



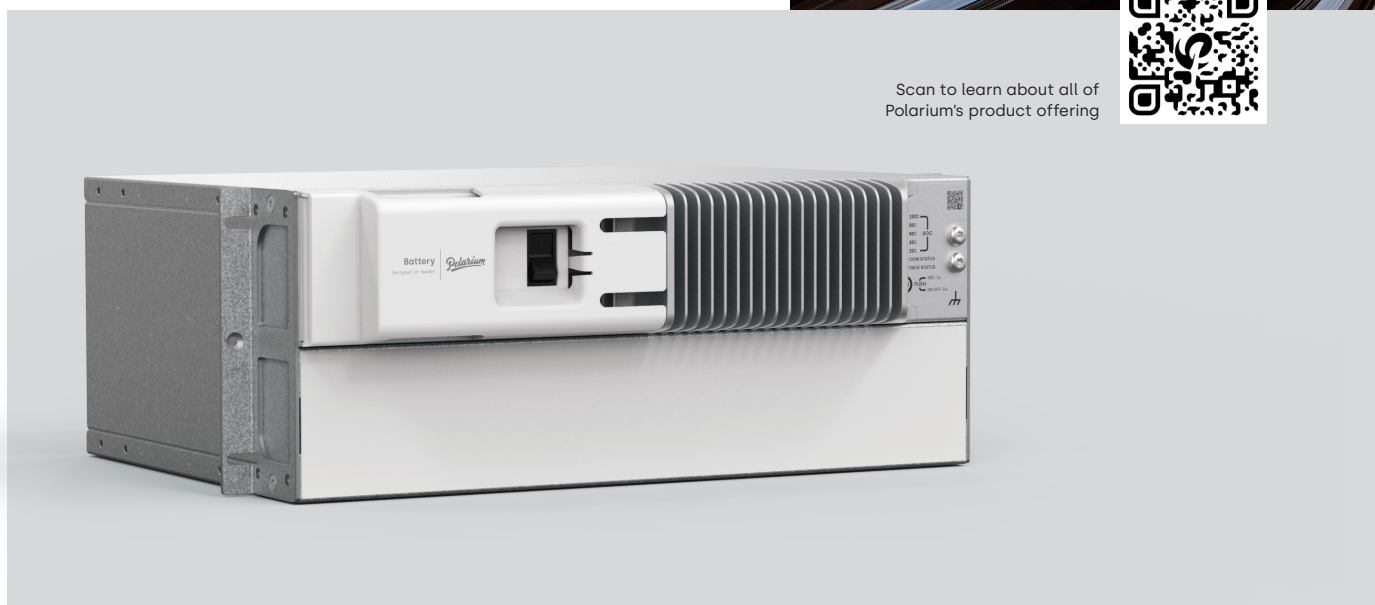
Product 770-00114 rev. 6.3

Installation and Operation Instructions

Generation 5 Lithium Battery



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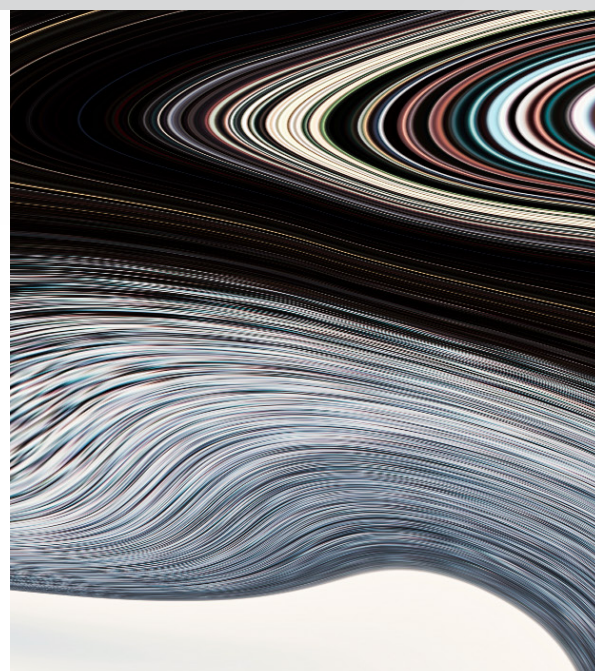


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1 Introduction

1.1 Document Description

This instruction document serves to describe how to install the Polarium™ Lithium-Ion battery in an indoor environment.

This serves as a general overview of the processes involved to safely install and operate the SLB48 product range offered by Polarium™. It does not include product specific information regarding the technical specifications of the specific unit being installed. Refer to the technical reference documents published on-line, or contact Polarium™ to get accurate technical information.

1.2 Target Audience

This document is aimed at the to be utilized by the installer on site and maintenance personnel.

1.3 Product Description

Polarium™ SLB batteries are designed to be used in a weather proof and semi-controlled environment i.e. no direct exposure to outdoor climate conditions. The batteries are designed to operate within the following temperate range;

Normal Operating Temp Ambient	0 to +45°C (32 to 113°F)
Limited Function Mode (cell temp)	-20 to +60°C (-4 to 140°F)

The standard accessory busbars are recommended for a current of maximum 300 A. It is recommended that all cabling within and from battery groups are to the same lengths and dimensions to keep current flow in the system as balanced as possible. Polarium recommend max 500 A draw from batteries connected to the same battery fuse. To draw 500 A using standard accessory busbars (300 A) recommendation is to make two sub-groups which both connect via separate cabling to the same battery fuse. By using larger busbars or cables (rated for >500 A) between batteries and batteries to fuse, 500 A can be drawn from one group of batteries. However, these cables will be large and difficult to install and handle.

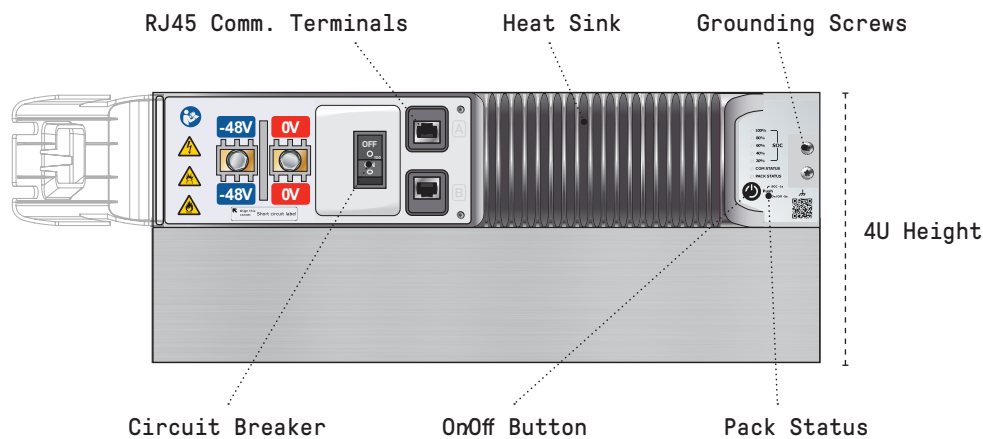
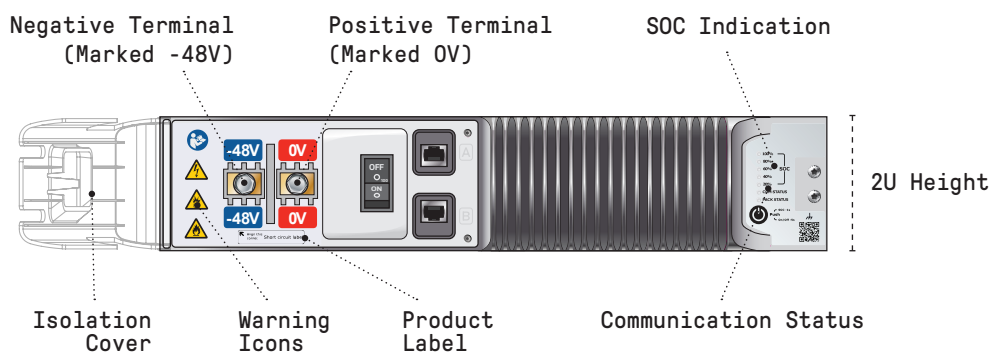
Each battery has its own protective circuit breaker (100 A) and the batteries can be connected in parallel up to a maximum 500 A load (eg 6 x 100 Ah batteries in one group can discharge max 500 A). For large load requirements, batteries should be grouped with separate system circuit breakers or fuses for max 300A load per battery group branch – Polarium recommendation is to dimension systems with multiple batteries or battery groups for a utilization of max 80% of batteries full load (A) capabilities. From a monitoring/balancing/communications perspective up to 26 batteries can be connected in one monitor loop. Each battery



has a battery manager (BMS) and will operate independently within its operating parameters. Connecting several batteries together with the provided RJ45 cabling will ensure balancing between batteries and provide a possibility to communicate with the batteries as a group or with single batteries.

