

ESS Energy Storage System for UL9540

Galaxy VL with Galaxy Lithium-ion Battery Cabinets

Operation

NOTE: This is a Solution Manual and replaces individual manuals for these products.

Latest updates are available on the Schneider Electric website
3/2025



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UL (480 V)



https://www.productinfo.schneider-electric.com/galaxyvl_ul/

Here you can find your UPS installation manual, UPS operation manual, and UPS technical specifications, and you can also find installation manuals for your auxiliary products and options.

This online manual portal is available on all devices and offers digital pages, search functionality across the different documents in the portal, and PDF download for offline use.

Learn More About the Galaxy VL Here:

Go to <https://www.se.com/ww/en/product-range/22545656> to learn more about this product.

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Important Safety Instructions — SAVE THESE INSTRUCTIONS

Read these instructions carefully and look at the equipment to become familiar with it before trying to install, operate, service or maintain it. The following safety messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety message indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages with this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

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

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this type of safety message.

Failure to follow these instructions can result in equipment damage.

Please Note

Electrical equipment should only be installed, operated, serviced, and maintained by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

FCC Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Electromagnetic Compatibility

NOTICE

RISK OF ELECTROMAGNETIC DISTURBANCE

This is a product category C2 UPS product. In a residential environment, this product may cause radio inference, in which case the user may be required to take additional measures.

Failure to follow these instructions can result in equipment damage.

Safety Precautions

⚡⚠ DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

All safety instructions in this document must be read, understood and followed.

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

⚡⚠ DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION OR ARC FLASH

After the UPS system has been electrically wired, do not start up the system. Start-up must only be performed by Schneider Electric.

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

⚠ CAUTION

RISK OF HOT SURFACE

The outer plates of the cabinet can exceed temperatures of 65 °C (149 °F) at 50 °C (122 °F) ambient room temperature, if the air filter(s) in the front door is clogged. Replace the air filter regularly as described in the UPS operation manual.

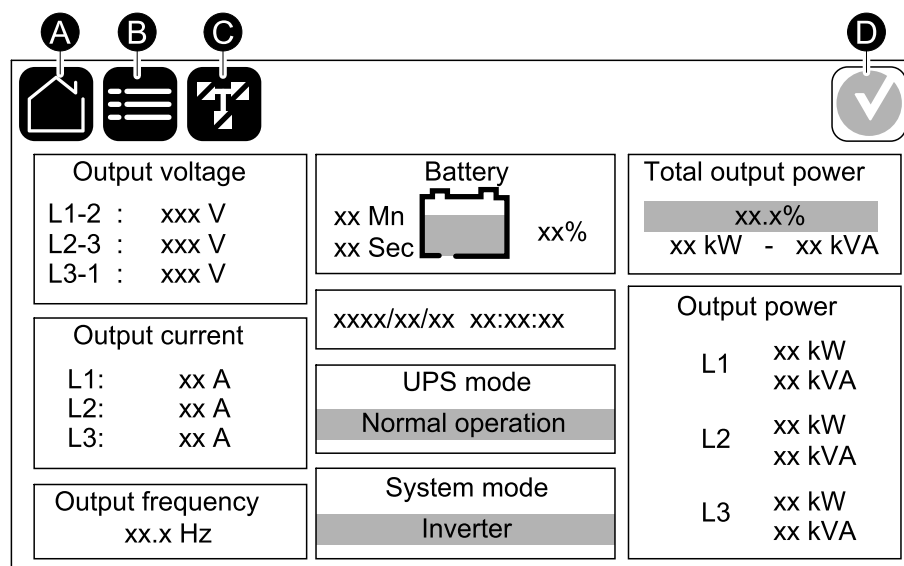
Failure to follow these instructions can result in injury or equipment damage.

UPS Operation

Overview of User Interface

Display

Overview of the Home Screen



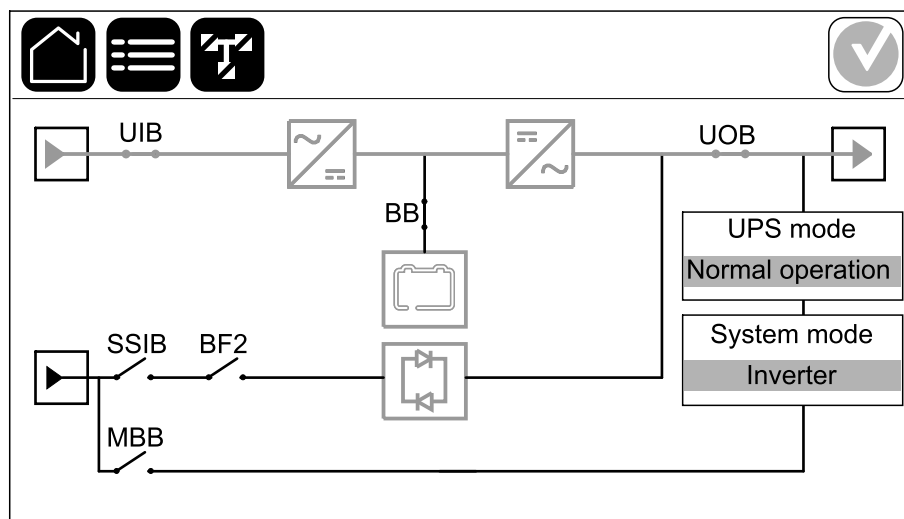
- A. Home button - tap this button on any screen to return to the home screen.
- B. Main menu button - tap this button on any screen to access the menus.
- C. Mimic diagram button - tap this button on any screen to access the mimic diagram.
- D. Alarm status symbol - tap this button on any screen to access the active alarms log.

You can tap on the output or battery fields on the home screen to go directly to the detailed measurement pages.

Mimic Diagram

The mimic diagram will adapt to your system configuration – the mimic diagrams shown here are just examples.

Example of Single UPS System – Dual Mains

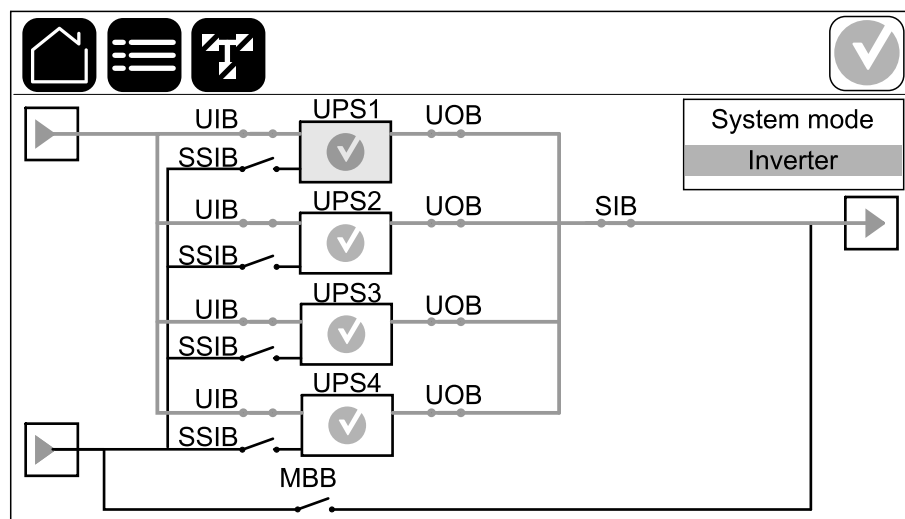


The green power line (gray in illustration) in the mimic diagram shows the power flow through the UPS system. Active modules (inverter, rectifier, battery, static bypass switch, etc.) are framed in green and inactive modules are framed in black. Modules framed in red are inoperable or in an alarm condition.

NOTE: The mimic diagram only shows one battery disconnect device BB even if more battery disconnect devices have been connected and configured for monitoring. If one or more of the monitored battery disconnect devices are in the closed position, the BB on the mimic diagram will show as closed. If all of the monitored battery disconnect devices are in the open position, the BB on the mimic diagram will show as open.





In mimic diagrams for parallel systems, tap on the gray UPS to see the mimic diagram on UPS level.

Example of Parallel System – Dual Mains with Individual UIB and SSIB



Alarm Status Symbol

The alarm status symbol (gray in illustration) in the top right corner of the display changes depending on the alarm status of the UPS system.

	Green: No alarms present in the UPS system.
	Blue: Informational alarm(s) present in the UPS system. Tap the alarm status symbol to open the active alarms log.
	Yellow: Warning alarm(s) present in the UPS system. Tap the alarm status symbol to open the active alarms log.
	Red: Critical alarm(s) present in the UPS system. Tap the alarm status symbol to open the active alarms log.

Menu Tree

- **Status**
 - **Input**
 - **Output**
 - **Bypass**
 - **Battery**
 - **Temperature**
 - **Power modules**
 - **Peak shaving**
 - **Parallel¹**
- **Logs**
- **Control²**
 - **Operation mode**
 - **Inverter**
 - **Charger**
 - **Guided sequences**
- **Configuration²**
 - **UPS**
 - **Output**
 - **Battery**
 - **Standard**
 - ◇ **General settings**
 - **Custom**
 - ◇ **General settings**
 - ◇ **Specific settings**
 - **High efficiency**
 - **Schedule**
 - **Grid interactive UPS**
 - **Protected Modbus**
 - **Breakers**
 - **Contacts and relays**
 - **Network**
 - **Modbus**
 - **General**
 - **Reminder**
 - **Save/restore**
 - **Update status**

1. This menu is only available in a parallel system.

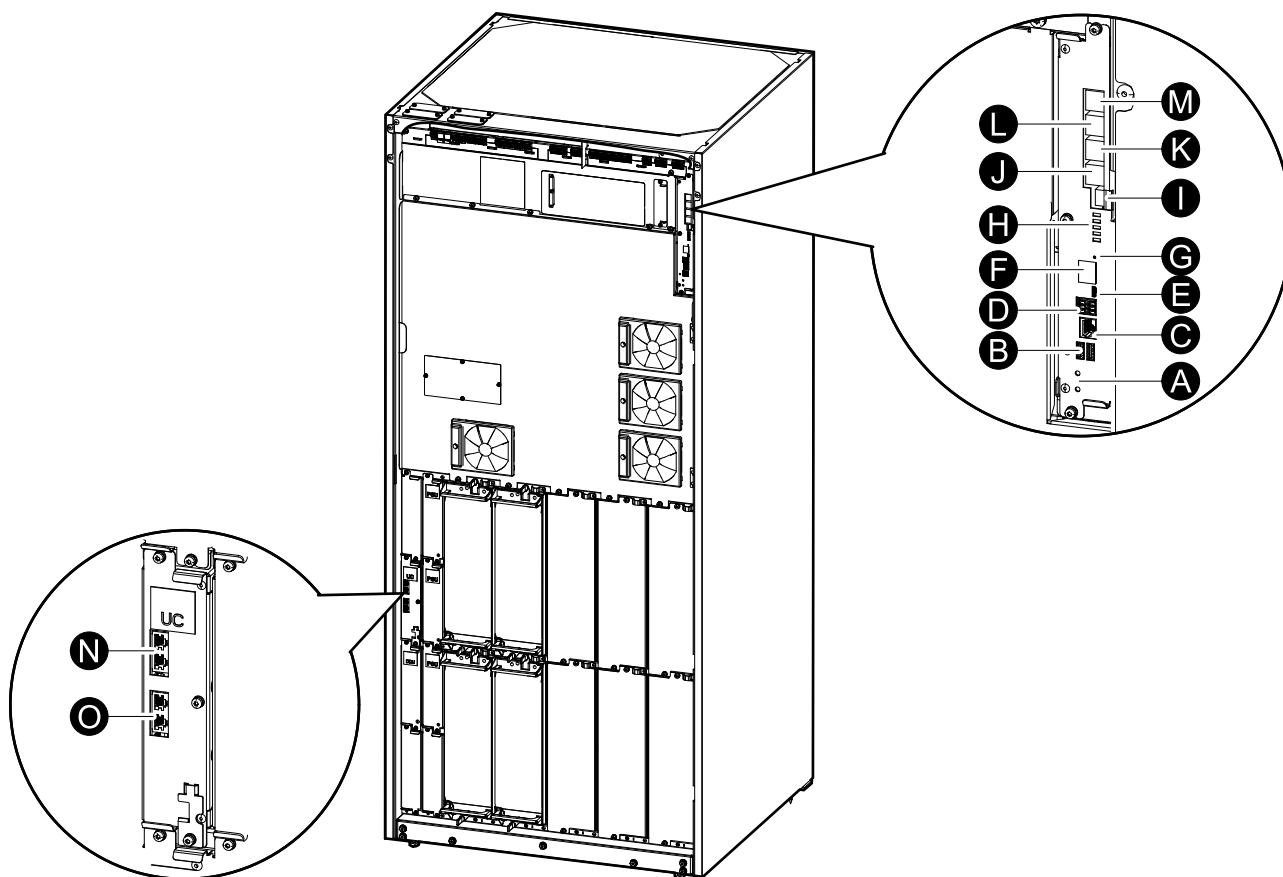
2. This menu requires administrator login to access.

- **Maintenance**
 - **Buzzer**
 - **Status LEDs**
 - **Breaker lamp**
 - **Battery³**
 - **Runtime calibration³**
 - **Battery replacement³**
 - **Battery SPoT mode³**
 - **UPS report³**
- **Statistics**
- **About**
- **Logout**
- Flag button – Tap this button to set the display language.

