Backcountry electronics can increase your capability (performance, comfort, safety).

Backcountry electronics can increase the enjoyment of your experience in nature.
Backcountry electronics require additional time, attention, and different skills.

Battery Management & Portable Battery Chargers

"What is the best way to calculate how much battery capacity I need?" - Carrie (email)
How to calculate portable battery charger capacity needed for a particular trip?

\[
\# \text{ recharges} \times \text{ battery capacity (Wh) of Device 1} + \\
\# \text{ recharges} \times \text{ battery capacity (Wh) of Device 2} + \\
\# \text{ recharges} \times \text{ battery capacity (Wh) of Device 3} = \\
\text{specified battery capacity of portable battery charger needed}
\]

**MEMBER Q&A • BACKCOUNTRY ELECTRONICS**

I know a 10,000 mAh rated external battery pack doesn’t provide me with a true 10,000 mAh worth of power. Is there an accurate assumption of how much of the 10,000 mAh we actually get (i.e., 60%, 70%, etc.)?” - Rick (email)

**Manufacturer energy specifications vs. reality**


How to calculate portable battery charger capacity?

\[
\# \text{ recharges} \times \text{ battery capacity (Wh) of Device 1} + \\
\# \text{ recharges} \times \text{ battery capacity (Wh) of Device 2} + \\
\# \text{ recharges} \times \text{ battery capacity (Wh) of Device 3} = \\
\text{delivered (measured) battery capacity of portable battery charger needed}
\]
What about wasted energy in cables, connectors, circuit bleed, environmental conditions, and device battery aging?

CASE STUDY: 8-Day Trek

Petzl Bindii: 680 mAh battery \times 1\text{ recharge} = 680 \text{ mAh}
Garmin inReach Mini: 1,250 mAh battery \times 1\text{ recharge} = 1,250 \text{ mAh}
Garmin Fenix 5X Plus: 430 mAh battery \times 2\text{ recharges} = 860 \text{ mAh}
Sony RX100 m6: 1,240 mAh \times 4\text{ recharges} = 4,960 \text{ mAh}
iPhone SE: 1,620 mAh \times 3\text{ recharges} = 4,860 \text{ mAh}

\textbf{12,610 \text{ mAh (needed)}}

*Consider a 20-40% energy loss from portable battery pack specification

\textbf{16,000 - 20,000 \text{ mAh PBC Spec}}

Can I operate my electronic device at cold temperatures?

What if I need to operate it below freezing?

<table>
<thead>
<tr>
<th>Safe Battery Temperatures</th>
<th>Operation</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>35° C 95° F</td>
<td>45° C</td>
<td>113° F</td>
</tr>
<tr>
<td>0° C 32° F</td>
<td>-20° C</td>
<td>-4° F</td>
</tr>
</tbody>
</table>


Energy Wasted in One Night

Should I leave my device plugged into the portable battery charger overnight?

"Who takes electronic toys backpacking? Get a map. Get a compass." - Michael (email)

"Any good solar panel setups for extended ultralight trips?" - elliotwdh (instagram)

"Are there any tricks to get a higher % of mAh (i.e., charge the devices from 25% to 75% twice verses charging them from 0% to 100% once, etc.)" - Rick (email)
"How effective are walkie-talkies, particularly in canyons?" - deasy_does_it (Instagram)

"For a novice learning backcountry navigation, and in consideration of costs, could you please recommend an easy to use and learn starter package?" - Caroline of Canada (email)

"Why won't my phone hold a charge when hiking in the cold?" - bigskysteph (Instagram)

"What's the best solar charger for a phone or watch?" - mtcammerer_jds (Instagram)
"How do you keep track of the miles you make?" - zumieke (instagram)

"Best handheld GPS?" - jeffersonalle (twitter)

"Recommended watch with altimeter that's solar powered?" - natenelson84 (instagram)

"Is a data/metrics centered watch worth the investment?" - natenelson84 (instagram)
"Any updated power bank products we should consider?" - mike.obester (Instagram)

"Best battery charger?" - jeffersonalle (Twitter)

**key performance metrics:**
- Energy density (1,000 to 2,000)
- Delivered (measured) energy (85%)
- Weather sealing (IPX rating/observed)
- Multi-device charging

"I would be curious about your thoughts of battery efficiency with a conventional camera versus a cell phone. I am assuming the cell phone is more efficient per picture than a conventional camera given the intense design focus on cell phone power efficiency. But I have never done measurements to validate that assumption.

For multi day trips, I’m usually part of a group. With someone else navigating. So my primary usage for my phone is taking pictures. I do see a fairly significant impact on phone battery charge if I take a large number of pictures in a given day." - Arthur (Email)