Using Polarium™ Studio and a data cable (105-00006) will provide access to the battery data for monitoring and recording (eg test data). Download the latest version of Polarium™ Studio software for this communication at www.polarium.com/

1.4 Product Diagrams



2U Unit Cover Closed



4U Unit Cover Closed



1.5 Optimizing Battery Cycle Life

It is important to note that Lithium battery characteristics are very different from VRLA (lead) batteries – lithium batteries can be used in a much wider operating windows both with regards to State of Charge (SoC) and with regards to temperatures.

A lithium battery can be deep discharged until it's cut off level, does not require any boost charge and does not have to be fully charged after every cycle to optimize life. A lead acid battery is often required to be kept fully charged (or even boost charged) to optimize life of the battery. VRLA batteries can also be susceptible to deep discharge (often recommended not to discharge lower than 20-50% depending on conditions).

A lithium battery will continue to be usable below 70 % of the original capacity and the aging will continue all the way down way below 50%.

A VRLA is normally used to 70-80% of its original capacity, after this it will typically quickly loose capacity and need to be taken out of service.

In order to further increase the Lithium battery cycle life Polarium would recommend two different charging voltages:

- If the battery is operating in stable power conditions (the battery is only operated a few times per month or year) then the recommendation is to fully charge (100%) the battery – this will provide the full battery capacity for use – number of full charge/discharge cycles will be reduced (vs a battery charged to 80%) but will still be sufficient as not to limit life time of battery.
- If the battery is operating in hybrid or un-stable grid conditions (very frequent or continuous cycling) recommendation is to charge to 80 % of capacity – this will significantly extend the number of cycles the battery can operate.

Once you have decided which of the two operating conditions above is best suitable for your installation, please refer to the technical data sheet for the specific product and note the recommended voltage setting to apply to the Power System (rectifier operating voltage):

- Charge Voltage for 100 % SoC (Setting A)
- Charge Voltage for 80 % SoC (Setting B)

See also page 24 (Setting Power System Voltage) for more information on these settings.



2 Prerequisites

2.1 Before Installation

Ensure access to the User Guide/Quick Start Guide, MSDS, Personal Health and Safety Information, and any and all other documentation required by the site controller is on hand and available.

Ensure the space is adequate to install the product, and space for the product, tools, and hardware is accounted for.

2.2 Required Tools

Torx Screwdriver	Size T25/T30, torque setting 5-25Nm
Socket Wrench	Size M8, torque setting 10-15Nm
Sharp Knife (box cutter)	No additional note
Insulated Gloves	No additional note

Note:
Installation must be made by a trained professional only. If you have any doubt on how to install and connect the product safely consult Polarium after sales support.

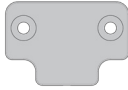
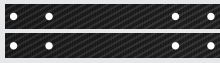
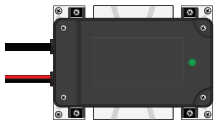
2.3 Included Hardware

SLB48 Gen 5 Battery	The battery unit
Documentation	Quick Start Guide / Warnings and Precautions
RJ45 Comm. Cable	To interconnect battery units communication
Terminator Plug	Placed in comm. port at the end of the string



2.4 Before Installation

In addition to the included hardware, the following items can be ordered separately for use in the battery installation.

Name	Image	Description
Polarium Stacking Kit		Designed to guide and position product into place in shelf installation - for batteries <50 kgs/110 lbs
Hand Straps w/ Hardware		Flexible straps to be attached to side of battery unit to ease handling during installation.
Modbus Communication Cable		RJ45 to USB cable used between battery and PC (Polarium Studio)
Battery Interconnection Busbars		Copper busbars installed to interconnect batteries (Recommended for max 300A)
Extended Battery Power Cables		3 meter cables to connect installed battery string to power system.
Extended RJ45 Communication Cables		To extend communication loop further than the cable thats included with each battery. Should the site require.
Polarium Anti Theft Device (ATD)		Anti theft solution for sites that require additional security measures.
Polarium Connect Alert		Provides two (2) NO/NC relay contacts for extended alarm capabilities. Configurable by Bluetooth.
Polarium Connect Bridge		Provides additional communication protocol capabilities. TCP/IP, SNMP trap, modbus, and Bluetooth monitoring.



3 Warnings and Precautions

3.1 Read the User Guide

It is important that the product is handled, transported, stored, installed and used in line with the instructions and specifications in this User Guide. Handling and usage which is not in accordance with instructions and specifications will invalidate the warranties.



Installation must be made by a professional only. If you have any doubt about how to install and connect the product, please consult Polarium immediately.

When installing the product, follow the User Guide every time.

When working with the connection of the battery power poles, use tools with insulated handles. Only use Polarium provided cabling

Remove rings, wristwatch and articles of clothing with metal parts that may come into contact with the battery terminals.

For warnings and instructions regarding the battery electrolyte refer to the safety data sheet for the concerned battery.

3.2 Electrical Hazard

The batteries are supplied in a charged condition and are capable of extremely high short circuit currents. Take care to avoid short-circuiting terminals of opposite polarity. Accidental shorting of terminals or cables can result in severe electrical arcing, causing burns and electric shock to nearby personnel.



If installing on an existing site, the batteries will likely be in a charged state.

Systems that are not in use should be switched off (The Circuit Breaker should be moved to the Off position).

- This Battery Module is available for use in parallel applications only. Do not connect SLB modules in series.
- Battery systems that are not required to be live should be switched off with the power button and the battery circuit breaker should be switched off.

3.3 Before Start of Installation

Ensure site access permission has been received before going to the site, that all required documentation is on hand, that all tools required are available, and the instructions/precautions are read and understood.

Failure to follow these instructions or actions which are not in accordance with instructions and specifications can be dangerous and will invalidate the warranties.

3.4 Risk of Fire

- Do not disassemble.
- Do not intentionally short circuit the Battery Module.
- Do not expose the Battery Module to fire or temperatures higher than 70°C (158°F). High temperature may cause the battery to overheat or even self-ignite. High temperature may also result in loss of performance and decreased life expectancy of the product.
- Immediately disconnect the battery if, during operation the battery appears to heat up rapidly or in any way feels abnormally hot, (60°C/140°F or greater) or appears abnormal in any way.



