# Victron Energy and Discover AES Rackmount Batteries

The Discover Lithium Iron Phosphate batteries are compatible with Victron products in various systems.

These instructions are intended to be used in conjunction with the product manuals supplied by Discover Energy Systems.

For the latest product details, installation, and operation manuals, visit the Discover website https://discoverlithium.com/support/resources

## 1. Introduction

The Discover $LiFePO_4$ battery includes a Battery Management System (BMS) that interfaces with the Victron GX device and can support multiple batteries connected in parallel.

These instructions provide information about integrating Discover Lithium batteries with Victron Energy devices in a closed-loop configuration using the LYNK II Communication Gateway set to communicate with Victron devices. The AES RACKMOUNT batteries can be used in an Energy Storage System (ESS) for self-consumption, Grid backup, and Off-grid applications.

Configuration, installation, 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:

- Installing electrical equipment
- Applying applicable installation codes
- Analyzing and reducing hazards involved in performing electrical work
- Installing and configuring batteries
- Installing and configuring systems activated by relays

***No responsibility is assumed by Discover for any consequences arising from using this material. Read the AES RACKMOUNT Installation and Operation Manual and safety instructions before installing the battery. Read Victron manuals for guidance on product features, functions, and parameters and for using the product safely.***

**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 can result in death or serious injury.**

**CAUTION: ELECTRIC SHOCK HAZARD**

- 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.

**Failure to follow these instructions can damage equipment**

**CAUTION: HAZARD OF EQUIPMENT DAMAGE**

- Do not install the LYNK II outdoors.
- Do not connect any port of the LYNK II to a network with power over Ethernet (POE) or to a public telecommunication network.
- Do not run CAT5 cables or other cables connected to LYNK through a conduit that could be exposed to lightning strikes.

**Failure to follow these instructions can damage equipment**

# 2. Documentation

The LYNK II Communication Gateway is compatible with the following:

**Discover Power Batteries**

- AES RACKMOUNT 48-48-5120 / 48-48-5120-H

**Victron Products**

Control Panels

- Cerbo GX
- Color Control GX
- Ekrano GX
- Venus GX

Inverter-Chargers

- Quattro/Quattro II Inverter-Charger
- Multiplus/Multiplus II Inverter-Charger
- SmartSolar MPPT

**Victron Energy Reference Documents:**

- Quattro Inverter Charger Manual
- MultiPlus Inverter Charger Manual
- SmartSolar / BlueSolar Charger Controller Manual
- GX device (Cerbo GX) Manual

**Discover Power Reference Documents:**

- 808-0039 48-48-5120 AES RACKMOUNT Data Sheet
- 808-0040 48-48-5120-H AES RACKMOUNT (Heated) Data Sheet

- 805-0043 AES RACKMOUNT Installation and Operation Manual
- 805-0033 LYNK II Installation and Operation Manual
- 805-0040 LYNK II Victron (Solar) Manual
- 805-0051 LYNK II Victron (Mobile) Manual
- 805-0059 LYNK LITE Victron (Mobile) Manual

# 3. Overview

## 3.1 System Overview

The LYNK II Communication Gateway unlocks the full potential of a Discover Lithium battery by enabling the internal Battery Management System (BMS) to provide real-time data in a closed-loop configuration to other devices. This configuration allows hybrid inverter-chargers and solar charge controller systems to optimize control over the charging process in solar applications. LYNK II also enables the remote monitoring of Discover Lithium battery SOC and data logging of multiple sites using the data monitoring services offered by off-grid inverter systems. Discover Lithium batteries must be set up to work with power conversion and monitoring devices in either an open-loop or closed-loop configuration.

In an open-loop configuration, charge and discharge settings are set up manually through the controller for the power conversion device at the time of installation.

In a closed-loop configuration, the Discover Lithium battery's BMS sends the battery status over a network data connection with the power conversion device. Power conversion devices use the Discover Lithium battery BMS data to fine-tune the output of their charger and deliver other functional controls based on battery voltage, temperature, and percent State-of-Charge.

If communication between the BMS and Victron inverter-charger is interrupted, the Victron inverter-charger stops charging until communication is re-established.

