

ROCKSOLAR

3.5 kW Off-Grid Solar System with 5 kWh Energy Storage

USER MANUAL

Product	ROCKSOLAR 3.5 kW Off-Grid Solar System with 5 kWh Energy Storage
System SKU	SYS-35KW-GRWT5-SPF35-6x440PHIL-1
Inverter	Growatt SPF 3500TL LVM-US
Solar Array	6 x 440 W bifacial panels - 2,640 W total
Battery	5 kWh LiFePO4 energy storage

IMPORTANT SOLAR ARRAY WIRING

All six supplied 440 W solar panels must be connected in one series string (6S). Do not connect the six panels in parallel and do not create two strings of three panels.

For off-grid residential, cottage, cabin and backup-power applications

Installation and commissioning must be performed by a qualified solar/electrical professional.

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1. Introduction

Thank you for choosing the ROCKSOLAR 3.5 kW Off-Grid Solar System with 5 kWh Energy Storage. This system combines solar generation, lithium battery storage and AC power conversion into an integrated off-grid energy solution.

During daylight hours, solar energy can power connected loads and charge the battery. Stored battery energy can then supply loads when solar production is insufficient or unavailable. The Growatt inverter can also accept utility-grid or compatible generator input when configured for auxiliary charging or backup operation.

- System overview
- Safety information
- Installation guidance
- Startup and shutdown procedures
- Basic inverter operation
- Battery operation
- Wi-Fi monitoring guidance
- Maintenance recommendations
- Troubleshooting information

INSTALLATION REQUIREMENT

This system must be installed and commissioned by a qualified solar/electrical professional in accordance with applicable Canadian electrical codes, local regulations, and the individual component manufacturers' instructions.

2. What's Included

Component	Quantity
Growatt SPF 3500TL LVM-US Off-Grid Inverter	1
440 W Bifacial Solar Panels	6
5 kWh LiFePO4 Battery	1
40 ft 10 AWG PV-to-inverter cables	1 set
10 ft 2 AWG battery-to-inverter cables	1 set
Wi-Fi monitoring module	1
300 V / 20 A DC circuit breaker	1
DC circuit breaker box	1
Solar mounting rack	Optional
User documentation	1 set

Battery controls, communication settings and indicators may differ between battery versions. Always follow the battery manual supplied with the exact battery included with your kit.

3. Main System Specifications

3.1 Inverter

Specification	Rating
Rated output	3,500 W / 3,500 VA
Battery voltage	48 VDC
AC output	100/110/120 VAC selectable
Frequency	50/60 Hz
Waveform	Pure sine wave
Surge capacity	Up to 7,000 VA
Maximum PV array rating	4,500 W
PV startup voltage	Approx. 150 VDC
MPPT operating range	120-225 VDC
Maximum PV open-circuit voltage	280 VDC
Maximum solar charging current	80 A
AC charging current	Up to 40 A
Parallel capability	Up to 6 units

PV VOLTAGE LIMIT

Never allow the PV string open-circuit voltage to exceed the inverter maximum PV input voltage. Solar-panel voltage rises in cold weather, so string design must be checked using the panel temperature coefficient and the lowest expected local temperature.

3.2 Solar Array

The supplied array consists of 6 x 440 W bifacial monocrystalline modules, for 2,640 W total rated array power. Bifacial modules can generate energy from light reaching both the front and rear surfaces. Actual output depends on sunlight, orientation, temperature, shading, snow cover, mounting configuration and site conditions.

3.3 Battery

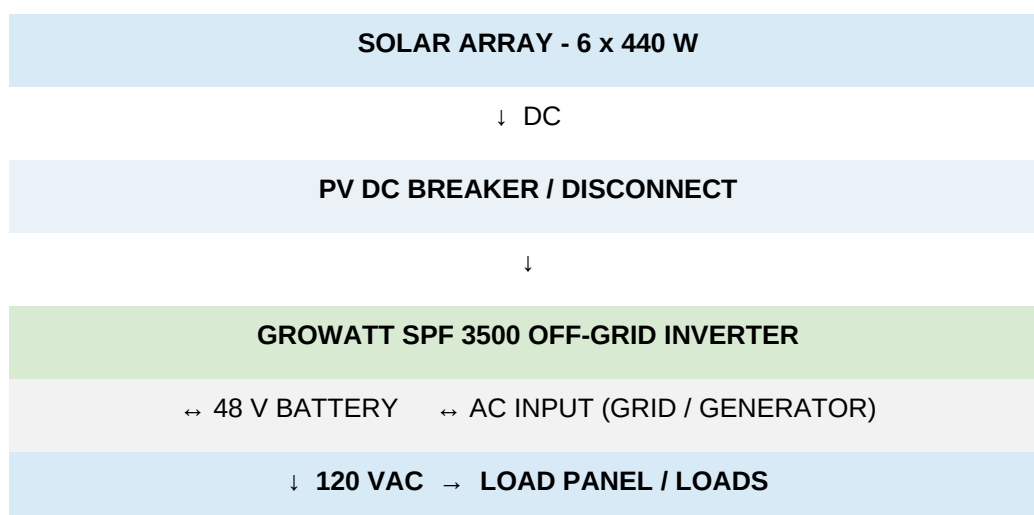
Specification	Typical Rating
Chemistry	LiFePO4 / LFP
Nominal energy	5.0 kWh
Usable energy	Approx. 4.6 kWh for Growatt ALP version

