

APPLICATION NOTE

**CONNECTING AES RACKMOUNT SLIMLINE
ENCLOSURES OR QUICK STACK RACKS IN PARALLEL**

READ AND SAVE THESE INSTRUCTIONS

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Introduction

Each AES RACKMOUNT Slimline Enclosure and Quick Stack Rack can be loaded with up to six AES RACKMOUNT Battery Modules.

In a closed-loop configuration, connect in parallel up to six Slimline Enclosures or six Quick Stack Racks for an energy storage system with up to 36 Battery Modules. In an open-loop configuration, the number of Slimline Enclosures or Quick Stack Racks that can be paralleled is limited by only the busbars, AIC, and the ability to charge.

The following describes how to electrically connect Slimline Enclosures or Quick Stack Racks in parallel, and how to connect them in a closed-loop configuration.

WARNING

HAZARD OF ELECTRIC SHOCK, EXPLOSION, ARC FLASH, AND FIRE

- This document is in addition to, and incorporates by reference, the relevant product manuals for the inverter, the AES RACKMOUNT Battery Module, the AES RACKMOUNT Battery Module Combiner, the AES RACKMOUNT Slimline Enclosure, and AES RACKMOUNT Quick Stack Rack. Before reviewing this document, read all the relevant product manuals.
- Unless specified, information on safety, specifications, installation, and operation is as shown in the primary documentation that comes with the product. Be familiar with that information before proceeding.

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

1. DOCUMENTATION

Refer to:

Inverter/Charger

- Documentation provided by the Inverter/Charger manufacturer

Battery Module (900-0062, 900-0067)

- AES RACKMOUNT Installation and Operation Manual (document number 805-0043 Rev E or later)

Enclosure (950-0053)

- AES RACKMOUNT Slimline Enclosure Manual (document number 805-0068 Rev B or later)

Quick Stack Rack (950-0050)

- AES RACKMOUNT Quick Stack Rack Manual (document number 805-0056 Rev D or later)

Battery Module Combiner (950-0049)

- AES RACKMOUNT Battery Module Combiner User Manual (document number 805-0055 Rev C or later)

2. WIRING AND COMMUNICATION

2.1 Wiring

WARNING

HAZARD OF ELECTRIC SHOCK AND FIRE

- Battery capacity must accept the maximum charge current of the system or curtail the charging to below the operating limit of the installed batteries. Derive this value by adding the charge capacities of all inverter-chargers and solar charge controllers in the system.
- 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 current values.
- Configuration and installation should only be performed by qualified personnel.
- Size the wires, busbars, and any other connections in accordance with the maximum loads and follow codes and regulations in accordance with the local Authority Having Jurisdiction.
- Size fuses and disconnects to handle AIC and peak current.
- Review the commissioning checklist in the Slimline Enclosure or Quick Stack Rack manual before electrifying the system.

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

This manual provides only example configurations and is not a comprehensive guide to the programming and configuration of a specific installation. Each 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, optimize equipment and settings where needed, and follow codes in accordance with the local authority having jurisdiction.

NOTE

Installation

- Minimum cable lengths. To reduce the voltage drop from impedance, which could lead to reduced performance, select a location that minimizes the length of battery cables.
- Appropriate cable gauge. The cables should be capable of carrying the normally expected current, plus a margin of safety.
- Proper polarity. Confirm the polarity of all cables and terminal connection. Positive (+) is connected to positive (+), and negative (-) is connected to negative (-).

2.2 Grounding

WARNING

HAZARD OF ELECTRIC SHOCK

For grounding specifications, follow codes and regulations in accordance with the local authority having jurisdiction.

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

2.3 Closed-Loop Communication

Closed-loop communication between the AES RACKMOUNT battery modules and inverter-chargers is achieved through the LYNK II communication gateway.

NOTICE

- Only one LYNK II communication gateway is required for the LYNK network.
- One LYNK network can support up to 36 AES RACKMOUNT Battery Modules. The total length of the LYNK network cables must not exceed 36 m (118.11 ft).
- Do not pass communication cables through the same conduit as power cables. For best practice, use shielded communication cables.