Some menus contain more submenus than described in this manual. These submenus are grayed out and are only for use by Schneider Electric to avoid unwanted load impacts. Other menu items can also be grayed out/not shown on the display if they are not relevant or not released yet for this particular UPS system.

3. This menu requires administrator login to access.

System Level Controller (SLC) and Unit Controller (UC) Overview



- A. Inverter ON/OFF buttons
- B. USB ports⁴
- C. Universal I/O⁴
- D. Modbus port⁴
- E. USB Micro-B port⁴
- F. Network port⁴
- G. Reset button⁴
- H. Status LEDs⁵
- I. Display power supply
- J. Display port
- K. Service port⁶
- L. EXT port
- M. For future use
- N. PBUS 1⁷
- O. PBUS 2⁷

4. Built-in network management card.

5. See Status LED Lighting per UPS Operation Mode, page 58.

6. The service port can only be used by a Schneider Electric Field Service Representative with approved Schneider Electric tools to configure the unit, retrieve logs, and upgrade firmware. The service port cannot be used for any other purpose. The service port is only active when the Field Service Representative is within physical proximity to the UPS and manually activates the connection. Do not connect to a network. The connection is not intended for network operation and may cause inoperability of the network.

7. Do not disconnect during operation of the UPS. Do not connect to a network. The connection is not intended for network operation and may cause inoperability of the network.

Operation Modes

The UPS has two different levels of operation modes:

- **UPS mode:** The operation mode of the individual UPS. See [UPS Modes](#), page 15.
- **System mode:** The operation mode of the complete UPS system that supplies the load. See [System Modes](#), page 18.

UPS Modes

eConversion Mode

eConversion provides a combination of maximum protection and highest efficiency, that permits to reduce the electricity absorbed by the UPS by a factor three compared with double conversion. eConversion is now the generally recommended operation mode and is enabled by default in the UPS but it can be disabled via the display menu. When enabled, eConversion can be set to always active or on a set schedule configured through the display menu.

In eConversion the UPS supplies the active part of the load through the static bypass as long as the utility/mains supply is within tolerance. The inverter is kept running in parallel so the input power factor of the UPS is maintained close to unity, regardless of the load power factor, as the reactive part of the load is significantly reduced in the UPS input current. In case of an interruption of the utility/mains supply, the inverter maintains the output voltage providing an uninterrupted transfer from eConversion to double conversion. The batteries are charged when the UPS is in eConversion mode and harmonics compensation is also provided.

eConversion mode can be used for the Galaxy VL UPS in the following conditions:

- The load on the UPS is $>5\%$ for a UPS in a single system.
- Voltage fluctuation is $\leq 10\%$ versus nominal voltage (adjustable setting from 3% to 10%).
- THDU is $\leq 5\%$.

NOTE: When changes to eConversion mode settings are made on one UPS in a parallel system, the settings are shared to all UPSs in the parallel system.

NOTE: When a genset/generator is in use and frequency fluctuations are seen (typically due to downsizing), it is recommended to configure an input contact to disable high efficiency modes while the genset/generator is on.

NOTE: If external synchronization is required, it is generally recommended to disable eConversion.

Double Conversion (Normal Operation)

The UPS supports the load with conditioned power. Double conversion mode permanently creates a perfect sinewave at the system output, but this operation also uses more electricity.

Battery Operation

If the utility/mains supply fails, the UPS transfers to battery operation and supports the load with conditioned power from the DC source.

Requested Static Bypass Operation

The UPS can be transferred to requested static bypass operation following a command from the display. During requested static bypass operation, the load is supplied from the bypass source. If a fault is detected, the UPS will transfer to double conversion (normal operation) or forced static bypass operation. If there is an interruption to the utility/mains supply during requested static bypass operation, the UPS will transfer to battery operation.

Forced Static Bypass Operation

The UPS is in forced static bypass operation following a command from the UPS or because the user has pressed the inverter OFF button on the UPS. During forced static bypass operation, the load is supplied from the bypass source.

NOTE: The batteries are not available as an alternate power source while the UPS is in forced static bypass operation.

Maintenance Bypass Operation

When the maintenance bypass disconnect device MBB is closed in the external maintenance bypass cabinet, maintenance bypass panel, or third party switchgear, the UPS transfers to external maintenance bypass operation. The load is supplied with unconditioned power from the bypass source. Service and replacement can be performed on the entire UPS during external maintenance bypass operation via the maintenance bypass disconnect device MBB.

NOTE: The batteries are not available as an alternate power source while the UPS is in external maintenance bypass operation.

Static Bypass Standby Operation

Static bypass standby is only applicable to an individual UPS in a parallel system. The UPS enters static bypass standby operation if the UPS is prevented from entering forced static bypass operation and the other UPSs of the parallel system can support the load. In static bypass standby the output of the specific UPS is OFF. The UPS automatically transfers to the preferred operation mode when possible.

NOTE: If the other UPSs cannot support the load, the parallel system transfers to forced static bypass operation. The UPS in static bypass standby operation will then transfer to forced static bypass operation.

Battery Test Mode

The UPS is in battery test mode when the UPS is performing a battery self-test or a runtime calibration.

NOTE: The battery test will be aborted if the utility/mains supply is interrupted or if a critical alarm is present and the UPS will return to normal operation upon return of utility/mains.

ECO Mode

In ECO mode the UPS uses requested static bypass to power the load as long as the power quality is within tolerance. If a fault is detected (bypass voltage out of tolerance, output voltage out of tolerance, power interruption, etc) the UPS will transfer to double conversion (normal operation) or forced static bypass. Depending on the transfer conditions, a minimal interruption of the load supply may happen (up to 10 ms). The batteries are charged when the UPS is in ECO mode. The main advantage of ECO mode is a reduction in the consumption of electrical power compared with double conversion.

NOTE: When changes to ECO mode settings are made on one UPS in a parallel system, the settings are shared to all UPSs in the parallel system.

OFF Mode

The UPS is not supplying the load with power. The batteries are charged and the display is on.

System Modes

The system mode indicates the output status of the complete UPS system including the surrounding switchgear and indicates which source supplies the load.

eConversion Mode

eConversion provides a combination of maximum protection and highest efficiency, that permits to reduce the electricity absorbed by the UPS by a factor three compared with double conversion. eConversion is now the generally recommended operation mode and is enabled by default in the UPS but it can be disabled via the display menu. When enabled, eConversion can be set to always active or on a set schedule configured through the display menu.

In eConversion the UPS system supplies the active part of the load through the static bypass as long as the utility/mains supply is within tolerance. The inverter is kept running in parallel so the input power factor of the UPS system is maintained close to unity, regardless of the load power factor, as the reactive part of the load is significantly reduced in the UPS system input current. In case of an interruption of the utility/mains supply, the inverter maintains the output voltage providing an uninterrupted transfer from eConversion to double conversion. The batteries are charged when the UPS system is in eConversion mode and harmonics compensation is also provided.

eConversion mode can be used for the Galaxy VL UPS system in the following conditions:

- See the UPS installation manual for minimum load percentage for parallel UPS systems in eConversion.
- Voltage fluctuation is $\leq 10\%$ versus nominal voltage (adjustable setting from 3% to 10%).
- THDU is $\leq 5\%$.

NOTE: When changes to eConversion mode settings are made on one UPS in a parallel system, the settings are shared to all UPSs in the parallel system.

NOTE: When a genset/generator is in use and frequency fluctuations are seen (typically due to downsizing), it is recommended to configure an input contact to disable high efficiency modes while the genset/generator is on.

NOTE: If external synchronization is required, it is generally recommended to disable eConversion.

Inverter Operation

In inverter operation the load is supplied by the inverters. The UPS mode can be in either double conversion (normal operation) or battery operation when the UPS system operation mode is inverter operation.

Requested Static Bypass Operation

When the UPS system is in requested static bypass operation, the load is supplied from the bypass source. If a fault is detected, the UPS system will transfer to inverter operation or forced static bypass operation.

Forced Static Bypass Operation

The UPS system is in forced static bypass operation following a command from the UPS system or because the user has pressed the inverter OFF button on the UPSs. During forced static bypass operation, the load is supplied directly by the bypass source with unconditioned power.

NOTE: The batteries are not available as an alternate power source while the UPS system is in forced static bypass operation.

Maintenance Bypass Operation

In maintenance bypass operation, the load is supplied directly by the bypass source with unconditioned power via the maintenance bypass disconnect device MBB.

NOTE: The batteries are not available as an alternate power source in maintenance bypass operation.

ECO Mode

In ECO mode the UPS system uses requested static bypass to power the load as long as the power quality is within tolerance. If a fault is detected (bypass voltage out of tolerance, output voltage out of tolerance, power interruption, etc) the UPS system will transfer to double conversion (normal operation) or forced static bypass. Depending on the transfer conditions, a minimal interruption of the load supply may happen (up to 10 ms). The batteries are charged when the UPS system is in ECO mode. The main advantage of ECO mode is a reduction in the consumption of electrical power compared with double conversion.

NOTE: When changes to ECO mode settings are made on one UPS in a parallel system, the settings are shared to all UPSs in the parallel system.

OFF Mode

The UPS system is not supplying the load with power. The batteries are charged and the display is on.

Configuration

Set the Display Language





- 1. Tap the flag button on the main menu screen.
- 2. Tap your language.

Configure the UPS Input

NOTE: This configuration is mandatory for correct UPS operation.

- 1. Tap **Configuration > UPS**.
 - a. Set the **Mains configuration** to **Single mains** or **Dual mains**.
 - b. Select **Autostart of the inverter** if you want to enable this function. When **Autostart of the inverter** has been enabled, the inverter will start up automatically when input voltage returns, after a shutdown due to drained battery.

NOTE: Autostart of the inverter is not allowed in a parallel system.




  **DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Always perform correct Lockout/Tagout before working on the UPS. A UPS with autostart enabled will automatically restart when the mains supply returns.


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

- c. Set **Transformer present** to **No transformer present**, **Input transformer**, **Output transformer**, or **Input and output transformers**.
 - d. Set **Power module redundancy** to **N+0** or **N+1**.



Configuration

UPS



Mains configuration

☐ Single mains

☐ Dual mains

Autostart of the inverter

☐

Transformer present

▼

Power module redundancy

☐ N+0

☐ N+1

OK

Cancel

- 2. Tap **OK** to save your settings.

Configure the Output

NOTE: This configuration is mandatory for correct UPS operation.

1. Tap **Configuration > Output**.

- Set the **AC voltage ph-ph** to **380VAC**, **400VAC**, **415VAC**, **440VAC**, or **480VAC** depending on your configuration.
- Set the **Frequency** to **50Hz \pm 1.0**, **50Hz \pm 3.0**, **50Hz \pm 10.0**, **60Hz \pm 1.0**, **60Hz \pm 3.0**, or **60Hz \pm 10.0** depending on your configuration.
- Tap **OK** to save your settings and tap the arrow symbol to go to the next page.

The screenshot shows the 'Output' configuration screen. At the top, there are icons for home, menu, and a specific function, followed by tabs for 'Configuration' and 'Output'. The 'Output' tab is active. Below the tabs, there are two main sections: 'AC voltage ph-ph' and 'Frequency'. Each section contains several radio button options. In the 'AC voltage ph-ph' section, the '380VAC' option is selected. In the 'Frequency' section, the '50Hz +/-3.0' option is selected. At the bottom of the screen, there are navigation arrows, a '1/2' indicator, and 'OK' and 'Cancel' buttons.

- d. Set the **Bypass and output tolerance (%)**. The bypass and output tolerance range is +3% to +10%, default is +10%.
- e. Set the **Voltage compensation (%)**. The output voltage of the UPS can be adjusted up to $\pm 3\%$ to compensate for different cable lengths. Default is 0%.
- f. Set the **Overload threshold (%)**. The overload range is 0% to 100%, default is 75%.
- g. Set the **Transformer voltage compensation (%)**. The transformer voltage compensation range is 0% to 3%, default is 0%. See [Output Transformer Voltage Compensation](#), page 22 for more details and [Configure the UPS Input](#), page 20 for configuring that an output transformer is present.
- h. Tap **OK** to save your settings.

Configuration Output

Bypass and output tolerance (%) xx

Voltage compensation (%) xx

Overload threshold (%) xx

Transformer voltage compensation (%) xx

< 2/2 > OK Cancel

Output Transformer Voltage Compensation

It is possible to compensate for an output transformer and balance the output voltage drop (0-3%).

1. Disconnect the load from the UPS.
2. Measure the voltage on the secondary side of the transformer at 0% load, and adjust the output voltage of the UPS manually via the **Voltage compensation (%)** setting to compensate for the voltage offset, if any.
3. Connect the load to the UPS.
4. Measure the voltage on the secondary side of the transformer again at X% load, and adjust the output voltage of the UPS via the **Transformer voltage compensation (%)** setting to compensate for the voltage drop in the transformer.

The transformer voltage compensation required at the specific load is used to make an automatic linear output voltage adjustment on the UPS according to the output load percentage.

