ROCKSOLAR

24 kW Whole-Home Off-Grid Solar System

15.84 kW Solar Array + 30 kWh LiFePO4 Energy Storage

Inverters	2 x Growatt SPE 12000US
Total AC Output	24,000 W, 120/240 VAC split-phase
Solar Array	36 x 440 W bifacial panels = 15,840 W
Battery Storage	6 x 5 kWh Growatt ALP LV-US = 30 kWh total
PV String Configuration	FOUR strings of NINE panels in series (9S x 4)
PV Allocation	Inverter 1: Strings 1 & 2 | Inverter 2: Strings 3 & 4

CRITICAL PV WIRING The 36 supplied panels are configured as four separate 9-panel series strings. Inverter 1 receives two 9-panel strings; Inverter 2 receives two 9-panel strings. Each string must contain exactly 9 panels in series. Each PV string must pass through its own 600 VDC / 20 A DC circuit breaker before connection to the assigned inverter PV input.

System-level operating and installation guidance. This manual does not replace the current Growatt inverter, battery, solar-module, electrical-code, or local authority requirements.

ROCKSOLAR CANADA

115 Randall Drive, Unit 9, Waterloo, ON N2V 1C5, Canada | +1 800-858-4318 | support@rocksolar.io

Contents

1. Introduction and Intended Use

Thank you for choosing the ROCKSOLAR 24 kW whole-home off-grid solar system. This package combines two Growatt SPE 12000US split-phase inverters, a 36-panel 15.84 kW bifacial solar array, and a 30 kWh Growatt ALP LV-US lithium battery bank. It is designed for large off-grid homes, farms, rural properties, workshops, and backup-power applications requiring 120/240 VAC split-phase power.

The two inverters operate as a coordinated parallel system. Each inverter is assigned two PV strings of 9 panels, for four PV strings total. The shared energy system can use solar, battery, utility, and compatible generator sources according to the commissioned configuration.

Qualified Installation Required	Installation, parallel-inverter configuration, battery wiring, PV string verification, AC distribution, generator/grid integration, and commissioning must be performed by qualified personnel familiar with photovoltaic systems, lithium batteries, split-phase power, and applicable Canadian electrical requirements.

2. System Components

Item	Specification
Inverters	2 x Growatt SPE 12000US, 12 kW each, 24 kW total
Solar panels	36 x 440 W bifacial monocrystalline solar panels
Battery storage	6 x Growatt ALP LV-US 5 kWh 48 V-class LiFePO4 battery modules (30 kWh total)
Monitoring	2 x SHINE Wi-Fi monitoring modules
PV cable	100 ft UV-resistant 6 mm2 / 10 AWG DC cable, plus supplied connectors/accessories as packaged
Battery cable	1 x 10 ft 2 AWG battery-to-inverter connection cable set as listed with the kit; final parallel-inverter battery cabling must follow the approved design
PV protection	4 x 600 VDC / 20 A PV DC circuit breakers - one per PV string
Breaker enclosure	1 x circuit breaker box
Documentation	Growatt inverter/battery and solar-module manuals/datasheets supplied with the system

3. System Specifications

Item	Specification
Total inverter output	24,000 W from 2 x 12,000 W inverters
AC output	120/240 VAC split-phase
Battery system	48 V class
Battery energy	30 kWh nominal total from 6 x 5 kWh modules
Solar array	15,840 W total from 36 x 440 W panels

Item	Specification
PV configuration	4 strings x 9 panels in series (9S x 4)
PV allocation	2 strings to Inverter 1; 2 strings to Inverter 2
PV protection	4 independent 600 VDC / 20 A DC breaker circuits
PV tracking	Each SPE 12000US provides dual MPP tracking
Maximum PV input voltage	Growatt lists up to 550 VDC for the SPE 6000-12000 US platform
Monitoring	Wi-Fi/4G capable with Growatt monitoring platform
Supported sources	Solar, battery, grid, and compatible generator

Always use the current Growatt datasheet and user manual for detailed MPPT voltage/current limits, AC overcurrent protection, battery current limits, conductor sizing, and parallel-communication requirements.

4. Safety Information

DANGER - MULTIPLE ENERGY SOURCES	This system contains four energized PV strings, a 30 kWh lithium battery bank, two 12 kW inverters, and potentially utility/generator AC sources. Turning off one inverter does not de-energize the complete system.

- Solar panels produce DC voltage whenever exposed to sufficient light.
- Battery conductors can deliver very high fault current even when AC loads are off.
- Use appropriately rated PPE, test instruments, insulated tools, disconnects, and lockout/tagout procedures.
- Verify absence of voltage before touching conductors; never assume a circuit is de-energized because a display is off.
- Never short battery terminals, reverse polarity, open battery enclosures, or bypass battery protection systems.
- Do not connect or disconnect PV connectors under load unless the connector and procedure are explicitly rated for that operation.
- Follow current Canadian Electrical Code requirements, local permitting rules, manufacturer instructions, and the authority having jurisdiction.