Specification	Typical Rating
Nominal voltage	51.2 V
Operating voltage range	46.4-57.6 V
Module capacity	100 Ah
Installation	Wall or floor, model-dependent
Communication	CAN for Growatt ALP version

The battery contains an integrated battery-management system (BMS) that monitors parameters such as voltage, current, cell voltage and temperature.

4. System Operating Principle

A typical system operates as shown below:



During normal solar operation, available PV energy can supply the loads and charge the battery according to inverter configuration. When solar energy is insufficient, the battery can supply the connected loads. Utility or generator input may also be used according to selected operating and charging priorities.

5. Safety Instructions

DANGER - HIGH VOLTAGE

Solar panels produce DC voltage whenever exposed to light. Turning the inverter OFF does not necessarily remove voltage from PV wiring. Battery terminals can also deliver extremely high fault current.

Installation, electrical connection, troubleshooting and repair should therefore be performed only by qualified personnel.

Always:

- Use insulated electrical tools.
- Wear appropriate personal protective equipment.
- Verify polarity before making DC connections.
- Install correctly sized circuit protection.
- Ensure all equipment is properly grounded.
- Disconnect energy sources before maintenance.

- Keep conductive objects away from battery terminals.
- Follow the Canadian Electrical Code and local requirements.
- Keep children and unauthorized persons away from electrical equipment.

Never:

- Short-circuit battery terminals.
- Reverse battery polarity.
- Exceed inverter PV voltage limits.
- Operate damaged electrical equipment.
- Open or modify the battery.
- Expose the battery to fire.
- Install the battery in standing water or a persistently wet environment.
- Install damaged or deformed batteries.
- Dispose of LiFePO4 batteries with household waste.

6. Installation Location

Install equipment in clean, accessible locations that provide adequate ventilation and appropriate environmental protection.

6.1 Inverter

- Mount on a solid, non-combustible supporting surface.
- Provide adequate ventilation.
- Protect from direct water exposure.
- Maintain required service clearances.
- Keep away from combustible materials.

6.2 Battery

- Use a clean, dry, ventilated installation area.
- Avoid excessive heat and prolonged direct sunlight.
- Use appropriate lifting methods; a 5 kWh battery is heavy.
- Follow the exact environmental limits in the battery manufacturer manual.

7. Solar Panel Installation

Install the array in an unshaded location with appropriate mounting, structural support, cable protection and spacing.

1. Select an unshaded location.
2. Orient panels for strong solar exposure.
3. Use mounting hardware suited to the roof or ground structure.
4. Maintain ventilation behind modules.
5. Secure modules according to mounting specifications.
6. Protect PV cables from abrasion, sharp edges, standing water and accidental damage.
7. Clearly identify positive and negative conductors.

8. Electrical Connections

Electrical installation should be organized around grounding, battery, AC output, optional AC input, and PV input circuits.

8. Establish equipment grounding and bonding first.
9. Connect the battery circuit through correctly rated protection.
10. Connect inverter AC output to an approved load panel or distribution system.
11. Connect utility or generator input if used.
12. Connect the solar array through the designated PV DC disconnect/breaker.

9. Battery Connection

Before connecting the battery, confirm the battery, inverter, PV and AC sources are off or isolated, then verify polarity and compatible battery voltage.

BATTERY POLARITY

Battery positive (+) must connect through appropriate DC protection to inverter BAT+. Battery negative (-) must connect to inverter BAT-. Never reverse battery polarity.

10. Battery Communication

When using a compatible Growatt battery, connect the BMS communication interface as specified by Growatt so charging, discharging, state of charge and protection limits can be coordinated.

- Charging
- Discharging
- State of charge
- Voltage limits
- Current limits
- Temperature protection
- Battery alarms

11. Solar Panel Connection - 6S Series Wiring

REQUIRED CONFIGURATION

All 6 supplied 440 W solar panels must be connected together as ONE SERIES STRING (6S) before connecting to the Growatt SPF 3500TL LVM-US inverter. Do not connect the six panels in parallel. Do not create two strings of three panels.

