



APPLICATION NOTE

AES RACKMOUNT EMERGENCY STOP

READ AND SAVE THESE INSTRUCTIONS

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INTRODUCTION

This document describes setting up an emergency stop (E-stop) button or bladed lockable disconnect for an AES RACKMOUNT energy storage system that utilizes either the AES RACKMOUNT Slimline Enclosure or Battery Module Combiner Box. These instructions are for AES RACKMOUNT Battery Modules and cannot be used to design a system that turns off any other types of batteries.

Please use this document as a guide only. It should not supersede the requirements of the local authority having jurisdiction nor the requirements of the electrical power company.

1. AUDIENCE, MESSAGES, 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.

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 Documentation

This supplement provides information about setting up an emergency switch (E-stop or bladed lockable disconnect) for an AES RACKMOUNT energy storage system that uses either the AES RACKMOUNT Slimline Enclosure or Battery Module Combiner Box.

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

Discover Energy Systems

- [AES RACKMOUNT Installation and Operation Manual](#)
- [AES RACKMOUNT Slimline Enclosure Manual](#)
- [AES RACKMOUNT Battery Module Combiner User Manual](#)

2. PARTS

The following parts are required to set up the E-stop/bladed lockable disconnect in an AES RACKMOUNT energy storage system.

No.	Part	Description
1	AES RACKMOUNT Slimline Enclosure or AES RACKMOUNT Battery Module Combiner Box	The Remote Power Off (RPO) board is a component in the Slimline Enclosure and Battery Module Combiner Box. The RPO board is a proprietary device from Discover Energy Systems that can be configured with an external switch to turn off AES RACKMOUNT batteries.
2	AES RACKMOUNT Lithium Battery	Using the RPO board with the AES RACKMOUNT Slimline Enclosure or Battery Module Combiner, you can configure a switch to shut down up to 36 AES RACKMOUNT batteries.
3	Emergency stop button / bladed lockable disconnect	Switch for shutting down the AES RACKMOUNT energy storage system. For a list of switches that may meet your system requirements, see 6. E-STOP BUTTON / BLADED LOCKABLE DISCONNECT .
4	2-Conductor, shielded or unshielded, 14-18 AWG wire, with the jacket rated for 300+ V	Wire to connect the E-stop button or bladed lockable disconnect to the RPO board.

3. REMOTE POWER OFF (RPO) BOARD

The RPO board is a component of the AES RACKMOUNT Slimline Enclosure and AES RACKMOUNT Battery Module Combiner Box.

There are two ways to use the RPO board.

- When the RPO board is used with the ON/OFF key, you can toggle all the batteries in the system ON or OFF with a single press of the ON/OFF key.
- When the RPO board is used with an E-stop button or a bladed lockable disconnect, pressing the E-stop button or pulling the disconnect handle turns OFF all the batteries in the system. The ON/OFF key is deactivated while the E-stop or bladed lockable disconnect is enabled (open).

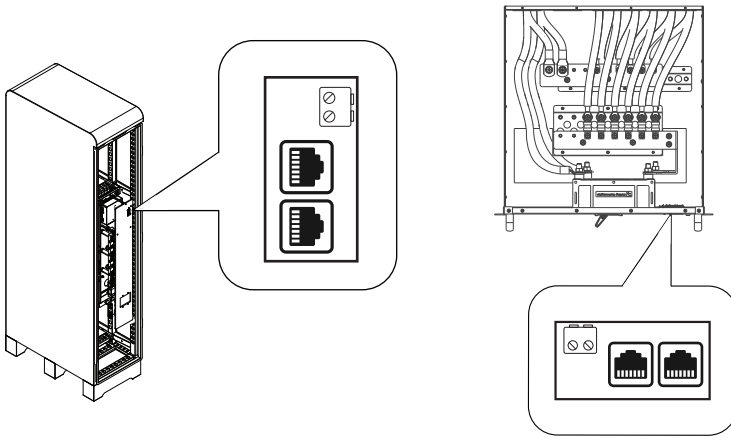


Figure 1. RPO Board on the Slimline Enclosure and Battery Module Combiner Box

4. E-STOP/BLADED LOCKABLE DISCONNECT - SYSTEM OVERVIEW

In the E-stop/bladed lockable disconnect systems below ([Figure 2](#), [Figure 3](#)), AES RACKMOUNT Lithium batteries are connected with an inverter. An emergency switch that is normally closed is connected to the RPO terminals in the system, allowing communication until the switch is engaged.

In an emergency, push down on the E-stop button or pull the handle of the bladed lockable disconnect to open (disconnect) the communication circuit and turn off the batteries.

