

Off-Grid Solar & Battery System Reference Guide

Technical Specifications • Runtime Calculations • SmartShunt & BMS Troubleshooting

1. CABIN PRIMARY SYSTEM SETUP

COMPONENT	SPECIFICATION / CONFIGURATION	NOTES & PERFORMANCE
Solar Array	2× 400W PV Panels in Series (800W Total)	~80V–85V V_{oc} / ~68V V_{mp} . Ground mount with full southern exposure.
Wiring & Distance	200 ft 10 AWG Solacity PV wire (120 ft distance)	120 ft elevated 20" off ground, 6 ft in underground 3/4" PVC conduit. ~2.6% voltage drop.
Charge Controller	Victron SmartSolar MPPT 100/30	Capped at 30A output (~430W @ 12V). Safe auto-clipping during peak noon hours.
Battery Bank	460Ah LiFePO4 (2× 230Ah LiTime Low-Temp in parallel)	12.8V nominal, ~5,888 Wh storage. Includes built-in low-temp heating protection.
AC Inverter	700W Renogy Pure Sine Wave Inverter	Idle power consumption: ~0.6A–0.8A (~10W–12W continuous).
Backup Generator	Honda EU2200i + Victron Smart Charger (~460W net)	Replenishes 50% capacity (225Ah / 2,880 Wh) in 6.0 to 6.5 hours at ~25% eco-load.

Cabin Runtime Summary (Fully Charged 460Ah / 5,888 Wh)

- **50W AC Load (via 700W Inverter):** ~63–68 hours continuous (factoring 90% inverter conversion efficiency + ~10W–12W idle draw).
- **50W Direct DC Load (12V fuse block):** 110+ hours (~4.5 days continuous) by bypassing inverter overhead.

2. VICTRON SMARTSHUNT CONFIGURATION & DRIFT PREVENTION

The SmartShunt measures State-of-Charge (SOC) via *coulomb counting* and requires periodic 100% full charges to reset its baseline. To eliminate SOC drift:

SETTING / PARAMETER	RECOMMENDED VALUE	PURPOSE / BEHAVIOR
Charged Voltage	14.1V – 14.2V	Set 0.2V–0.3V below MPPT Absorption voltage to ensure auto-sync triggers.
Tail Current	1.0% – 2.0%	Optimized for LiFePO4 sharp charge termination curve (default 4% is too high).
Charged Detection Time	10 minutes	Sustained conditions required before resetting SOC counter to 100%.
Shunt Wiring Rule	Strict Single-Ground	Battery Minus: Connects ONLY to battery terminal. System Minus: ALL loads, grounds, MPPT, and chargers attach here.

Manual SOC Reset Procedure

- **To set current estimate (e.g., 90%):** Tap *State-of-Charge* in VictronConnect and enter 90%.
- **When batteries hit 100% full:** Tap *Synchronize SOC to 100%* to manually calibrate the zero-point.