Required series connection:

Panel 1 (+)	→	Panel 2 (-)
Panel 2 (+)	→	Panel 3 (-)
Panel 3 (+)	→	Panel 4 (-)
Panel 4 (+)	→	Panel 5 (-)
Panel 5 (+)	→	Panel 6 (-)
Remaining end leads	→	PV String (-) and PV String (+)

In simpler terms:

[440 W] - [440 W] - [440 W] - [440 W] - [440 W] - [440 W]

Panel 1 Panel 2 Panel 3 Panel 4 Panel 5 Panel 6
ONE SERIES STRING (6S) -> PV DC breaker/disconnect -> Growatt PV input

Why the panels are connected in series

- The panel voltages add together.
- The string current remains approximately equal to the current of one panel.
- The combined string voltage is high enough for the inverter MPPT solar charger to operate correctly.

The Growatt SPF 3500TL LVM-US MPPT operating range is approximately 120-225 VDC, PV startup is approximately 150 VDC, and maximum PV open-circuit voltage is 280 VDC.

WARNING - COLD-WEATHER VOC

Before energizing the PV circuit, the installer must verify the actual module specifications and calculate maximum cold-weather open-circuit voltage. The total series-string Voc must never exceed 280 VDC, including the voltage increase that occurs at low temperatures.

Connection procedure

13. Ensure the PV breaker/disconnect is OFF.
14. Confirm all six modules are the supplied matching 440 W panels.
15. Connect Panel 1 positive (+) to Panel 2 negative (-).
16. Connect Panel 2 positive (+) to Panel 3 negative (-).
17. Connect Panel 3 positive (+) to Panel 4 negative (-).
18. Connect Panel 4 positive (+) to Panel 5 negative (-).
19. Connect Panel 5 positive (+) to Panel 6 negative (-).
20. Use the two unused end leads as the complete PV string positive and negative conductors.
21. Verify string polarity with a suitable DC voltmeter.
22. Measure complete string open-circuit voltage.
23. Confirm voltage is within inverter limits.
24. Connect the string to the PV DC breaker/disconnect.
25. Connect the breaker/disconnect output to the inverter PV input.
26. Confirm all PV connectors are fully seated and locked before energizing the system.

DO NOT ALTER THE STRING DESIGN

This ROCKSOLAR kit is designed with all six supplied solar panels connected in one series string (6S). Do not alter the series/parallel configuration unless ROCKSOLAR or a qualified solar professional has reviewed and approved the revised electrical design.

12. AC Output Connection

The SPF 3500TL LVM-US is a 120 VAC single-phase inverter rated for 3.5 kW continuous output. Suitable loads may include lighting, refrigerators, electronics, TVs, internet equipment, small kitchen appliances, and appropriately sized pumps or other 120 V loads.

- Keep total simultaneous load within inverter capacity.
- Motors, compressors and pumps may require much more starting power than running power.
- The inverter provides surge capability, but connected loads must still be properly sized.

13. 120/240 V Systems

120 V OUTPUT

A single SPF 3500TL LVM-US provides 120 VAC output. Do not connect a single inverter directly to a 120/240 V split-phase panel as though it were a conventional 240 V source.

Parallel or split-phase systems require the correct number of compatible inverters, approved parallel equipment and appropriate configuration by a qualified installer.

14. Initial Startup

Initial commissioning should be completed by the installer. Before startup, verify:

- All mounting hardware is secure.
- All conductors are properly terminated.

- Grounding is complete.
- PV polarity is correct.
- Battery polarity is correct.
- DC and AC breakers are correctly sized.
- No exposed conductors remain.
- Battery communication is connected where applicable.
- Inverter settings match the battery chemistry.

A typical commissioning sequence is: Battery -> Inverter -> AC source if applicable -> PV -> AC loads. Follow the current manufacturer manuals supplied with the equipment.

15. Normal Operation

Once commissioned, the system can operate automatically according to programmed power priorities. A common off-grid strategy is:

Condition	Typical Energy Flow
Daytime	Solar -> Loads -> Battery charging
Evening / Night	Battery -> Loads
Low battery	Generator or utility -> Loads + battery charging, when configured

Actual priority depends on installer-selected settings.

16. Battery Indicators

Indicator	Meaning
RUN - Green	Normal operation
ALM - Red	Fault or protection condition
LED 1	0-25% SOC
LED 2	26-50% SOC
LED 3	51-75% SOC
LED 4	76-100% SOC

Indicator behavior may differ with battery model. If the red ALM indicator remains illuminated, check system monitoring and the battery manual, then contact technical support if the fault cannot be identified.

17. Wi-Fi Monitoring

The system includes a Wi-Fi monitoring module. Once configured, remote monitoring may provide access to:

- Solar production
- Battery status
- Load consumption
- System operating mode

- Charging status
- Faults and warnings

18. System Shutdown

For routine shutdown, isolate the system according to the manufacturer procedures and site design. A typical controlled shutdown is:

27. Turn off or disconnect major AC loads.
28. Disable AC/grid/generator input.
29. Turn off the PV DC disconnect.
30. Switch off the inverter.
31. Switch off or isolate the battery.