3. EXAMPLE SYSTEM: AES RACKMOUNT SLIMLINE ENCLOSURE

⚠ CAUTION

EQUIPMENT DAMAGE

- Follow instructions in the relevant manuals when installing, wiring, and commissioning the system.
- Torque all connections as specified in the manual.
- Failure to follow instructions in the manual will void the warranty.

Failure to follow these instructions may result in injury.

3.1 Wiring Example: Slimline Enclosures in Parallel

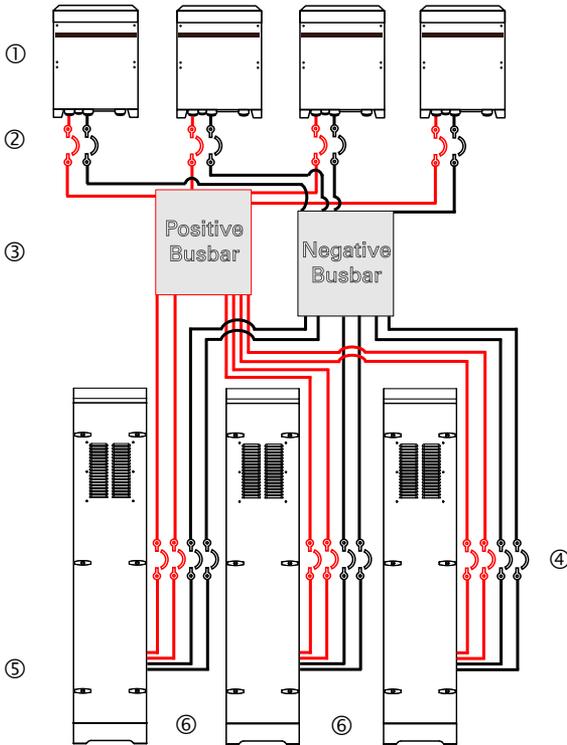


Figure 1. Wiring Example: Slimline Enclosures

Item	Description
1	Select the number of inverters as required by the application.
2	Positive/Negative wires between the inverter and busbars, and between the busbars and the Enclosures. Each Enclosure requires two positive and two negative wires to carry the 500 A maximum current available on the busbar, and to utilize the two separate connections for breakers or fuses in the Enclosure.

Item	Description
3	<p>Positive and negative busbars. Size busbars to handle the maximum current of the system.</p> <p>In this example, the three Slimline Enclosures are rated at 500 A each for a total of 1500 A. To allow for overcurrent, consider using a 2,000 A busbar.</p>
4	<p>Disconnects between power conversion equipment and energy storage. Some regions require disconnects in both the positive and negative cables. Others require the disconnect in the positive cables only. Refer to the applicable code and check with the authority having jurisdiction to confirm local requirements.</p> <p>Overcurrent protection is recommended inline for all positive conductors.</p>
5	<p>This example (above) has three Slimline Enclosures, each with six Battery Modules, for a system with a total of 18 batteries.</p> <p>In an open-loop configuration, the number of Slimline Enclosures that can be paralleled is limited by only the busbars, AIC, and the ability to charge. In a closed-loop configuration with a single LYNK II communication gateway, a maximum 36 Battery Modules in six Slimline Enclosures can be paralleled.</p>
6	<p>The minimum spacing between enclosures is 44.45 mm (1.75 in). More space may be required depending on the wires and grommets in the installation.</p>

NOTICE

Protect all cables from sharp steel edges with cable glands, nipples, or conduits.

NOTE

- Each Slimline Enclosure has unpopulated positions for two DC breakers. When fully populated with six Battery Modules, two 250 A DC-rated breakers are recommended. When fully populated with six Battery Modules, two appropriately sized positive power cables would be required, one for each DC breaker mounted in the Slimline Enclosure. Two appropriately sized negative power cables would also be attached to the negative bus bar inside the Slimline Enclosure.
- Each AES RACKMOUNT Battery Module is equipped with a built-in 100 A breaker to protect the power terminal.

3.2 Grounding Example: Slimline Enclosures in Parallel

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

For grounding specifications, follow codes and regulations in accordance with the local authority having jurisdiction.

