

# LYNK II

(950-0025)

## LYNK II SMA SUNNY ISLAND USER MANUAL

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## Introduction

This Application Note provides information about integrating network-enabled Discover Lithium Batteries using the LYNK II Communication Gateway with SMA Sunny Island inverter-chargers.

## 1. AUDIENCE, SAFETY, MESSAGES, AND WARNINGS

### 1.1 Audience

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

### 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



Do not crush, disassemble or dispose of the battery module in fire or the garbage.



This product is made of recyclable materials and must be recycled.

#### **⚠ 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 top of 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 integrating LYNK and AEBus network-enabled Discover Lithium Batteries using the LYNK II Communication Gateway with SMA Sunny Island Solar inverter-chargers.

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

### SMA Reference Documents

- Operating Manual Sunny Island 4548-US / 6048-US (en-21)
- Operating Manual Sunny Island 4.4M / 6.0H / 8.0H (en-14)
- Installation Manual Sunny Island 4.4M / 6.0H / 8.0H (en-33)

Visit <https://www.sma.de/en/> for the most recent version of published documents.

### Discover Energy Systems Documentation

Visit <http://discoverlithium.com> for the most recent version of published documents, including Discover Lithium battery user manuals and the LYNK II Installation and Operation Manual (805-0033).

### 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 of values. Installers must be capable of reviewing and adapting to the specifics of an installation and its specific use case and optimizing settings where needed.

- Review and confirm equipment compatibility and correct sizing.
- Configure the LYNK II Communication Gateway's CAN out pins to match the CAN in pins of the power conversion equipment.
- Mount the LYNK II Gateway, connect the Discover battery communication network to either the LYNK Port or AEBus Port, and then connect the CAN Out Port to the power conversion equipment's communication network.
- Terminate all networks correctly.
- Set the LYNK II Gateway using LYNK ACCESS software to the correct protocol to enable closed-loop communication between the Discover batteries and the power conversion equipment.
- Set up user preferences and enable the use case using the power conversion control system.

#### 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 SMA Sunny Island Inverter-Chargers in a closed-loop configuration. In a closed-loop configuration, the BMS of the Discover Lithium battery sends the battery status over a network data connection with the SMA Sunny Island Inverter-Charger. The SMA Sunny Island Inverter-Charger uses the Discover Lithium battery BMS data to finetune the output of the charger and deliver other functional controls based on battery voltage, temperature, and percent State-of-Charge.

As a safety precaution, Sunny Island automatically reduces the lithium charge voltage setpoint received from the BMS by 1 V when AC-coupled with PV inverters or microinverters. Therefore, when Sunny Island is used in an AC-coupled configuration, lithium batteries will never reach 100% SOC. Over time, continuously undercharging lithium batteries will result in unbalanced cells, reduced capacity, and a shorter battery life.

When Sunny Island uses energy from the grid or a generator, 1 V is not deducted from the BMS set point, and lithium charging occurs normally. Therefore, lithium batteries may be used with Sunny Island when AC-Coupled so long as they are charged to 100% SOC and the cells are balanced at least once a week using the grid or generator as the power source.

Additionally, if communication is interrupted between the BMS and SMA Sunny Island Inverter-Charger, after about 1 minute the power conversion device throws a fault (F952 MalfunctionExtBMSTimeout). Once communication is re-established, power conversion device operations resume.

## NOTICE

SMA Sunny Island Inverter-Charger cannot be operated in an open-loop configuration with Lithium batteries based on voltage-only charge settings.