Configure the Battery Solution

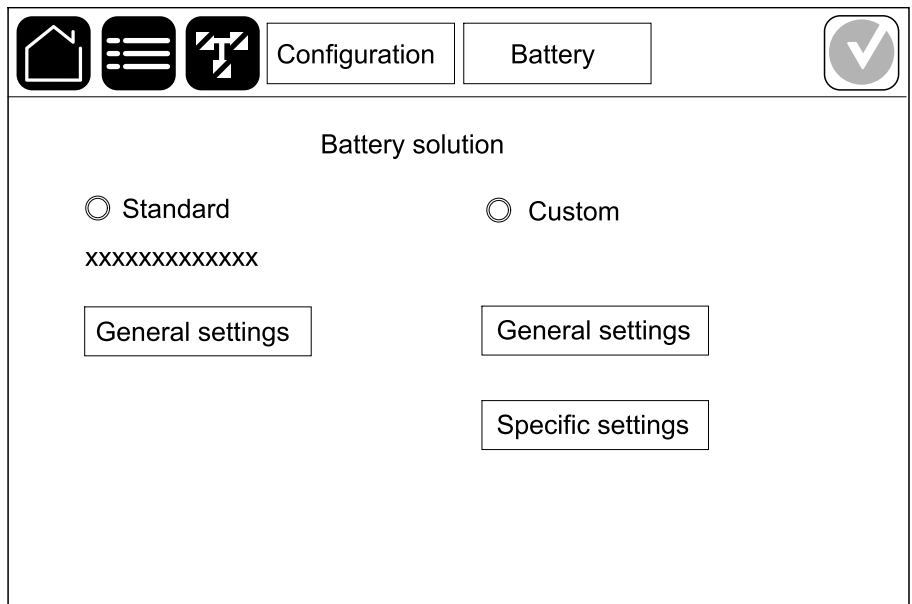
⚠⚠ DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

Battery settings must only be configured by qualified personnel knowledgeable of batteries, battery configuration, and the required precautions.

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

1. Tap **Configuration > Battery**.
2. Select your battery solution type as **Standard** and select the commercial reference LIBSESMG16UL or LIBSESMG17UL from the drop-down list as per your configuration.



The screenshot shows a mobile application interface for configuring a battery solution. At the top, there is a navigation bar with three icons: a home icon, a menu icon, and a refresh icon. To the right of these icons are two tabs: 'Configuration' and 'Battery'. A checkmark icon is visible in the top right corner. Below the navigation bar, the title 'Battery solution' is centered. There are two radio button options: 'Standard' and 'Custom'. The 'Standard' option is selected. Below the 'Standard' option, the text 'xxxxxxxxxxxxx' is displayed. There are three buttons: 'General settings' (under 'Standard'), 'General settings' (under 'Custom'), and 'Specific settings' (under 'Custom').

3. Tap **General settings** and set up the following parameters:

NOTE: On each page, tap **OK** to save your settings and tap the arrow symbol to go to the next page.

Number of battery cabinets connected to the battery breaker	Shows number of battery cabinets connected to the battery disconnect device. Only configurable by Schneider Electric Service.
Low runtime warning (sec)	Set the threshold for remaining runtime in seconds that will activate the low runtime warning.
Charge capacity (%)	Set the maximum charge capacity in percentage of the UPS nominal power rating.
Temperature monitoring	Shows if temperature monitoring is enabled. Only configurable by Schneider Electric Service.
Temperature sensor # 1/Temperature sensor # 2	Shows presence of temperature sensors. Only configurable by Schneider Electric Service.
Minimum threshold	Set the minimum acceptable battery temperature in Celsius or Fahrenheit. Temperatures below this threshold will activate an alarm.
Maximum threshold	Set the maximum acceptable battery temperature in Celsius or Fahrenheit. Temperatures above this threshold will activate an alarm.
Charger autoboot mode	Shows charger autoboot mode. This function will automatically transfer the charger to boost charger mode after the system has been in battery operation. Only configurable by Schneider Electric Service.
Cyclic charge mode	Shows cyclic charge mode. During a cyclic charge, the system cycles between periods of float charging and resting. This function will continuously maintain the battery charge status without stressing the batteries by conducting a permanent float charging. Only configurable by Schneider Electric Service.
Test interval every	Set how often the UPS should run a battery test.
Test day of the week	Set on which day of the week the battery test should run.
Test start time (hh:mm)	Set which time of day the battery test should run.
Manual battery self-test mode	Set which battery test type should run: By capacity or By voltage/time . By capacity will discharge the batteries and use about 10% of the total capacity. By voltage/time will discharge the batteries to a set time or voltage.
Time limit (minutes)/Voltage limit (V)	If you chose battery test type By voltage/time , set the time limit or set the voltage limit.

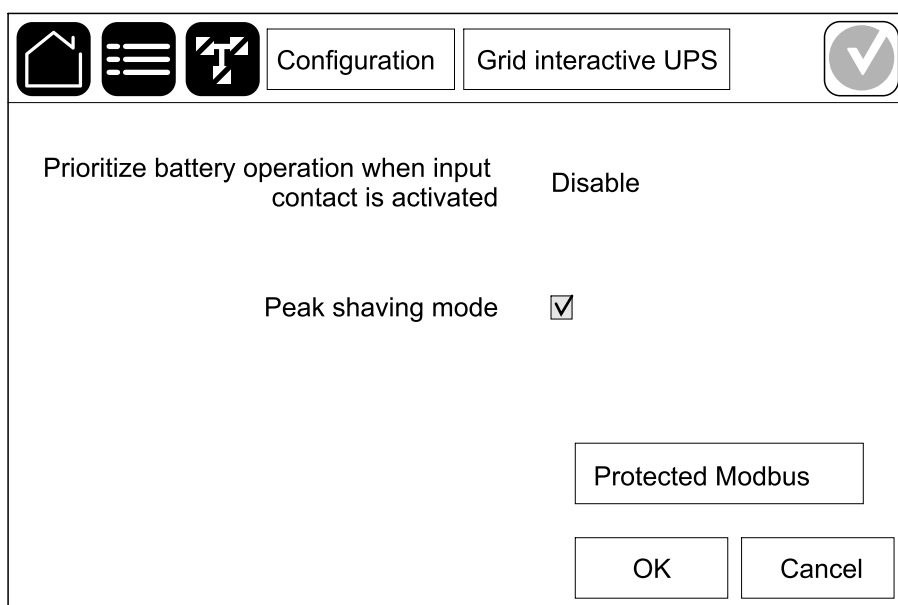
Configure High Efficiency Mode

1. Tap **Configuration > High efficiency**.
2. Select the **High efficiency mode**: **Disable**, **ECO mode**, **eConversion**. If high efficiency mode has been disabled by the system due to battery discharge over the configured limit, **Disabled by system** will be marked.
NOTE: Contact Schneider Electric to enable **ECO mode**.
3. Select **eConversion harmonics compensator**, if relevant. This is only selectable when eConversion is enabled.
4. Select the **High efficiency schedule**: **Active on schedule**, **Always active**, or **Never active**.
 - a. For **Active on schedule**, tap **Schedule** and set up and enable the schedule(s) as needed.

View Configuration for Prioritizing Battery Operation When Input Contact is Activated

The feature **Prioritize battery operation when input contact is activated** allows you to prioritize battery operation to remove your load from the grid at certain times/in certain situations, controlled by an input contact signal. When this feature is enabled, the UPS will transfer to battery operation on an input contact signal. The UPS will only transfer to battery operation if battery operation is possible, i.e. if there is sufficient runtime available from the batteries and no other restrictions are detected. When the input contact signal is deactivated, the UPS will return to its default operation mode. This feature is only configurable by Schneider Electric Service.

1. Tap **Configuration > Grid interactive UPS** to see if **Prioritize battery operation when input contact is activated** is enabled/disabled.



Configuration Grid interactive UPS

Prioritize battery operation when input contact is activated Disable

Peak shaving mode ☒

Protected Modbus

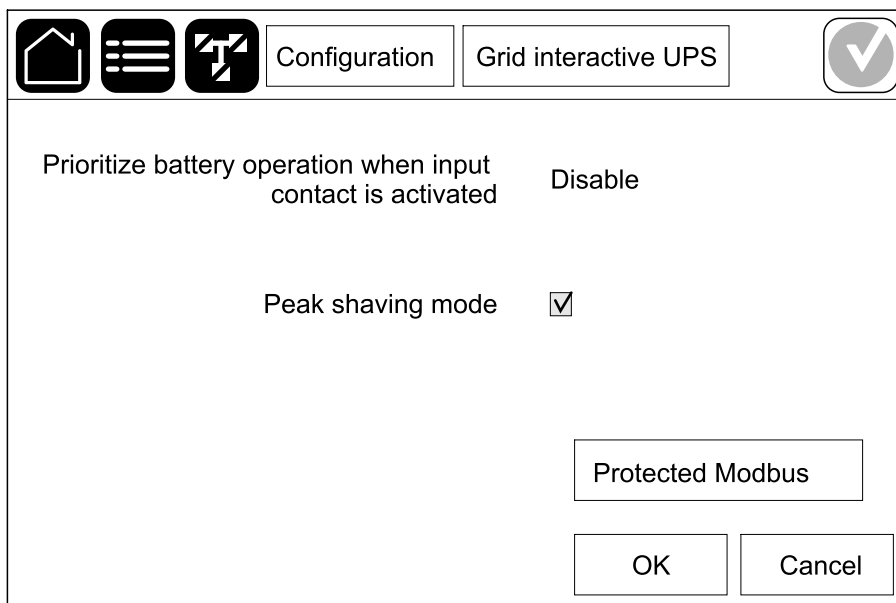
OK Cancel

Enable Peak Shaving Mode

Peak Shaving Mode allows the UPS to reduce the power consumed from the utility/mains supply during grid peak periods, and supplement power to the load with power from the battery.

NOTE: Peak shaving mode must be enabled locally by Schneider Electric during service configuration to make this selection available, but it must be controlled via a remote software application. The remote software application is connected through protected write for Modbus. Contact Schneider Electric for more details.

1. From the home screen on the display, select **Configuration > Grid interactive UPS**.
2. Select **Peak Shaving Mode** if you want to enable this function.



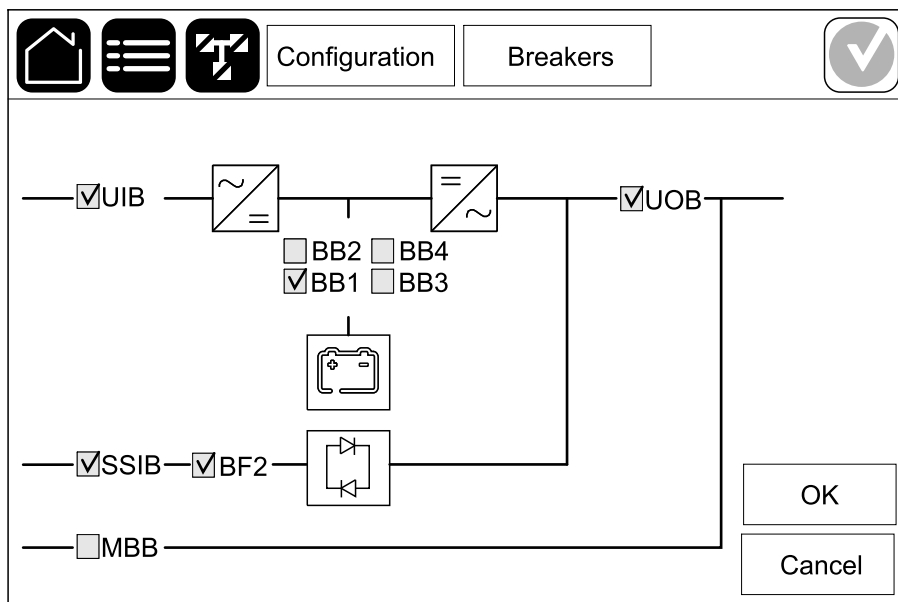
The screenshot shows the 'Configuration' screen for 'Grid interactive UPS'. The top navigation bar includes icons for Home, Menu, and a specific function, along with the text 'Configuration' and 'Grid interactive UPS'. A checkmark icon is in the top right corner. The main content area has two settings: 'Prioritize battery operation when input contact is activated' set to 'Disable', and 'Peak shaving mode' which is checked with a checkbox. At the bottom right, there are three buttons: 'Protected Modbus', 'OK', and 'Cancel'.

3. Tap on **Protected Modbus** to reconfigure the preshared keys for the protected write for Modbus. **Protected Modbus** is an encrypted bi-directional handshake protocol using exchange keys and authentication codes. The write requests for peak shaving mode settings from the external system are only accepted by the UPS if they pass the requirements from the **Protected Modbus** handshake protocol.
4. Tap **OK** to confirm your settings.

Configure the Disconnect Devices

NOTE: This configuration is mandatory for correct UPS operation.

1. Tap **Configuration > Breakers**.
2. Tap the different disconnect devices in the mimic diagram to configure which disconnect devices are present in the UPS system. Square with a ✓ means that the disconnect device is present, empty square means that the disconnect device is not present. BF2 presence can only be configured by Schneider Electric Service.



NOTE: The UPS can monitor up to four battery disconnect devices in a battery solution. The mimic diagram only shows one battery disconnect device BB even if more battery disconnect devices have been connected and configured for monitoring. If one or more of the monitored battery disconnect devices are in the closed position, the BB on the mimic diagram will show as closed. If all of the monitored battery disconnect devices are in the open position, the BB on the mimic diagram will show as open.