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

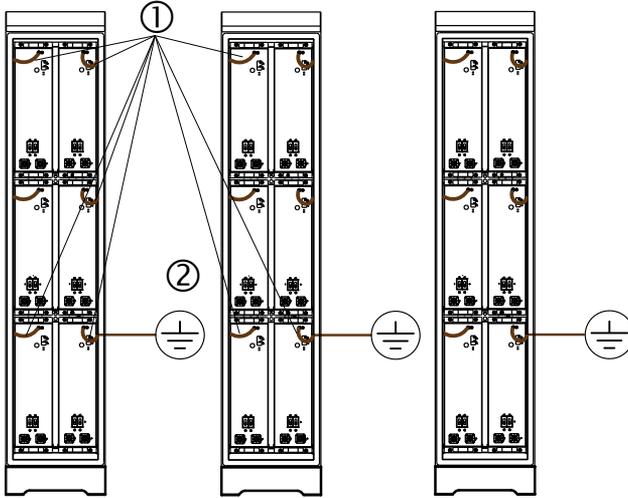


Figure 2. Grounding Example: Slimline Enclosures

Item	Description
1	Included with each AES RACKMOUNT Battery Module is a #6 ground wire. On the inside of the Slimline Enclosure are six grounding screws along the rack frame. Connect the ground wires from the grounding port on each Battery Module to a grounding screw on the Slimline Enclosure.
2	To ground the Slimline Enclosure, connect a #4 ground wire from one of the six grounding screws in the Slimline Enclosure to the equipment grounding point or grounding busbar.

NOTE

The internal rack frame of the Slimline Enclosure includes a bonding wire. Ground the door by connecting the bonding wire to the door with a M5 screw, using a torque of 7 to 8 Nm (5.16 to 5.9 ft-lb).

3.3 Communication Example: LYNK II and Battery Modules in Slimline Enclosure

NOTICE

- Only one LYNK II communication gateway is required for the LYNK network.
- One LYNK network can support up to 36 AES RACKMOUNT Battery Modules. The total length of the LYNK network cables must not exceed 36 m (118.11 ft).
- Do not pass communication cables through the same conduit as power cables. For best practice, use shielded communication cables.

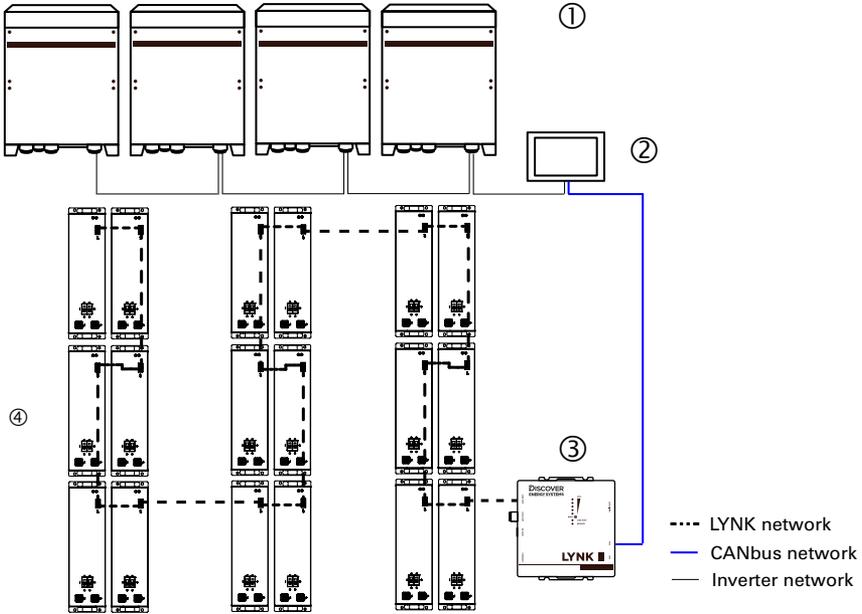


Figure 3. Communication Example: LYNK II and Battery Modules in Slimline Enclosures

Item	Description
1	Inverters connected via communication system.
2	Connection to the power conversion equipment communication network.
3	LYNK II Communication Gateway connected to the LYNK network and configured with the appropriate protocol to communicate with inverters.
4	Battery Modules connected together over the LYNK network sharing information about the battery bank.