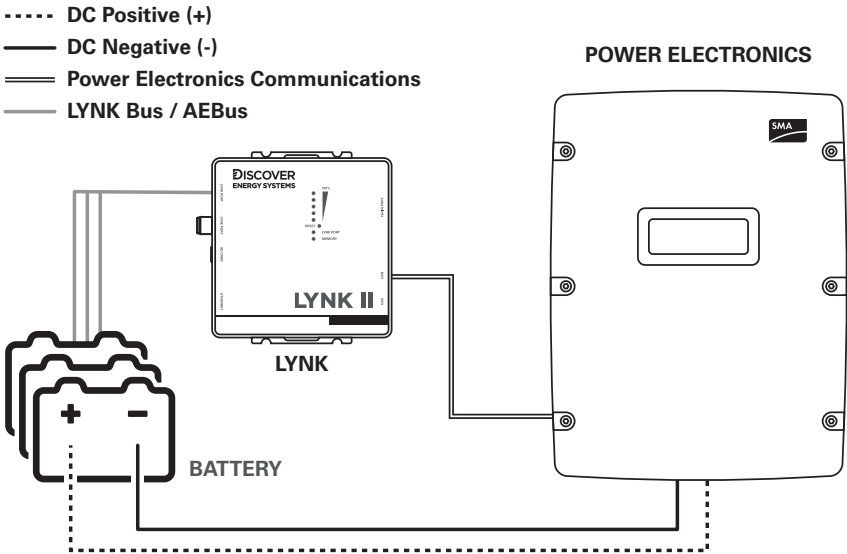


Figure 1. LYNK II to SMA Sunny Island

### 3.2 Compatibility

LYNK II Communication Gateway is compatible with the following:

#### Discover Lithium Batteries

- AES LiFePO<sub>4</sub>: 42-48-3000, 42-48-6650
- AES RACKMOUNT: 48-48-5120, 48-48-5120-H

#### SMA Solar

- Sunny Island 4.4M
- Sunny Island 6.0H
- Sunny Island 8.0H
- Sunny Island 4548-US
- Sunny Island 6048-US

### 3.3 Minimum Battery System Capacity

Battery charge and discharge rates are managed automatically by the Discover Lithium Battery and SMA Sunny Island 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. Curtail the charging below the operational limit of the installed batteries, or the battery capacity must accept the maximum charge current of the system. Calculate this value 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 demanded by the load attached to the inverter. Match all inverter peak power values with the sum of all battery peak battery current values.

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

Model	Inverter Peak (3s)	Max Discharge Current (1m)	Max Charge Current	AES 3.0 44-48-3000 Minimum Single phase (Three phase)	AES 7.4 42-48-6650 Minimum Single phase (Three phase)	AES RACKMOUNT 48-48-5120 Minimum Single phase (Three phase)
Sunny Island 4548-US <sup>1</sup>	242 A	185 A	110 A	4 (10)	2 (5)	2 (6)
Sunny Island 6048-US <sup>2</sup>	242 A	185 A	140 A	4 (10)	2 (5)	2 (6)
Sunny Island 4.4M-13 <sup>3</sup>	121A	106 A	75 A	2 (6)	1 (3)	2 (4)
Sunny Island 6.0H-13 <sup>4</sup>	243 A	165 A	110 A	3 (9)	2 (4)	2 (6)
Sunny Island 8.0H-13 <sup>5</sup>	243A	212 A	140 A	3 (14)	2 (5)	3 (7)

1 Calculated based on max 11000W at 120VAC 3-second output, 8400W at 120VAC 1-minute output, efficiency 94.5% (CEC), and 100A DC max charging, as published in SMA manual SI4548-6048-US-BE-en-21.

2 Calculated based on max 11000W at 120 VAC 3-second output, 8400W at 120VAC 1-minute output, efficiency 94.5% (CEC), and 140A DC max charging, as published in SMA manual SI4548-6048-US-BE-en-21.

3 Calculated based on max 5500W at 230 VAC 3-second output, 4800W at 120VAC 1-minute output, efficiency 94.0% (European weighted), and 75A DC max charging, as published in SMA manual SI44M-80H-13-BE-en-14.

4 Calculated based on max 11000W at 230 VAC 3-second output, 7500W at 120VAC 1-minute output, efficiency 94.3% (European weighted), and 110A DC max charging, as published in SMA manual SI44M-80H-13-BE-en-14.