Only use Polarium provided cabling

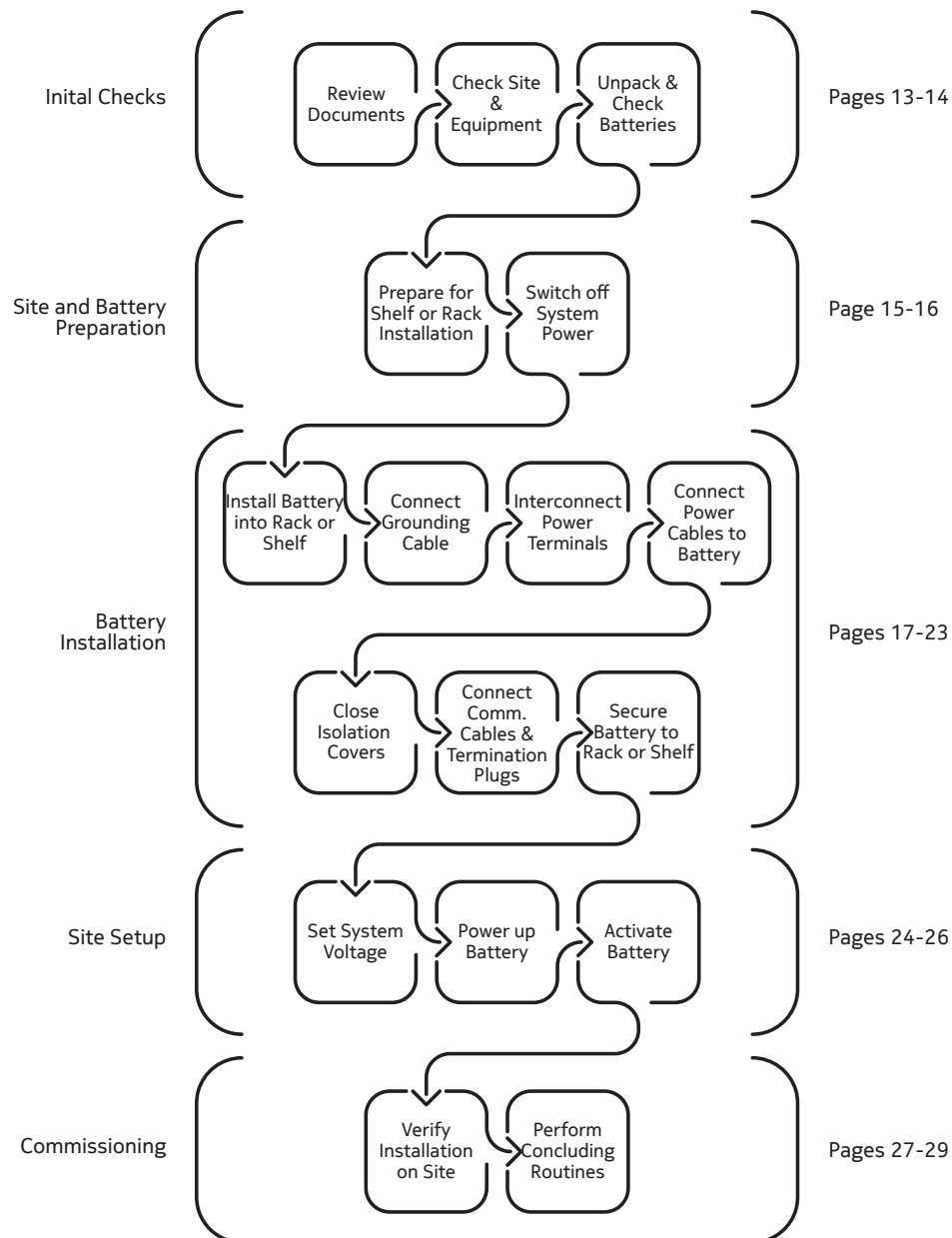
3.5 First Aid Measures

The following first aid measures are required only in case of exposure to interior battery components after damage of the external battery casing. Undamaged, closed cells do not represent a danger to the health.

- After inhalation ensure access to fresh air. Consult a physician immediately.
- After contact with skin, wash off immediately with plenty of water. Consult a physician immediately.
- After contact with eyes rinse immediately with plenty of water, including under the eyelids, for at least 15 minutes. Seek immediate medical treatment by an eye specialist.
- After ingestion drink plenty of water. Call a physician immediately.



4 Workflow for Installing Battery Unit





5 Installation

5.1 Installation Options

Polarium™ Generation 5 products are designed to be installed in different orientations and still operate safely to design specifications.

Make sure the site accommodates one of these installation options, or one approved by Polarium™.



Horizontal Rack Mounting
with Rail Supports



Horizontal Shelf Mounting
with Stacking Kit



Vertical Rack Mounting
With Rear Rack Support



5.2 Review Documentation

Ensure all paperwork and product documentation is included with the battery unit and is available at the installation site. These should include the quick start guide, installation instructions, and any site owner provided documentation.

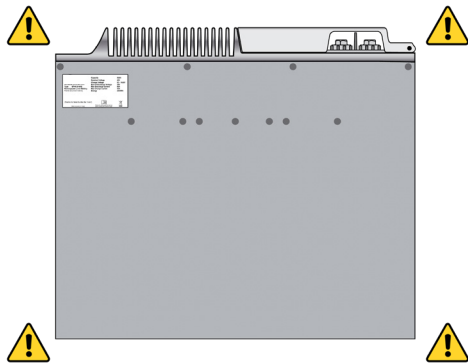
Any questions about the provided documents should be directed to the site owner or Polarium™.

5.3 Inspect Site

Ensure work area is appropriate for the products to be installed. The area should be clean and free of excess debris. It should be large enough for the product to be temporarily stored, and safely installed.

Be sure all tools required for install are available along with all required hardware.

The site must be able to support both the front and rear of the battery. Do not install Polarium™ Batteries with only one end supported. Failure to install products securely voids any guarantees and can create safety concerns.



Ensure both the front and rear of the battery is supported.

Secure in place.



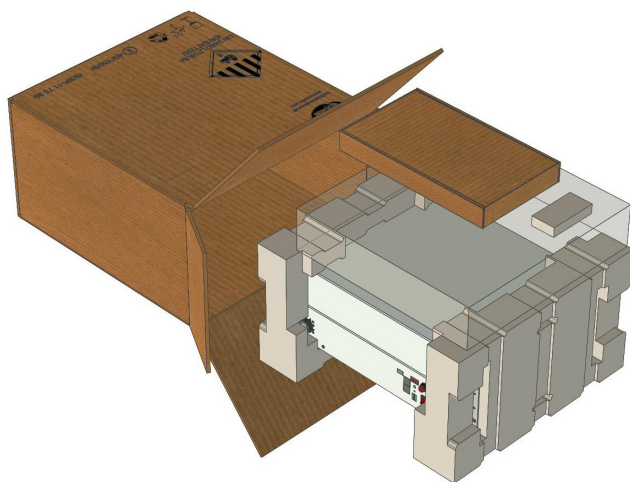
5.4 Unpacking

Unpack the battery on site, not beforehand. The battery must be shipped in its original packaging to prevent damage.

Batteries may be heavy, Polarium recommends unpacking with no less than 2 people.

Step 1: Initially inspect the package and battery for any damage before starting installation. Record (photograph) any noticeable damage and do not install a battery that is suspected to have been damaged during transport.

Step 2: Lay the box flat on the floor and slide the battery from the box. Never attempt to lift the battery vertically from the box. Check that all ordered parts are included in the delivery and take care to retain the packaging material if you require it later.



Note:
Do not unpack the product in the warehouse and transport without original packaging to site.

Note:
Please recycle all unneeded packaging responsibly



5.5 Safety Checks

Ensure battery circuit breakers are in the off position.

Turn off system power if required.



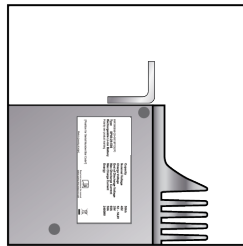
TURN OFF

Batteries may be heavy, Polarium recommends unpacking with no less than 2 people.

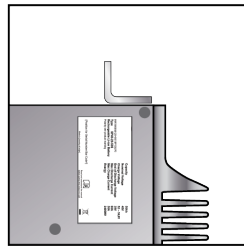


5.6 Rack Installation

Step 1: Before installing the unit to any rack, ensure the correct position of the mounting brackets, front or rear depending on your specific requirements. There are several mounting locations on each side. The brackets can be mounted with wings to the front or back. The mounting brackets shall be installed to the side of the unit using the attached M5 X 6mm screws (T25).



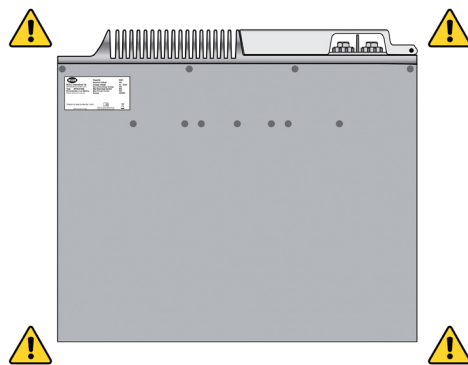
Wings Front



Wings Back

Step 2: Ensure the rack rail system or shelves are installed correctly. The front and rear of the battery must be supported.

