Ham Radio

Portable Battery Box

Design · Build · Deploy

Field-Portable Power for QRP & Beyond

Why Build a Portable Battery Box?

Field & SOTA Operations

Take your station anywhere — mountain summits, parks, remote sites — without relying on AC power.

Emergency Preparedness

Be ready when the grid goes down. A self-contained power unit keeps you on the air during disasters.

Contest & POTA Activations

Parks on the Air, Field Day, and portable contests reward off-grid operation. Purpose-built power wins.

Solar Charging Ready

Combine with a solar panel for truly indefinite portable operation. The box becomes a solar power station.

Know Your Use Case

QRP Ops

5W or less

SSB/CW with radios like the KX3, IC-705, or FT-818. Sips power. A small 10Ah LiFePO4 lasts a full day.

Mid-Power

25–100W

The IC-7300, FT-991A portable. Needs larger capacity — typically 20–50Ah. A pelican case build makes sense.

High Power

100W+

Full legal limit portable. Large AGM or LiFePO4 packs required. Generator backup often needed for long sessions.

Key Design Considerations

Capacity (Ah)

How many amp-hours do you need? Runtime = Ah ÷ avg current draw. Account for depth-of-discharge limits.

Battery Chemistry

AGM (heavy, cheap), LiFePO4 (lighter, longer cycle life, more expensive), or SLA. Each has trade-offs.

Weight & Portability

Will you carry it on your back? Backpack ops demand lightweight LiFePO4. Car-portable allows heavier AGM.

Charging Sources

AC wall charger, 12V vehicle, or solar panel. Your BMS and charge controller must match your chemistry.

Safety & Fusing

Always fuse close to the battery positive terminal. A short-circuit fire can be catastrophic.

Connector Standards

Anderson Powerpole connectors are the ARRL/ARES standard. Use them for interoperability.

Calculating Runtime & Capacity

The Formula

```
Runtime (hrs)  =  Battery Capacity (Ah)  ÷  Average Current Draw (A)
```

20 Ah

Typical QRP box
(LiFePO4 16Ah usable)

40 Ah

Mid-power build
(32Ah usable at 80% DoD)

100 Ah

Base-camp / EMCOMM
(80Ah usable)

⚡ *Real-world tip: LiFePO4 = 80% DoD safe | AGM = 50% DoD safe | Always add 20% buffer*

Battery Chemistry Comparison

	SLA / AGM	LiFePO4	Li-Ion (18650)
Weight (20Ah)	~6–7 kg	~2.5–3 kg	~1.5–2 kg
Cycle Life	~300–500	~2,000–5,000	~500–1,000
Usable DoD	~50%	~80–100%	~80%
Cost (20Ah)	~$40–60	~$100–200	~$80–150
Cold Weather	Fair	Good	Poor
Safety	Very safe	Very safe	Requires BMS
Best For	Car-portable, EMCOMM	All portable ops	Ultralight backpack

★ *LiFePO4 is the recommended choice for most portable ham radio builds*

Parts List: What You'll Need

01	**Battery**	— LiFePO4 or AGM, sized to your Ah needs
02	**Enclosure / Case**	— Pelican 1510, Harbor Freight Ammo Can, or custom aluminum box
03	**Anderson Powerpole Connectors**	— 45A or 30A — ARES/ARRL standard output connectors
04	**Main Fuse / Breaker**	— Inline fuse holder or automotive circuit breaker near battery positive
05	**Battery Management System (BMS)**	— Required for LiFePO4 — protects against over/under-voltage
06	**Voltmeter / Battery Monitor**	— Panel-mount DC voltmeter or Bluetooth shunt monitor (e.g., Victron)
07	**Charge Input Port**	— SAE connector, barrel jack, or Anderson PP for solar / charger input
08	**Wire (10–12 AWG)**	— Stranded, rated for your max current. Keep runs short.
09	**Bus Bars / Distribution Block**	— + and − bus bars for multiple output ports
10	**Toggle / Rocker Switch**	— Main power on/off switch rated for your current

Choosing Your Enclosure

Pelican / Case Club

✔ Weather-sealed, foam inserts, airline carry-on sizes available

✘ Expensive, limited internal height

Best for: QRP & mid-power portable

Ammo Can (30 / 50 cal)