## 3.2 Minimum Battery Capacity

Battery charge and discharge rates are managed automatically by the Discover Lithium battery and Victron Energy 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. Either curtail the charging below the operational limit of installed batteries, or the battery capacity must accept the maximum charge current of the system. This value is derived by adding the charge capacities of all inverter-chargers and solar charge controllers in the system. Additionally, battery peak capacity must support the surge requirements of the load attached to the inverter. Match all inverter peak power values with the sum of all battery peak battery current values.

| 120 V Models | Inverter Peak | Max Continuous Discharge | Max Continuous Charge | AES RACKMOUNT Min 48-48-5120/ 48-48-5120-H |
|---|---|---|---|---|
| **Quattro 48/3000/35** [1] | 133 Adc | 54 Adc | 35 Adc | 1 |
| **Quattro 48/5000/70** [2] | 220 Adc | 88 Adc | 70 Adc | 1 [3] |

| 120 V Models | Inverter Peak | Max Continuous Discharge | Max Continuous Charge | AES RACKMOUNT Min 48-48-5120/ 48-48-5120-H |
|---|---|---|---|---|
| **Quattro 48/10000/140** [4] | 434 Adc | 174 Adc | 140 Adc | 2 [3] |
| **MultiPlus-II 48/3000/35** [5] | 121 Adc | 53 Adc | 35 Adc | 1 |
| **MultiPlus-II 48/5000/70** [6] | 195 Adc | 87 Adc | 70 Adc | 1 |

[1] Calculated based on max 6000W at 120 VAC peak output, 2400W at 120VAC continuous output, efficiency 94.0 %, and 35A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[2] Calculated based on max 10000W at 120 VAC peak output, 4000W at 120VAC continuous output, efficiency 95.0 %, and 70A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[3] Depending on the application, another battery may be required as the battery peak and inverter peak values are on the edge.

[4] Calculated based on max 20000W at 120 VAC peak output, 8000W at 120VAC continuous output, efficiency 96.0 %, and 70A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[5] Calculated based on max 5500W at 120 VAC peak output, 2400W at 120VAC continuous output, efficiency 95.0 %, and 35A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[6] Calculated based on max 9000W at 120 VAC peak output, 4000W at 120VAC continuous output, efficiency 96.0 %, and 70A DC max charging, as published in Victron Data Sheet as of 24-05-01.

| 230 V Models | Inverter Peak | Max Continuous Discharge | Max Continuous Charge | AES RACKMOUNT Min 48-48-5120/ 48-48-5120-H |
|---|---|---|---|---|
| **Quattro 48/5000/70** [1] | 220 Adc | 88 Adc | 70 Adc | 1 [*2] |
| **Quattro 48/8000/110** [3] | 347 Adc | 139 Adc | 110 Adc | 2 |
| **Quattro 48/10000/140** [4] | 434 Adc | 174 Adc | 140 Adc | 2 [2] |
| **Quattro 48/15000/200** [5] | 542 Adc | 260 Adc | 200 Adc | 3 |
| **Quattro-II 48/5000/70** [6] | 195 Adc | 87 Adc | 70 Adc | 1 |
| **MultiPlus 48/2000/25** [7] | 77 Adc | 35 Adc | 25 Adc | 1 |
| **MultiPlus 48/3000/35** [8] | 132 Adc | 53 Adc | 35 Adc | 1 |
| **MultiPlus 48/5000/70** [9] | 219 Adc | 88 Adc | 77 Adc | 1 [2] |
| **MultiPlus-II (GX) 48/3000/35** [10] | 121 Adc | 53 Adc | 35 Adc | 1 |
| **MultiPlus-II (GX) 48/5000/70** [11] | 195 Adc | 87 Adc | 70 Adc | 1 |
| **MultiPlus-II 48/8000/110** [12] | 329 Adc | 140 Adc | 110 Adc | 2 |
| **MultiPlus-II 48/10000/140** [13] | 391 Adc | 174 Adc | 140 Adc | 2 |
| **MultiPlus-II 48/15000/200** [14] | 592 Adc | 263 Adc | 200 Adc | 3 |
| **Multi RS Solar 48/6000 Dual Tracker** [15] | 199 Adc | 117 Adc | 100 Adc | 2 |
| **EasySolar-II 48/3000/35 MPPT 250/70 GX** [16] | 121 Adc | 53 Adc | 35 Adc | 1 |

| 230 V Models | Inverter Peak | Max Continuous Discharge | Max Continuous Charge | AES RACKMOUNT Min 48-48-5120/ 48-48-5120-H |
|---|---|---|---|---|
| **EasySolar-II 48/5000/70 MPPT 250/100 GX [17]** | 195 Adc | 87 Adc | 70 Adc | 1 |

[1] Calculated based on max 10000W at 230 VAC peak output, 4000W at 230VAC continuous output, efficiency 95.0 %, and 70A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[2] Depending on the application, another battery may be required as the battery peak and inverter peak values are on the edge.