ENERGY REMAINS PRESENT

Do not assume wiring is safe simply because the inverter display is off. Solar panels can continue producing voltage in daylight, and batteries retain stored electrical energy.

19. Emergency Shutdown

Do not touch damaged equipment. If safe and accessible:

32. Turn off the AC output/load disconnect.
33. Turn off the PV disconnect.
34. Turn off AC/grid/generator input.
35. Shut down the inverter.
36. Isolate the battery according to its manufacturer procedure.

BATTERY FIRE / THERMAL EVENT

Evacuate people from the area, contact emergency services, do not approach the battery, and inform responders that a lithium-ion/LiFePO4 battery energy-storage system is involved.

20. Routine Maintenance

Interval	Recommended Checks
Monthly	Inverter status, battery status, alarms, production trends, ventilation openings
Every 3-6 months	PV cabling, connectors, mounting hardware, DC disconnects, battery enclosure, ventilation, signs of heat/corrosion/moisture
Annually	Qualified technician inspection of terminations, grounding/bonding, breakers, PV strings, battery condition, inverter fault history and performance

Do not open the battery enclosure.

21. Solar Panel Cleaning

Clean modules when dirt, dust, leaves or debris significantly reduce solar exposure. Use clean water and soft non-abrasive materials. Avoid abrasive cleaners, metal scrapers, excessive pressure and walking on the modules. Snow accumulation can significantly reduce winter production.

22. Battery Storage

For extended storage, follow the battery manufacturer requirements. Store in a dry, clean, ventilated environment protected from direct sunlight and rain. Long-term unused batteries may require periodic charging.

23. Troubleshooting

Condition	Possible Cause	Recommended Action
Inverter does not turn on	Battery disconnected or depleted	Check battery disconnect and status
No solar charging	PV disconnect off	Check PV disconnect
No solar charging	Insufficient sunlight	Check again during good sunlight
No solar charging	PV voltage outside range	Qualified installer should measure string voltage
Low solar production	Shade, snow or dirty modules	Inspect array
Battery not charging	BMS communication issue	Check communication connection
Battery ALM light	Battery protection/fault	Check monitoring and battery manual
Inverter overloaded	Loads exceed capacity	Disconnect unnecessary loads
Trips when appliance starts	Appliance surge too high	Reduce loads or evaluate starting requirement
No AC output	Breaker off or inverter fault	Check display and breakers
Wi-Fi offline	Network or dongle issue	Restart monitoring and verify network
Battery often reaches low SOC	Insufficient solar or excessive use	Reduce consumption or increase PV/storage capacity

Do not repeatedly reset a system that continues to produce the same fault. Persistent faults should be diagnosed by a qualified installer.

24. Understanding Available Energy

A 5 kWh battery does not mean every 5 kWh can necessarily be delivered to household appliances. For example, a 5.0 kWh nominal battery may provide approximately 4.6 kWh usable energy depending on model and operating limits.

Actual runtime depends on load power, state of charge, temperature, inverter losses, battery protection limits and solar production occurring at the same time.

RUNTIME EXAMPLE

A 500 W average load would theoretically use 4.5 kWh in approximately 9 hours, before considering actual operating losses and changing loads.

25. System Expansion

The system can be expanded, but expansion should be professionally engineered. Compatible inverter platforms may support parallel configurations, and some batteries support modular expansion. Do not add batteries, panels or parallel inverters without checking:

- Inverter compatibility
- BMS compatibility
- PV input limits
- Cable size
- Protection devices
- Available fault current
- Electrical-code requirements

26. Technical Support

Item	Details
Company	ROCKSOLAR Canada
Phone	+1 800-858-4318
Email	support@rocksolar.io
Address	115 Randall Drive, Unit 9, Waterloo, Ontario N2V 1C5, Canada

When requesting support, provide the order number, product model, inverter serial number, battery serial number, description of the problem, fault/error code, photos of the installation and inverter display, approximate PV voltage, and battery state of charge.

27. Important Notice

This ROCKSOLAR system manual is intended as a system-level operating guide. It does not replace the manufacturer installation and service manuals for the Growatt inverter, battery, solar modules, mounting equipment or electrical protection equipment.

CODE AND MANUFACTURER REQUIREMENTS

Electrical installation and commissioning must be performed in accordance with applicable electrical codes, local permitting requirements, manufacturer instructions and the authority having jurisdiction.

Reference documents

- ROCKSOLAR product page for the 3.5 kW Growatt home solar storage kit.
- Growatt SPF 3000-3500TL LVM-US datasheet and product documentation.
- Growatt ALP LV-US battery datasheet and user manual, where applicable.
- The specific 440 W solar module datasheet supplied with the kit.

End of Manual