This can be achieved by a shelf, a full length rail or 2 separate guide rails. These rails should be strong enough to support the weight of the battery unit. Check technical reference documents for the weight of the battery.



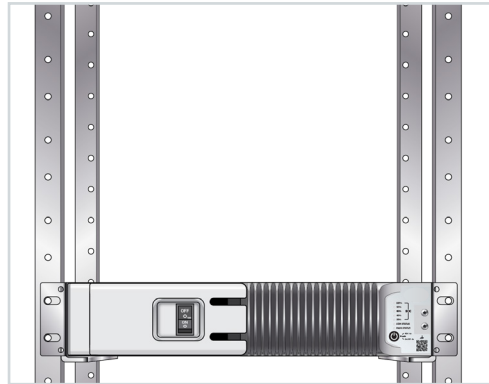
Ensure both the front and rear of the battery is supported.

Secure in place.



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Step 3: Starting from the bottom position, fit the batteries into the rack, fasten the Battery unit to the 19/23" rail. Allow approx. 0-2 mm between batteries if using Polarium Bus bars.



Step 4: Repeat this process to the next highest position until the rack is filled to the required units.

Note:

Batteries can also be installed vertically.

The battery units may be heavy and should not be installed alone.





5.7 Shelf Installation - Polarium Stacking Kit

The Polarium Stacking Kit is used to ease installation by guiding batteries into position and making sure they are aligned to the railing. The stacking kit should not replace measures to secure the batteries to the rack. Ensure the included mounting brackets are utilized. The stacking kit is supplied with documentation that should be followed during installation.

Stacking kit is recommended for use in shelf installations. For batteries up to 100 Ah it is recommended to stack a maximum of 6 units. For batteries larger than 100 Ah a stack of maximum 4 units is recommended.

Step 1: Before installing the unit to any rack, ensure the correct hardware has been supplied and the stacking kit is available

Step 2: Check the existing shelves in the rack are properly installed and secured, and are rated to take the weight of the battery units. Check technical reference documents for the weight of the battery unit.

Step 3: Attach the stacking kit hardware to each side of the battery unit, the position of the unit will dictate which aspect of the kit will be installed.

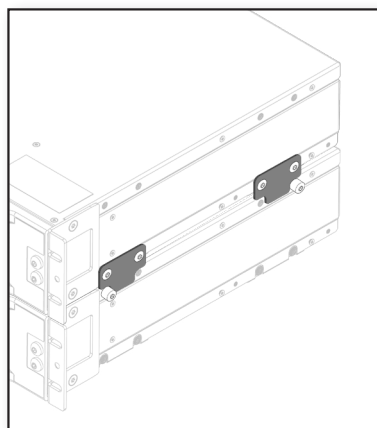
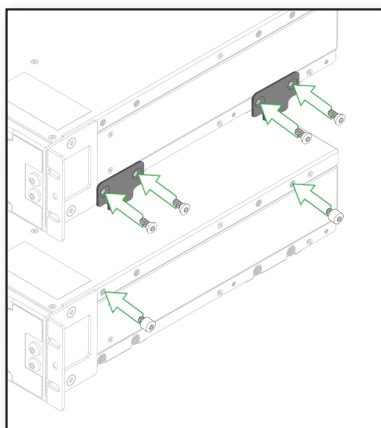
The **top unit** (the battery unit with only units installed below) will only have the separators installed.



The **middle unit/s** (those with battery unit/s above and below) will have both the locking screws and separators installed.



The **bottom unit** (the battery unit with only units above) will only have the locking screws installed.



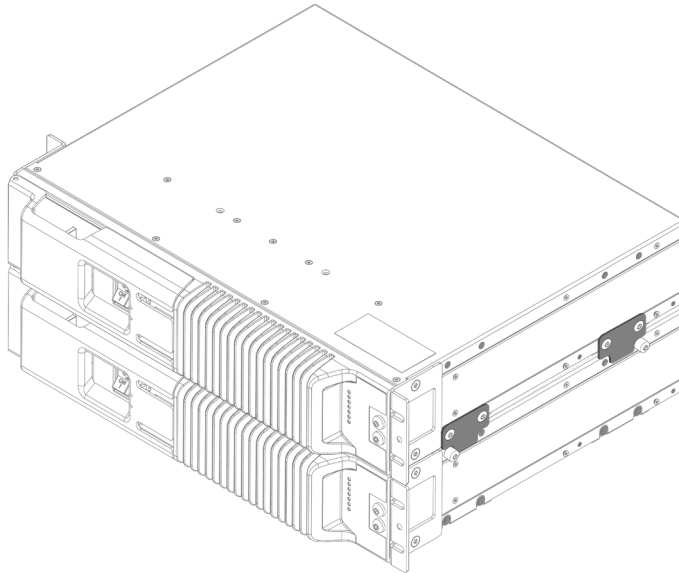
Note:

The stacking kit is designed to work with busbars supplied with the battery unit with a gap allowance of 0-2mm. Check battery spacing.

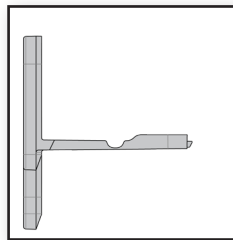


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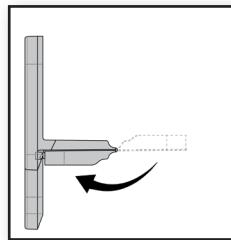
Step 4: Load the bottom most unit into the shelf in its final resting position. Proceed to stack the remaining batteries on top. The last pack stacked (top unit) should only have the separator installed and not the locking screws.



The stacking kit is designed to be used with either 2U or 4U battery units by folding the tab which rests between battery units during installation.



When Stacking
2U Batteries



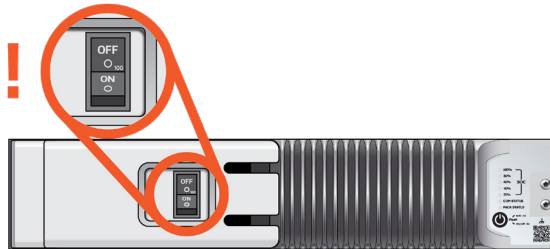
When Stacking
4U Batteries



5.8 Bus Bar Battery Interconnection

This example will illustrate a 19" 2U product, but the methodology will be the same across all products. Busbars are recommended for use up to 300A. Higher current will require a different method to interconnect products.

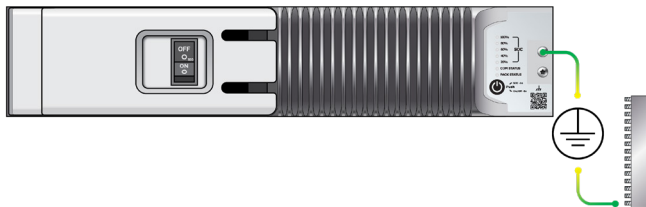
Step 1: Ensure the circuit breakers on all batteries are set to the off position.



Note:

For installations in US and Canada the recommendation is to always use grounding cable which is sized according to article 250.122 of NFPA 70 or Rule 10-810 of C22.1. This would mean a Copper cable of at least AWG 6 (16 mm²), green / yellow striped in colour or green and provided with a two hole cable lug fitting.

Step 2: Polarium™ recommends you always install grounding cable unless you have ensured battery is connected to ground (ie rack).



Step 3: Open isolation cover.



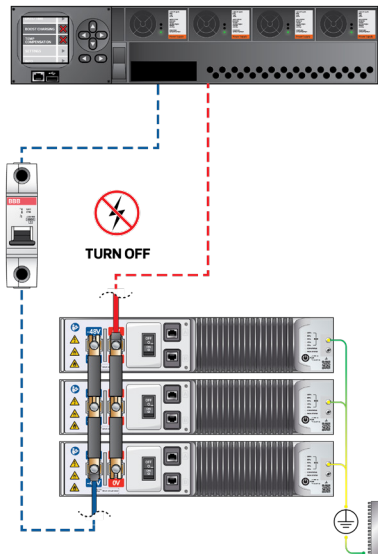
Step 4: Determine the orientation and connections of how the battery will be connected to the power system, and where the batteries will need to be paralleled. See examples on next page.