NOTE

Extra network termination is not required. AES RACKMOUNT Battery Modules and the LYNK II communication gateway are automatically terminated.

4. EXAMPLE SYSTEM: AES RACKMOUNT QUICK STACK RACKS

⚠ CAUTION

EQUIPMENT DAMAGE

- Follow instructions in the relevant manuals when installing, wiring, and commissioning the system.
- Torque all connections as specified in the manual.
- Failure to follow instructions in the manual will void the warranty.

Failure to follow these instructions may result in injury.

4.1 Wiring Example: Quick Stack Racks in Parallel

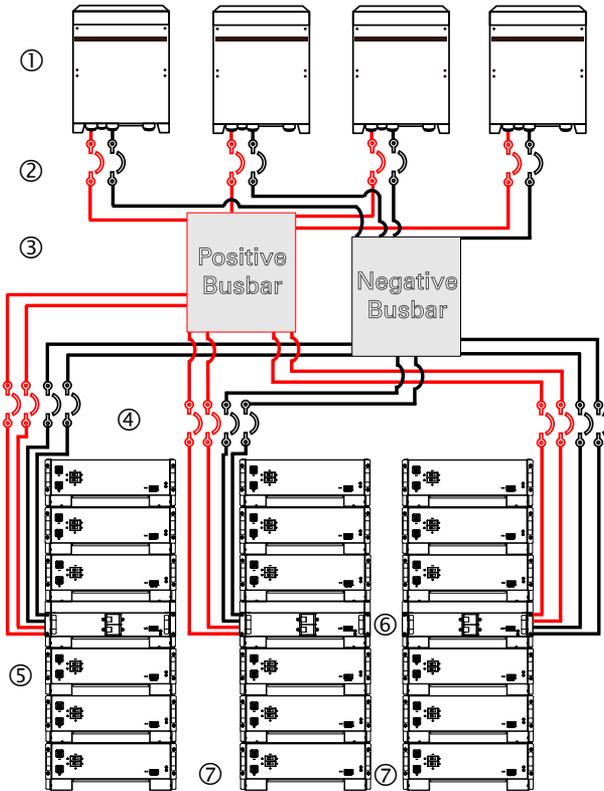


Figure 4. Wiring Example: Quick Stack Racks

Item	Description
1	Select the number of inverters as required by the application.
2	Positive/Negative wires between the inverter and busbars, and between the busbars and the Battery Module Combiners.

Item	Description
3	<p>Positive and negative busbars. Size busbars to handle the maximum current of the system.</p> <p>In this example, the three sets of Quick Stack Racks are rated at 500 A each for a total of 1500 A. To allow for overcurrent, consider using a 2,000 A busbar.</p>
4	<p>Disconnects between power conversion equipment and energy storage. Some regions require disconnects in both the positive and negative cables. Others require the disconnect in the positive cables only. Refer to the applicable code and check with the authority having jurisdiction to confirm local requirements.</p> <p>Overcurrent protection is recommended inline for all positive conductors.</p>
5	<p>This example (above) has three sets of Quick Stack Racks, each with six Battery Modules and the Battery Module Combiner, for a system with a total of 18 batteries.</p> <p>In an open-loop configuration, the number of Quick Stack Racks that can be paralleled is limited by only the busbars, AIC, and the ability to charge.</p> <p>In a closed-loop configuration with a single LYNK II communication gateway, parallel a maximum 36 Battery Modules in six Quick Stack Racks.</p>
6	<p>Each Battery Module Combiner has two 250 A single-pole breakers, which require two positive and two negative power cables.</p>
7	<p>The minimum spacing between Quick Stack Racks is 44.45 mm (1.75 in). However, 50 mm (2 in) or more may be required to allow access to the locking latches on the sides of the Quick Stack Racks for maintenance purposes.</p>

NOTE

Each AES RACKMOUNT Battery Module is equipped with a built-in 100 A breaker to protect the power terminal.