NOTE

- Apply the E-stop/bladed lockable disconnect circuit identified in this document to one RPO board only.
- To connect the maximum 36 AES RACKMOUNT batteries with the E-stop/bladed lockable disconnect circuit, do not connect communication cables (CAT6 or higher) to the RJ45 ports of the RPO board on more than one Slimline Enclosure or Battery Module Combiner Box.
- To connect the maximum 36 AES RACKMOUNT batteries, they must be set up with firmware version 4.6 or later.

4.1 Slimline Enclosure Circuit

Legend

- - - CAT6 or higher cable
- 14-18 AWG wire

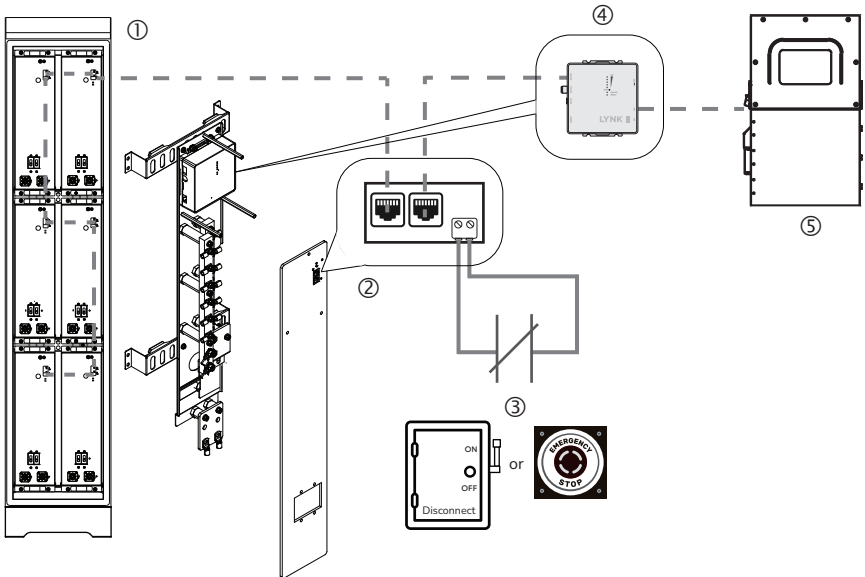


Figure 2. Slimline Enclosure Circuit

Item	Description
1	AES RACKMOUNT batteries are networked in a Slimline Enclosure.
2	RPO board on the plexiglass busbar protector in the AES RACKMOUNT Slimline Enclosure. Wire the emergency switch to the terminals on the edge of the RPO board. NOTE: The terminals do not have a positive or negative. They need to be wired to opposite ends of the emergency switch.
3	Normally Closed emergency switch (E-stop button or bladed lockable disconnect)
4	(Optional) LYNK II or LYNK LITE Communication Gateway attached to the busbar mounting assembly on the Slimline Enclosure. It is not required to operate the E-stop/bladed lockable disconnect.
5	Inverter It is not required to operate the E-stop/bladed lockable disconnect.

4.2 Battery Module Combiner Box Circuit

Legend

- - CAT6 or higher cable
- 14-18 AWG wire

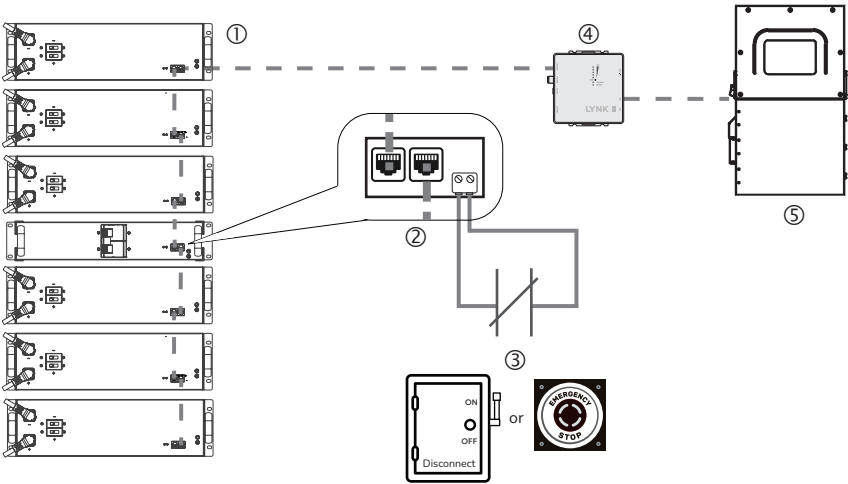


Figure 3. Battery Module Combiner Box Circuit

Item	Description
1	AES RACKMOUNT batteries networked with the Battery Module Combiner Box.
2	RPO board inside the Battery Module Combiner Box. Wire the emergency switch to the terminals on the edge of the RPO board. NOTE: The terminals do not have a positive or negative. They need to be wired to opposite ends of the emergency switch.
3	Normally Closed emergency switch (E-stop button or bladed lockable disconnect)
4	(Optional) LYNK II or LYNK LITE Communication Gateway It is not required to operate the E-stop/bladed lockable disconnect.
5	Inverter It is not required to operate the E-stop/bladed lockable disconnect.