[3] Calculated based on max 16000W at 230 VAC peak output, 6400W at 230VAC continuous output, efficiency 96.0 %, and 110A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[4] Calculated based on max 20000W at 230 VAC peak output, 8000W at 230VAC continuous output, efficiency 96.0 %, and 140A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[5] Calculated based on max 25000W at 230 VAC peak output, 12000W at 230VAC continuous output, efficiency 96.0 %, and 200A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[6] Calculated based on max 9000W at 230 VAC peak output, 4000W at 230VAC continuous output, efficiency 96.0 %, and 70A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[7] Calculated based on max 3500W at 230 VAC peak output, 1600W at 230VAC continuous output, efficiency 95.0 %, and 25A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[8] Calculated based on max 6000W at 230 VAC peak output, 2400W at 230VAC continuous output, efficiency 95.0 %, and 25A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[9] Calculated based on max 10000W at 230 VAC peak output, 4000W at 230VAC continuous output, efficiency 95.0 %, and 25A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[10] Calculated based on max 5500W at 230 VAC peak output, 2400W at 230VAC continuous output, efficiency 95.0 %, and 35A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[11] Calculated based on max 9000W at 230 VAC peak output, 4000W at 230VAC continuous output, efficiency 96.0 %, and 70A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[12] Calculated based on max 15000W at 230 VAC peak output, 6400W at 230VAC continuous output, efficiency 95.0 %, and 110A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[13] Calculated based on max 18000W at 230 VAC peak output, 8000W at 230VAC continuous output, efficiency 96.0 %, and 35A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[14] Calculated based on max 27000W at 230 VAC peak output, 12000W at 230VAC continuous output, efficiency 95.0 %, and 35A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[15] Calculated based on max 9000W at 230 VAC peak output, 5300W at 230VAC continuous output, efficiency 94.0 %, and 100A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[16] Calculated based on max 5500W at 230 VAC peak output, 2400W at 230VAC continuous output, efficiency 95.0 %, and 100A DC max charging, as published in Victron Data Sheet as of 24-05-01.

[17] Calculated based on max 9000W at 230 VAC peak output, 4000W at 230VAC continuous output, efficiency 96.0 %, and 100A DC max charging, as published in Victron Data Sheet as of 24-05-01.

| 277 V Models | Inverter Peak | Max Continuous Discharge | Max Continuous Charge | AES RACKMOUNT Min 48-48-5120/ 48-48-5120-H |
|---|---|---|---|---|
| **Quattro 48/15000/200** [1] | 542 Adc | 260 Adc | 200 Adc | 3 |

[1] Calculated based on max 25000W at 277 VAC peak output, 12000W at 277VAC continuous output, efficiency 96.0 %, and 200A DC max charging, as published in Victron Data Sheet as of 24-05-01.

# 4 Configuring Discover Products

## 4.1 Configuring the LYNK II

### LYNK II: Setting Up Jumpers

Jumpers configure termination for the LYNK Network and the CAN Out pin assignments. Follow the instructions in the LYNK II Installation and Operation Manual (805-0033) for accessing and configuring the header board with jumpers. Detailed pin configurations are included in the LYNK II manual and are repeated here for convenience.

**NOTE:**

- Disconnect power and all LYNK II Communication Gateway connections before configuring header boards and jumpers.
- The LYNK II Communication Gateway terminates the LYNK Network by default. Unless instructed, do not remove the termination jumper inside the LYNK II Communication Gateway.

Adjust the jumpers on the header board to assign CAN signals (CAN H, CAN L, CAN GND) to the pins of the RJ45 connector.

| CAN Out RJ45 Pin | Header Jumper | RJ45 Pin |
|---|---|---|
| **CAN L** | H1 - 6-8 | 8 |
| **CAN H** | H1 - 7-9 | 7 |
| **CAN GND** | H3 - 1-3 | 3 |

### LYNK ACCESS Software

LYNK ACCESS software for 64-bit Windows 10 / 11 is required to configure the LYNK II settings for closed-loop CAN communication with Victron Energy devices.

1. Download the current version of LYNK ACCESS software from the Discover Energy Systems website to get the most up-to-date suite of available protocol configurations.
2. Using a USB cable with a Type-B mini-plug, connect the 64-bit Windows 10/11 device with the LYNK ACCESS software to the USB port on the LYNK II communication gateway. Ensure the LYNK II is powered and connected to the correct Victron COM port (VE.Can).
3. Open LYNK ACCESS and confirm that only one LYNK device is connected to the computer.
4. Select the LYNK tab for optional configuration and settings. Select the blue gear icon in the upper right area of the CAN Settings tile.
5. Select the pre-configured Victron protocol and the baud rate (250 or 500 kbps) to complete the closed-loop configuration for LYNK II, then click SAVE.

