



SELECTRONIC SELF-MANAGED (OPEN LOOP) CONFIGURATION WITH DISCOVER LITHIUM BATTERIES

READ AND SAVE THESE INSTRUCTIONS

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INTRODUCTION

This document describes how to set up Selectronic inverter-chargers to create a self-managed (open-loop) charge configuration with AES LiFePO₄ batteries and AES RACKMOUNT battery modules.

1. AUDIENCE, WARNINGS, MESSAGES, GENERAL SAFETY, PERSONAL PROTECTIVE EQUIPMENT

1.1 Audience

Configuration, installations, service, and operating tasks should only be performed by qualified personnel in consultation with local authorities having jurisdiction and authorized dealers. Qualified personnel should have training, knowledge, and experience in the:

- Installation of electrical equipment
- Application of electrical codes, safety, and installation standards
- Analysis and reduction of hazards involved in performing electrical work
- Installation and configuration of batteries
- Installation and configuration of systems activated by relays

1.2 Warning, Caution, Notice, and Note Messages

Messages in this manual are formatted according to this structure.



Additional information concerning important procedures and features of the product. Read all the instructions before installation, operation, and maintenance.



Important information regarding hazardous conditions.

⚠ WARNING

Important information regarding hazardous conditions that may result in personal injury or death.

⚠ CAUTION

Important information regarding hazardous conditions that may result in personal injury.

NOTICE

Important information regarding conditions that may damage the equipment but not result in personal injury.

NOTE

Ad hoc information concerning important procedures and features unrelated to personal injury or equipment damage.

1.3 General Warnings

WARNING

ELECTRIC SHOCK AND FIRE HAZARD

- This equipment must only be installed as specified.
- Do not disassemble or modify the battery.
- If the battery case has been damaged, do not touch exposed contents.
- There are no user-serviceable parts inside.

Failure to follow these instructions may result in death or serious injury.

WARNING

ELECTRIC SHOCK AND FIRE HAZARD

Do not lay tools or other metal parts on the battery or across the terminals.

Failure to follow these instructions may result in death or serious injury.

CAUTION

ELECTRIC SHOCK

- Do not touch the energized surfaces of any electrical component in the battery system.
- Before servicing the battery, follow all procedures to fully de-energize the battery system.
- Follow the “Safe Handling Procedures” below when working with the battery.

Failure to follow these instructions may result in injury.

1.4 Safe Handling Procedures

Before using the battery and any power electronics, read all instructions and cautionary markings on all components and appropriate sections of their manuals.

- Use personal protective equipment when working with batteries.
- Do not dispose of the battery in a fire.
- Promptly dispose of or recycle used batteries following local regulations.
- Do not disassemble, open, crush, bend, deform, puncture, or shred.
- Do not modify, re-manufacture, or attempt to insert foreign objects into the battery, immerse or expose the battery to water or other liquids, fire, explosion, or other hazards. If the user suspects damage to the battery module due to water, heat, or other reason, take it to a service center for inspection.
- Only use the battery for the system for which it is specified.
- Do not lift or carry the battery while in operation.
- When lifting a heavy battery, follow the appropriate standards.
- Only lift, move, or mount following local regulations.
- Take care when handling battery terminals and cabling.
- Only use the battery with a charging system that meets specifications. Using a battery or charger that does not meet specifications may present a risk of fire, explosion, leakage, or other hazards.

- Do not short-circuit a battery or allow metallic conductive objects to contact battery terminals.
- Replace the battery only with another battery that has been qualified for the system. Using an unqualified battery may present a risk of fire, explosion, leakage, or other hazards.
- Do not drop the device or battery. If the device or battery is dropped, especially on a hard surface, and the user suspects damage, take it to a service center for inspection.

1.5 Personal Protective Equipment

When handling or working near a battery:

- Use Personal Protective Equipment, including clothing, glasses, insulated gloves, and boots.
- Do not wear rings, watches, bracelets, or necklaces.