✔ Extremely rugged, cheap (~$15 surplus), naturally shielded

✘ Heavy steel, not weather-sealed unless gasket-modded

Best for: Car-portable, EMCOMM caches

Harbor Freight Case

✔ Budget-friendly, decent foam, adequate weather resistance

✘ Less durable than Pelican, latches can fail

Best for: Budget builds, beginners

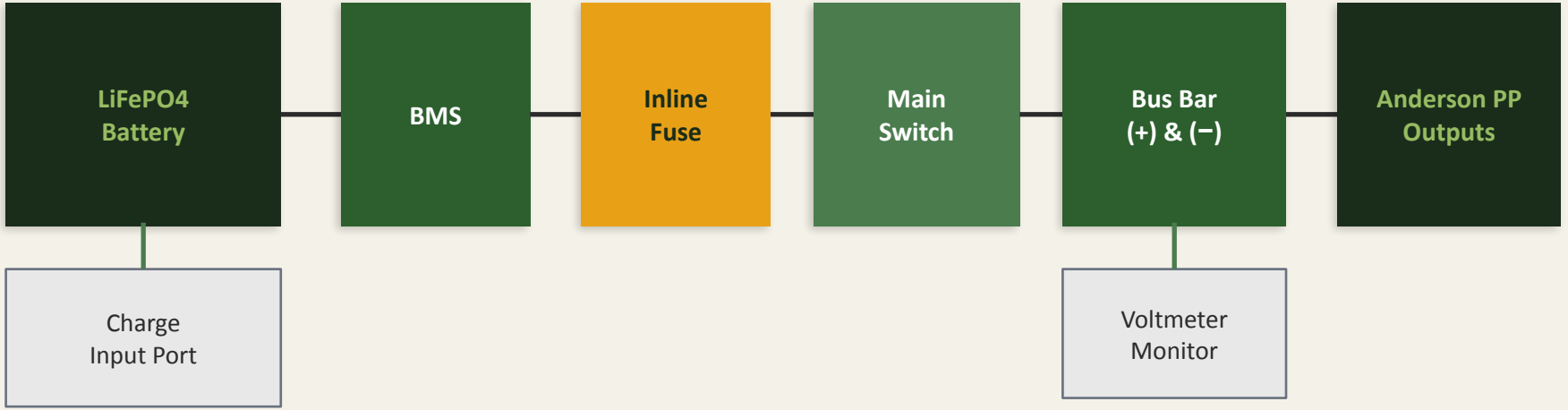
Custom Aluminum Box

✔ Exact fit, professional finish, great RF shielding

✘ Requires metalworking skills or fabrication cost

Best for: Permanent club/repeater builds

Wiring Layout & Circuit Overview



Note: Fuse must be within 18" of battery positive terminal | BMS handles cell protection for LiFePO4 chemistry

Step-by-Step Build Process

1

Plan & Size

Determine radio's peak and average current draw. Choose battery Ah for desired runtime. Sketch your layout.

2

Prep the Case

Cut holes for connectors, switch, voltmeter, and ventilation. File edges smooth. Test-fit all components.

3

Install Battery

Secure battery with foam or straps. Attach BMS if LiFePO4. Never let battery slide freely.

4

Run Main Wiring

Connect battery (+) → BMS (if used) → fuse → switch → (+) bus bar. Run (−) to (−) bus bar directly.

5

Mount Panel Components

Install voltmeter, switch, Anderson PP connectors, charge port. Drill cleanly and use grommets on wire holes.

6

Final Connections

Connect bus bars to panel components. Torque all terminals. Double-check polarity before first power-on.

Connectors & Wiring Standards

Anderson Powerpole

The ARRL/ARES standard for ham radio power connections

- 15A, 30A, and 45A ratings — use 30A or 45A for radio power
- Genderless design — any two connectors mate together
- Assembled in ARRL standard: red on top, black on bottom, tongue facing left
- Purchase a PowerPole Crimper or use needle-nose pliers to seat contacts
- Carry spare contacts in the field — they can back out under vibration

Wire Gauge Guide

AWG	Max Amps	Use Case
18 AWG	10A	Low-current accessories
14 AWG	20A	QRP radio leads
12 AWG	30A	Standard radio power leads
10 AWG	40A	100W radio main feeds
8 AWG	55A+	High-current bus / main fuse

Safety: Non-Negotiable Rules

Always Fuse Near the Battery

Install your main fuse or circuit breaker within 18" of the battery's positive terminal. This is your last line of defense against a catastrophic short.

Never Over-Discharge LiFePO4

Discharging below 10.5–11V can permanently damage cells. Use a BMS with low-voltage cutoff — it's not optional.

Ventilate AGM Batteries

AGM batteries emit hydrogen gas during charging. Ensure adequate ventilation in your enclosure or charge outdoors.

Verify Polarity Before Connecting

Reverse polarity will destroy your radio instantly. Double-check (+) and (−) every single time. Use polarity-protected connectors where possible.

Charging Your Battery Box

AC Wall Charger

- Dedicated LiFePO4 or AGM charger (not car charger!)
- Look for CC/CV charging profile
- Noco Genius, Victron Blue Smart — proven options
- Typical: 10A charger for 20Ah = ~2hr full charge

Vehicle / 12V DC

- DC-to-DC charger (e.g., Victron Orion) recommended
- Prevents alternator overload and voltage spikes
- Charges while you drive to the site
- Set current limit to protect vehicle electrical system

Solar Charging

- MPPT charge controller strongly preferred over PWM
- Size panel to roughly 1–1.5× battery Ah in watts (e.g., 30W for 20Ah)
- Pair with a solar-to-PP adapter and SAE connector on box
- Victron SmartSolar MPPT 75/15 is a popular choice

Real-World Build Examples

The Ultralight SOTA Box

- Battery: 10Ah LiFePO4 (Bioenno)
- Case: Small NEMA enclosure or stuff sack
- Radio: KX3 / FT-818 (QRP)
- Weight: ~1.2 kg (2.5 lbs)
- Runtime: ~8–10 hrs at QRP levels

Designed to fit in a summit pack. Often just battery + Powerpole pigtail.

The Field Day Workhorse

- Battery: 40Ah LiFePO4 (Dakota Lithium)
- Case: Pelican 1510 or ammo can
- Radio: IC-7300 or FT-991A (100W)
- Charger: Victron Blue Smart + solar
- Runtime: ~4–6 hrs at full 100W TX

Includes voltmeter, dual Powerpole outputs, 30A breaker, charge port.

The EMCOMM Cache Box

- Battery: 100Ah AGM (sealed)
- Case: Heavy-duty storage tote
- Radio: Multiple rigs + accessories
- Charger: Shore power + solar backup
- Runtime: 12+ hrs with multiple ops

Designed for club deployment. Heavy but powerful. Stays in the vehicle.

You're Ready to Build!

- Define your use case — QRP, mid-power, or EMCOMM
- Size your battery with an Ah calculation + 20% buffer
- Choose LiFePO4 for best weight-to-capacity ratio
- Fuse within 18" of battery positive — always
- Use Anderson Powerpole connectors — ARES standard
- Plan your charging sources: AC + solar = no excuses
- Test at home before taking to the field
- Get on the air — 73 de the field!

73 — Good Luck & Good DX!