**NOTE:** In most cases, the communication speed for the Victron protocol should be 250 kbps to match the networked Victron devices. However, if communication cannot be established at that speed, the Victron device may require a communication speed of 500 kbps.

## 4.2 Connecting LYNK II to the VE.CAN Network

### Setting up the Battery

For instructions on network layouts and connections, refer to the LYNK II Installation and Operation Manual (805-0033). Some key points are repeated here for convenience.

- Connect at least one battery to the LYNK Port on the LYNK II.
- A network of batteries will communicate as one battery.
- No more than one network of batteries may be connected to the LYNK II.
- Proper system function requires network termination – some batteries and devices may auto-terminate.
- LYNK II requires power from one of three possible sources (13-90 VDC power supply, a USB device, or AEbus Port or LYNK Port enabled Discover Lithium battery).
- Discover Lithium batteries must be set to ON to supply power and communicate with LYNK II.

LYNK II and AES RACKMOUNT battery modules are both internally terminated. No external termination is required when installing LYNK II with AES RACKMOUNT battery modules.

Before connecting LYNK II to the VE.Can network, ensure that the Victron GX device uses firmware version 2.89 or later. Also, ensure the CAN out pins on the LYNK II are configured correctly.

Insert one end of a CAT5e or higher communication cable into the LYNK II CAN out port and the other end into one of the two VE.Can ports (A-B) on the back of the Victron device. As the LYNK II is internally terminated, the external terminator provided with the GX is not required.

1. VE.Bus: RJ45 socket for connecting to the Victron inverter.
2. VE.Can: RJ45 socket for connection to LYNK II CAN Out.
    - Insert a terminator in the other VE.Can port to terminate the CAN network.

# 5 Configuring Victron Products

When the LYNK II is in a closed-loop network using the CANopen protocol, LYNK II will transmit real-time parameters from the Discover Lithium battery, including voltage, current, temperature, state of charge, and fault conditions, to a Victron Energy device. LYNK II also transmits charge voltage and current requests from the Discover Lithium battery to the Victron device.

If there is a break in communication between the Victron Energy device and the LYNK II, the Victron device stops charging. Charging only resumes after communication between the Victron device and the LYNK II communication gateway is restored. If communication cannot be restored, you may have to set the system to open loop until an installation professional is available.

As a precautionary measure, it is recommended that the inverter-charger be programmed with the correct voltage-based parameters before setting up the system to operate in a closed-loop configuration. If closed-loop communication fails, after the open loop parameters have been configured, turn the Victron device OFF and ON with the On/Off/Charger Only switch to enable the open-loop settings.

## 5.1 Setting Up Open-Loop Configuration

Whenever possible, using a closed-loop configuration with Discover batteries and Victron devices is recommended. However, an open-loop configuration may be required if the closed-loop communication system encounters an issue, such as a failure of the LYNK II gateway, cables or connections, or the Victron device.

In such cases, you may have to set the system to open loop until the issue is resolved. The following describes how to set up open-loop on Victron devices.

You will need the latest firmware on all connected devices. The following presumes familiarity with VE Configure software. After setting the voltage-based open-loop parameters using the VE Configure 3 software, ‘send’ all parameters to the inverter-charger and GX device and then restart the GX device.

**Procedure**

1. Set the Discover Lithium batteries to ON and the inverter to ON.
2. Connect your computer to the Victron GX device or inverter.
3. On the computer, start the VE Configure 3 software configuration tool.
4. Enable and disable parameter values according to the tables below.
5. Send the parameters in the following tables to the Victron inverter-charger and GX device.
6. Toggle the On/Off/Charger Only switch to turn the inverter OFF and ON.

VE Configure 3 > General Tab

| **General Tab** | **48-48-5120 / 48-48-5120-H** |
|---|---|
| **[AC1] Overruled by remote** [1] | Enable |
| **[AC2] Overruled by remote** [1] | Enable |
| **Dynamic current limiter** | Enable |

| General Tab | 48-48-5120 / 48-48-5120-H |
|---|---|
| External current sensor connected | Disable |
| Enable battery monitor | Enable |
| State of charge when Bulk finished [2] | 95% |
| Battery capacity | Number of batteries x 100 Ah |
| Charge efficiency [2] | 1.00 |

[1] Enable is recommended.

[2] Precautionary setting ignored during regular operation and communicating with Discover lithium batteries.

VE Configure 3 > Inverter Tab

| Inverter Tab | 48-48-5120 / 48-48-5120-H |
|---|---|
| DC input low shutdown [1] | 48.0V |
| DC input low restart [2] | 52.0V |
| DC input low pre-alarm [3] | 49.5V |
| Enable AES [4] | Disable |

[1] The lowest operating voltage allowed. Increase voltage as required.