2. DOCUMENTATION

This Application Note provides information about the integration of Discover Lithium Batteries with Selectronic inverter-chargers in a self-managed (open-loop) configuration.

Before installation and configuration, consult the relevant product documentation, including Manuals, Application Notes, Installation and Configuration Guides.

Selectronic Documentation

- SP PRO 2i Instruction Manual (Document No: OI0003 Part 004122 Rev 42 - Feb 2023)
- SP PRO Series 2i datasheet (Document No: BR0007_20 Aug 2022)
- Instruction Manual for SP LINK - Configuration and monitoring for SP PRO Series 2i (Document No: OI0005 Rev30 2022)

Visit <https://www.selectronic.com.au/> for the most recent version of published documents.

Discover Energy Systems Documentation

- [AES 42-48-6650 LiFePO4 Installation and Operation Manual](#) (805-0065)
- [AES LiFePO4 datasheet](#) (808-0004)
- [AES RACKMOUNT Installation and Operation Manual](#) (805-0043)
- [AES RACKMOUNT datasheet](#) (808-0039)

Visit <https://www.discoverlithium.com> for the most recent version of published documents.

3. OVERVIEW

This manual provides general settings and is not a comprehensive guide to the programming and configuration of a specific installation. An installation may have unique conditions or use cases that require modification or adaptations. Installers must be capable of reviewing and adapting to the specifics of an installation and its specific use case and optimizing settings where needed.

3.1 System Overview

The key steps required to install and configure the Discover Lithium batteries and power conversion equipment are as follows:

- Review and confirm equipment compatibility and correct sizing.
- Terminate all networks correctly.
- Set up the self-managed (open-loop) configuration parameters such as charge and discharge settings on the power conversion equipment.
- Set up user preferences and enable the use case using the power conversion control system.

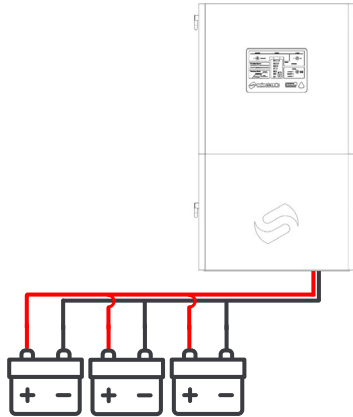


Figure 1. System Overview

Discover Lithium Batteries

- AES LiFePO₄: 42-48-6650
- AES RACKMOUNT: 48-48-5120, 48-48-5120-H

Selectronic Inverters

- SPMC480-AU
- SPMC481-AU
- SPMC482-AU

NOTE

LYNK II Communication Gateway

- The LYNK II communication gateway is not required in a self-managed (open-loop) configuration. However, it is a useful tool to diagnose the battery. For example, by connecting the LYNK II to the battery, you can access the battery logs, which can be used to confirm if the inverter charge settings are fully charging the battery.
- As another example, use the relays on the LYNK to turn equipment or warning lights ON/OFF based on various conditions on the battery.

Selectronic SP PRO 2i Instruction Manual

- Follow installation instructions outlined in the SP PRO 2i Instruction Manual, especially content about pre-charge wiring and requirements on DC coupling.

3.2 Minimum Battery System Capacity

Battery charge and discharge rates are managed automatically by the Discover Lithium Battery and Selectronic device. Using large solar arrays with battery banks that are too small can exceed the operating limits of the battery to charge and possibly lead to the BMS triggering over-current protection. Battery capacity must accept the maximum charge current of the system, or charging must be curtailed below the operating limit of the installed batteries. Derive this value by adding together the charge capacities of all inverter-chargers and solar charge controllers in the system. Additionally, battery peak capacity must support the surge requirements demanded by the load attached to the inverter-charger. Match all inverter-charger peak power values with the sum of all battery peak battery current values.

$$\text{Inverter Peak} = (\text{Inverter Surge Value}) / (\text{Inverter Efficiency}) / (48\text{V: Low Battery Cut-Off})$$