5 Calculated based on max 11000W at 230 VAC 3-second output, 9600W at 120VAC 1-minute output, efficiency 94.1% (European weighted), and 140A DC max charging, as published in SMA manual SI44M-80H-13-BE-en-14.



## 4. LYNK II CAN HARDWARE TERMINATION AND CAN OUT PIN CONFIGURATION

### 4.1 LYNK II CAN Termination

Jumpers configure termination for AEBus and LYNK Network and the CAN Out pin assignments. Follow the LYNK II Installation and Operation Manual (805-0033) to learn how to access and configure the header board with jumpers.

Detailed pin configurations are included in the LYNK II Manual but are repeated here for convenience.

#### NOTICE

Disconnect power and all connections to LYNK II before attempting to configure header jumpers.

#### NOTE

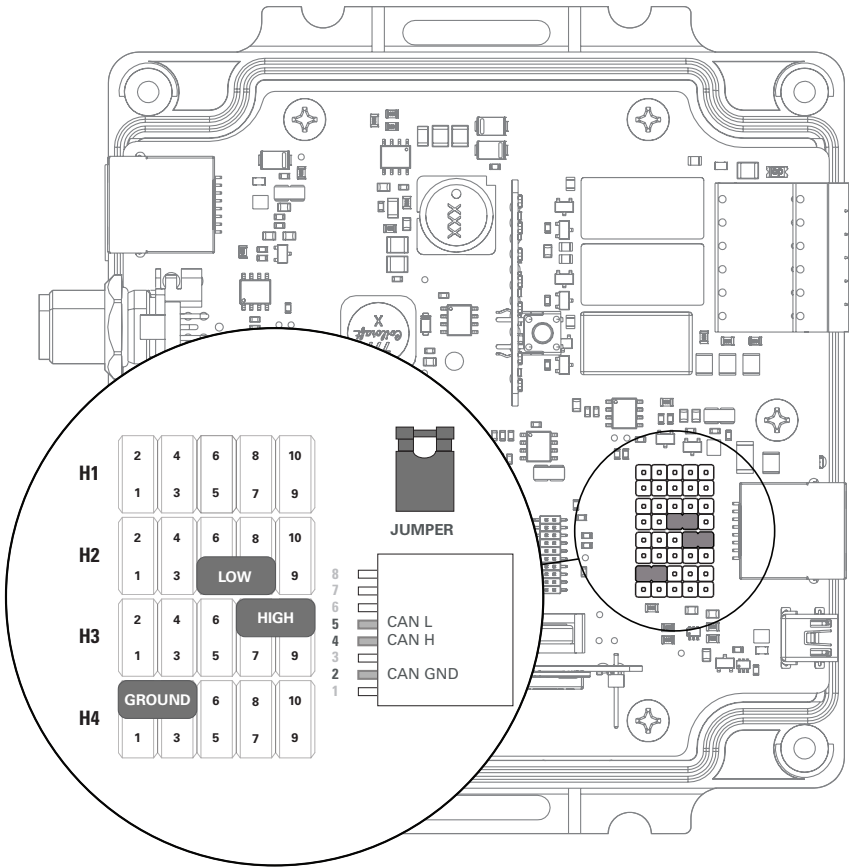
LYNK II terminates the AEBus and LYNK Network by default. Do not remove the termination jumper inside LYNK II unless instructed to do so by Discover Energy Systems.

### 4.2 LYNK II CAN Out - RJ45 Pin Assignments for Sunny Island Inverters

CAN signals (CAN H, CAN L, CAN GND) can be assigned to any pin of the RJ45 connector by adjusting the jumpers on the header board.