3. Tap **OK** to save your settings.

Configure the Input Contacts

1. Tap **Configuration > Contacts and relays** and select the input contact that you want to configure.
2. Select a function from the drop-down list for the selected input contact:

Configuration Contacts and relays

Input contact 1

Genset is supplying the UPS ▼

Battery charge power during genset supply

☐ 0% ☐ 10% ☐ 25%
☒ 50% ☐ 75% ☐ 100%

OK Cancel

None: No action assigned to this input contact.	Genset is supplying the UPS: Input to indicate that the UPS is being supplied by a generator. You must also select the reduction in battery charge current while the UPS is being supplied by a generator. Set Battery charge power during genset supply to 0% (no battery charging), 10% , 25% , 50% , 75% , or 100% (full battery charging). Battery charge power during genset supply is only selectable for this function.
Ground fault: Input to indicate that a ground fault is present.	Battery room ventilation is inoperable: Input to indicate that the battery room ventilation is inoperable. When the input is active, the battery charger will turn OFF.
User-defined 1: General purpose input.	External battery monitoring detected a fault: Input to indicate that the external battery monitoring has detected a fault. When the input is active, the UPS will post an alarm (no other action).
User-defined 2: General purpose input.	High efficiency mode is disabled: If this input is activated, the UPS is prevented from entering high efficiency mode (ECO mode and eConversion mode) or will exit any active high efficiency mode.
External energy storage monitoring detected a minor fault: Input to indicate that the external energy storage monitoring has detected a minor fault.	External signal turns charger off: If this input is activated, the charger will turn OFF on a signal from external equipment, e.g. on a signal from the external energy storage.
External energy storage monitoring detected a major fault: Input to indicate that the external energy storage monitoring has detected a major fault.	Transformer temperature is too high: Input to indicate that there is a high temperature alarm for the transformer.

3. Tap **OK** to save your settings.

Configure the Output Relays

1. Tap **Configuration > Contacts and relays** and select the output relay that you want to configure.
2. Set the **Delay (sec)**.
3. Select to enable **Energized check mode** (disabled as default).




When **Energized check mode** is enabled, the output relay is activated, and will deactivate when the events assigned to the output relay occurs (normally activated).

When **Energized check mode** is disabled, the output relay is deactivated, and will activate when the events assigned to the output relay occurs (normally deactivated).

Energized check mode must be individually enabled for each output relay and makes it possible to detect if the output relay is inoperable:


- If the power supply to the output relays is lost, the events assigned to all the output relays will be indicated as present.
- If a single output relay has become inoperable, the events assigned to the single output relay will be indicated as present.

4. Select the event(s) you want to assign to the output relay. On each page, tap **OK** to save your settings and tap the arrow symbol to go to the next page.



Configuration

Contacts and relays



Output relay 1



Delay (sec)

☒ Energized check mode

☒ UPS common alarm

☒ UPS informational alarm

☒ UPS warning alarm

 1/5 

OK

Cancel

NOTE: It is possible to assign several functions to the same output relay.

UPS common alarm: The output is triggered when any alarm is present for the UPS.	UPS in maintenance mode: The output is triggered when the unit output disconnect device UOB has been opened which transfers the UPS to maintenance mode. The UPS is not supplying the load.
UPS informational alarm: The output is triggered when an information alarm is present for the UPS.	External fault: The output is triggered the UPS detects an external fault.
UPS warning alarm: The output is triggered when a warning alarm is present for the UPS.	Fan inoperable: The output is triggered when one or more fans are inoperable.
UPS critical alarm: The output is triggered when a critical alarm is present for the UPS.	Battery voltage low: The output is triggered when the battery voltage is below the threshold.
System common alarm: The output is triggered when any alarm is present for the system.	Battery is not working correctly: The output is triggered when the batteries are not working correctly.
System informational alarm: The output is triggered when an information alarm is present for the system.	Battery is disconnected: The output is triggered when the batteries have been disconnected or the battery disconnect device(s) are open.
System warning alarm: The output is triggered when a warning alarm is present for the system.	Inverter overload: The output is triggered when there is an overload condition, while the UPS is in inverter operation.
System critical alarm: The output is triggered when a critical alarm is present for the system.	Output overload: The output is triggered when there is an overload condition, while the UPS is in inverter operation or bypass operation.
UPS in normal operation: The output is triggered when the UPS is in normal operation.	Input out of tolerance: The output is triggered when the input is out of tolerance.
UPS in battery operation: The output is triggered when the UPS is in battery operation.	Bypass out of tolerance: The output is triggered when the bypass is out of tolerance.
UPS in static bypass operation: The output is triggered when the UPS is in forced static bypass operation or requested static bypass operation.	EPO active: The output is triggered when the EPO has been activated.
UPS in maintenance bypass operation: The output is triggered when the UPS is in internal maintenance bypass operation or external maintenance bypass operation.	

5. Tap **OK** to save your settings.

Configure the Network

The network can be configured for the integrated and the optional network management card (NMC).

1. Tap **Configuration > Network** and select **IPv4** for the **Integrated NMC** to configure the integrated network management card or for the **Optional NMC** to configure the optional network management card (if present).

The screenshot shows the 'Network' configuration screen. At the top, there are navigation icons (home, menu, back) and two tabs: 'Configuration' and 'Network'. A checkmark icon is in the top right corner. The screen is divided into two columns: 'Integrated NMC' and 'Optional NMC'. Each column contains two buttons: 'IPv4' and 'IPv6'.

2. Configure the IPv4 settings on the page for the chosen NMC:

The screenshot shows the 'IPv4' configuration screen. At the top, there are navigation icons (home, menu, back) and two tabs: 'Configuration' and 'Network'. A checkmark icon is in the top right corner. The screen contains a checkbox labeled 'Disable integrated NMC IPv4' which is currently unchecked. Below this, there are three radio buttons for 'Address mode': 'Manual', 'DHCP', and 'BOOTP'. The 'Manual' option is selected. Below the radio buttons, there are four input fields for 'System IP', 'Subnet mask', 'Default gateway', and an unlabeled field. Each input field contains an 'x' placeholder. At the bottom right, there are two buttons: 'OK' and 'Cancel'.

- a. Remove the check mark for **Disable integrated NMC IPv4/Disable optional NMC IPv4** to configure the **IPv4**. When the check mark is present, no settings can be made and the function is disabled.
- b. Set the **Address mode** to **Manual**, **DHCP**, or **BOOTP**. For manual address mode, add the values.
- c. Tap **OK** to save your settings.

3. Tap **Configuration > Network** and select **IPv6** for the **Integrated NMC** to configure the integrated network management card or for the **Optional NMC** to configure the optional network management card (if present).

The screenshot shows the 'Network' configuration screen. At the top, there are three icons: a home icon, a list icon, and a network icon. Below these are two tabs: 'Configuration' and 'Network'. A checkmark icon is in the top right corner. The main area is divided into two columns: 'Integrated NMC' and 'Optional NMC'. Each column contains two buttons: 'IPv4' and 'IPv6'.

4. Configure the IPv6 settings on the page for the chosen NMC:

The screenshot shows the IPv6 configuration screen. At the top, there are three icons: a home icon, a list icon, and a network icon. Below these are two tabs: 'Configuration' and 'Network'. A checkmark icon is in the top right corner. The main area contains the following settings:

- Disable integrated NMC IPv6** ☐ **DHCPv6 mode**
- ☐ **Auto configuration** ☐ **Address and other information**
- ☐ **Manual** ☐ **Non-address information only**
- ☐ **IPv6 never**
- System IP**
- Default gateway**
- Current address**
- OK**
- Cancel**

- Remove the check mark for **Disable integrated NMC IPv6/Disable optional NMC IPv6** to configure the **IPv6**. When the check mark is present, no settings can be made and the function is disabled.
 - Set the **DHCPV6 mode** to **Address and other information**, **Non-address information only**, or **IPv6 never**.
 - Select **Auto configuration** or **Manual**. For manual mode, add the values.
 - Tap **OK** to save your settings.
5. Repeat the steps to configure the other NMC, if needed.

Configure the Modbus

The Modbus can be configured for the integrated and the optional network management card (NMC).

1. Tap **Configuration > Modbus** and select **Integrated NMC** to configure the integrated network management card or **Optional NMC** to configure the optional network management card (if present).

2. Configure the settings on the first page for the chosen NMC:

- a. Remove the check mark for **Disable** to configure the **Serial Modbus**. When the check mark is present, no settings can be made and the function is disabled.
- b. Set the **Parity** to **None**, **Even**, or **Odd**.
- c. Set the **Stop bit** to 1 or 2.
- d. Set the **Baud rate** to **2400**, **9600**, **19200**, or **38400**.
- e. Set the **Target unique ID** to a number between 1 and 247.

NOTE: Every device on the bus must have exactly the same settings except the device address **Target unique ID**, which must be unique for every device. No two devices on the bus can have the same address.

- f. Tap **OK** to save your settings and tap the arrow symbol to go to the next page.

3. Configure the settings on the second page:

The screenshot shows the 'Modbus' configuration screen. At the top, there are three icons: a house, a list, and a settings icon. To the right of these icons are two tabs: 'Configuration' and 'Modbus'. The 'Modbus' tab is active. Below the tabs, the title 'TCP Modbus' is centered. There are three settings listed: 'Disable' with a checked checkbox, 'Port 502' with a selected radio button, and 'Port [5000 to 32768]' with an unselected radio button and a text input field. At the bottom, there are navigation arrows, a '2/2' indicator, and 'OK' and 'Cancel' buttons.

- a. Remove the check mark for **Disable** to configure the **TCP Modbus**. When the check mark is present, no settings can be made and the function is disabled.
 - b. Select **Port 502** or **Port [5000 to 32768]**.
 - c. Tap **OK** to save your settings.
4. Repeat the steps to configure the other NMC, if needed.

Set the UPS Name

1. Tap **Configuration > General > UPS name**.
2. Set the UPS name.
3. Tap **OK** to save your settings.

Set the Date and Time

1. Tap **Configuration > General > Date and time**.
2. Set the **Year, Month, Day, Hour, Minute, and Second**.
3. Tap **OK** to save your settings.

Configure the Display Preferences

1. Tap **Configuration > General > Display**.
 - a. Set the **Alarm sound** to **Enable** or **Disable**. This will enable/mute all alarm sounds.
 - b. Set the **Alarm sound (informational alarms only)** to **Enable** or **Disable**. This will enable/mute all informational alarm sounds.
 - c. Set the temperature unit to **Celsius** or **Fahrenheit**.
 - d. Set the **Screen saver on after** to **5 min, 15 min, 30 min**, or **Never**. The screen saver will turn on after the set time where no activity has been performed on the display.
 - e. Set the **Display brightness** by tapping the - or +.
 - f. Set the **Touch screen sound** to **Enable** or **Disable**. This will enable/mute all display sounds (excluding alarm sounds).
 - g. Calibrate the touch functionality of the display by tapping the calibration button twice.

Configure the Air Filter Reminder

When the air filter has been replaced, reset the air filter reminder.

1. Tap **Configuration > Reminder**.
 - a. Select **Enable reminder** to get reminders about replacing the air filter.
 - b. Select the reminder interval: **1 month**, **3 months**, **6 months**, or **1 year** based on the installation room environment.
 Under **Remaining time (weeks)** you can see how much service life the air filter in use has left.
 - c. Tap **Reset** to reset the air filter service life counter.

2. Tap **OK** to save your settings.

Save the UPS Settings on a USB Device

NOTE: The UPS can only accept settings that were originally saved from the same UPS. Settings saved from other UPSs cannot be reused.

1. Tap **Configuration > Save/restore**.
2. Open the front door.
3. Insert your USB device in USB port 1 in the system level controller.
4. Tap **Save** to save the present UPS settings on the USB device.

NOTE: Do not remove the USB device until the save process has finished.

Restore the UPS Settings from a USB Device

NOTE: The UPS can only accept settings that were originally saved from the same UPS. Settings saved from other UPSs cannot be reused. Settings can only be restored when the UPS is in maintenance bypass operation or off mode.

NOTE: Do not open the unit input disconnect device UIB at the end of the shutdown sequence as this will turn off the power to the display.

NOTE: It is recommended to keep the battery disconnect device(s) closed during this procedure.

1. Tap **Control > Guided sequences > Shut down UPS system** or **Control > Guided sequences > Shut down a UPS in a parallel system**, and follow the steps which appear on the display.
2. Select **Configuration > Save/restore**.
3. Open the front door.
4. Insert your USB device in one of the USB ports on the UPS.
5. Tap **Restore** to implement saved UPS settings from the USB device. Wait for the system level controller to reboot automatically.

NOTE: Do not remove the USB device until the restore process has finished.
6. Select **Control > Guided sequences > Start up UPS system** or **Control > Guided sequences > Start up a UPS in a parallel system**, and follow the steps which appear on the display.

Change the Password

NOTE: Always change your password on your first login and keep the password in a secure location.

TIP: Create complex passwords to protect your UPS:

- The password should be at least eight characters long.
- The password should be significantly different from previous passwords and from passwords to other devices.
- Use a combination of uppercase letters, lowercase letters, numbers and special characters.

1. Tap **Logout**.
2. Tap **Configuration**.
3. Enter your password.

NOTE: The default administrator username and password is **admin**.

