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Trimble Recon Handheld: Batteries FAQs

This document answers some frequently asked questions about the PowerBoot Module™ battery pack (“the battery”) in a Trimble® Recon® handheld.

Battery life

How long will the battery last on a full charge?

Battery life can vary between 3 and 30 hours, depending on internal radio and CompactFlash (CF) card usage, backlight settings, and ambient temperature.

You can expect a battery life of about 23–27 hours under the following conditions:

- radios are not in use
- display light is in constant use

Factors that decrease battery life include the following:

- Internal radio usage. The 802.11g radio is very power-demanding and can decrease the battery life to as little as five hours. The Bluetooth® radio will also decrease battery life, but by only 10-20 %. To maximize battery life, turn off the radios when they are not in use.
- Frequent use of power-hungry CF cards such as GPS, cameras, and scanners can decrease battery life by 33 %–50 %.
- Cold temperature reduces battery capacity. The colder the temperature, the more the capacity is reduced. Extremely cold temperatures (-20 °C) can reduce battery life to just a few hours.

How can I maximize the battery life?

Manage the display light well. The battery life could more than double if you turn off the display light, especially outdoors in bright daylight. You can also adjust the intensity of the display light.

If you are not using the Bluetooth and/or 802.11g wireless radios, Trimble recommends that you disable them.

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How else can I improve battery life?

Select a power scheme to match your application.

Allow the handheld to turn itself off when inactive. To do this:

1. From the Control Panel, select *Start / Settings / Power / Advanced*.
2. Select an appropriate timeout for your application. A shorter timeout means lower power usage at a non-essential time.

Except for applications that perform constant Input/Output operations, the handheld turns on instantly and resumes exactly where it shut down. This is also true if you use the keypad button to turn off the handheld.

How does the handheld indicate the charge status of its battery?

The operating system monitors the battery voltage and reports the battery power that is remaining on the *Power Status* screen.

Note: *This battery gauge is not very accurate. The accuracy varies with temperature and power demands on the battery.*

A low battery warning message appears when approximately 15 % of the total battery power remains. Depending on power demands, this means that there can still be several hours of battery life remaining. When you see this message, plan to recharge the battery at the next opportunity, and consider how to conserve the remaining power.

When only a few minutes of power remains, a critical battery warning message appears. You must immediately replace the battery with a fresh one, or connect the handheld to external power. To preserve the real-time clock and data stored in volatile memory, the handheld shuts down within a few minutes of this warning message.

What is the effect of temperature on battery life?

The battery is optimized to perform best at temperatures comfortable to humans (“room temperature”). The battery is very stable at temperatures above this but cold temperatures cause shorter battery life.

- At room temperature, with constant display light usage and no radio usage, the battery will last about 24 hours.
- At cold temperatures (5-10 °F), battery life will drop to about 18 hours.
- At extremely cold temperatures (-22 °F), battery life will drop to about 3 hours.

Note: *A moderate voltage warms the battery and keeps it performing nearer its peak. At low temperatures, you may achieve longer battery life by using a little more power to create heat.*

If I use the serial port, will it affect the battery life?

Using the serial port does not significantly affect battery life. However, processing the data coming from or going to the serial port may keep the CPU more active than usual. This could have a small effect on battery life.

If I use the USB port, will it affect the battery life?

The USB port does not significantly affect battery life unless it is used constantly to transfer files.

If I use CompactFlash cards, will they affect the battery life?

CompactFlash memory cards do not have a significant affect on battery life. However, some other CompactFlash cards may actually use more power than the handheld and could more than halve battery life if used frequently or continuously.

Cards that are likely to consume power at a high rate include:

- Wireless modems
- Wireless LAN (802.11a/b)
- GPS cards
- Barcode scanners
- Bluetooth cards
- Camera cards

Battery charging

How long does it take the battery to charge when it is detached from the handheld or when the handheld is turned off?

12 hours. Trimble strongly recommends that, when you charge the battery, you remove it from the handheld or turn off the handheld.

How can I tell when charging is complete?

Since the battery gauge is not always accurate, charging for a full 12 hours is the best way to make sure that charging is complete. Usually, this means charging overnight. A charged battery feels warm to the touch.

Will it damage the battery to leave it on the charger?

Leaving a battery on charge for extended periods of time exposes it to prolonged high temperature because the excess charge energy is dissipated as heat from the battery cells. Battery manufacturers warn against charging the battery continuously in very warm environments because chemical interactions that degrade battery performance are accelerated at high temperature.

Continuous charging for many months will decrease the service life of the battery, depending on environment and manufacturing variations.

Voltage spikes can damage the battery if it is not attached to a surge protector.

