

EG4[®] LIFEPOWER4 24V V2 SERVER RACK

TROUBLESHOOTING & MAINTENANCE GUIDE



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1. ABBREVIATIONS

- AWG – American Wire Gauge
- A – Amps
- Ah – Amp hour(s)
- AC – Alternating Current
- AFCI – Arc-Fault Circuit Interrupter
- AHJ – Authority Having Jurisdiction
- kAIC – kilo-Amp Interrupting Capability
- ANSI – American National Standards Institute
- BAT – Battery
- BMS – Battery Management System
- COM – Communication
- CT – Current Transformer
- DC – Direct Current
- DIP – Dual In-line Package
- DOD – Depth of Discharge
- EG – Equipment Ground
- EGS – Equipment Grounding System
- EMC – Electromagnetic Compatibility
- EPS – Emergency Power System
- ESS – Energy Storage System
- E-Stop – Emergency Stop
- FCC – Federal Communication Commission
- GE – Grounding Electrode
- GEC – Grounding Electrode Conductor
- GFCI – Ground Fault Circuit Interrupter
- GFDI – Ground Fault Detector/Interrupter
- Imp – Maximum Power Point Current
- IEEE – Institute of Electrical and Electronic Engineers
- IP – Ingress Protection
- I_{sc} – Short-Circuit Current
- In-lbs. – Inch Pounds
- kW – Kilowatt
- kWh – Kilowatt-hour
- LCD – Liquid Crystal Display
- LFP – Lithium Iron Phosphate
- L1 – Line 1
- L2 – Line 2
- mm – Millimeters
- MPPT – Maximum Power Point Tracking
- mV – Millivolt
- N – Neutral
- NEC – National Electric Code
- NEMA – National Electrical Manufacturers Association
- NFPA – National Fire Prevention Association
- Nm – Newton Meters
- NOCT – Normal Operating Cell Temperature
- PC – Personal Computer
- PCB – Printed Circuit Board
- PE – Protective Earth
- PPE – Personal Protective Equipment
- PV – Photovoltaic
- RSD – Rapid Shut Down
- SCC – Standards Council of Canada
- SOC – State of Charge
- STC – Standard Testing Conditions
- UL – Underwriters Laboratories
- UPS – Uninterrupted Power Supply
- V – Volts
- VOC – Open-Circuit Voltage
- VMP – Voltage Maximum Power

2. TECHNICAL SPECIFICATIONS

MODULE OPERATING PARAMETERS			
PARAMETER	BMS	RECOMMENDED	
VOLTAGE	25.6V	-	
CAPACITY	200Ah	-	
CHARGING VOLTAGE (BULK/ABSORB)	28.0 ± 0.4V	-	
SOC CUTOFF	22.4V	20%*	
CHARGING CURRENT	200A (Max. continuous)	30A	
DISCHARGING CURRENT	200A (Max. continuous)	-	
MAXIMUM CONTINUOUS DISCHARGE RATE	5.12kW		
NAMEPLATE ENERGY CAPACITY	5.12kWh		
BMS PARAMETERS			
CHARGE	SPEC	DELAY	RECOVERY
CELL VOLTAGE PROTECTION	3.8V	1 sec	3.45V
MODULE VOLTAGE PROTECTION	30.0V	1 sec	27.6V
OVER CHARGING CURRENT 1	>220A	10 sec	-
OVER CHARGING CURRENT 2	≥250A	3 sec	-
TEMPERATURE PROTECTION	<23°F or >158°F <-5°C or >70°C	1 sec	>41°F or <140°F >5°C or <60°C
DISCHARGE			
CELL VOLTAGE PROTECTION	2.3V	1 sec	3.1V
MODULE VOLTAGE PROTECTION	22.4V	1 sec	24.0V
OVER CHARGING CURRENT 1	>220A	30 sec	60 sec
OVER CHARGING CURRENT 2	>300A	5 sec	60 sec
SHORT-CIRCUIT	>500A	<0.1 mS	-
TEMPERATURE PROTECTION	<-4°F or >167°F <-20°C or >75°C	1 sec	>14°F or <149°F >-10°C or <65°C
PCB TEMP PROTECTION	>221°F (>105°C)	1 sec	<176°F (<80°C)

*EG4 recommends this value be set no lower than 20% to maintain the recommended 80% depth of discharge.