#### 4.2.1 Sunny Island Pin Assignments

CAN Out	Header Jumper	RJ45 Pin
CAN L	H2 - 5-7	5
CAN H	H3 - 8-10	4
CAN GND	H4 - 2-4	2



**Figure 2. SMA Pin Assignment**

### 4.3 Off-grid System Components

SMA Sunny Island systems are often AC coupled with Sunny Boy PV inverters for off-grid applications.

#### NOTICE

- Sunny Island automatically reduces the lithium charge voltage setpoint received from the BMS by 1 V when AC-coupled with PV inverters or microinverters. This protective measure prevents unintended overcharging under high dynamic conditions (sudden changes in PV and load). Therefore, when Sunny Island is used in an AC-coupled configuration, lithium batteries will never reach 100% SOC. Over time, continuously undercharging lithium batteries will result in unbalanced cells, reduced capacity, shorter battery life, and void the battery warranty.
- When Sunny Island uses energy from the grid or a generator, 1 V is not deducted from the BMS set point, and lithium charging occurs normally. Therefore, lithium batteries may be used with Sunny Island when AC-Coupled so long as they are charged to 100% SOC and the cells are balanced at least once a week using the grid or generator as the power source.

**Failure to follow these instructions may result in equipment damage.**

#### NOTE

SMA brand Sunny Charge Controllers are not approved for lithium batteries and therefore must not be used with Discover Lithium batteries.

### 4.4 Battery Protection – Off-grid

The Sunny Island system's operation and battery protection depend on the battery's state of charge (SOC). In off-grid operation, the Battery Protection mode prevents the battery from a deep discharge due to low energy supply, preventing total system failure and damage to the battery. If the battery's SOC falls below threshold settings (Setting: #223) (Web: Battery > Protection mode), the Battery Protection mode is activated, and the Sunny Island switches to either standby mode or off. The Discover battery BMS reports SOC to Sunny Island through LYNK II Gateway but does not override the threshold settings. Refer to the relevant Sunny Island Manual for how to use and set up Battery Protection.

## 4.5 Battery Protection - Self-Consumption

The options for increased self-consumption depend on the battery SOC and the availability of PV energy. To use the battery optimally, adjust the depth of discharge of the battery based on location and season (Setting: #262) (Web: Battery > Areas of application > Season operation active). The Discover battery BMS reports SOC to Sunny Island through LYNK II Gateway but does not override the threshold settings. Refer to the relevant Sunny Island Manual for how to use and set up threshold settings. Self-consumption adjustments are not available on the 4548-US and 6048-US models.

### NOTE

Self-consumption Battery Protection adjustments are unavailable on Sunny Island 4548-US and 6048-US models.

## 5. INSTALLING AND CONNECTING LYNK II TO THE SMA NETWORK

### 5.1 Networking Discover Lithium Batteries with LYNK II Gateway

### NOTICE

- Turn OFF all devices before connecting cables.
- Do not plug an AEBus or LYNK RJ45 network cable or terminator into the 10/100 Ethernet port of the LYNK II.
- Do not connect a CAT5 cable from the AEBus, LYNK, or Ethernet ports of the LYNK II to a WAN or MODEM port of a network router.
- Mixing the LYNK Network with other networks may result in equipment malfunction and damage.

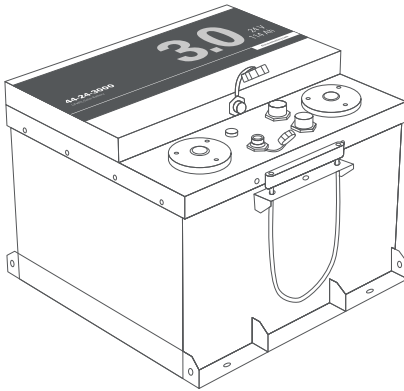
### NOTICE

Unless specified by Discover Energy Systems, do not connect power electronics directly to the LYNK network or AEBus network.

Refer to the **LYNK II Installation and Operation Manual (805-0033)** for instructions on network layouts, connections, and termination of compatible Discover Lithium battery models. Some key points are repeated here for convenience.

