Falcon Off-Grid Electrical Upgrade

Upgrade path from two 6 V golf-cart batteries + Go Power 1500 W inverter to a LiFePO4-based system sized for campground convenience and practical boondocking.

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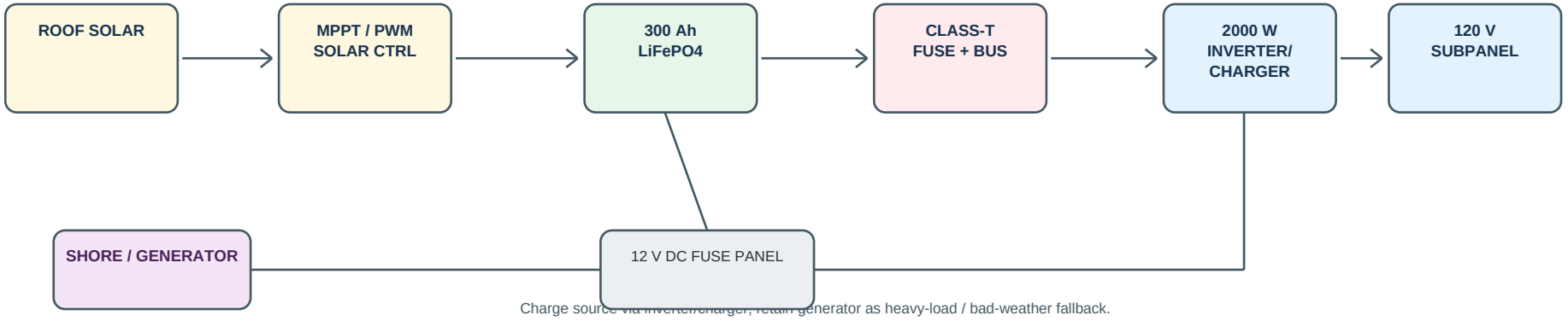

Charge source via inverter/charger; retain generator as heavy-load / bad-weather fallback.

Existing condition

Component	Current	Engineering implication
Battery bank	2 x ~6 V, ~200 Ah golf-cart batteries in series	~12 V, ~200 Ah total. Approx. 2.4 kWh nameplate; practical lead-acid usable energy often ~1.2 kWh if limiting routine depth of di
Inverter	Go Power 1500 W pure sine	Coffee maker + 120 V refrigerator can push continuous/surge load high enough to trip inverter or expose battery-voltage sag.
Solar	Existing roof solar	Retain if controller supports LiFePO4 charging profile and array voltage/current remain within controller limits.
Large summer load	9,800 BTU inverter window A/C	Phase 1: shore/generator load. Do not size the first lithium upgrade around all-night battery A/C.

Recommended Phase 1

300 Ah LiFePO4 + 2,000 W pure-sine inverter/charger + shunt monitor. This is the practical sweet spot for lights, Starlink, projectors, refrigerator, coffee, and short appliance bursts while keeping generator/shore power responsible for the window A/C and other sustained heavy loads.

Why not jump straight to a 3,000 W inverter?

At 12 V and ~90% efficiency, 2,000 W can demand roughly 185 A from the battery; 3,000 W can approach 278 A. A 3 kW inverter therefore drives larger cable, fuse, busbar, BMS, and battery-current requirements even if the energy bank is unchanged.

Electrical sizing - concept values

Circuit / component	Recommended concept	Notes
Battery	12.8 V nominal, 300 Ah LiFePO4; BMS continuous current >=200 A (prefer margin)	Heated battery or low-temp charge protection if winter charging below freezing is possible.
Main battery fuse	Class-T sized to inverter manufacturer recommendation; typically 250-300 A for ~2 kW class	Mount close to battery positive; final size follows inverter manual and cable ampacity.
Battery cables	Short runs; typically 2/0 copper for ~2 kW 12 V installations	Final gauge depends on one-way length, insulation temp rating, and inverter manual.
Inverter / charger	2,000 W pure sine with integrated shore/gen charger and transfer capability	Simplifies lithium charging and reduces duplicate hardware.
Shunt	500 A smart shunt	Battery negative passes through shunt; all coach loads/chargers land on system side.
Solar controller	Retain only if programmable / LiFePO4 compatible	Set absorption/float per battery maker; disable lead-acid equalization.
120 V A/C	Shore / generator in Phase 1	Future battery A/C requires larger energy bank and charging analysis.
Generator interface	Feed inverter/charger or transfer equipment per listing/manual	Generator remains fallback for cloudy/snowy conditions and high-draw periods.

Approximate energy picture

Bank	Nameplate energy	Practical planning energy	Comment
Current ~12 V / 200 Ah lead-acid	~2.4 kWh	~1.2 kWh	Voltage sag under high current is a major limitation.
Proposed 12.8 V / 300 Ah LiFePO4	~3.84 kWh	~3.2-3.6 kWh	Higher usable fraction and much flatter voltage curve.
Future 12.8 V / 400 Ah LiFePO4	~5.12 kWh	~4.3-4.8 kWh	Makes 3 kW inverter / limited A/C experiments more sensible.

Load-management rule

Keep the system convenient enough that normal cabin use does not require constant breaker-juggling. Use the generator deliberately for the A/C, microwave plus other heavy loads, and bulk recharging in poor solar weather.

Upgrade sequence

Step	Action	Reason
1	Install shunt monitor on current bank and collect real-trip data.	Confirms actual daily Ah/kWh use before buying batteries.
2	Verify existing converter/charger and solar controller models.	Old lead-acid charge profiles may not safely/fully charge LiFePO4.
3	Install 300 Ah LiFePO4 bank, main fuse, busbars, disconnect, and proper cabling.	Fixes voltage sag and multiplies usable energy.
4	Replace 1500 W inverter with ~2000 W inverter/charger.	Adds surge margin and proper lithium shore/generator charging.
5	Test coffee + refrigerator + AV + Starlink simultaneously.	Validate real-world convenience load.
6	Only then decide whether 3 kW / 400 Ah is justified.	Avoid buying heavy copper and inverter capacity that is rarely used.

Installation cautions

High-current 12 V systems can deliver destructive fault current. Final fuse sizing, conductor gauge, grounding/bonding, inverter neutral-ground behavior, transfer switching, and battery BMS limits must follow the actual equipment manuals and applicable RV electrical practice. Have Abe's RV Service or a qualified RV electrical installer review the final equipment-specific design if you do not want to own the high-current wiring work.