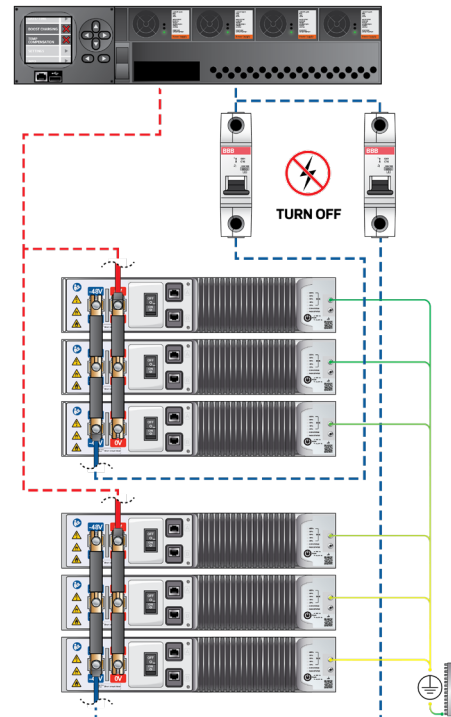
Installation Examples

These are just examples, and may not accurately reflect your application needs. Polarium recommends utilizing equal cable lengths throughout the system installation to and from battery groups.

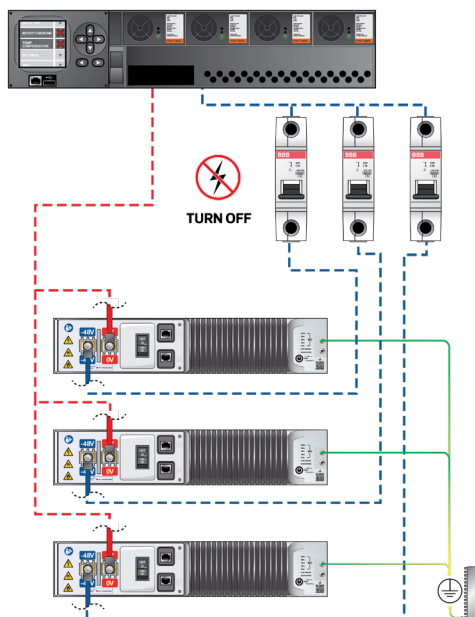
Red dotted line indicates the 0V cable path, blue dotted line indicates the -48V path, green/yellow line indicates the grounding cable path.



1 Strings
One Circuit Breaker



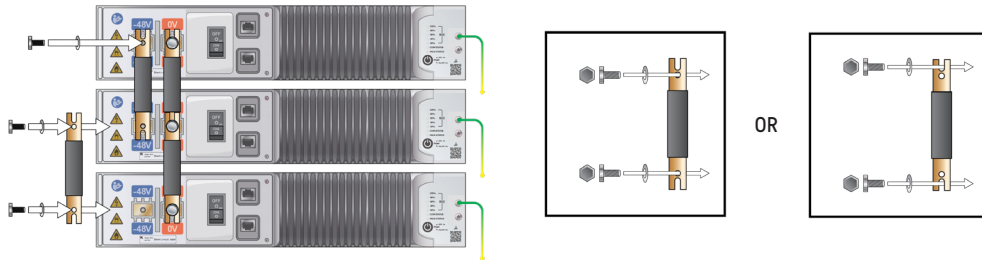
2 Strings
One Circuit Breaker per String



Individual Battery Connections via Cable
One Circuit Breaker per Battery Unit

Step 5: Use the DC bus bars on positive and negative terminals to connect two or more batteries into one battery group.

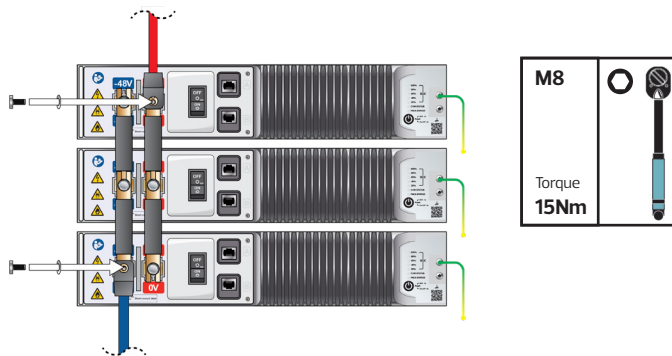
The bus bars provided are designed to allow for up to 45mm between battery units. For installation with other distances, use cabinet specific Bus bars or cables. Recommended torque setting for terminal connections is 15 Nm.



Step 6: Connect battery cables from the power system (charger/load) to the battery group:

- Negative power system cable to the -48V terminal of the battery.
- Positive power system cable to the 0V terminal on the battery.

Ensure that the circuit breaker between the power system and the batteries to be installed are set to the OFF position.



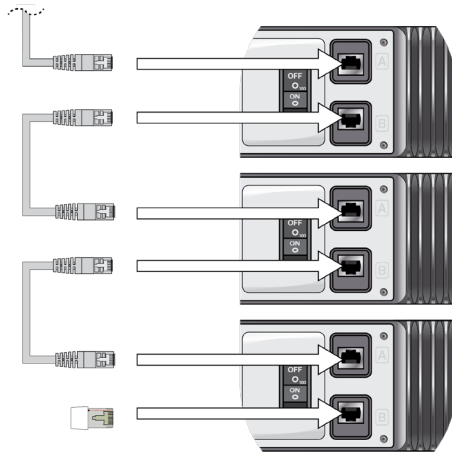


Step 7: Attach the communication cables between all the batteries. Batteries utilize CANbus protocol for internal communication and MODbus for external communication.

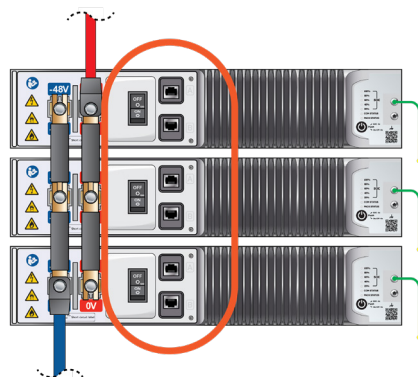
Mount CANbus/MODbus TERMINATOR on the top and bottom of the battery group. A connection to an external site controller with built in termination may replace one of the terminators. If the external site controller does not have built in termination, a CANbus/MODbus TERMINATOR must be used after the controller.

Note: If you have on site communication cables ensure they are 3 wire RJ45 cables. These must have a ground wire and be fully shielded.

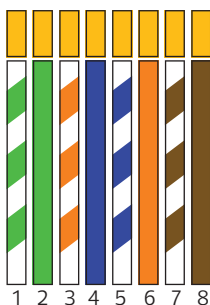
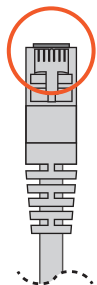
To System
Controller



Terminator Plug
at end of Series



RJ45 Pinout Information

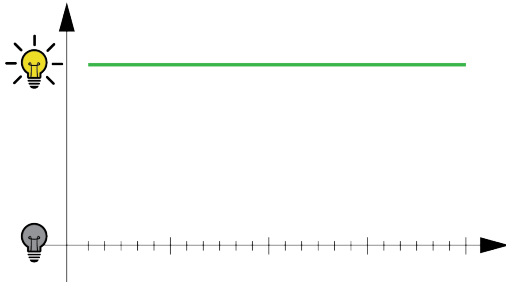


RJ45 Pinout		
1	White/Green	(Floating)
2	Green	(Floating)
3	White/Orange	(Floating)
4	Blue	Data+ (A)
5	White/Blue	Data- (B)
6	Orange	Modbus GND
7	White/Brown	CAN-L
8	Brown	CAN-H

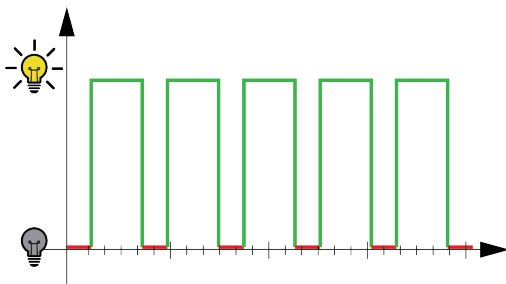
5.9 Setting Power System Voltage

Set the power system voltage according to the application needs and product installed. Refer to product specific technical documentation for the appropriate settings for your application.