4. Tap **Change password** and enter the new password.

Operation Procedures

Transfer the UPS from Normal Operation to Static Bypass Operation

1. Select **Control > Operation mode > Transfer to bypass operation**.
2. Tap **OK** on the confirmation screen.

Transfer the UPS from Static Bypass Operation to Normal Operation

1. Select **Control > Operation mode > Transfer to normal operation**.
2. Tap **OK** on the confirmation screen.

Turn the Inverter OFF

IMPORTANT: This will turn off the supply to the load.

1. Select **Control > Inverter > Inverter off**.
2. Tap **OK** on the confirmation screen.

Turn the Inverter ON

1. Select **Control > Inverter > Inverter on**.
2. Tap **OK** on the confirmation screen.

Set the Charger Mode

1. Tap **Control > Charger**.
2. Tap **Float, Boost, or Equalization**.
3. Tap **OK** on the confirmation screen.

Shut Down the UPS System into Maintenance Bypass Operation

NOTE: Only operate a disconnect device when the associated disconnect device indicator lamp is illuminated.

1. Tap **Control > Guided sequences > Shut down UPS system** or **Control > Guided sequences > Shut down a UPS in a parallel system**, and follow the steps which appear on the display.

2. **Generic shutdown procedure for a UPS system with maintenance bypass disconnect device MBB:**

NOTE: The following are generic shutdown procedures. Always follow the steps of the **Guided sequences** which are specific to your system

- a. Select **Control > Operation mode > Transfer to bypass operation**.
- b. Close the maintenance bypass disconnect device MBB.
- c. Open the system isolation disconnect device SIB (if present).
- d. Open the unit output disconnect device UOB.
- e. Select **Control > Inverter > Inverter off** or press the inverter OFF button (hold for five seconds) on the system level controller section.
- f. Open the static switch input disconnect device SSIB (if present).
- g. Open the battery disconnect device(s).
- h. Open the unit input disconnect device UIB.
- i. Repeat step d to h for other UPSs in a parallel system.

Shut Down into Maintenance Bypass Operation for Single UPS System with Kirk Key Installed

NOTE: Only operate a disconnect device when the associated disconnect device indicator lamp is illuminated.

1. Select **Control > Operation mode > Transfer to bypass operation**.
2. Hold down the SKRU push-button, turn and remove key A from the SKRU interlock.
3. Insert key A in the interlock for the maintenance bypass disconnect device MBB and turn the key.
4. Close the maintenance bypass disconnect device MBB.
5. Open the unit output disconnect device UOB.
6. Turn and remove key B from the interlock for the unit output disconnect device UOB.
7. Insert key B in the SKRU interlock and turn the key to the locked position.
8. Select **Control > Inverter > Inverter off**.
9. Open the static switch input disconnect device SSIB (if present).
10. Open the battery disconnect device(s).
11. Open the unit input disconnect device UIB.

Start Up the UPS System from Maintenance Bypass Operation

NOTE: Only operate a disconnect device when the associated disconnect device indicator lamp is illuminated.

1. If open, close the unit input disconnect device UIB.
The display turns on. The rebooting sequence lasts approximately 3 minutes.
2. Select **Control > Guided sequences > Start up UPS system** or **Control > Guided sequences > Start up a UPS in a parallel system**, and follow the steps which appear on the display.
3. **Generic start-up procedure for a UPS system with maintenance bypass disconnect device MBB:**

NOTE: The following are generic start-up procedures. Always follow the steps of the **Guided sequences** which are specific to your system

- a. If open, close the unit input disconnect device UIB.
- b. Close the static switch input disconnect device SSIB (if present).
- c. Close the bypass backfeed disconnect device BF2 (if present).
- d. Close the battery disconnect device(s).
- e. Select **Control > Operation mode > Transfer to bypass operation** if possible.
- f. Close the unit output disconnect device UOB.
- g. Repeat step a to f for other UPSs in a parallel system.
- h. Close the system isolation disconnect device SIB (if present).
- i. Open the maintenance bypass disconnect device MBB.
- j. Select **Control > Inverter > Inverter on** or press the inverter ON button (hold for five seconds) on the system level controller.

Start Up from Maintenance Bypass Operation for Single UPS System with Kirk Key Installed

NOTE: Only operate a disconnect device when the associated disconnect device indicator lamp is illuminated.

1. Close the unit input disconnect device UIB.
The display turns on. The rebooting sequence lasts approximately three minutes.
2. Close the static switch input disconnect device SSIB (if present).
3. Close the bypass backfeed disconnect device BF2 (if present).
4. Close the battery disconnect devices.
5. Select **Control > Operation mode > Transfer to bypass operation**.
6. Hold down the SKRU push-button, turn and remove key B from the SKRU interlock.
7. Insert key B in the interlock for the unit output disconnect device UOB and turn the key.
8. Close the unit output disconnect device UOB.
9. Open the maintenance bypass disconnect device MBB.
10. Turn and remove key A from the interlock for the maintenance bypass disconnect device MBB.
11. Insert key A in the SKRU interlock and turn the key to the locked position.
12. Select **Control > Inverter > Inverter on**.

Access a Configured Network Management Interface

The network management card web interface is compatible with:
Windows® operating systems:

- Microsoft® Internet Explorer® (IE) 10.x or higher, with compatibility view turned on.
- The latest release of Microsoft® Edge®.

All operating systems:

- The latest releases of Mozilla® Firefox® or Google® Chrome®.

The below procedure describes how to access the network management interface from a web interface. If enabled, it is also possible to use the following interfaces:

- SSH
- SNMP
- FTP
- SFTP

NOTE: Please visit www.schneider-electric.com to view the Security Deployment Guidelines and Security Handbook for the product.

The network management card supports NTP connection for synchronization of time. Ensure that only one network management interface in the entire UPS system (single or parallel) is set to synchronize time.

You can use either of the following protocols when you use the web interface:

- The HTTP protocol (disabled by default), which provides authentication by user name and Pin but no encryption.
- The HTTPS protocol (enabled by default), which provides extra security through Secure Socket Layer (SSL); encrypts user names, Pin, and data being transmitted; and authenticates network management cards by means of digital certificates.

See [Enable HTTP/HTTPS Protocols](#), page 43.

By default, SNMP protocols are disabled on the network management card to avoid cybersecurity risks. SNMP protocols must be enabled to use the monitoring functions of the network management card, or to connect to EcoStruxure IT Gateway or StruxureWare Data Center Expert. You can enable and use either of these SNMP protocols:

- SNMPv1, which provides minimal security. If using this protocol, Schneider Electric recommends customizing the access control parameters to enhance security.
- SNMPv3, which provides extra security through both encryption and authentication. Schneider Electric recommends using this protocol for better security and customizing the access control parameters.

See [Enable SNMP Protocols](#), page 44.

Enable HTTP/HTTPS Protocols

1. Access the network management interface by its IP address (or its DNS name, if a DNS name is configured).
2. Enter the user name and password. The default user name and password is **apc**. You will be prompted to change this password on the first login.
3. To enable or disable the HTTP or HTTPS protocol, go to **Configuration > Network > Web > Access**, select the protocol, set the parameters, and click on **Apply**.

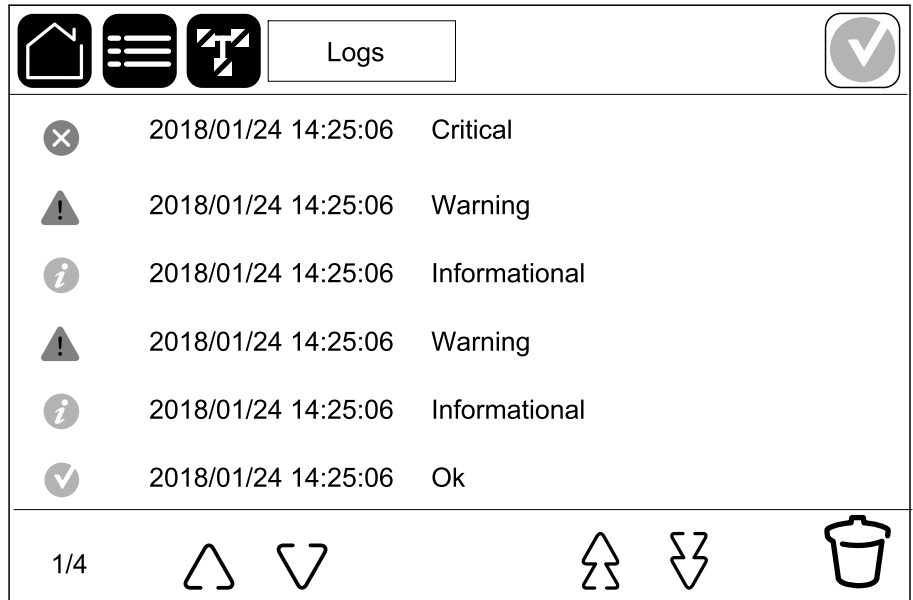
Enable SNMP Protocols

1. Access the network management interface by its IP address (or its DNS name, if a DNS name is configured).
2. Enter the user name and password. The default user name and password is **apc**. You will be prompted to change this password on the first login.
3. To enable SNMPv1 protocol:
 - a. Go to **Configuration > Network > SNMPv1 > Access**, select **Enable** and click on **Apply**.
 - b. Go to **Configuration > Network > SNMPv1 > Access Control** and set up the parameters.
4. To enable SNMPv3 protocol:
 - a. Go to **Configuration > Network > SNMPv3 > Access**, select **Enable** and click on **Apply**.
 - b. Go to **Configuration > Network > SNMPv3 > Access Control** and set up the parameters.
 - c. Go to **Configuration > Network > SNMPv3 > User Profiles** and set up the parameters.

NOTE: The SNMPv1 or SNMPv3 settings must match your settings on the EcoStruxure IT Gateway or StruxureWare Data Center Expert for the network management card 4 to communicate correctly with EcoStruxure IT Gateway or StruxureWare Data Center Expert.

View the Logs

1. Tap **Logs**. The log shows the latest 100 events with the newest events at the top of the list.
 - a. Tap the arrow buttons to go to the next or previous page.
 - b. Tap the double arrow buttons to go the first or last page.
 - c. Tap the recycle bin button to delete all events stored in the log.



View the System Status Information

NOTE: The UPS display does not show real time data, and a comparison between the UPS display and an external power analyzer will not show the same data. Please allow for a tolerance of $\pm 1\%$ for voltages, $\pm 3\%$ for power, and $\pm 3\%$ for currents.

1. Tap **Status**.

a. Tap **Input** to see the status.

Input

Voltage ph-ph (phase-to-phase)	The present phase-to-phase input voltage.
Current	The present input current from the AC utility power source per phase in amperes (A).
Frequency	The present input frequency in hertz (Hz).
Voltage ph-N (phase-to-neutral) ⁸	The present phase-to-neutral input voltage in volts (V).
Total power	The present total active power input (for all three phases) in kW.
Power	The present active power (or real power) input for each phase in kilowatts (kW). Active power is the portion of power flow that, averaged over a complete cycle of the AC waveform, results in net transfer of energy in one direction.
Peak current	The present input peak current in amperes (A).
Power factor	The present ratio of the active power to apparent power.
Max. RMS current	The present maximum RMS current for each phase in amperes (A).
Energy	The total energy consumption since the time of installation.

b. Tap **Output** to see the status.

Output

Voltage ph-ph (phase-to-phase)	The phase-to-phase output voltage at the inverter in volts (V).
Current	The present output current for each phase in amperes (A).
Frequency	The present output frequency in hertz (Hz).
Voltage ph-N (phase-to-neutral) ⁸	The phase-to-neutral output voltage at the inverter in volts (V).
Load	The percentage of the UPS capacity presently used across all phases. The load percentage for the highest phase load is displayed.
Neutral current ⁸	The present output neutral current in amperes (A).
Total power	The present active total output power (for all three phases) in kilowatts (kW).
Power	The present active power (or real power) output for each phase in kilowatts (kW). Active power is the portion of power flow that, averaged over a complete cycle of the AC waveform, results in net transfer of energy in one direction.
Peak current	The output peak current in amperes (A).
Power factor	The present output power factor for each phase. Power factor is the ratio of active power to apparent power.
Max. RMS current	The present maximum RMS current for each phase in amperes (A).

8. Only applicable in systems with neutral connection.

Output (Continued)

Crest factor	The present output crest factor for each phase. The output crest factor is the ratio of the peak value of the output current to the RMS (root mean square) value.
Energy	The total energy supplied since the time of installation.

c. Tap **Bypass** to see the status.

Bypass

Voltage ph-ph (phase-to-phase) ⁹	The present phase-to-phase bypass voltage (V).
Current	The present bypass current for each phase, in amperes (A).
Frequency	The present bypass frequency in hertz (Hz).
Voltage ph-N (phase-to-neutral)	The present phase-to-neutral bypass voltage (V).
Total power	The present total active bypass power (for all three phases) in kilowatts (kW).
Power	The present active bypass power for each phase in kilowatts (kW). Active power is the time average of the instantaneous product of voltage and current.
Peak current	The bypass peak current in amperes (A).
Power factor	The present bypass power factor for each phase. Power factor is the ratio of active power to apparent power.
Max. RMS current	The present maximum RMS current for each phase in amperes (A).

d. Tap **Battery** to see the status.