4.2 Grounding Example: Quick Stack Racks in Parallel

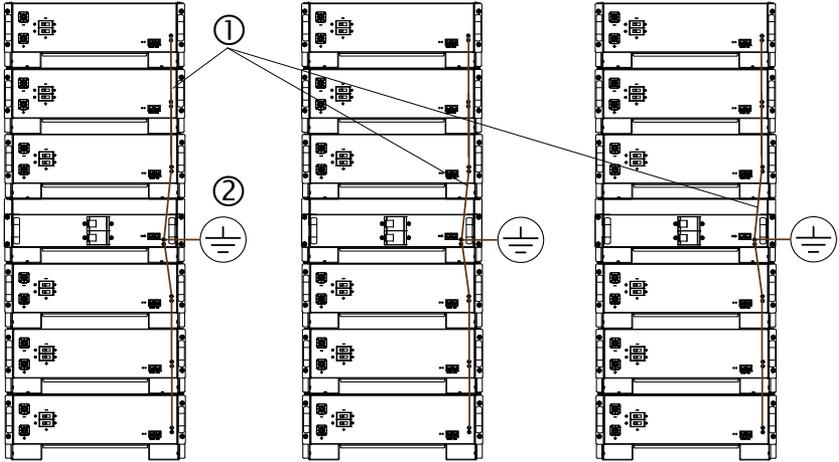


Figure 5. Grounding Example: Quick Stack Racks

Item	Description
1	Included with each AES RACKMOUNT Battery Module is a #6 ground wire. Connect the ground wires from the grounding port on each Battery Module to the grounding port on the next Battery Module or Battery Module Combiner, until all the units are connected together.
2	To ground the Quick Stack Rack system, connect a #4 ground wire from one of the grounding ports to the equipment grounding point or grounding busbar. For grounding specifications, follow codes and regulations in accordance with the local Authority Having Jurisdiction.

4.3 Communication Example: LYNK II and Battery Modules in Quick Stack Racks

NOTICE

- Only one LYNK II communication gateway is required for the LYNK network.
- One LYNK network can support up to 36 AES RACKMOUNT Battery Modules. The total length of the LYNK network cables must not exceed 36 m (118.11 ft).
- For best practice, use shielded communication cables.

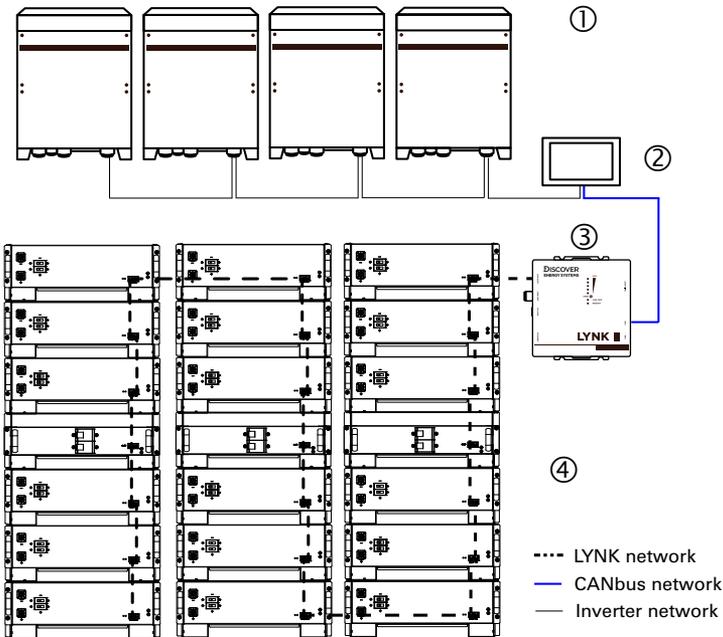


Figure 6. Communication Example: LYNK II and Battery Modules in Quick Stack Racks

Item	Description
1	Inverters connected via communication system.
2	Connection to the power conversion equipment communication network.
3	LYNK II Communication Gateway connected to the LYNK network and configured with appropriate protocol to communicate with inverters.
4	Battery Modules connected together over the LYNK network sharing information about the battery bank.

NOTE

Extra network termination is not required. AES RACKMOUNT Battery Modules and the LYNK II communication gateway are automatically terminated.