5. Dual-Inverter System Architecture

The system uses two Growatt SPE 12000US inverters operating as a coordinated 24 kW split-phase system. The battery bank supplies both inverters through the approved battery distribution arrangement, while the 36-panel array is divided equally between the two inverters.

PV allocation

Balanced PV Assignment	Inverter 1 String 1: 9 x 440 W in series String 2: 9 x 440 W in series PV power assigned: 7.92 kW nominal Inverter 2 String 3: 9 x 440 W in series String 4: 9 x 440 W in series PV power assigned: 7.92 kW nominal

Each inverter must be configured and interconnected using the current Growatt parallel-system instructions. Do not treat the two inverters as unrelated standalone units feeding the same AC panel.

6. Site Planning and Equipment Location

- Mount both inverters in a clean, dry, serviceable location with manufacturer-required clearances and ventilation.
- Locate battery modules on a stable approved surface with adequate clearance, protection from impact, and access for service.
- Keep equipment away from combustible materials, corrosive chemicals, uncontrolled water exposure, and locations prohibited by code or the manufacturer.
- Plan cable routes to minimize voltage drop, mechanical damage, unnecessary conductor length, and crossing of service access areas.
- Provide labels that clearly identify Inverter 1, Inverter 2, PV Strings 1-4, battery disconnects, AC sources, and emergency shutdown points.

7. Solar Array Installation

Install the 36 bifacial modules on an approved roof- or ground-mount structure. The final racking design must account for local wind, snow, roof structure, corrosion environment, and module clamp-zone requirements.

- Use identical 440 W modules within each string.
- Avoid shading differences within a string whenever possible.
- Route PV conductors so they are supported, protected from sharp edges, and kept away from standing water and high-heat surfaces.
- Maintain correct connector compatibility and do not mix incompatible connector brands or types.
- Before final connection, verify each string using the panel Voc, Vmp, Isc, Imp, and temperature coefficient from the current module datasheet.

8. PV Wiring - Four 9-Panel Series Strings

REQUIRED CONFIGURATION	36 panels = 4 strings x 9 panels in series. Inverter 1: String 1 + String 2. Inverter 2: String 3 + String 4. Each string uses its own 600 VDC / 20 A DC breaker.

```
STRING 1 -> INVERTER 1
P1 - P2 - P3 - P4 - P5 - P6 - P7 - P8 - P9

STRING 2 -> INVERTER 1
P10 - P11 - P12 - P13 - P14 - P15 - P16 - P17 - P18

STRING 3 -> INVERTER 2
P19 - P20 - P21 - P22 - P23 - P24 - P25 - P26 - P27

STRING 4 -> INVERTER 2
P28 - P29 - P30 - P31 - P32 - P33 - P34 - P35 - P36
```

Series connection procedure

- String 1: connect Panels 1 through 9 in series. The two unused end leads become String 1 positive and negative.
- String 2: connect Panels 10 through 18 in series. The two unused end leads become String 2 positive and negative.
- String 3: connect Panels 19 through 27 in series. The two unused end leads become String 3 positive and negative.
- String 4: connect Panels 28 through 36 in series. The two unused end leads become String 4 positive and negative.
- Route each string through its own 2-pole 600 VDC / 20 A DC breaker/disconnect circuit if the supplied breaker is a 2-pole device; both PV conductors must be handled according to the approved system design and applicable code.
- Connect String 1 and String 2 to the designated PV inputs of Inverter 1.
- Connect String 3 and String 4 to the designated PV inputs of Inverter 2.
- Before energizing, measure and record polarity and open-circuit voltage (Voc) of all four strings using a properly rated DC meter.
- Confirm the maximum cold-weather Voc of each 9-panel string remains below the inverter maximum PV input voltage.
- Confirm the operating Vmp and current of each string are within the applicable MPPT input limits.

Do Not Reconfigure	Do not connect all 36 panels in one series string. Do not create strings with unequal panel counts. Do not move three or four strings onto one inverter without a new electrical design. The intended system configuration is two 9-panel strings per inverter.

9. Battery Bank Installation and Communication

The standard battery option uses six Growatt ALP LV-US 5 kWh LiFePO4 modules for 30 kWh nominal storage. The battery bank must be assembled using the current Growatt-approved parallel module, BMS communication, protection, and cable arrangement.

- Keep all battery modules off while making power and communication connections.
- Verify polarity before connecting any battery conductor.
- Use the required battery disconnects, overcurrent protection, busbars/distribution hardware, conductor sizes, and torque values for the two-inverter design.
- Configure battery module addressing and BMS communications according to the current ALP manual.
- Both inverters must receive battery information and operate within the battery system current limits established by Growatt.
- Do not mix incompatible battery chemistries, capacities, firmware families, or nominal voltages unless explicitly approved by the manufacturer.