Battery

Measurements	The present DC power being drawn from the battery, in kilowatts (kW).
	The present battery voltage (VDC).
	The present battery current in amperes (A). A positive current indicates that the battery is charging; a negative current indicates that the battery is discharging.
	Battery temperature from the connected temperature sensors in Celsius or Fahrenheit.
Battery	The amount of time before the batteries reach the low-voltage shutdown level. Also shows charge level of the battery as a percentage of full charge capacity.
	The present battery charge (Ah).
Configuration	Shows battery type.
Status	The general condition of the charger.
Mode	The operation mode of the charger (Off, Float, Boost, Equalization, Cyclic, Test).
Charging capacity	The maximum charge capacity in percentage of the UPS nominal power rating.

e. Tap **Temperature** to see the status.

9. Only applicable in systems with neutral connection.

Temperature

Ambient temperature	Ambient temperature in Celsius or Fahrenheit.
Battery temperature	Battery temperature in Celsius or Fahrenheit from the connected battery temperature sensors.
Temperature	Ambient temperature in Celsius or Fahrenheit from the optional connected temperature sensors (AP9335T and AP9335TH). Naming to be set up via the network management interface.
Humidity	Humidity in percentage from the optional connected humidity sensors (AP9335TH). Naming to be set up via the network management interface.

f. Tap **Power modules** to see the status.

Power modules

The view will show presence (present/not present) and status (OK, warning, critical) for each power module.

g. Tap **Peak shaving** to see the status.

Peak shaving

Peak shaving mode	Shows if peak shaving mode is active or inactive at this moment.
Input power	The present input power used by the UPS.
Battery power	The present battery power used by the UPS.
Charging in peak shaving mode	Shows if battery charging is allowed while the UPS is in active peak shaving mode.
Forced battery operation	Shows if forced battery operation is enabled (green).
State of charge	The present state of charge for the batteries. The state of charge for the batteries must be at a specified level before peak shaving mode is allowed to be active. Peak shaving mode will be deactivated if the state of charge reaches a specified minimum level.
Remaining time: Battery operation Peak shaving mode	The remaining time scheduled for battery operation. The remaining time scheduled for active peak shaving mode.

h. Tap **Parallel** to see the status.

Parallel

Input current	The present input current from the input source per phase in amperes (A).
Bypass current	The present bypass current from the bypass source per phase in amperes (A).
Total output power	The total output power of the parallel UPS system showing the total load percentage and the total output power in kW and kVA for the parallel system.
Output current	The present output current for each phase in amperes (A).
Number of redundant UPSs	The number of redundant UPSs present.
Redundancy setting	The configured redundancy setting.

Tests

The UPS system can perform the following tests to ensure correct performance of the system:

- **Buzzer**
- **Status LEDs**
- **Breaker lamp**
- **Runtime calibration**
- **Battery**

Tap the menu button on the home screen and select **Maintenance** and **Buzzer**, or **Status LEDs**, or **Breaker lamp** to start the test of these functions. See [Start a Runtime Calibration Test](#), page 49 and [Start a Battery Test](#), page 50 for details and requirements for these tests.

Start a Runtime Calibration Test

This feature is used for calibrating the estimated remaining battery runtime value. In this test, the UPS transfers to battery operation and the batteries are discharged to the low DC warning level. Based on the elapsed time and information about the load, the battery capacity can be calculated and the estimated runtime calibrated.

Schneider Electric recommends performing a runtime calibration test at start-up, when batteries are replaced, or when changes are made to the battery solution.

NOTICE

RISK OF EQUIPMENT DAMAGE

- During a runtime calibration test, the batteries are reduced to a very low capacity and are therefore not capable of supporting the load in case of an input power failure.
- Batteries will be discharged to the low DC warning level and this will result in a short battery runtime after the calibration until the batteries are fully recharged.
- Repeated battery testing or calibration can affect the service life of the battery.

Failure to follow these instructions can result in equipment damage.

Prerequisites:

- No critical alarms present.
- Batteries must be 100% charged.
- The load percentage must be at least 10% and must not change more than 20% during the test. Example: If the load percentage is 30% at the start of the test, the test will abort if the load percentage drops below 24% or rises above 36% during the test.
- The bypass supply must be available.
- The operation mode must be normal operation, eConversion, or ECO mode.
- The system operation mode must be inverter, eConversion, or ECO mode.

1. Tap the menu button on the home screen.
2. Select **Maintenance > Runtime calibration > Start calibration**.
3. Tap **OK** on the confirmation screen.

Stop a Runtime Calibration Test

1. Tap the menu button on the home screen.
2. Select **Maintenance > Runtime calibration > Stop calibration**.
3. Tap **OK** on the confirmation screen.

Start a Battery Test

Prerequisites:

- The battery disconnect devices are closed.
- No critical alarms present.
- The bypass supply must be available.
- Static bypass operation must be available.
- The batteries must be more than 50% charged.
- The runtime available must be more than 4 minutes.
- The operation mode must be normal operation, eConversion, or ECO mode.
- The system operation mode must be inverter, eConversion, or ECO mode.

This feature performs a number of tests on the batteries, such as fuse-blown check and weak battery detection. The test will discharge the batteries and use about 10% of the total runtime capacity. Example: If you have 10 minutes of runtime, the test will run for 1 minute. The battery test can be scheduled to run automatically in different time intervals (from weekly and up to once a year).

1. Select **Maintenance > Battery > Start test**.
2. Tap **OK** on the confirmation screen.

Stop a Battery Test

1. Tap the menu button on the home screen.
2. Select **Maintenance > Battery > Stop test**.
3. Tap **OK** on the confirmation screen.

Maintenance

Recommended Personal Protective Equipment (PPE)

For all procedures where the outermost front door on the unit is opened, Schneider Electric recommends the following personal protective equipment (PPE) as a minimum:

- Non-flammable cotton clothing
- Eye protection (e.g. glasses or goggles)
- Safety shoes
- Any personal protective equipment required or recommended by local or national regulation

CAUTION

RISK OF PERSONAL INJURY

Always perform a risk assessment before operating or maintaining this equipment. Use appropriate personal protection equipment.

Failure to follow these instructions can result in injury or equipment damage.

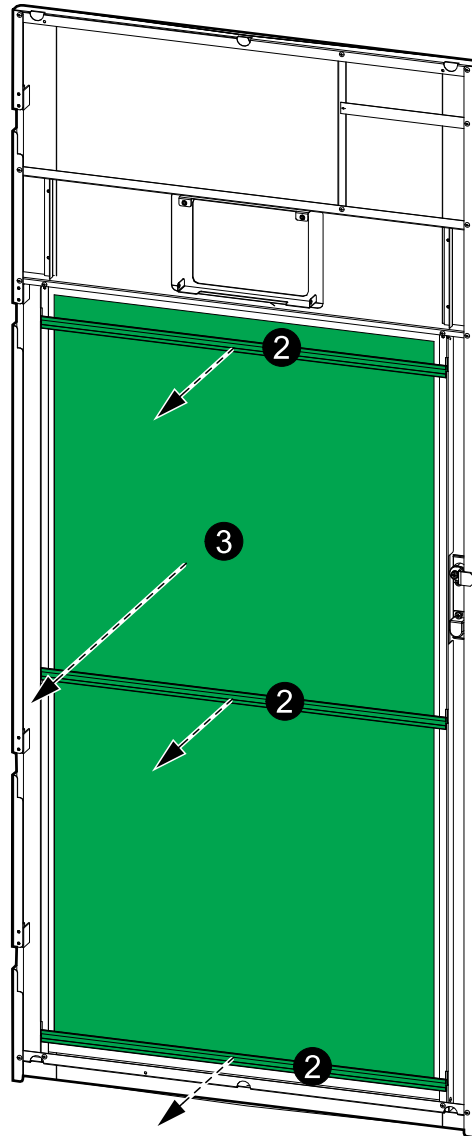
Connect Temperature/Humidity Sensor (Option)

Temperature/humidity sensor (AP9335T or AP9335TH) can be connected to the network management card.

1. Connect the temperature/humidity sensor to the universal I/O port of the network management card.
2. Set up the temperature/humidity sensor via the network management interface, see [Access a Configured Network Management Interface](#), page 43.
3. To see the temperature/humidity measurements, tap **Status > Temperature**.

Replace the Air Filter (GVLOPT001)

1. Open the front door.
2. Remove the three horizontal brackets.
3. Remove the old air filter and install the new air filter.



4. Reinstall the three horizontal brackets.
5. Close the front door.
6. Reset the air filter counter, see [Configure the Air Filter Reminder](#), page 36.

Live Swap: Add, Remove, or Replace a Power Module

NOTE: This UPS has been designed and evaluated for power module insertion and removal in any operation mode: **Live Swap**. This page specifies manufacturer's instructions for how to perform **Live Swap**.

NOTE: Incident energy is $<1.2 \text{ cal/cm}^2$ when installed and first startup commissioned in accordance with product instructions. Incident energy is measured 200 mm (8 in) from cabinet front.

DISCLAIMER:

- Electrical equipment should be installed, operated, serviced, maintained, replaced, or have similar work carried out on it only by suitably qualified, trained, experienced, and competent personnel who hold any necessary authorizations (e.g. licenses, permits or certifications) to perform such work. All work must be carried out in a way that does not give rise to danger and using appropriate personal protective equipment (PPE).
- User must ensure compliance with the manufacturer's instructions and user manual and with all applicable laws, regulations, standards, and guidance when using this equipment and carrying out work or permitting work to be carried out on or near electrical equipment.
- Neither Schneider Electric nor any of its affiliates shall be liable for any claims, costs, losses, damages, death, or injuries arising out of the improper use of this equipment or any failure to comply with any of the above requirements.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Verify that the UPS has the **Live Swap** label present.
- If no **Live Swap** label is present on the UPS, then the UPS must be transferred to maintenance bypass operation or turned off before a power module can be inserted or removed.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- Insertion or removal of power modules must only be performed by qualified personnel knowledgeable of electrical work and the required precautions. Keep unqualified personnel away.
- This procedure requires opening the front door. All other doors and covers must remain closed and secured during this procedure.
- Verify that the UPS is secured against movement before performing this procedure.
- If evidence of poor maintenance or poor installation is observed, do not proceed with this procedure.
- Do not install power modules which have been accidentally dropped, broken, flooded, contaminated, infested, or damaged in any way.
- Do not install power modules which are of unknown operational state.
- Keep a minimum distance of 200 mm (8 in) from the cabinet front while the system is energized.
- Do not use any tools inside the empty power module slot.
- Do not reach into the empty power module slot.

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

⚠ WARNING**RISK OF EQUIPMENT DAMAGE**

- Store the power modules at an ambient temperature of -15 to 40 °C (5 to 104 °F), 10-80% non-condensing humidity.
- Store the power modules in their original protective packaging.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION**HEAVY LOAD**

Power modules are heavy (38 kg (83.77 lbs)) and require two persons to lift.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE**RISK OF INSTALLATION OVERLOAD**

Check and verify that the installation is correctly sized for the increase in power rating before installing more power modules in the UPS. Incorrect sizing of the installation can result in an installation overload. See the installation manual for requirements for upstream and downstream protection, cable sizes, etc.

Failure to follow these instructions can result in equipment damage.

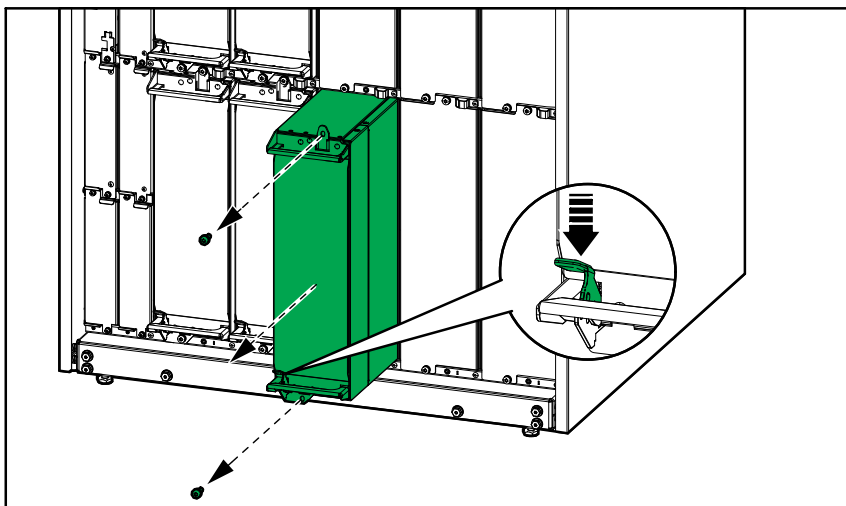
NOTICE**RISK OF LOAD DROP**

Check and verify that the remaining power modules can support the load before removing a power module from the UPS.

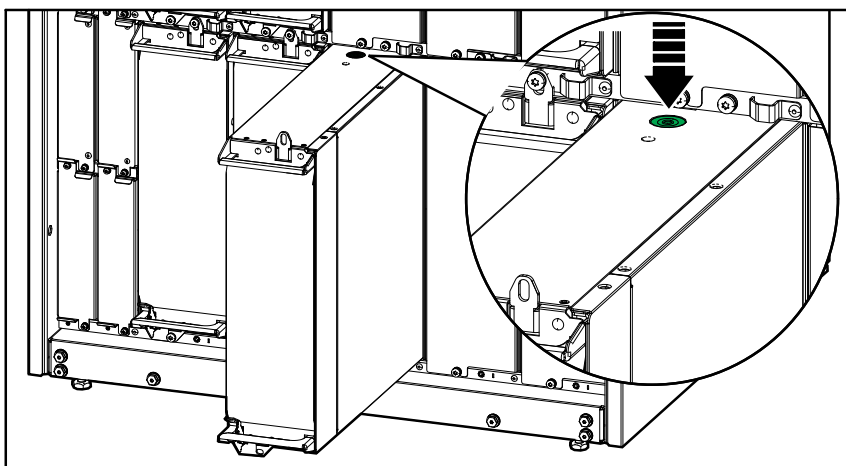
Failure to follow these instructions can result in equipment damage.