GENERAL SPECIFICATIONS			
PARAMETER	SPEC	TYPE	CONDITION
CELL BALANCE	120mA	Passive Balance	Cell Voltage Difference >40mV
TEMPERATURE ACCURACY	3%	Cycle Measurement	Measuring Range 40°F – 212°F (-40°C – 100°C)
VOLTAGE ACCURACY	0.5%	Cycle Measurement	For Cells/Module
CURRENT ACCURACY	3%	Cycle Measurement	Measurement Range +/-200A
SOC	5%	-	Integral Calculation
POWER CONSUMPTION (SLEEP & OFF MODE)	<300uA	-	Storage/Transport/Standby
POWER CONSUMPTION (OPERATING)	<20mA	-	Charging/Discharging
COMMUNICATION PORTS	RS485/CAN	-	Customizable
MAXIMUM MODULES IN SERIES		1	
MAXIMUM MODULES IN PARALLEL		64	
DIMENSION (H×W×D)	6.1×19×17.4 in. (155×442×470 mm)		
WEIGHT	99.2 lbs. (45 kg)		
ENVIRONMENTAL PARAMETERS			
CHARGING RANGE	32°F – 113°F (0°C – 45°C)		
DISCHARGING RANGE	-4°F – 122°F (-20°C – 50°C)		
STORAGE RANGE	-4°F – 122°F (-20°C – 50°C)		
INGRESS PROTECTION	IP21		

3. BATTERY SAFETY

3.1 SAFETY INSTRUCTIONS

Before any work begins, carefully read all safety instructions, and always observe them when working on or with the battery. The installation must follow all applicable national or local standards and regulations. Consult with the local AHJ to obtain the proper permits and permissions before installation.

Incorrect installation may cause:

- *Injury or death to the installer, operator or third party*
- *Damage to the battery or other attached equipment*

3.2 IMPORTANT SAFETY NOTIFICATIONS



DANGER: Hazardous Voltage Circuits!

There are various safety concerns that must be carefully observed before, during, and after the installation, as well as during future operation and maintenance. The following are important safety notifications for the installer and any end users of this product under normal operating conditions.

1. **Do not disassemble the battery.** Contact the distributor for any issues that need repair for more information and proper handling instructions. Incorrect servicing or re-assembly may result in a risk of electric shock or fire and void the warranty.
2. **Never short-circuit DC inputs.** Short-circuiting the battery may result in a risk of electric shock or fire and can lead to severe injury or death and/or permanent damage to the unit and/or any connected equipment.
3. **Use caution when working with metal tools on or around batteries and systems.** **Risk** of electrical arcs and/or short circuiting of equipment can lead to severe injury or death and equipment damage.
4. **Beware of high battery current.** Ensure that the battery module breakers and/or on/off switches are in the “open” or “off” position before installing or working on the battery. Use a voltmeter to confirm there is no voltage present to avoid electric shock.
5. **Do not make any connections or disconnections to the system while the batteries are operating.** Damage to system components or risk of electrical shock may occur if working with energized batteries.
6. Make sure the battery and rack are properly grounded.
7. An installer should make sure to be well protected by reasonable and professional insulative equipment [e.g., personal protective equipment (PPE)].
8. Before installing, operating, or maintaining the system, it is important to inspect all existing wiring to ensure it meets the appropriate specifications and conditions for use.
9. Ensure that the battery and system component connections are secure and proper to prevent damage or injuries caused by improper installation.



WARNING: TO REDUCE THE RISK OF INJURY, READ ALL INSTRUCTIONS!

All work on this product (system design, installation, operation, setting, configuration, and maintenance) must be carried out by qualified personnel. To reduce the risk of electric shock, do not perform any servicing other than those specified in the operating instructions unless qualified to do so.

1. Read all instructions before commencing installation. For electrical work, follow all local and national wiring standards, regulations, and these installation instructions. All wiring should be in accordance with the National Electrical Code (NEC), ANSI/NFPA 70.
2. The battery and system can connect with the utility grid only if the utility provider permits. Consult with the local AHJ before installing this product for any additional regulations and requirements for the area.
3. All warning labels and nameplates on this battery should be clearly visible and must not be removed or covered.
4. The installer should consider the safety of future users when choosing the battery's correct position and location as specified in this manual.
5. Keep children away from touching or misusing the battery and relevant systems.

The battery is designed to stop charging when reaching the low threshold of 32°F. If charging current is observed when the internal battery temperature is below 32°F, disconnect battery immediately and consult distributor.



WARNING!



Cancer and Reproductive Harm – See www.P65Warnings.ca.gov for more details.

DISCLAIMER

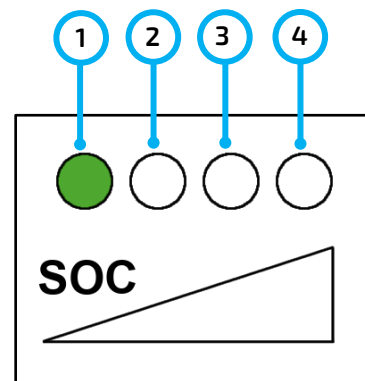
EG4 reserves the right to make changes to the material herein at any time without notice.