Shared Battery Bank	Because two 12 kW inverters can place high demand on the 48 V battery system, final battery conductor sizing, distribution, fusing, and current limits are critical. Use only the approved parallel-inverter/battery architecture.

10. Dual-Inverter AC, Grid and Generator Connections

The two SPE 12000US units must be connected and configured as a manufacturer-approved parallel system before supplying the 120/240 VAC load panel. Grid or compatible generator input may also be integrated if the system is designed and commissioned for those sources.

- Install all inverter parallel communication and power interconnections exactly as specified by Growatt.
- Use appropriately rated AC breakers, disconnects, conductor sizes, and transfer/interlock equipment.
- Verify L1, L2, neutral, and grounding/bonding arrangements before energizing the load panel.
- Confirm generator voltage, frequency, neutral/ground arrangement, capacity, and waveform compatibility.
- Never connect a generator or inverter output to utility wiring through an unapproved backfeed arrangement.
- Consider high-starting-current loads such as well pumps, compressors, HVAC equipment, welders, and large motors during system design and commissioning.

11. Initial Commissioning and Startup

Commissioning should be completed by the installer after all mechanical, PV, battery, AC, grounding, communication, and parallel-inverter inspections are complete.

Pre-start checklist

- Both inverters are securely mounted and labelled Inverter 1 and Inverter 2.
- Parallel-inverter power and communication connections are complete and verified.
- Grounding and bonding are complete.
- Battery bank power, protection, BMS communication, and module addressing are correct.
- PV String 1 contains exactly 9 panels in series and is assigned to Inverter 1.
- PV String 2 contains exactly 9 panels in series and is assigned to Inverter 1.
- PV String 3 contains exactly 9 panels in series and is assigned to Inverter 2.
- PV String 4 contains exactly 9 panels in series and is assigned to Inverter 2.
- Each PV string has its own 600 VDC / 20 A breaker circuit.
- Polarity and open-circuit voltage of all four PV strings have been measured and recorded.

- AC output, utility input, and generator input wiring (if used) have been verified.
- Both inverter battery profiles and operating settings match the installed battery system.

Typical startup sequence

Follow the latest Growatt manuals for the exact parallel-system startup sequence. A typical controlled sequence is: battery system ON -> initialize/configure both inverters and parallel communications -> verify battery/BMS communication -> enable permitted AC source if used -> enable PV Strings 1-4 -> energize AC loads gradually.

12. Normal Operation and Energy Flow

Once commissioned, the dual-inverter system manages solar generation, battery charging/discharging, connected loads, and configured grid/generator support according to the selected operating priorities.

Item	Specification
Sunny daytime	PV from all four strings supplies loads and may charge the battery with surplus energy, subject to inverter settings and battery limits.
Cloudy / high-load periods	Available PV and battery power may work together to support the load.
Night operation	The battery bank supplies loads until the configured reserve or low-SOC threshold is reached.
Low battery	Configured utility or generator input may support loads and/or charge the battery.
High load	The two inverters share system demand according to the approved parallel configuration.
PV imbalance	A missing or weak string may reduce output from one inverter; compare Inverter 1 vs Inverter 2 production when troubleshooting.

Load management

A 24 kW system can support substantial loads, but simultaneous demand and battery current remain important. Electric heating, water heaters, ranges, dryers, EV chargers, large pumps, compressors, and workshop equipment can consume available capacity quickly. Staggering major loads generally improves runtime and operating margin.

13. Monitoring and User Controls

The kit includes two SHINE Wi-Fi monitoring modules, one for each inverter. Configure both devices so the customer can review solar production, battery state of charge, load demand, operating mode, and alarms for the complete dual-inverter system.

- Confirm both inverters appear online in the monitoring platform.
- Compare PV production between Inverter 1 and Inverter 2 to identify possible string or breaker issues.
- Review battery state of charge before adding large discretionary loads.
- Investigate repeated warnings rather than repeatedly resetting the system.
- Restrict protection-setting and firmware changes to qualified personnel.

14. Controlled Shutdown and Emergency Shutdown

Controlled shutdown

Use the current Growatt parallel-system procedure. A typical controlled shutdown is: reduce/disconnect major AC loads -> disable grid/generator input if used -> open all four PV DC breakers -> switch off both inverters in the required sequence -> isolate the battery bank.

Emergency	If there is fire, smoke, arcing, severe overheating, flooding, damaged battery equipment, or exposed conductors, do not approach or touch the equipment. Evacuate the immediate area as needed and contact emergency services.