1. To remove an installed power module:

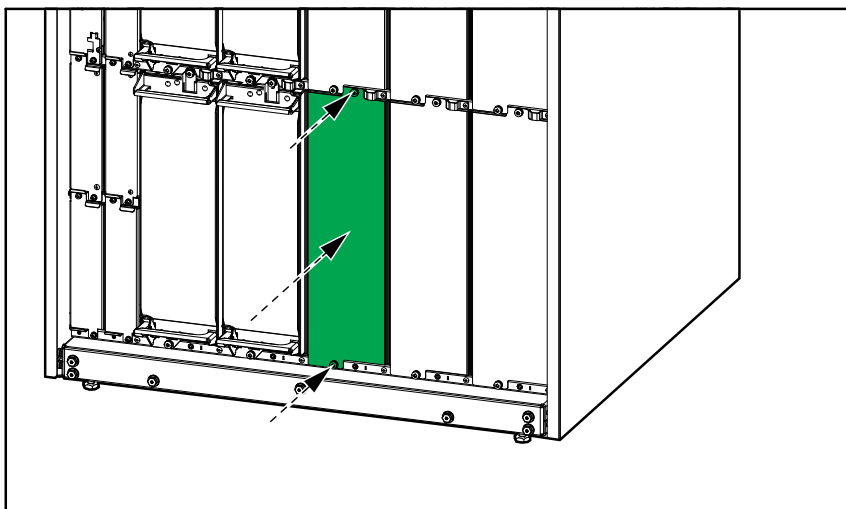
- a. Remove the screws in the top and bottom of the power module and push the unlock switch.



- b. Pull the power module halfway out. A locking mechanism prevents the power module from being pulled all the way out.
c. Release the lock by pressing the release button on the top of the power module and remove the power module.

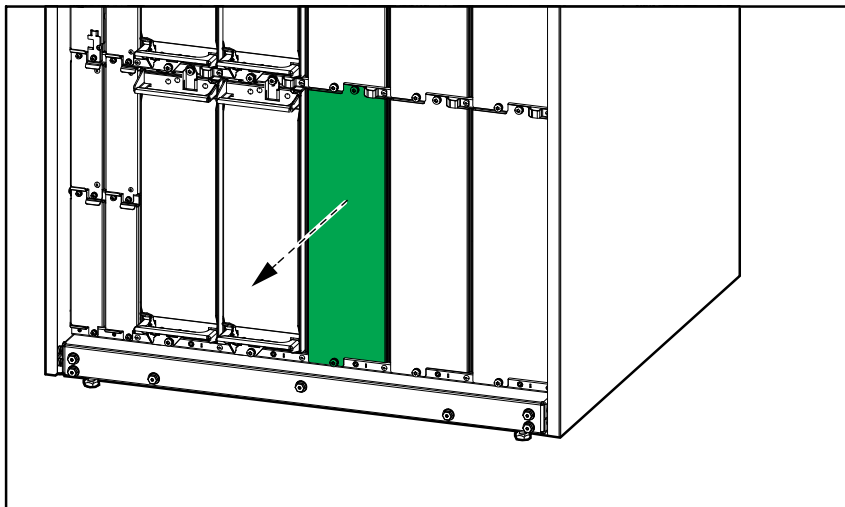


- d. If no replacement power module will be installed: Install a filler plate in front of the empty power module slot.

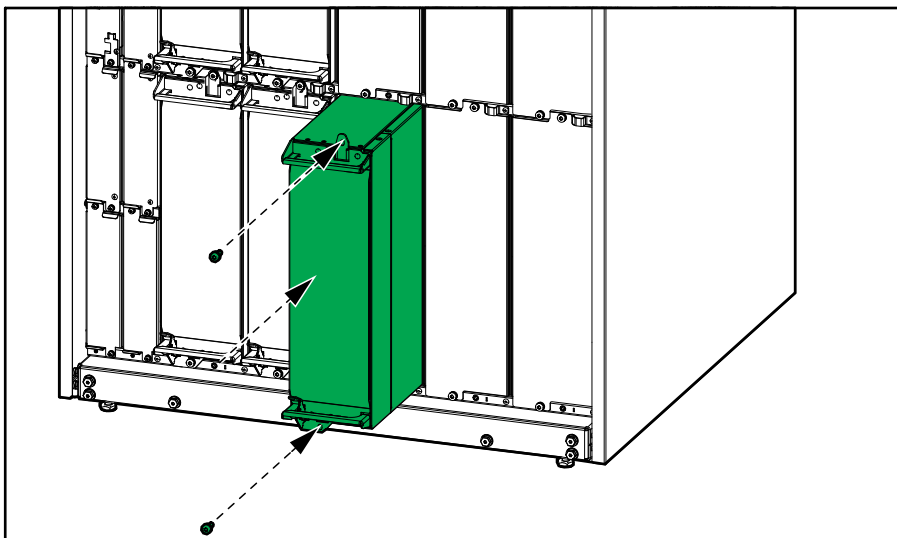


2. To install a new power module:

- a. If this is an additional power module that is being installed: Remove the filler plate from the empty power module slot. Save the filler plate for future use.



- b. Push the power module into the slot. The enable mechanism will latch when the power module is correctly inserted.
- c. Install the provided screws in the top and the bottom of the power module.



The power module will perform a self-test, automatically upgrade the firmware according to the system, and then go online.

⚡ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

All power module slots must have either a power module or a filler plate installed.

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

Determine if you need a Replacement Part

To determine if you need a replacement part, contact Schneider Electric and follow the procedure below so that the representative can assist you promptly:

1. In the event of an alarm condition, scroll through the alarm lists, record the information, and provide it to the representative.
2. Write down the serial number of the unit so that you will have it easily accessible when you contact Schneider Electric.
3. If possible, call Schneider Electric from a telephone that is within reach of the display so that you can gather and report additional information to the representative.
4. Be prepared to provide a detailed description of the problem. A representative will help you solve the problem over the telephone, if possible, or will assign a return material authorization (RMA) number to you. If a module is returned to Schneider Electric, this RMA number must be clearly printed on the outside of the package.
5. If the unit is within the warranty period and has been started up by Schneider Electric, repairs or replacements will be performed free of charge. If it is not within the warranty period, there will be a charge.
6. If the unit is covered by a Schneider Electric service contract, have the contract available to provide information to the representative.

Return Parts to Schneider Electric

To return an inoperable part to Schneider Electric, contact Schneider Electric customer support to obtain an RMA number.

Pack the part in the original shipping materials, and return it by insured, prepaid carrier. The customer support representative will provide the destination address. If you no longer have the original shipping materials, ask the representative about obtaining a new set.

- Pack the part properly to avoid damage in transit. Never use styrofoam beads or other loose packaging materials when shipping a part. The part may settle in transit and become damaged.
- Enclose a letter in the package with your name, RMA number, address, a copy of the sales receipt, description of the problem, a phone number, and a confirmation for payment (if necessary).




































NOTE: Damages sustained in transit are not covered under warranty.

Troubleshooting

Status LED Lighting per UPS Operation Mode

If the display becomes inoperable, you can see the UPS operation mode via the status LEDs behind the front panel.

- Green LED means function active.
- Off LED means function inactive.
- Red LED means function inoperable or in alarm condition.

Double conversion (normal operation)	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>
Battery operation (in dual mains system with bypass available)	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>
Battery operation (in single mains system or in dual mains system with bypass unavailable)	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>
Requested static bypass operation Forced static bypass operation ECO mode	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>
eConversion mode	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>
Off mode	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>
Static bypass standby operation	<div> <div>INPUT</div><div>INVERTER</div><div>OUTPUT</div><div>BYPASS</div><div>BATTERY</div> <div>      </div> </div>

Export UPS Report to a USB Device

1. Select **Maintenance > UPS report**.
2. Open the front door.
3. Insert your USB device in the USB port on the system level controller.
4. Tap **Export**.
NOTE: Do not remove the USB device until the export process has finished.
5. Send the UPS report to Schneider Electric customer support.

Galaxy Lithium-ion Battery Cabinet Operation

Operation Procedures

Shut Down the Battery Solution

NOTE: This procedure is only for a short temporary shutdown of the battery solution. If the battery solution should remain shut down for a longer period, please contact Schneider Electric.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

The battery cabinet contains an internal energy source. Hazardous voltage is still present after the battery breaker has been opened.

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

1. Manually set the battery breaker of each individual battery cabinet to the OFF (open) position to disconnect the battery power from the UPS.

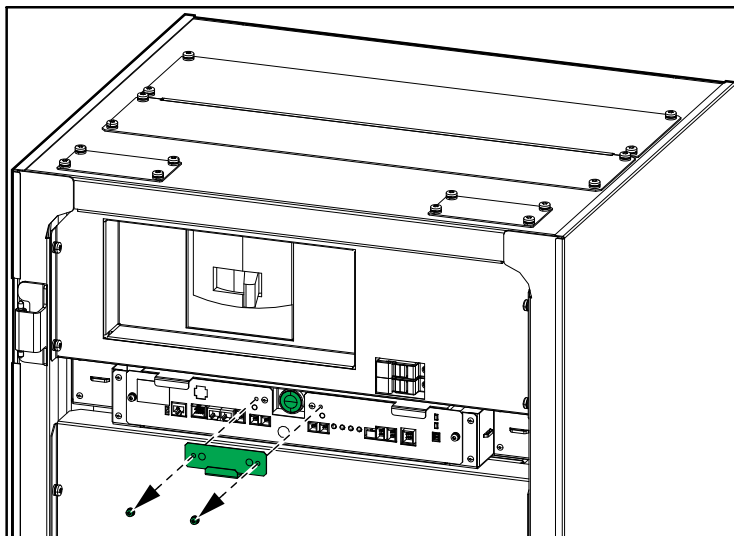
NOTE: The system BMS and rack BMS will still be operating.

2. Battery cabinet EPO cables should be connected to the system EPO. Shut down the system EPO to disconnect the UPS and all battery cabinets in emergency.

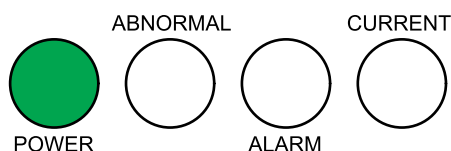
NOTE: E-stop manual switch device should be installed in the energy storage system. Rating for the E-stop manual switch: voltage minimum rated for 24 VAC or 24 VDC, current rating minimum rated for 0.5 A.

Restart the Battery Solution

1. Perform the following steps on all battery cabinets in the battery solution.
 - a. Remove the cover in front of the start-up button and push the start-up button.



- The PSU2 LED and the POWER LED will turn on.
- The ABNORMAL and ALARM LEDs should remain off.







- b. Reinstall the cover in front of the start-up button.
 - c. Set the battery breaker to the ON (closed) position.

Monitor the Battery System

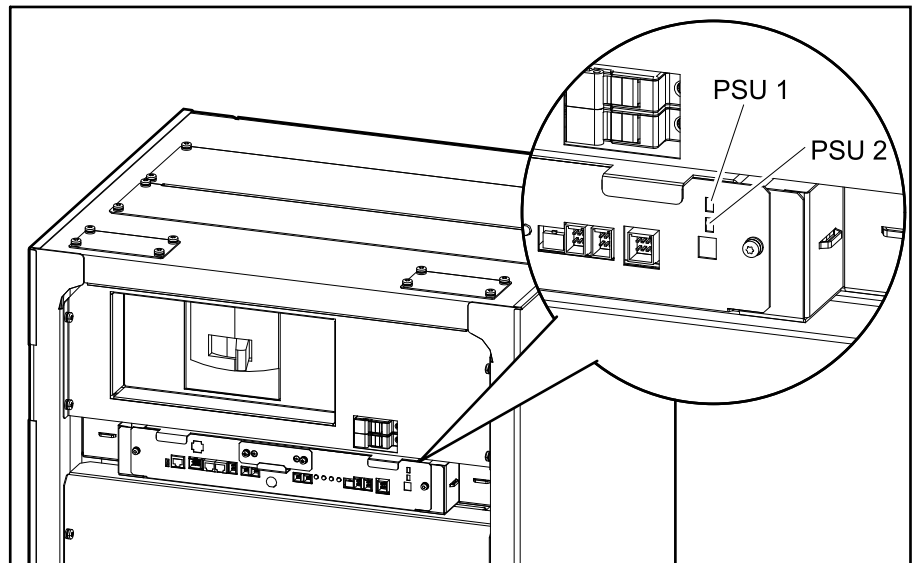
NOTE: Schneider Electric uses the battery system monitoring software ITE/ DCE to monitor the performance of the battery system. Please contact Schneider Electric application engineering team to obtain its installation instructions and operation instructions.