- Connect at least one battery to the LYNK Port on the LYNK II Communication Gateway.
- A network of batteries will communicate as one battery.
- Connect no more than one network of batteries 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 available 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 is internally terminated. AES batteries are not internally terminated. When using LYNK II with an AEBus network, install a terminator at the end opposite LYNK II.

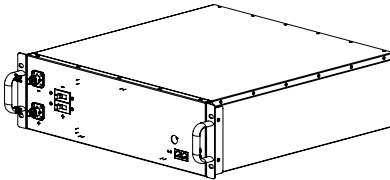


**Figure 3. AES**

**NOTE**

AES LiFePO<sub>4</sub> 48 V batteries sold before Jan 1, 2020, will not supply power to LYNK II using the network cable connection. An external 13-90 VDC power source connected to the Phoenix 12-pin connector on LYNK II is REQUIRED for the AES LiFePO<sub>4</sub> batteries listed below.

- 42-48-6650 with a serial number before DET424820275xxxx



**Figure 4. AES RACKMOUNT**

LYNK II and AES RACKMOUNT batteries are both internally terminated. When installing LYNK II with AES RACKMOUNT batteries, no external termination is required.

## 6. ENABLING LYNK II TO COMMUNICATE WITH SMA SUNNY ISLAND DEVICES

When properly connected to a closed-loop network and set to use the CANbus protocol, LYNK II will transmit real-time parameters from the Discover Lithium battery, including voltage, current, temperature, state of charge, and fault conditions to the SMA network. LYNK II will also transmit charge voltage and current requests from the Discover Lithium battery to devices on the SMA network.

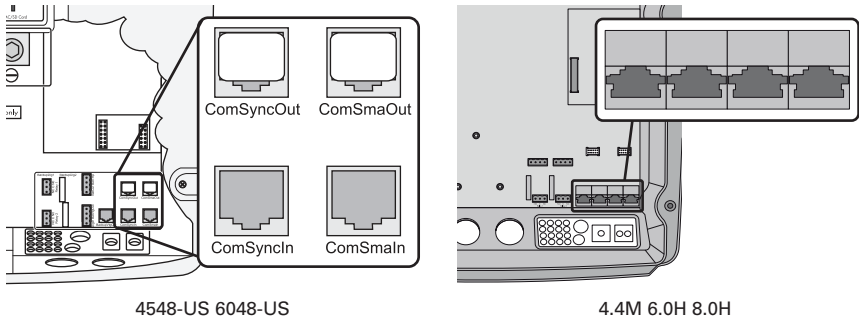
LYNK ACCESS software for 64-bit Windows 10 is required to configure LYNK II settings for closed-loop communication with devices on a CANbus network.

### 6.1 Connecting LYNK II to the SMA Network

Connect the LYNK II Gateway CAN out port to the 'ComSync In' port on the Sunny Island inverter-charger using a CAT5 cable. Terminate the ComSync communication bus at both ends. The LYNK II Communication Gateway is internally terminated.

Sunny Island ComSync In Port RJ45 Pin configuration:

1. Sync1 - reserved
2. CAN\_GND
3. SYNC\_H
4. CAN\_H
5. CAN\_L
6. SYNC\_L
7. Sync7 - reserved
8. Sync8 - reserved



**Figure 5. Sunny Island RJ45 Pin Configuration**

## 6.2 LYNK II and Sunny Island Network Terminations

The LYNK II Gateway unit is internally terminated. Using the SMA termination plug supplied with the Sunny Island, terminate the Sunny Island ComSync communication network at both ends. For a single Sunny Island, the end of the communication bus is the ComSync Out port on the Sunny Island. For a Sunny Island cluster, the end of the communication bus is the ComSync Out port on the last Sunny Island in the cluster.

ComSync network termination:

- 100 Ohm resistor between CAN\_H and CAN\_L **and** a 100 Ohm resistor between SYNC\_H and SYNC\_L.