Occasionally charging for 7-14 days continuously is unlikely to degrade performance.

After you retrieve the handheld and battery from long term storage, fully charge the battery separately before attaching it to the handheld.

Will the battery suffer from “battery memory” issues, and loss of capacity, if it is not fully charged and discharged on each cycle?

No. Modern battery design and chemistry has virtually eliminated “battery memory”.

The PowerBoot Module battery pack uses Nickel Metal Hydride (NiMH) cells. Even though NiMH is marketed as memory free, partial charge cycles can decrease available battery charge life (commonly known as battery memory) over time. However, to reverse any possible impact from residual memory, carry out two or three full charge/discharge cycles. If you notice a drop in the capacity of the battery, run it down completely on the handheld and then do a full 12-hour charge.

If the handheld is turned on while the battery is charging, will the charging be affected?

Yes, the charging time will increase. If the display light and radios are on, they will draw power away from the charger. In some situations, the battery could continue to drain while it is on external power.

If the operating system detects this situation, this message appears after the handheld has been on charge for a few minutes.

Trimble strongly recommends that you turn off the handheld while it is charging. If the battery is very low, and you must use the handheld while it is on charge, Trimble recommends that you disable the 802.11g wireless radio.



I charged my handheld overnight. It was turned off while charging, as recommended, but when I turned it on in the morning, the power gauge reported only 85 percent charge. Is something wrong with the battery?

The battery is probably fine. While the handheld is turned off, the battery driver is not able to gather information about the battery charge level. After you turn on the handheld, it can take up to 30 minutes for the power gauge to more accurately reflect the battery charge state.

When I insert or remove the external charger, the remaining power level jumps. Why?

The battery driver constantly gathers information about the battery voltage and history, and uses this information to report the charge level. Inserting or removing the external charger changes the battery state and resets the battery history information. It can take up to 30 minutes after changing the battery state before the battery driver has enough information to more accurately report the battery charge level.

How can I test the battery to see if it is performing as well as it should be?

The operating system includes a Battery Logger utility to help evaluate battery performance:

1. Connect the AC charger to the Recon and allow it to charge at least 12 hours *with the Recon turned off*.
2. Configure the Recon to never go to sleep. Choose *Start / Settings / System / Power / Advanced* and then clear the *On battery power* check box. Tap **OK**.
3. Select *Start / Programs / Battery Logger* to launch the battery logger utility.
4. Enter a file name and file location (or use the default) and then tap **Save**.
5. Tap *Tools / Start Battery Logging*. The utility creates a file that records the battery voltage at intervals.
6. Disconnect external power and then allow the program to run until the battery is exhausted and the unit shuts down.
7. Reapply AC power.

When the handheld turns on, you will see a rundown graph of the battery voltage versus time. Note how many hours the battery lasted. A healthy battery should last over 20 hours at room temperature if the display light is constantly on at the default brightness, and both the Bluetooth and 802.11g wireless radios are off.

What are the required input parameters for charging the battery?

- The battery requires a nominal input of 5 V DC at a minimum of 500 mA. Keep input voltage above 4.5 V and below 6.0 V. There is no need to regulate the current as long as the minimum is met.
- Charge the battery only when the ambient temperatures is in the range of 0 °C – 35 °C.
- The central pin is positive. The barrel plug is 5.5 mm OD, 2.5 mm ID and a minimum of 9 mm in length.

Replacing the battery

Will I lose my data if I change the battery?

On a handheld that is running the Microsoft® Windows Mobile® version 5.0 software, all saved data, programs, and settings will survive an indefinite loss of power. Unsaved data (open files in running applications) and the clock setting may be lost unless you follow the procedure given here.

All data stored in flash memory is retained, regardless of power status.

All data stored in RAM is lost if power is interrupted:

- when the handheld is turned on
- for more than 30 seconds when the handheld is turned off

The following procedure is the recommended way to replace the battery within the required time:

1. Make sure that you have a spare, charged battery ready.
2. Make sure the arrows on the bottom of this spare battery point toward the I/O connectors. If necessary, use the blade end of the handheld stylus to rotate the arrows.
3. Save data from any open applications to flash memory or a compact flash card. If you have a Trimble Recon handheld running Windows Mobile PPC 2003, use the built-in backup program (Sprite Backup) to save your configuration.
4. **Turn off the handheld.** Otherwise, all data in RAM will be lost.
5. Disconnect the hand strap. To do this, loosen the strap and then slide the buckle toward the I/O connectors.
6. Rotate the arrows on the attached battery so that they point toward the I/O connectors.
You now have approximately 30 seconds to perform the next 2 steps.
7. Firmly push the attached battery in the direction of the arrows and then slide it off the handheld.
8. Firmly slide the replacement battery onto the handheld. The rubber of the battery pack should mate closely with the matching relief of the plastic. Push hard until the battery pack is fully seated.
9. To lock the battery in place, reverse the orientation of the arrows.
10. Reattach the hand strap and then turn on the handheld.

