for the device.

Other elements to consider: How quickly can the battery be recharged? Will data be lost if the device loses power before the battery can be changed? Can the batteries be "hot swapped" while the computer is still operating? What is the maximum number of times the battery can be recharged?

Extending the Life of a Battery

Generally speaking, the batteries used for rugged mobile devices in high-use environments should be replaced each year to ensure device performance. That's because even the best batteries will degrade over time, losing as much as 30% of their capacity in the course of a year, depending on the number of recharging cycles they've gone through.

But even though batteries will lose capacity over time, there are still strategies that end users can employ to make sure they get the most out of their batteries. By properly maintaining and storing your batteries, and adjusting device settings to maximize the time between charges, you can make sure that your batteries last a full shift and can be utilized for 12 months or more before replacement.

Check the thermostat: While lithium-ion batteries can survive very cold temperatures, excessive heat can harm the batteries and reduce their useful life. So if your mobile computers or spare batteries are to be stored for any length of time, make sure the storage environment will not expose the equipment to extreme temperatures. Typically, Li-ion batteries can be stored in areas that are between 32 and 104 degrees Fahrenheit, but lower-temperature storage out of direct

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sunlight is best. Ideally, store the batteries in a cooler place, with a charge of about 40% of capacity.

Take advantage of power management tools: Do your new mobile devices come equipped with power management capabilities to help reduce battery consumption? Power management software allows users to create power saving profiles for both work and idle hours, and may include settings so that users can determine when a display will dim if the computer has not been used after a certain period of time, or to power down the computer after a lengthy period of being idle. Many of these settings can be manually adjusted (see below), but power management tools can make it easier to create a device profile that maximizes battery life.

For example, Datalogic offers power management tools in its mobile computers that offer a sleep/off mode with programmable timeout, as well as settings that can adjust the power output in both idle and operating modes. These devices also have a low battery indicator so that workers have plenty of time to swap out batteries before they are completely discharged.

Turn down the (back)lights: One easy way to improve battery performance is to reduce the drain the backlight places on the power source. Most mobile devices allow users to control the brightness on the display, as well as the amount of time that passes before the backlight dims when the device is idle. Adjusting these settings can improve battery performance, but how much flexibility you have in altering the backlight will be determined by the lighting conditions in which employees have to work.

Turn down the volume: A less obvious strategy is to simply turn down the volume on the device. Mobile computers often utilize audible tones to indicate an error, or a successful bar code scan. By reducing the volume, users can decrease the time between charges by as much as 36%.

Adjust wireless LAN settings: For warehouse management applications that rely on real-time communications, mobile computers communicate with back-end enterprise solutions via a wireless LAN; depending on the network coverage and device settings, the process of connecting with a wireless LAN access point and then authenticating the mobile device can rapidly deplete the battery in your hand-held computer.

If a wireless device is left in a constant “on” state, perpetually broadcasting a signal to the network even when no data is being transmitted, batteries can be drained in as little as two or three hours. Wireless LAN modules typically include power management tools that allow users to configure the device in a “power saver” mode. Typically, a device can be set to use a lower power signal in areas of dense wireless coverage, and a higher field strength where coverage is weak.

Network security settings can also impact battery life. Requiring a wireless LAN module to go through a full re-authentication when a user moves from one WLAN access point to another can increase power usage, for example.

The Wi-Fi Alliance, the non-profit industry association that manages and promotes standards related to wireless LAN products, introduced WMM Power Save to help manage battery power in mobile devices. Power Save works by allowing client devices to “doze” between data packets, while the access points buffer downlink frames. According to the Alliance, Power Save can improve battery performance by 15% to 40%, depending on the application.

However, using WLAN power management tools can negatively impact data throughput in some scenarios. Careful testing should be conducted before deployment to determine the impact of various power controls on both battery life and transmission speeds.

Even companies that aren't currently using a wireless LAN should take a look at their radio settings. If you are using a device with WLAN capabilities, even though you aren't taking advantage of them right now, make sure the radio is turned off; otherwise, the radios could quickly deplete your batteries while searching for wireless signals that aren't there.

Monitor Battery Life

Eventually, even with best practices in place for battery management, the batteries in your mobile devices will need to be replaced. Most of the batteries available for rugged mobile computers are good for approximately 500 recharging cycles before they begin to significantly lose capacity.

Some battery chargers include built-in battery condition monitoring tools so that you can quickly see if a battery has lost any of its recharge capacity. Once a battery loses half or more of its capacity, it should be replaced. Otherwise, workers will waste a significant amount of time swapping out batteries mid-shift.

Work with your mobile device supplier or integrator to establish the best process for ordering new batteries, and disposing of or recycling the old ones.

Conclusion

Batteries play a key role in the success of any mobile deployment. If the batteries in your mobile devices can't last a full shift, employees will have to stop working to retrieve and replace their batteries, which can create a significant drain on productivity. If batteries die while the device is in use, you could also lose valuable operational data in the process.

By selecting batteries with enough capacity to handle your warehouse applications, and instituting a power management strategy that includes the proper storage of your batteries, as well as adjusting the device settings to maximize battery life, you can ensure that your mobile computers can provide a full shift's worth of benefits.

About Datalogic Mobile Inc.

Datalogic Mobile is a global manufacturer of mobility solutions for retail applications, assisted shopping, warehouse solutions, and field-force automation.

Our diverse product range of rugged mobile computers includes pocket-sized computers, pistol grip mobile computers, and industrial PDAs designed to keep workers connected to their enterprise inside or outside the four walls. Our mobile computers use Cisco® Certified CCX radios for maximum levels of: RF security, data throughput, and efficiency. Datalogic Mobile computers use the latest technologies for voice and data communications giving mobile workers on-the-go connectivity.



Datalogic Mobile has a complete line of rugged mobile computers for retail, warehouse and field force applications.

Datalogic Mobile is the worldwide leader in Assisted Shopping. Over 350 retail stores have implemented Datalogic Shopevolution™ software and the Datalogic Joya™ handheld pod as their assisted shopping solution. Datalogic assisted shopping gives retailers a competitive advantage while reducing their operational costs. Joya makes shopping a multimedia experience that increases consumer loyalty.

Datalogic Mobile has worldwide presence in over 30 countries and over 800 business partners worldwide. A leader in technology, Datalogic has a growing portfolio of over 850 patents, eight research and development centers, and 300 engineers.

See us on the web at www.mobile.datalogic.com or call 800-929-7899