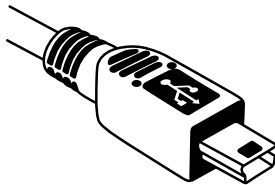
## 6.3 Sunny Island Battery Temperature Sensor

For Discover Lithium batteries, as the internal BMS transfers the battery temperature to Sunny Island, do not use an external battery temperature sensor.

## 6.4 Setting the LYNK II Communication Protocol to CANbus

### The Protocol Configuration Procedure

1. Download the current version of LYNK ACCESS software from the Discover Energy Systems website to obtain 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 device running LYNK ACCESS software to the USB port on LYNK II. Ensure LYNK II is powered and connected to the correct end of the CANbus network.



3. Ensure that only one LYNK device is connected to the computer.
4. Connect the LYNK II Communication Gateway, open the LYNK ACCESS software, and click the LYNK tab.
5. Select the blue gear icon in the upper right area of the CAN Settings tile.
6. Select the pre-configured SMA protocol to complete the closed-loop configuration for LYNK II. Click SAVE to confirm the configuration.

### NOTE

Saving configuration changes using LYNK ACCESS will automatically cause the LYNK II Communication Gateway to shut down and restart.

## 7. CONFIGURING SUNNY ISLAND

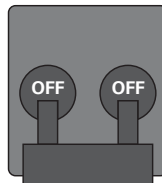
### 7.1 Setting Up Sunny Island 4548-US and 6048-US

Before connecting LYNK II to the Sunny Island network, update the firmware on Sunny Island 4548-US and 6048-US to version 7.3 or later.

The following instructions are for a system with a single Sunny Island in an off-grid application. Refer to the Sunny Island Manual to install a system with multiple Sunny Island inverters.

After installing the batteries described in the Discover battery manual, follow the SMA Quick Configuration Guide (QCG) instructions to set up the Sunny Island for use with Discover Lithium batteries.

1. Switch the DC circuit breaker of the Sunny Island from OFF to ON.



DC-Disconnect

To init system  
hold <Enter>

STNDBY: to Start  
INV hold <ENTER>

2. Sunny Island will initiate the startup phase and displays several notifications. 'To init system' is the last notification.
3. Press and hold down <ENTER> until the Sunny Island beeps three times to start the QCG setup.
4. Set the parameters for Discover Lithium batteries.  
When replacing batteries with Discover Lithium batteries in an existing SI system, select 'New Battery.'  
When commissioning a 'New System,' wait until prompted to enter battery parameters.
  - Battery Type: Lilon\_Ext-BMS
  - Nominal capacity of the battery: Installed number of batteries x their nominal capacity in AhAfter entering all parameters, the 'INIT MASTER OK START?' notification will appear.
5. Press <ENTER> to confirm, and the following notification appears.
6. Press <ENTER> and hold until you hear an acoustic signal.

The operation of Sunny Island now begins.



## NOTE

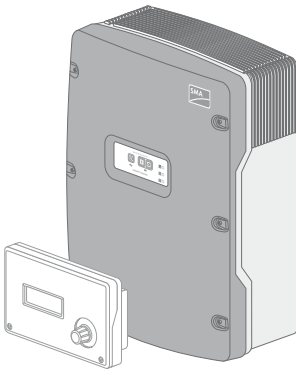
- Nominal voltage for the battery is automatically set to 48 V.
- Only mandatory settings for basic operation of the Sunny Island system are available for set up in the QCG.

## 7.2 Setting Up Sunny Island 4.4M, 6.0H, and 8.0H with Legacy Sunny Remote Control

Geared to readers familiar with SMA Sunny Island operations, the following instructions are for a system with a single Sunny Island in an off-grid application. Refer to the Sunny Island Manual to install a system with multiple Sunny Island inverters.