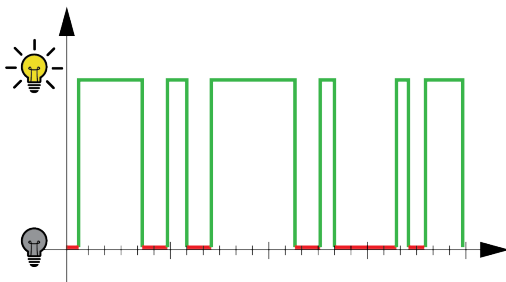
Setting A: Battery Charged to 100 %, typically for stand-by applications with stable grid conditions



Setting B: Battery Charged to 80 % to optimize battery cycle life. Consistent discharge rates and down time. Typically for hybrid applications.



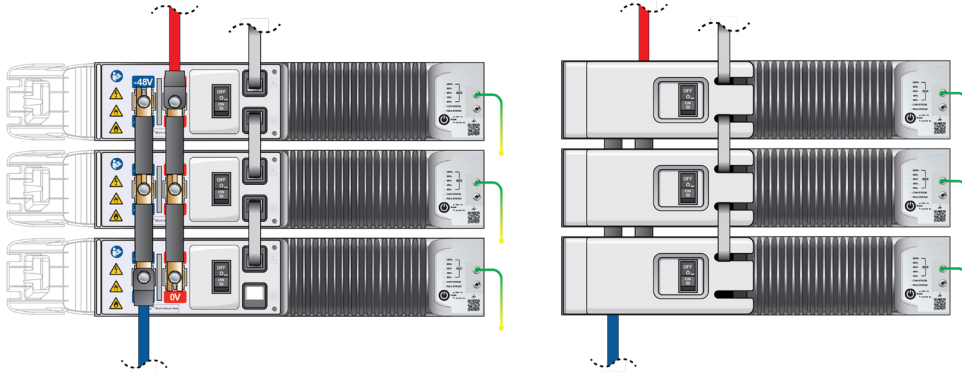
Setting B: Battery Charged to 80 % to optimize battery cycle life. Inconsistent discharge rates and down time. Typically for unstable grid applications.





5.10 Powering Up

Step 1: Close Isolation Covers on each unit.



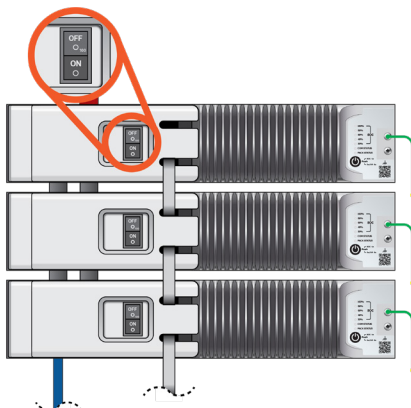
Step 2: Power up Power System if shut down, and switch the in line circuit breakers to "ON" if installed.



TURN ON



Step 3: Switch the circuit breakers, one battery at a time to "ON". The battery should now automatically start and indicator LEDs light up (provided power system is "ON" and is providing charge). Repeat for all batteries in the group



The power button can be used independent of a power supply.

<5 sec press:
Displays SoC

5 sec press:
Turns on Battery

**Step 4:** Check the status of the activated battery units.

Make sure the PACK STATUS indicator shows solid or blinking **GREEN**.

If the optical indicator shows **RED** it means that there is an error preventing discharge. Refer to troubleshooting guide and contact Polarium if problem persists.

For all battery units, make sure that the optical indicator COM STATUS emits no light.

If the optical indicator shows flashing **BLUE** it means that there is a communication problem. Verify that the communication cables between the batteries are properly installed.

When using the battery in a single battery operation (not connected to other units) the **BLUE** LED will always flash. This is not an indication of a battery communication failure.

For all battery units, make sure that the optical indicator SoC shows correct charging level.

Pack Status LED

Steady Green		Normal Condition
Flashing Green		Charge-Stop Balancing Mode
Steady Red		Any Error Condition Preventing Discharge (DSG Alarm)
White		Report Faulty - Take Out of Service
Unlit		Shut Down or Waking Up

Note:

Batteries are typically delivered with a State of Charge (SoC) less than 30 % due to transport restrictions for lithium batteries. Notice that when the 40% LED light is on, that means the SOC is 20%-40%, etc.

Communication Status LED

Unlit		Normal Condition
Flashing Blue		Battery Installed Alone or Communication Failure

Note:

See section 5.14 Maintenance and Troubleshooting for more detailed information about the LED indications

5.11 Battery Addressing

Battery addressing between units is done automatically based on the internal MCU. Once the installed string is powered up the on board controller determines the battery internal addressing. There is no manual addressing required.

For identification of units on an external monitoring device (eg Power Controller) the serial number of each battery is used. If the controller present units in numerical order the batteries would have to be arranged in the same way to represent the same logic.



As an example: arrange batteries numerically from lowest serial number at the bottom to identify first battery at the bottom To identify or verify the position/address of a battery when monitoring the batteries through Polarium Studio or another program you can switch the battery circuit breaker to "OFF". This will throw an error code allowing the identification of the specific battery.

5.12 Operational Engineering Notes

Battery Balancing and the CLD

When installing a new battery to a site to expand capacity or to replace an existing unit the new SLB48 G5 battery can enter a charge balancing state. This is indicated by a flashing green illumination on the "PACK STATUS" LED. This is not an indication of an improper installation.

If this occurs in a large system installation and the new battery is supplied by a charge current higher than designed, the battery CLD will activate and limit the charge current. This will significantly impact the initial charge time. If the charge time is not a factor (eg. in a stable grid application) then the battery installation can be left alone to stabilize . However if the charge time is a factor (eg. in an unstable grid application or high cyclic application) then the unit should be pre-charged outside the battery string before integration to the rest of the site or the site charge range should be adjusted to prevent the CLD from activating.

Battery Testing

When evaluating a battery on site by performing high load charging/discharging, the battery can experience higher than normal temperatures. Once the battery reaches 50°C the CLD will activate to protect the unit. This will limit the charge current and can impact site testing/evaluation. This is not an error in design, but rather a safety feature to protect the battery. If the unit reaches 55°C then the unit will automatically power off. This is another safety feature to protect site and equipment.

Should either of these states occur during site installation testing/evaluation, wait for the unit to cool down normally and then resume testing. Do not try to cool down the battery with water, or other means of temperature management outside of the ambient air temperature.



5.13 Maintenance and Troubleshooting

During the operational life of the product no maintenance is required. Ensure the product is kept clean.

Troubleshooting COM Status LED

LED Light	Status	Indication Message	Troubleshooting Steps
	Multiple battery units installed and connected via COM cable, Blue LED flashing.	Communication failure between battery unit and the rest of the string.	1) Verify COM cables are installed and secured correctly. 2) Verify COM termination is installed on both ends of the string (via termination plug or via site controller) 3) Check for damage to COM cables
	Battery unit is installed alone, Blue LED flashing.	Communication failure between battery unit and the rest of the string.	Blue LED will always flash when powered but not connected via COM cables to other Polarium batteries. This is not a fault indication. No troubleshooting required.
	Battery unit uninstalled, powered on via "Push" power on/off button. Blue LED Flashing	Communication failure between battery unit and the rest of the string.	Blue LED will always flash when powered but not connected via COM cables to other Polarium batteries. This is not a fault indication. No troubleshooting required.