4.4 Requirements

The local authority having jurisdiction and the electrical power company will each have their own set of requirements for the emergency switch of an energy storage system.

Some example requirements:

- Distance of the emergency switch from the meter.
- Information on how to confirm the emergency switch has turned off the energy storage system. E.g. Battery LED has turned off, 0 V on battery terminals.
- Information on the location of batteries and other components of the system.
- 30 amp, NEMA 3R or higher, bladed lockable disconnect.

NOTE

Refer to the local authority having jurisdiction and the local electrical power company for their requirements on an emergency switch (E-stop button, bladed lockable disconnect, or other) of the energy storage system.

5. RPO BOARD (AES RACKMOUNT SLIMLINE ENCLOSURE, BATTERY MODULE COMBINER BOX)

The RPO board is available on the AES RACKMOUNT Slimline Enclosure and Battery Module Combiner. The following instructions describe how to access the RPO board.

5.1 Wiring the RPO Board on the Slimline Enclosure

⚠ WARNING

ELECTRIC SHOCK

- Even if the battery LED is OFF, the energy storage system may be energized by the power conversion system (inverter-charger / MPPT controller).
- Do not touch the energized surfaces of any electrical component in the Enclosure.
- Follow the procedures outlined in the AES RACKMOUNT Slimline Enclosure Manual to fully de-energize the energy storage system.
- Verify the terminal voltage with a voltmeter before handling any components in the Energy Storage System.

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

1. Isolate the Enclosure from external power sources by opening all the disconnects of externally connected equipment, such as inverters, battery chargers, and charge controllers.
2. Open and remove the Enclosure door. Be careful not to loosen the bonding wire between the door and the internal rack frame.
3. Turn off all the batteries and open all battery breakers.
4. Use a voltmeter to confirm no voltage across the positive and negative busbars. Over the Busbar Mounting Assembly is a sheet of plexiglass. Connected to the plexiglass is the RPO board.

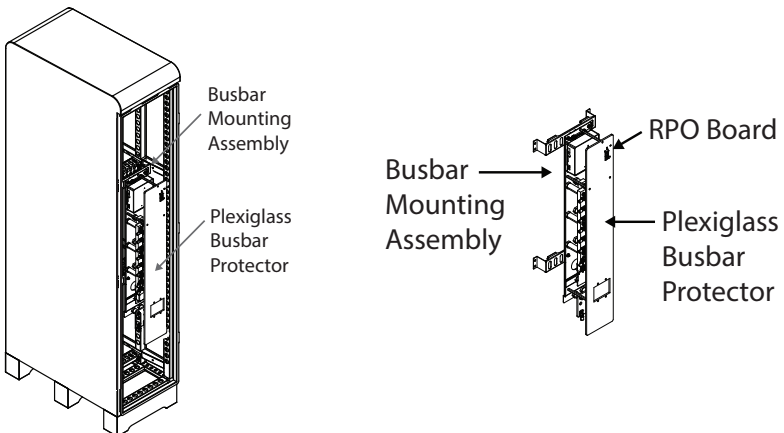


Figure 4. RPO Board on the Slimline Enclosure

5. Plan:
 - a. Where to locate the E-stop or bladed lockable disconnect. Typically the emergency switch is located close to the meter.
 - b. Where to route the wires. The choice of cables will determine if you need to run them through conduit or, if the wiring is specified for this purpose, can run them free air.
6. Remove the plexiglass busbar protector to access the wiring terminals of the RPO board.
7. Connect one end of the 14-18 AWG wire to one of the terminals on the RPO board and connect the other end of the wire to one side of the switch.
8. Connect another strand of 14-18 AWG wire to the open terminal on the RPO board and the open side of the switch.

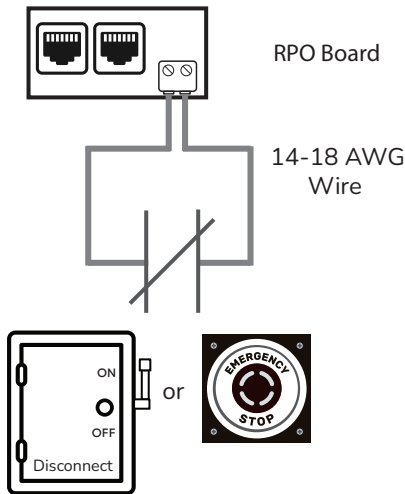


Figure 5. E-Stop Button/Bladed Lockable Disconnect Wiring

5.2 Wiring the RPO Board on the Battery Module Combiner Box

⚠ WARNING

ELECTRIC SHOCK

- Always assume the Battery Module Combiner Box is energized, even if the At-a-glance LED shows the battery modules are OFF.
- Even if the Battery Module Combiner LED is OFF, the combiner box may be energized with power from the power conversion system (inverter-charger / MPPT controller).
- Verify the terminal voltage with a voltmeter before handling any components in the energy storage system. Do not touch the energized surfaces of any electrical component in the enclosure.