Opening only one PV breaker or switching off only one inverter does not de-energize the complete system. PV strings remain energized in daylight and the battery bank retains stored energy.

15. Routine Maintenance

Item	Specification
Monthly	Review both inverter statuses, battery SOC, alarms, and production trends. Check ventilation openings and visible equipment condition.
Every 3-6 months	Inspect accessible PV wiring, four PV breaker circuits, connectors, conduit, battery enclosures, inverter areas, and mounting hardware for damage, corrosion, moisture, or overheating.
Seasonally	Manage snow, vegetation, and shading using safe methods that do not damage modules or wiring.
Annually	Have a qualified technician inspect electrical terminations, parallel communications, breaker/disconnect condition, grounding/bonding, battery condition, fault history, and system performance.

Solar-module cleaning

Use clean water and non-abrasive materials when cleaning is necessary. Do not walk on modules or use metal scrapers, harsh chemicals, or methods that can damage glass, frames, seals, or cables.

16. Troubleshooting

Item	Specification
One inverter offline	Check its battery/DC supply, parallel communications, AC status, and fault code. Do not continue operating the parallel system in an unapproved state.
No solar charging	Confirm daylight is adequate and all four PV breakers are on. A qualified technician should measure each string separately.
Inverter 1 PV low	Check Strings 1 and 2, their breakers, connectors, and corresponding PV inputs.
Inverter 2 PV low	Check Strings 3 and 4, their breakers, connectors, and corresponding PV inputs.
PV input alarm	Open the affected PV breaker(s) and have the installer verify polarity, string voltage, cold-weather Voc, connectors, insulation, and input limits.
Battery not charging	Check BMS communication, battery state/temperature, both inverter charge settings, and available PV/AC charging source.
Frequent low battery	Reduce loads, verify all four strings are producing, review operating priorities, or evaluate additional storage/generation.
Overload / parallel fault	Reduce loads and verify parallel configuration, inverter synchronization, AC wiring, and large motor starting requirements.
Wi-Fi offline	Check the affected SHINE module, internet/router status, pairing, and monitoring configuration.
Repeated fault code	Record the exact code and operating conditions, then contact ROCKSOLAR support or a qualified installer. Do not repeatedly reset a persistent fault.

17. Expansion and System Changes

Any change to inverter count, battery modules, PV string length, number of strings, generator capacity, or AC distribution must be engineered before installation.

- Do not add panels to a 9-panel string without recalculating maximum cold-weather Voc and confirming the inverter MPPT operating window.
- Do not create unequal string lengths on the same intended MPPT arrangement unless the design is specifically approved.
- Do not move more than two of the four kit strings onto one inverter without a revised PV design.
- Additional batteries must be compatible with the installed battery system and within manufacturer limits.
- Additional inverter capacity requires the current Growatt parallel-system design, communication hardware, protection, and commissioning process.
- Electrical permits and inspections may be required for system modifications.

18. Technical Support and Commissioning Checklist

ROCKSOLAR Canada
115 Randall Drive, Unit 9
Waterloo, Ontario N2V 1C5, Canada

Phone: +1 800-858-4318
Email: support@rocksolar.io

When requesting support, have the order number, both inverter model/serial numbers, battery serial numbers, fault codes, photos of the installation, monitoring screenshots, and all four PV string Voc measurements available.

Commissioning Item	Initial / Date
Both inverter mountings complete and labelled	
Parallel inverter communications verified	
Grounding and bonding verified	
AC conductors and breakers verified	
Battery bank wiring/protection verified	
Battery BMS communication verified to both inverters	
String 1 = exactly 9 panels in series -> Inverter 1	
String 1 polarity and Voc recorded	
String 2 = exactly 9 panels in series -> Inverter 1	
String 2 polarity and Voc recorded	
String 3 = exactly 9 panels in series -> Inverter 2	
String 3 polarity and Voc recorded	
String 4 = exactly 9 panels in series -> Inverter 2	
String 4 polarity and Voc recorded	
Four 600 VDC / 20 A PV breaker circuits labelled	
Battery profile/current limits confirmed on both inverters	
Grid/generator settings confirmed if used	
Both Wi-Fi modules paired and operating	
Customer startup/shutdown orientation completed	

Source basis

This manual is based on the current ROCKSOLAR 24 kW off-grid system configuration: 2 x Growatt SPE 12000US inverters, 36 x 440 W bifacial panels, 6 x Growatt ALP LV-US 5 kWh batteries, 4 x 600 V / 20 A PV DC breakers, 2 x SHINE Wi-Fi modules, and related cabling/accessories listed on the ROCKSOLAR product page. The four-string, 9-panels-per-string configuration and allocation of two strings to each inverter are specified by ROCKSOLAR for this manual. For electrical limits and detailed installation procedures not reproduced here, use the latest Growatt and solar-module manuals supplied with the kit.