Please refer to www.eg4electronics.com for the most updated version of our manuals/spec sheets.

4. LED INDICATOR STATUS & DEFINITION

STATUS	NORMAL/ ALARM/ PROTECTION	RUN	ALM	SOC INDICATOR LED	NOTES	
				SOC1~SOC4*		
Shutdown/Sleep		OFF	OFF	OFF	-	
Stand-by	Normal	ON	OFF	Based on battery indicator (Each LED indicates 25% SOC)	-	
	Alarm	ON	FLASH		According to the state before stand-by	
Charge	Normal	Short flash	OFF		-	
	Alarm	Short flash	Short flash		-	
	End-off Voltage	OFF	ON		-	
	Over-temp Protection	OFF	Short flash		-	
	Over-current transfer limit protection	Short flash	Short flash/OFF		-	
Discharge	Normal	Long flash	OFF		Based on battery indicator	-
	Alarm	Long flash	Long flash			-
	End-off voltage	OFF	OFF			Go to sleep
	Over-temp/ Over-current protection	OFF	ON	-		
BMS Fault	-	OFF	Flash	All OFF	-	

***NOTE:** Below are two images of the SOC LED and what each LED represents.



NO	SOC %
1	25%
2	50%
3	75%
4	100%

5. TROUBLESHOOTING & MAINTENANCE

ALARM DESCRIPTION AND TROUBLESHOOTING

When the ALM light on the battery control panel is on, it means that the battery has given an alarm or has been protected from potential damage. Please check the cause of the failure through EG4® Monitor Center or BMS Tools and take appropriate measures or go directly to the battery site to troubleshoot. Scan the QR code to navigate to a BMS Tools setup video.



Warning and Protect Status Definitions Table:

STATUS	NAME	DEFINITION	ACTION
Charge	Charge OT	Charge over-temperature	Power off module and cool down location.
	Charge UT	Charge under-temperature	Power off module and warm up location.
Discharge	Discharge OT	Discharge over-temperature	Power off module and cool down location.
	Discharge UT	Discharge under-temperature	Power off module and warm up location.



NOTE:

The “Historical Record” tab, which can be found in the BMS Tools program, can indicate what occurred with the module before entering a warning or protection state. It is recommended to export this data into a text (.txt) file to provide to the distributor for any additional troubleshooting assistance.

Other Common Faults and Solutions

FAULT	ANALYSIS	ACTION
Inverter communication failure	Check communication port connection and battery ID setting.	Input proper “host” battery DIP switch address, and power cycle the battery.
No DC output	Open breaker, or battery voltage is too low.	Check battery breaker and/or charge the battery.
Power output is unstable	Battery capacity is not at full power.	Check for proper battery cable connection.
Battery will not fully charge	DC output voltage is below the minimum charge voltage.	Check the charging settings on the inverter to ensure they match battery requirements.
ALM LED always on	Short circuit	Turn off the battery breaker and check all cabling.
The battery output voltage is unstable.	Battery management system does not operate normally.	Press the reset button to reset the battery, then reboot the system.
ALM LED flashes 20 times with SOC1 LED on.	Unbalanced voltage within a cell	Deep discharge the battery bank (<20% SOC), then charge battery bank fully.

ALM LED flashes 20 times with SOC2 LED on.	Unbalanced temperature	Contact the distributor.
ALM LED flashes 20 times with SOC3/4 LED on.	BMS damaged	Contact the distributor.
Different SOC value of batteries in parallel operation.	No issue	Deep discharge the battery bank (<20% SOC), then charge battery bank fully.
Low voltage protection with no LED on	BMS is in low voltage protection, and is in sleep mode	Follow the below steps to reboot the module. 1. Charge the battery immediately and it will reboot itself. 2. Switch off and switch on, when on, charge it immediately. 3. Reboot and charge it immediately. If you follow step 1 or step 2 without charging immediately, BMS will protect and go to sleep mode in several minutes.
Deeply discharged with "RUN" LED on	The battery voltage is too low to start BMS.	Contact the distributor.



NOTE:

If any of the warnings or faults from both tables persist, please contact the distributor for additional troubleshooting steps.