Troubleshooting Pack Status LED

LED Light	Status	Indication Message	Troubleshooting Steps
	Multiple batteries installed and connected to site via power and COM cables, Red LED illuminated	Any error condition preventing battery unit discharge (DSG alarm) If an alarm is triggered users should wait 5 minutes before performing trouble shooting steps from the time the alarm is noticed. If the battery appears hot, wait until the battery has cooled down. Up-to 2 hours.	1) Verify battery unit is installed properly with both the front and rear of the battery supported. 2) Verify power cables are installed properly to the torque settings indicated in this document. 3) Check for damage to the battery unit or power cables, and for any excess over or under temperature areas of the unit. Photograph any damage found. 4) Check to ensure system power is on when connected to the battery unit, and that circuit breakers are in the "ON" position. 5) Try resetting unit by turning the on board circuit breaker OFF and back ON, or by using the power button labeled PUSH by holding for 5 seconds to turn the unit off, and again for 5 seconds to turn the unit ON. 6) Contact Polarium technical support
	Battery unit uninstalled, powered on via "Push" power on/off button. Red LED illuminated	Any error condition preventing battery unit discharge (DSG alarm) If an alarm is triggered users should wait 60 seconds before performing trouble shooting steps from the time the alarm is noticed.	1) Check for any exterior damage to the unit. Document any damage found. Do not disassemble. 2) Try resetting unit by turning the on board circuit breaker OFF and back ON, or by using the power button labeled PUSH by holding for 5 seconds to turn the unit off, and again for 5 seconds to turn the unit ON. 3) Contact Polarium technical support



Troubleshooting Pack Status LED

LED Light	Status	Indication Message	Troubleshooting Steps
Steady White 	Multiple batteries installed and connected to site via power and COM cables, White LED illuminated	Internal failure with the unit	1) Check for any exterior damage to the unit. Document any damage found. Do not disassemble. 2) Contact Polarium technical support
	Battery unit uninstalled, powered on via "Push" power on/off button. White LED illuminated	Internal failure with the unit	1) Check for any exterior damage to the unit. Document any damage found. Do not disassemble. 2) Contact Polarium technical support
Flashing Green 	Multiple batteries installed and connected to site via power and COM cables, Green LED Flashing	Undergoing charge balancing operation. This is a normal function, and is indicated for operation notification.	Green LED will always flash when undergoing charge balance operations. This is not a fault indication. No troubleshooting steps required.
Red & Green 	Multiple batteries installed and connected to site via power and COM cables, LED alternating between Red and Green in color.	Battery unit is unable to shut down	1) Wait 3-5 minutes and retry shutdown procedure. 2) Switch the circuit breaker to "OFF" position. 3) If alternating Red/Green LED continues flashing this can indicate an internal fault, contact Polarium technical support.
	Battery unit installed alone and connected to site via power and COM cables, LED alternating between Red and Green in color.	Battery unit is unable to shut down	1) Wait 3-5 minutes and retry shutdown procedure. 2) Switch the circuit breaker to "OFF" position. 3) If alternating Red/Green LED continues flashing this can indicate an internal fault, contact Polarium technical support.
	Battery unit uninstalled, powered on via "Push" power on/off button. LED alternating between Red and Green in color.	Battery unit is unable to shut down	1) Wait 3-5 minutes and retry shutdown procedure. 2) Switch the circuit breaker to "OFF" position. 3) If alternating Red/Green LED continues flashing this can indicate an internal fault, contact Polarium technical support.

If the unit is switched on when not connected to a power system and no LEDs are illuminated then the battery may have discharged to an inoperable state. To rectify this state try the following steps;

- Connect the unit via power cables to the terminals. Once outside power is supplied the unit should automatically turn on.
- If the unit does not automatically turn on check the cables are in the correct orientation and that the circuit breakers and power interfaces are switched to the ON position.
- Perform any site controller trouble shooting steps that could be preventing power supply to the battery.
- Contact Polarium Technical Support.



6 Checklist and Concluding Routines

6.1 Final Acceptance Checklist

Follow and perform the following checklist to ensure successful operation of the Polarium Battery. This document is available on-line at polarium.com



Final Acceptance Checklist

Generation 5 Battery Installation Checklist Version 1.0

Polarium Site Final Acceptance Contractor Responsibilities:

- The final acceptance contractor must be a trained professional certified to work with power backup sites in a safe and responsible manner to complete this form.
- The completed checklist for each final accepted system, along with site owner forms and checklists, shall be retained by the contractor/installer for quality assurance purposes. Furthermore the contractor shall provide the completed checklist to the site owner.
- Visit polarium.com for contact information if there are any questions about this form. Failure to follow these instructions will void any guarantees.

1 Commissioning Personnel Overview

1.1	Contractor/Installer Name _____
	Contractor Company _____
	If the installer is part of the site owner organization you may disregard contractor company information
1.2	Site Owner Company _____
	Site Owner Rep. _____
	Address _____
	City & State/Province _____
	Country _____

2 Site Installation Checklist

Follow this checklist to ensure the site is installed safely and correctly.

	YES	N/A	Notes:
2.1 Air Temperature within operating limits	☐	☐	
2.2 Battery units installed as specified in the installation guide and any site installation documents provided by site owner	☐	☐	
2.3 Cables are installed securely to the correct torque specifications	☐	☐	
2.4 Communication system installed correctly	☐	☐	
2.5 Cabinet is clean and undamaged	☐	☐	
2.6 Grounding cables are installed correctly and are undamaged	☐	☐	
2.7 All screws are tightened	☐	☐	
2.8 No cables are damaged	☐	☐	
2.9 Protective covers, dust caps, and termination plugs installed on all unused ports	☐	☐	

3 Site Testing Regime

3.1	Run the system for 15 minutes before recording test data. Site should be moisture free in an indoor environment. Operating temperature should not exceed 45°C (113°F). Indicator of any fault should halt the testing regime and be troubleshooted before proceeding with any discharge testing.	YES	N/A	Notes:
3.2	 Pack Status LEDs are illuminated either steady or flashing green	☐	☐	
3.3	 Com Status LED is unlit	☐	☐	
3.4	Follow instructions for Polarium Studio or follow instructions for site owner proprietary software to accurately log the battery unit during any site owner requested discharge or other testing regime.			

4 Sign Off

4.1	Installer Signature _____	Date _____
4.2	Site Owner Signature _____	Date _____

6.2 Concluding Routines

Step 1: Clean the site and remove objects such as wrapping paper and cable clippings.

Step 2: Dispose of waste according to local regulations

Polarium strongly recommends that installers pay particular attention to the environment when cleaning the site after installation. In particular, recycle all waste that can be recycled and sort the rest so that they can be disposed of according to local regulations.



Step 3: Fill in the verification checklist referenced in section 6

Step 4: Report any faults according to local requirements.

Step 5: Hand over all customer site documentation to the person responsible for the site.

Step 6: Lock all access points to the site, including doors and gates.



7 Packaging, Transportation, Storage & Disposal

7.1 Packaging

- Batteries are delivered from factory in packaging dedicated for transport and storage of the particular battery (UN Certified package for Transport of Dangerous Goods) – keep the battery in its packaging until it is time for installation.
- Keeping battery in original packaging helps to protect from pollution, moisture and mechanical damage.
- Do not remove the battery from packaging before arriving at location for installation.

7.2 Transportation

- Lithium Batteries are classified as Dangerous Goods and transport restrictions apply – be sure to follow any global and local regulations with regards to handling and transport of Lithium Batteries.
- Handle the battery in accordance with any specific marking on packaging – e.g. with regards to package position and any stacking instructions.
- The battery in its packaging should be handled with care, not exposed to weather conditions (rain, excessive heat etc), vibrations or sudden impacts, all of which could cause damage to or decrease performance of the battery.

7.3 Storage

- Batteries are best stored in a dry, cool environment in order to prevent degradation of performance.
- When batteries are stored for an extended period of time (see charge by date on product packaging), it is recommended to monitor State of Charge (SoC) on a regular basis, at least once a year and fully charge the battery if required (recommended at battery SoC < 20%). Refer to the battery datasheet to obtain the correct charging voltages. This is to prevent self-discharge to a level from which the battery does not permit recovery.