How long will the battery last before it needs to be replaced?

About two years. For the first 50 to 100 cycles, the battery will show a slight increase in capacity. It will peak after that and remain in top form for another 300 cycles. Around the 400 cycle mark, the capacity will begin to decline. At 500 cycles approximately 80% of their capacity will remain. The batteries will degrade quickly after 500 cycles. So, if you use the handheld for 250 working days per year, and recharge it every day, the batteries should last two or more years.

- Battery life can be decreased by high temperatures. Leaving a battery in a hot environment, particularly while charging, reduces the number of cycles that it can endure.
- Excess power dissipates as heat while batteries are on charge. Long term charging, where higher temperatures are sustained over an extended period can affect battery life.
- Using the battery in extremely high or low ambient temperatures can reduce battery life.

Should I attempt to service the battery pack myself?

No. The battery pack is not user-serviceable. Any attempt to do so will void your warranty. Do not puncture the cells or dispose of them in fire. The electrolyte in the cells is alkaline and can cause harm if it contacts eyes or skin. If the electrolyte does contact eyes or skin, immediately wash it off with fresh water and seek medical advice.

Storage, transportation, and disposal

Should I leave the battery connected to the handheld for shipment or long storage?

No. During shipment, the handheld could be bumped or jostled and accidentally turned on. This could violate rules of freight carriers.

What should I do if I plan to store the handheld for more than a couple of weeks?

If you plan to store the unit for longer than a couple of weeks, unplug the battery from the charger and then remove the battery from the handheld. After retrieving the handheld and battery from long-term storage, fully recharge the battery separately before attaching it to the handheld.

Leaving the batteries attached and idle for more than two months could lead to cell reversal, where connected cells approach zero volts. Typically, one cell has a slightly higher voltage than the other, so the cell with higher voltage tries to charge the weaker cell, and damages it. To avoid this, remove the battery from the handheld.

How long will the charge last when the battery is removed for storage?

- At room temperature, a battery will lose 20% to 30% of its capacity every 30 days.
- At ambient temperatures significantly above room temperature, capacity losses will be substantially faster.
- Lower temperatures tend to extend the shelf life of the charge.

What is the serviceable storage shelf life of a battery pack?

As long as the battery storage temperature specification of -20 °C to 35 °C (-4 °F to 95 °F) is followed, the battery should have a shelf life of several years. For best results, fully charge the battery **before** you attach it to the handheld after long term storage.

How long will the charge last when the battery is attached to a handheld that is turned off?

A fully charged battery should last 20 days under these conditions. High ambient temperatures will decrease the battery life.

After long term storage, is it safe to plug the battery into a charger and start using it immediately?

If the battery is very deeply discharged, allow the handheld to charge for approximately two hours before you install or use certain CompactFlash drivers or software. Some CompactFlash cards, for example, Bluetooth and Wireless LAN cards, can draw power from the handheld faster than the charger can supply it, causing the system to become unstable.

If the battery is so deeply discharged that the handheld has difficulty turning on, even when on external power, you can remove the battery and charge it separately.

What environmental hazards are associated with the battery?

The battery pack contains no heavy metals or other chemicals linked to environmental harm. Please dispose of batteries correctly, in accordance with local regulations.

What should I know about battery disposal and transportation?

The battery pack contains Panasonic NiMH batteries. For information on battery disposal (US only), go to <http://www.panasonic.com/industrial/battery/oem/enviro/index.html>.

For more information, including how to transport the battery, go to http://www.panasonic.com/industrial/battery/oem/images/pdf/Panasonic_NiMH_Info.pdf.

Miscellaneous

Can I use AA batteries in a Trimble Recon handheld?

Yes. If your handheld does not have a built-in 802.11g wireless radio, you can buy and use the optional AA PowerBoot Module, that accepts AA cells. These can be Alkaline, NiMH rechargeable, or Lithium cells. The Lithium cells give about double the life of Alkaline cells.

Do not use Alkaline cells in temperatures below 0 °C because their capacity drops quickly at low temperatures. In addition, standard alkaline batteries contain significant amounts of water, so they will freeze at approximately -12 °C (10 °F).

Does the handheld have a backup battery?

No. All files on a Trimble Recon handheld that is running the Windows Mobile 5.0 software are safely stored in non-volatile flash memory. This form of storage retains information indefinitely with or without battery power.