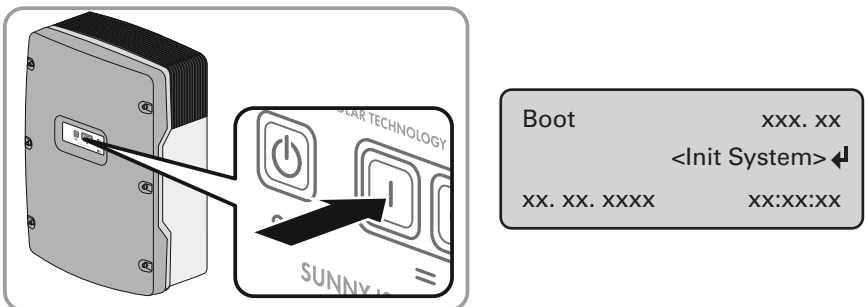
After installing the batteries described in the Discover battery manual, follow the SMA Quick Configuration Guide (QCG) instructions to set up the Sunny Island for use with Discover Lithium batteries.

The Quick Configuration Guide (QCG) starts up during the initial startup of Sunny Island. On the Sunny Remote Control – SRC-20 display, a menu structure guides the user for the commissioning of the system.



**Figure 6. Sunny Island with Sunny Remote Control**

1. Press the activation button on Sunny Island.
2. When the Sunny Island Remote Control displays 'Init System,' press and hold the button on the Sunny Remote Control until an acoustic signal sounds three times, and the Sunny Remote Control displays the QCG.



**Figure 7. Sunny Island Remote Control - Init System**

- When replacing batteries in an existing system with Discover Lithium batteries, turn clockwise the button on the Sunny Remote Control and select 'New Battery.' Press the button to confirm your selection of 'New Battery.'  
When commissioning a 'New System,' wait until prompted to enter battery parameters.  
Set the following parameters for Discover Lithium batteries:
  - BatteryType: Lilon\_Ext-BMS
  - Nominal capacity of the battery: Installed number of batteries x their nominal capacity in Ah
- Confirm the settings to complete the process.

### NOTE

- Nominal voltage for the battery is automatically set to 48V.
- Only mandatory values for the basic operation of the Sunny Island system are available for set up in the QCG.

## 7.3 Setting Up Sunny Island 4.4M, 6.0H, and 8.0H from the Integrated Web Interface

Geared to readers familiar with SMA Sunny Island -12 generation or later operations, the following instructions are for a system with a single Sunny Island in an off-grid application. Refer to the Sunny Island Manual to install a system with multiple Sunny Island inverters.

Follow the commissioning instructions in the Sunny Island 4.4M / 6.0H / 8.0H Operating Manual, which use a web-based interface.

- After installing the batteries described in the Discover Lithium battery manual, establish a direct connection (WLAN or Ethernet) to Sunny Island and log into the user interface as an installer.
- When replacing batteries in an existing system with Discover Lithium batteries, go to the Battery Configuration tab.  
When commissioning a system for the first time, the installation assistant guides you through the process.
- Set the following parameters for Discover Lithium batteries:
  - BatteryType: Lithium-ion (Li-Ion)
  - Nominal capacity of the battery: Installed number of batteries x their nominal capacity in Ah



**Battery configuration**

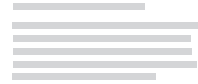
Type Minimum capacity

Lithium-ion (Li-ion)  Ah

Back Send Next

User Information

Battery Configuration



**Figure 8. Battery Configuration in WebConnect**

### NOTE

- Nominal voltage for the battery is automatically set to 48V.
- Only mandatory values for the basic operation of the Sunny Island system are available for set up in the QCG.

## 7.4 LYNK II and Sunny Island Communication

The LYNK II Communication Gateway provides power conversion and monitoring devices with BMS real-time data in a closed-loop configuration 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.

If communication is interrupted between the LYNK II and power conversion device, after about 1 minute the power conversion device throws a fault (952).

Once communication is re-established, the operations of the power conversion device and the LYNK II communication gateway resume.