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

1. De-energize the Power Conversion equipment.
2. Switch the Battery Module Combiner Breaker to the OFF (Open) position.
3. Switch all Battery Modules to OFF.

4. Disconnect all the Amphenol SurLok Plus connectors from all the battery modules to isolate the Battery Module Combiner.
5. Protect the Battery Module terminals from short-circuiting and touch by covering them with terminal covers or electrically rated tape.
6. Disconnect the Power Conversion cables attached to the Battery Module Combiner.
7. Plan:
 - a. Where to locate the E-stop or bladed lockable disconnect. Typically the emergency switch is located close to the meter.
 - b. Where to route the wires.
8. Access the top of the Battery Module Combiner and remove the top cover.
9. The RPO board is at the front of the Battery Module Combiner, where the RJ45 ports are.

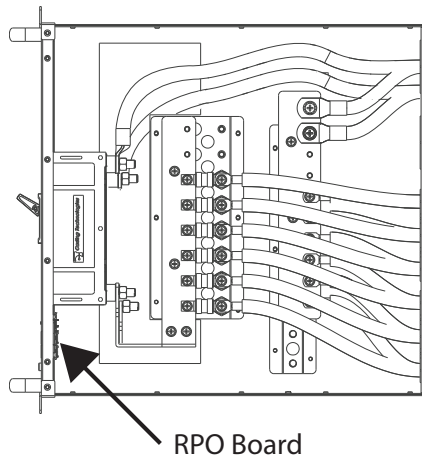


Figure 6. RPO Board on the Battery Module Combiner Box

10. Touch a grounded metal surface to remove the static electricity from your body.
11. Remove the screws securing the RPO board, then gently hold the top and bottom of the RPO board and dislodge it.
12. Once removed, you can access the wiring terminals of the RPO board.
13. Connect an E-stop button or a bladed lockable disconnect to the RPO board.

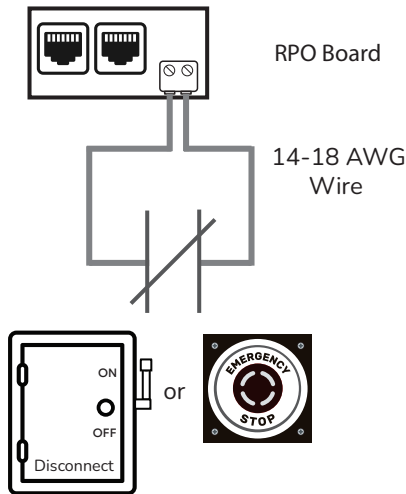


Figure 7. E-Stop Button/Bladed Lockable Disconnect Wiring

6. E-STOP BUTTON / BLADED LOCKABLE DISCONNECT

Minimum Requirements

- Normally closed (NC) in operational (ON) position
- NEMA 3R or higher (for outdoor installation)

The bladed lockable disconnects and E-stop buttons ([Table 1](#) and [Table 2](#), respectively) are examples of switches you can use for the emergency stop. You can use other switches that have the same or similar specifications.

We list two sets of emergency switches (bladed lockable disconnect and E-stop buttons) but your system will need only one for it to work.

Switches that you select should fulfill the above requirements as well as the requirements set by the local authority having jurisdiction and by the electrical power company.

NOTE

- Contact the local authority having jurisdiction AND the electrical power company for their requirements on the emergency switch. Each entity will have its own set of requirements for the E-stop button, bladed lockable disconnect, or other.
- Some electrical power companies require the emergency switch to be bladed and lockable.

Table 1. Bladed Lockable Disconnect

Manufacturer	Description	Part Number
Square D	DU221RB Disconnect Switch	SKU: SQD-DU221RB-30A
Siemens	Outdoor General Duty Max Series Safety Switch	Model number: GNF221RLLA
GE	Outdoor General-Duty Safety Switch	Model number: TGN3321R

Table 2. E-Stop Button

Manufacturer	Part Number
Schneider Electric	XALK198H7
ABB	CEPY1-2001
IMO Automation	BG10P34-11

NOTE

The above bladed lockable disconnects and E-stop buttons are only examples of switches you can use for the emergency stop. You can use other switches that have the same or similar specifications.