5.1 LONG TERM MAINTENANCE

ITEM	MAINTENANCE METHOD	MAINTENANCE INTERVALS
Power Cables	<ol style="list-style-type: none"> 1. Check whether there is mechanical damage to the power cable and whether the terminal insulation sleeve has fallen off. If there is such an occurrence, turn off the battery and carry out maintenance or replacement. 2. Check whether the power cable is loose; if there is any sign of looseness, use a standard torque wrench to tighten it. 3. Check the system for loose screws or discoloration of the copper busbar. If the screws are loose, tighten them with a standard torque wrench. If the copper busbar is discolored, contact the manufacturer for after-sales replacement. 	Once every 6 months
Communication Cables	<ol style="list-style-type: none"> 1. Confirm whether the battery communication cable is properly connected to the RJ45 terminals. 2. Check whether the color of the communication cable has obvious discoloration. If discolored, shut down the battery to replace the communication cable 	Once a year
Cabinet Cleanliness	Check the cleanliness of the front and back doors and the battery module inside the cabinet. If there is dust build-up, clean using appropriate measures.	Once every 6-12 months
System Running Status	<ol style="list-style-type: none"> 1. Check if all parameters are normal when the system is running (system voltage, current, temperature, etc.) 2. Check whether the main core components of the system are normal, (system switches, contactors, etc.,) showing no faults or warnings. 	Once every 6 months

<p>Charge and Discharge Maintenance</p>	<p>Use light load and shallow charge/discharge to check whether the SOC, SOH status of the battery is normal (using the BMS Tools computer software to read); it is recommended that the depth of discharge and charge/discharge power should not exceed 20% of the rated value.</p>	<p>Once every 6 months</p>
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6. STORAGE

Follow these instructions if choosing not to install the product immediately after purchasing or unpacking the box for the safe storage of the unit to maintain the longevity of the battery. There are a few steps that can be taken to ensure that batteries are stored safely and in a state that will ensure they are not damaged during storage. The steps are detailed below.

6.1 BATTERY STATE

The state of the battery when placed into storage will affect how long it can be stored as well as the battery's condition when it is brought out of storage. EG4® recommends that each battery is brought to a 50% SOC (state of charge) before placing it in storage. Lithium batteries will lose a certain percentage of their total charge while in storage, depending on how long they are stored and the conditions they are stored in. EG4 recommends recharging the batteries after 8–9 months in prolonged storage.

6.2 ENVIRONMENTAL FACTORS

The environment the battery is stored in can greatly affect the health of the battery. **For best results**, the temperature should range between 33°F and 90°F (0.6°C and 32°C). Mount the battery in a location where it is not exposed to direct rain, standing water and **ensure the battery is mounted on non-combustible material. Keep the battery away from direct sunlight.** Store the batteries away from combustible materials.

7. BATTERY END OF LIFE

The EG4® LifePower4 24V battery is designed to last for *more than 15 years* when used correctly. We have worked tirelessly to ensure that our batteries will maintain a charge after thousands of cycles. However, when it does come time to retire the battery, there are a few things to consider. Lithium iron phosphate batteries are considered a hazardous material and should not be disposed of by simply placing them in the trash. There are several websites and organizations that will accept this battery to recycle at little to no cost to the user. At EG4, we understand that we are working with customers across the United States and the world. Our recommendation is to go online and search the term "Lithium Battery Disposal Near Me." There will likely be an assortment of organizations that can safely dispose of LFP batteries.

EG4 recommends calling ahead of time to ensure that the location is still open and accepting material.

If users are unable to locate a disposal location safely, EG4 is here to help. Before dumping the battery or disposing of it incorrectly, please contact our customer service team for assistance.

8. BATTERY CHARGING

Ensure the proper settings are set on the charge controller and/or inverter being used to avoid overcharging or damaging the module.

(Refer to Section 1: Technical Specifications Table for a full list of charging/discharging parameters.)



IMPORTANT: (SOC Discrepancy)

It is normal for lithium batteries with their own internal BMS that are wired in parallel to demonstrate a wide variety of SOC readings during any given charge or discharge cycle. **Variations of up to 10% are common.** This is not cause for concern or indication that the module is providing less than the maximum capacity. This can be caused by a few different factors, including variations in wire resistance, internal battery resistance, temperature differences and cell variations. Even a slight variation causes one battery to take more of the load or charge for a short time. Over the duration of the discharge or charge cycle, this will balance out with the lagging battery taking the load or charge at the other end of the cycle resulting in recovering the full listed kWh capacity of the pack. The voltage differences created as batteries diverge in SOC will eventually cause them to converge at some point in the cycle.

For more information regarding depth of discharge, battery state of health and round trip efficiency, scan the QR code below.



SoH, DoD, and Round-trip Efficiency

9. WARRANTY INFORMATION

For information regarding warranty registration on EG4® Electronics products, please navigate to <https://eg4electronics.com/warranty/> and select the corresponding product to begin the registration process.

10. CHANGELOG

Version 1.2

- Modified warranty in section 9

Version 1.1

- Added P65 Warning to safety section
- Added additional certification logos to cover page
- Modified spec sheet recommended max charge from 100 to 30A

Version 1.0

- First version release



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