7.4 Disposal

When a battery reaches the end of its service life or becomes defective and cannot be repaired it will need to be disposed of and recycled. Batteries should be disposed according to local (country) regulations for electronic waste. Battery disposal and recycling must be carried out by qualified personnel only. Contact a waste disposal operator authorized for handling electronic and lithium battery waste and recycling or contact the organization where you purchased the batteries for further assistance.

Disassembling of Batteries: The batteries should not be opened or disassembled by anyone without proper training. Batteries can contain very high levels of energy which can result both in personal injuries such as burns or electrical shock or resulting in fire or combustion of the battery cells.

WARNING: All work to disassemble batteries must be carried out by qualified personnel only. There is a high possibility of electric shock or serious burns if not handled professionally. Wear rubber gloves and protective clothing (protective glasses and boots) when working on battery systems.





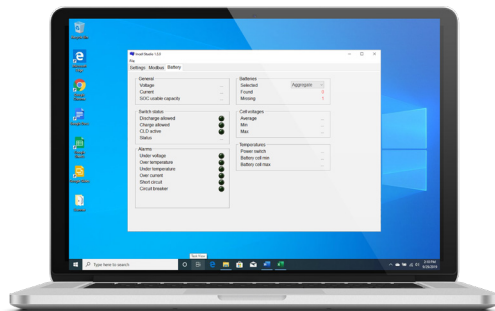
7 External Software

7.1 Studio PC Application

To install Polarium Studio PC download latest version from <https://polarium.com/studio/>

Studio is an in house produced software used to read and log battery diagnostic information.

Consult Studio Operations Guide or contact Polarium for more information.



7.2 Studio Mobile Application

Polarium™ Studio Mobile has a series of functions available to the operator at the mobile phone level. While the capabilities of the PC iteration are more advanced, Polarium Studio Mobile can monitor the alarm system and site information via Bluetooth or cloud data sources.

Utilize Bluetooth functionality by scanning QR codes on the product, making it easy to connect Polarium™ Studio Mobile to your site and start using its functions.

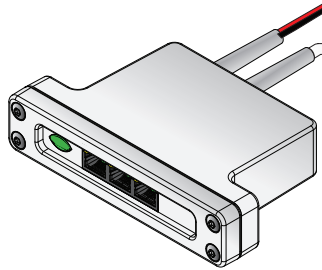
You can download Polarium Connect from the Apple Store and Google Play Store.



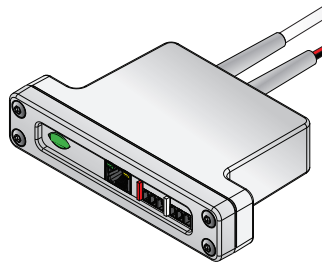
9 Additional Hardware

9.1 Connect Products

Connect – Bridge is a smart communications interface that translates the standard Modbus protocol used in SLB48 to various communication protocols. The Bridge comes with CAN, TCP/IP and can also be fitted with protocols customized for customer requirements.



Connect – Alert is an extended alarm interface which provide two configurable “normally open/normally closed” dry contacts. It also has an RJ45 contact which provide daisy chain access to the battery group communication loop.



Both units can be accessed by Polarium Studio Mobile App (via Bluetooth) or by cable to the RJ45 connectors. With Studio Mobile App you can monitor the battery system or individual batteries and for the Connect Alert you can configure the Alarm settings.

Connect Bridge and Connect Alert will accommodate up to 26 batteries in a single group.

Connect Bridge and Connect Alert are smart units which are simple to add to your system to provide extended functionality for communication, alarm or monitoring in a small, cost efficient and easy to install solution.

Please contact Polarium for more information or technical specifications on these products.

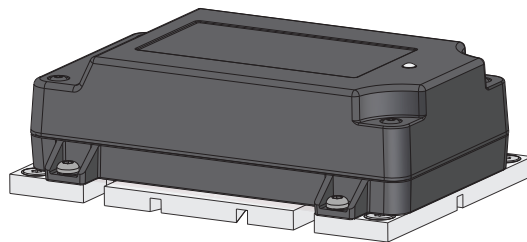


9.1 Anti Theft Device (ATD)

Theft of batteries is a signification problem in many countries. In order to make Polarium batteries less attractive to steal, Polarium™ has patented a method to make batteries inoperable (no discharge capacity will be available)

The Polarium™ ATD is a hardware and software solution to lock the function of the battery within 8 hours if removed from its position.

Only one ATD is required for a group (max 26) of batteries.



10 Services

10.1 Always Connected™

With Polarium batteries you can make sure to have full real time visibility of your batteries health and performance data.

Polarium™ Always Connected solutions will provide tools for real-time monitoring and optimizing of the power back-up systems.

Please contact Polarium™ to discuss your requirements or for more technical details.





11 Abbreviations

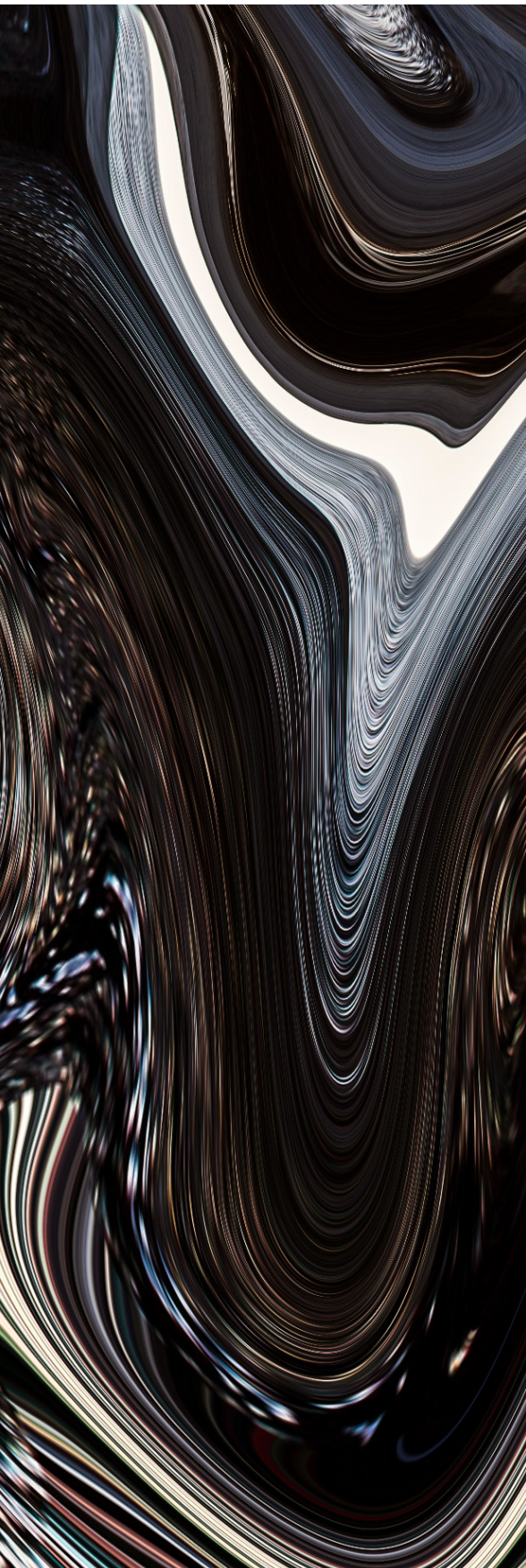
Abbreviation	Meaning
SLB	Smart Lithium Battery
SOC	State of Charge
VRLA	Valve Regulated Lead Acid
Ah	Amp Hour
A	Amp
SW	Software
mm	Millimeter
Nm	Newton Meter
V	Volts
LED	Light Emitting Diode
BMS	Battery Management System
ATD	Anti Theft Device
RFID	Radio Frequency Identification
MSDS	Material Safety Data Sheet
DSG	Discharge
COMM	Communication
UN	United Nations Qualification
QR	Quick Response Code

12 Contacts

Email	Purpose
sales@polarium.com	For all sales inquiries
info@polarium.com	For general inquiries
support@polarium.com	For all customer support and questions
order@polarium.com	For requesting information about order process, accessible from website form
trademark@polarium.com	For questions about using Polarium Trademarks on customer marketing materials



Product 770-00114 rev. 6.3



Scan to learn about all
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