Single-Phase Models	Inverter Peak (20 seconds)	Max Continuous Charge	Max Continuous Discharge	AES LiFePO ₄ 42-48-6650 Minimum per inverter ⁽²⁾	AES RACKMOUNT 48-48-5120/48-48-5120-H Minimum per inverter ⁽³⁾
SPMC480-AU	184 A ⁽¹⁾	73 ADC	83 ADC	1	1
SPMC481-AU	262 A ⁽¹⁾	104 ADC	119 ADC	1	2
SPMC482-AU	391 A ⁽¹⁾	156 ADC	179 ADC	2	2

⁽¹⁾ Calculated based on the surge power and efficiency CEC as published in Selectronic SP PRO Series 2i Instruction Manual (Doc OI0003 Part 004122 Rev 42 - Feb 2023).

⁽²⁾ Discover AES LiFePO₄ 42-48-6650 Battery, Peak Discharge Current: 300 A (3 seconds), 130 A DC Continuous Charge/Discharge, as published in Discover LiFePO₄ 42-48-6650 Installation and Operation Manual (805-0065 Rev A).

⁽³⁾ Discover AES RACKMOUNT 48-48-5120/48-48-5120-H Battery, Peak Power: 218 A RMS (3 seconds), 95 A DC Continuous Charge/Discharge, as published in Discover AES RACKMOUNT Installation and Operation Manual (805-0043 Rev E).

SP-LINK - Inverter

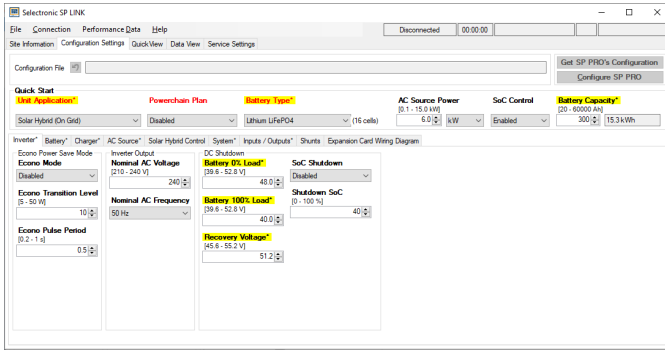


Figure 3. Inverter Settings

Setting	AES LiFePO ₄ 42-48-6650	AES RACKMOUNT 48-48-5120 / 48-48-5120H
Quick Start		
Battery Type	Lithium LiFePO ₄	Lithium LiFePO ₄
Battery Capacity	130 Ah x the number of batteries	100 Ah x the number of batteries
Inverter		
DC Shutdown	When setting the DC Shutdown Battery 0% Load voltage, consider what is set for the Generator Start SoC. These settings should not be the same and should be at least 10% SoC apart. For example, if DC Shutdown Battery 0% Load is 50.2 V (20% SoC), set the Generator Start SoC to 30% SoC or more.	
• Battery 0% Load	48.0 V (0% SOC) 49.5 V (10% SOC) 50.2 V (20% SOC)	
• Battery 100% Load	46.0 V	
• Recovery Voltage	51.2 V	
• Shutdown SoC	Recommended value varies, depending on the type of installation. For example, when off grid with no generator, set a higher Shutdown SOC such as 20%. If an automatic start generator is configured, 10%.	

SP-LINK - Battery

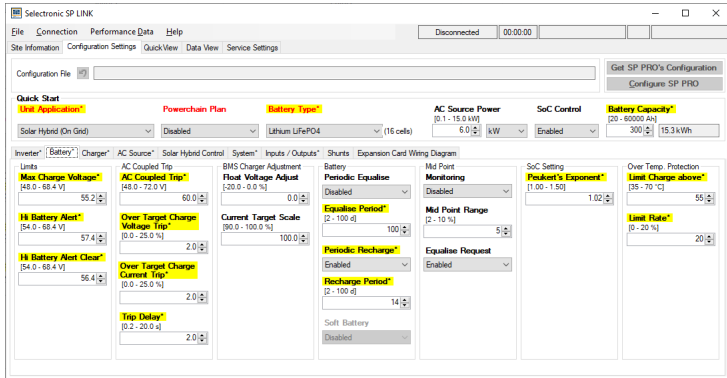


Figure 4. Battery Settings

All values and parameters assume an operating temperature of 25 °C.