[2] Restart voltage after DC input low shutdown. Recommend setting to the minimum value (minimum varies according to the DC Input low shutdown value).

[3] 49.5 V / 24.75 V value (approximately 10% SOC) will trigger a low battery warning. Increase or decrease as preferred.

[4] 'Enable AES' has no relation to the AES RACKMOUNT battery. Refer to Victron manuals for information on the AES setting and function.

VE Configure 3 > Charger Tab

| Charger Tab | 48-48-5120 / 48-48-5120-H |
|---|---|
| Enable Charger | Enable |
| Battery Type [1] | Blank |
| Lithium batteries [1] | Enable |
| Charge curve [1] | Select: Fixed |
| Absorption Voltage [1] | 55.2 V |
| Float Voltage [1] | 53.6 V |
| Charge Current | Installed x 95 Ah |
| Repeated absorption time [1] [2] | 1.0 < 3.0 Hr |
| Repeated absorption interval [1] | 7.0 Days |
| Absorption time [1] [2] | 1.0 < 3.0 Hr |

[1] Precautionary settings ignored during regular operation and communication with Discover lithium batteries.

[2] The recommended minimum is 1.0 hour. Multiple batteries may require a longer time to achieve a

smooth completion of charge.

## 5.1 Setting Up Closed-Loop Configuration

Refer to the latest Discover Energy Systems documentation for battery values and the latest Victron documentation for menu navigation and details on the setup procedure.

1. Set the Discover Lithium batteries to ON and the Victron GX device to ON.
2. Using a touch screen or other user interface of the GX device, set the VE.Can port and CAN-Bus BMS communication rate to 250 kbit/s to match the communication speed set up on the LYNK II communication gateway.

**Device List > Settings > Services > VE.Can port > CAN-bus profile**

- Select **VE.Can & CAN-bus BMS (250 kbit/s)**

(Select Victron solar inverters may operate with CAN-bus BMS 500 kbit/s)

- Return to the Device List, and the Discover Lithium Battery should now appear as one of the devices.

**Device List**

**NOTE:** If **Discover AES** does not appear on the Device List, confirm that the CAT5e or higher communication cable is a normal patch type, not a cross-over type. Use manufactured cables to avoid bad crimps and reduce the risk of a poor connection.

### 5.1.1 Configurable Closed-Loop Settings

During regular operation, the BMS sets the battery's charge parameter limits, which the Victron GX device communicates to the inverter-charger and MPPT.

To optimize the performance of a Victron system, manually set the following DVCC menu items using the Victron GX device and reboot the system.

**Device List > Settings > DVCC**

| DVCC Menu | Setting |
|---|---|
| **DVCC (Distributed Voltage and Current Control** | Forced on |
| **Limit charge current** | ON [1] |
| **Maximum charge current** [1] | Installed number of Discover batteries x rated Max Charge current |
| **Limit managed battery charge voltage** | Disabled |

| DVCC Menu | Setting |
|---|---|
| **SVS - Shared voltage sense** | Forced off [2] |
| **STS - Shared temperature sense** | Forced off |
| **SCS - Shared current sense** | ON |
| **SCS status** | (Displays the current status) |
| **Controlling BMS** | Automatic Selection |

[1] Limit charge current works across the system. MPPTs are automatically prioritized over the mains. In cases where the BMS requests a maximum charge current different from the user-configurable setting, it uses the lesser of the two.

[2] SVS should be set to OFF (Victron support has reported instances of conflicts when SVS is set to ON with a Lithium BMS).

#### 5.1.2 Saving the Configurable Closed-Loop Settings

**Device List > Settings > General > Reboot?**

After the DVCC menu items have been set, reboot the system to complete the closed-loop configuration.

**NOTE:** To avoid conflicting network information and data, do not use a Victron BMV battery monitor when using the LYNK II Communication Gateway.

# 6.0 Powering Up Equipment

- Make sure none of the Discover communication cables are attached.
- Safely connect MultiPlus/Quattro, GX device, MPPT, and so on to the batteries in accordance with the local electrical requirements/code.
- Connect all Victron communication cables at this time.
- Turn ON the AES RACKMOUNT battery.
- Turn on Multi/Quattro

If this is the initial set up of the MultiPlus or Quattro apply power to Victron Equipment and update firmware to the devices listed to:

- MultiPlus / Quattro - version 459 or later.
- GX device (Cerbo GX, Venus GX, etc) to include version 2.40 or later.
- VE.Direct MPPT - version 1.42 or later.

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