Setting	AES LiFePO ₄ 42-48-6650	AES RACKMOUNT 48-48-5120 / 48-48-5120H
Battery		
Max Charge Voltage	55.2 V	55.2 V
Hi Battery Alert Voltage	57.6 V	57.6 V
Hi Battery Alert Clear Voltage	56.8 V	56.8 V
Periodic Recharge	7 to 14 days	7 to 14 days
Peukert's Exponent	1.02	1.02
Limit Charge Above °C	45 °C	50 °C
Limit Rate %	20%	20%

SP LINK - Charger

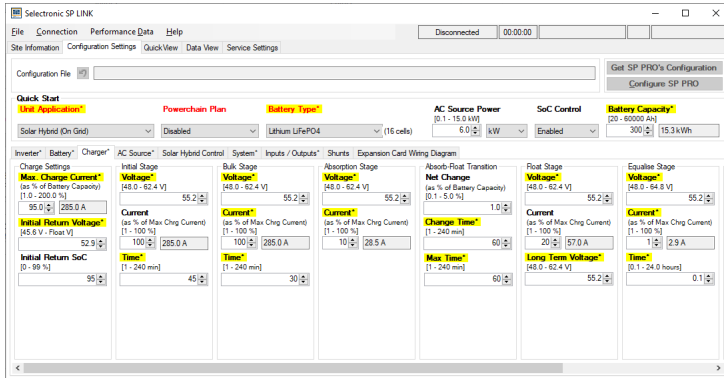


Figure 5. Charger Settings

All values and parameters assume an operating temperature of 25 °C.

Setting	AES LiFePO ₄ 42-48-6650	AES RACKMOUNT 48-48-5120 / 48-48-5120H
Charger		
Charger Settings		
• Max Charge Current	130 A x the number of batteries	95 A x the number of batteries
• Initial Return Voltage	52.9 V	52.9 V
• Initial Return SoC	95%	95%
Initial Stage		
• Voltage	55.2 V	55.2 V
• Current	100%	100%
• Time	45 minutes	45 minutes
Bulk Stage		
• Voltage	55.2 V	55.2 V
• Current	100%	100%
• Time	30 minutes	30 minutes
Absorption Stage		
• Voltage	55.2 V	55.2 V
• Current	10%	10%
Absorb - Float Transition		
• Net Change	1%	1%
• Change Time	60 minutes	60 minutes
• Max Time	60 minutes	60 minutes

Setting	AES LiFePO ₄ 42-48-6650	AES RACKMOUNT 48-48-5120 / 48-48-5120H
Float Stage		
• Voltage	55.2 V	55.2 V
• Current	Keep default value	Keep default value
• Long Term Float Voltage	55.2 V	55.2 V
Equalise Stage		
• Voltage	55.2 V	55.2 V
• Current	1%	1%
• Time	0.1 hours	0.1 hours
Battery Temperature Compensation	Not applicable	Not applicable

NOTE

- If a DC Solar Charge Controller is used with a SP PRO, there can be some conflicts when charging due to cable impedances. In some instances the displayed SoC on the SP PRO may not reach 100%. If the DC Solar Charge Controller is the main charging source, you may need to set the DC Solar Charge Controller 0.3V greater than the SP PRO.
 - The SP PRO inverter may default the SOC to 85% if the DC power supply is suddenly interrupted (e.g. BMS protection). Either reset the SOC via the Service setting or charge the batteries all the way to float mode prior to discharge.
 - Set at least a 10% difference between the DC Shutdown 0% Load and Generator Start SoC.
- Example:
- DC Shutdown 0% Load = 50.2V (20% SoC)
 - SoC Start = 30% SoC