Troubleshooting

Status LEDs

LED	Battery Status	Description
   	Normal	The battery breaker is in the OFF (open) position.
   	Normal	The battery breaker is in the ON (closed) position.
   	Normal	The batteries are being discharged.
   	Normal	The batteries are being recharged.
   	Major alarm	The battery breaker has tripped and is in the OFF (open) position.
   	Minor alarm	The battery breaker is in the ON (closed) position.

PSU LEDs



- When the LED is green, the PSU is powered ON.
- When the LED is OFF, the PSU is powered OFF or inoperable.

Alarm List

Protection Protocols

Protection Protocol for Battery Cabinet with 17 Battery Modules

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹⁰	Release condition	Time (sec)	Battery breaker status
1	Over voltage protection - cell	Major	Max cell ≥ 4.28 V	5	OFF	Max cell < 4.25 V and press the reset switch	5	ON
2	Under voltage protection - cell	Major	Min cell ≤ 2.5 V	3	OFF	Min cell > 2.70 V and press the reset switch	3	ON
3	Over voltage protection - cabinet	Major	Cabinet voltage ≥ 582.08 V	5	OFF	Cabinet voltage < 578 V and press the reset switch	5	ON
4	Under voltage protection - cabinet	Major	Cabinet voltage ≤ 340 V	3	OFF	Cabinet voltage > 367.2 V and press the reset switch	3	ON
5	Cabinet cell voltage imbalance	Major	$\Delta V_{\text{cell}} \geq 500$ mV	5	OFF	$\Delta V_{\text{cell}} \geq 50$ mV	5	ON
6	Module cell voltage imbalance	Major	$\Delta V_{\text{cell}} \geq 90$ mV	5	OFF	$\Delta V_{\text{cell}} \geq 30$ mV	5	ON
7	Voltage sensing error (cabinet)	Minor	$ \text{Cabinet V} - \text{cell sum V} \geq 40.8$ V	10	ON	$ \text{Cabinet V} - \text{cell sum V} < 20.4$ V and press the reset switch	3	ON
8	Voltage sensing error (module)	Minor	$ \text{Module V} - \text{cell sum V} \geq 190$ mV	5	ON	$ \text{Module V} - \text{cell sum V} < 190$ mV and press the reset switch	3	ON
9	Over temperature protection	Major	Max temp ≥ 75 °C (167 °F)	3	OFF	Max temp < 65 °C (149 °F) and press the reset switch	3	ON
10	Under temperature protection	Minor	Min temp ≤ 0 °C (32 °F)	3	ON	Min temp > 5 °C (41 °F) and press the reset switch	3	ON
11	Temperature imbalance	Major	Max cell T - min cell T ≥ 40 °C (104 °F)	30	OFF	Max cell T - min cell T < 20 °C (68 °F) and press the reset switch	3	ON
12	Over current protection (charge)	Major	Level2 current ≥ 250 A	2	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level1 current ≥ 200 A	60	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
13	Over current protection (discharge)	Major	Level4 $ \text{current} \geq 600$ A	1	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level3 $ \text{current} \geq 540$ A	10	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level2 $ \text{current} \geq 495$ A	30	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level1 $ \text{current} \geq 470$ A	60	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
14	Communication lost (module ↔ cabinet)	Major	No communication	30	OFF	Communication reestablished and press the reset switch	-	ON
15	Communication lost (cabinet ↔ system)	Minor	No communication	30	ON	Communication reestablished and press the reset switch	-	ON
16	SW failure - battery breaker	Minor	Battery breaker OFF and $ \text{current} \geq 2.4$ A	3	ON	(Battery breaker OFF and $ \text{current} < 2.4$ A)	-	ON

10. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 17 Battery Modules (Continued)

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹¹	Release condition	Time (sec)	Battery breaker status
						and press the reset switch		
17	SW sensor failure - battery breaker	Minor	Battery breaker contact ON = battery breaker trip ON	3	ON	(Battery breaker contact ≠ battery breaker trip) and press the reset switch	-	ON
18	Current sensing error	Minor	No communication with Current IC	3	ON	Communication with current IC OK	-	ON
19	Fuse failure	Minor	Fuse blown	10	ON	Fuse ON and press the reset switch	-	ON

11. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 16 Battery Modules

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹¹	Release condition	Time (sec)	Battery breaker status
1	Over voltage protection - cell	Major	Max cell ≥ 4.28 V	5	OFF	Max cell < 4.25 V and press the reset switch	5	ON
2	Under voltage protection - cell	Major	Min cell ≤ 2.5 V	3	OFF	Min cell > 2.70 V and press the reset switch	3	ON
3	Over voltage protection - cabinet	Major	Cabinet voltage ≥ 547.84 V	5	OFF	Cabinet voltage < 544 V and press the reset switch	5	ON
4	Under voltage protection - cabinet	Major	Cabinet voltage ≤ 320 V	3	OFF	Cabinet voltage > 345.6 V and press the reset switch	3	ON
5	Cabinet cell voltage imbalance	Major	$\Delta V_{cell} \geq 500$ mV	5	OFF	$\Delta V_{cell} \geq 50$ mV	5	ON
6	Module cell voltage imbalance	Major	$\Delta V_{cell} \geq 90$ mV	5	OFF	$\Delta V_{cell} \geq 30$ mV	5	ON
7	Voltage sensing error (cabinet)	Minor	$ \text{Cabinet V - cell sum V} \geq 38.4$ V	10	ON	$ \text{Cabinet V - cell sum V} < 19.2$ V and press the reset switch	3	ON
8	Voltage sensing error (module)	Minor	$ \text{Module V - cell sum V} \geq 190$ mV	5	ON	$ \text{Module V - cell sum V} < 190$ mV and press the reset switch	3	ON
9	Over temperature protection	Major	Max temp ≥ 75 °C (167 °F)	3	OFF	Max temp < 65 °C (149 °F) and press the reset switch	3	ON
10	Under temperature protection	Minor	Min temp ≤ 0 °C (32 °F)	3	ON	Min temp > 5 °C (41 °F) and press the reset switch	3	ON
11	Temperature imbalance	Major	Max cell T - min cell T ≥ 40 °C (104 °F)	30	OFF	Max cell T - min cell T < 20 °C (68 °F) and press the reset switch	3	ON
12	Over current protection (charge)	Major	Level2 current ≥ 250 A	2	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level1 current ≥ 200 A	60	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
13	Over current protection (discharge)	Major	Level4 $ \text{current} \geq 600$ A	1	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level3 $ \text{current} \geq 540$ A	10	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level2 $ \text{current} \geq 495$ A	30	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level1 $ \text{current} \geq 470$ A	60	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
14	Communication lost (module ↔ cabinet)	Major	No communication	30	OFF	Communication reestablished and press the reset switch	-	ON
15	Communication lost (cabinet ↔ system)	Minor	No communication	30	ON	Communication reestablished and press the reset switch	-	ON
16	SW failure - battery breaker	Minor	Battery breaker OFF and $ \text{current} \geq 2.4$ A	3	ON	(Battery breaker OFF and $ \text{current} < 2.4$ A) and press the reset switch	-	ON
17	SW sensor failure - battery breaker	Minor	Battery breaker contact ON = battery breaker trip ON	3	ON	(Battery breaker contact \neq battery breaker trip) and press the reset switch	-	ON

11. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 16 Battery Modules (Continued)

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹²	Release condition	Time (sec)	Battery breaker status
18	Current sensing error	Minor	No communication with Current IC	3	ON	Communication with current IC OK	-	ON
19	Fuse failure	Minor	Fuse blown	10	ON	Fuse ON and press the reset switch	-	ON

12. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 13 Battery Modules

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹³	Release condition	Time (sec)	Battery breaker status
1	Over voltage protection - cell	Major	Max cell ≥ 4.28 V	5	OFF	Max cell < 4.25 V and press the reset switch	5	ON
2	Under voltage protection - cell	Major	Min cell ≤ 2.5 V	3	OFF	Min cell > 2.70 V and press the reset switch	3	ON
3	Over voltage protection - cabinet	Major	Cabinet voltage ≥ 445.12 V	5	OFF	Cabinet voltage < 442 V and press the reset switch	5	ON
4	Under voltage protection - cabinet	Major	Cabinet voltage ≤ 260 V	3	OFF	Cabinet voltage > 280.8 V and press the reset switch	3	ON
5	Cabinet cell voltage imbalance	Major	$\Delta V_{\text{cell}} \geq 500$ mV	5	OFF	$\Delta V_{\text{cell}} \geq 50$ mV	5	ON
6	Module cell voltage imbalance	Major	$\Delta V_{\text{cell}} \geq 90$ mV	5	OFF	$\Delta V_{\text{cell}} \geq 30$ mV	5	ON
7	Voltage sensing error (cabinet)	Minor	Cabinet V - cell sum V ≥ 31.2 V	10	ON	Cabinet V - cell sum V < 15.6 V and press the reset switch	3	ON
8	Voltage sensing error (module)	Minor	Module V - cell sum V ≥ 190 mV	5	ON	Module V - cell sum V < 190 mV and press the reset switch	3	ON
9	Over temperature protection	Major	Max temp ≥ 75 °C (167 °F)	3	OFF	Max temp < 65 °C (149 °F) and press the reset switch	3	ON
10	Under temperature protection	Minor	Min temp ≤ 0 °C (32 °F)	3	ON	Min temp > 5 °C (41 °F) and press the reset switch	3	ON
11	Temperature imbalance	Major	Max cell T - min cell T ≥ 40 °C (104 °F)	30	OFF	Max cell T - min cell T < 20 °C (68 °F) and press the reset switch	3	ON
12	Over current protection (charge)	Major	Level2 current ≥ 250 A	2	OFF	Current < 10 A and press the reset switch	3	ON
		Major	Level1 current ≥ 200 A	60	OFF	Current < 10 A and press the reset switch	3	ON
13	Over current protection (discharge)	Major	Level4 current ≥ 600 A	1	OFF	Current < 10 A and press the reset switch	3	ON
		Major	Level3 current ≥ 540 A	10	OFF	Current < 10 A and press the reset switch	3	ON
		Major	Level2 current ≥ 495 A	30	OFF	Current < 10 A and press the reset switch	3	ON
		Major	Level1 current ≥ 470 A	60	OFF	Current < 10 A and press the reset switch	3	ON
14	Communication lost (module ↔ cabinet)	Major	No communication	30	OFF	Communication reestablished and press the reset switch	-	ON
15	Communication lost (cabinet ↔ system)	Minor	No communication	30	ON	Communication reestablished and press the reset switch	-	ON
16	SW failure - battery breaker	Minor	Battery breaker OFF and current ≥ 2.4 A	3	ON	(Battery breaker OFF and (current < 2.4 A) and press the reset switch	-	ON
17	SW sensor failure - battery breaker	Minor	Battery breaker contact ON = battery breaker trip ON	3	ON	(Battery breaker contact \neq battery breaker trip) and press the reset switch	-	ON

13. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 13 Battery Modules (Continued)

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹⁴	Release condition	Time (sec)	Battery breaker status
18	Current sensing error	Minor	No communication with Current IC	3	ON	Communication with current IC OK	-	ON
19	Fuse failure	Minor	Fuse blown	10	ON	Fuse ON and press the reset switch	-	ON

14. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 10 Battery Modules

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹⁵	Release condition	Time (sec)	Battery breaker status
1	Over voltage protection - cell	Major	Max cell ≥ 4.28 V	5	OFF	Max cell < 4.25 V and press the reset switch	5	ON
2	Under voltage protection - cell	Major	Min cell ≤ 2.5 V	3	OFF	Min cell > 2.70 V and press the reset switch	3	ON
3	Over voltage protection - cabinet	Major	Cabinet voltage ≥ 342.4 V	5	OFF	Cabinet voltage < 340 V and press the reset switch	5	ON
4	Under voltage protection - cabinet	Major	Cabinet voltage ≤ 200 V	3	OFF	Cabinet voltage > 216 V and press the reset switch	3	ON
5	Cabinet cell voltage imbalance	Major	$\Delta V_{cell} \geq 500$ mV	5	OFF	$\Delta V_{cell} \geq 50$ mV	5	ON
6	Module cell voltage imbalance	Major	$\Delta V_{cell} \geq 90$ mV	5	OFF	$\Delta V_{cell} \geq 30$ mV	5	ON
7	Voltage sensing error (cabinet)	Minor	$ \text{Cabinet V} - \text{cell sum V} \geq 24$ V	10	ON	$ \text{Cabinet V} - \text{cell sum V} < 12$ V and press the reset switch	3	ON
8	Voltage sensing error (module)	Minor	$ \text{Module V} - \text{cell sum V} \geq 190$ mV	5	ON	$ \text{Module V} - \text{cell sum V} < 190$ mV and press the reset switch	3	ON
9	Over temperature protection	Major	Max temp ≥ 75 °C (167 °F)	3	OFF	Max temp < 65 °C (149 °F) and press the reset switch	3	ON
10	Under temperature protection	Minor	Min temp ≤ 0 °C (32 °F)	3	ON	Min temp > 5 °C (41 °F) and press the reset switch	3	ON
11	Temperature imbalance	Major	Max cell T - min cell T ≥ 40 °C (104 °F)	30	OFF	Max cell T - min cell T < 20 °C (68 °F) and press the reset switch	3	ON
12	Over current protection (charge)	Major	Level2 current ≥ 250 A	2	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level1 current ≥ 200 A	60	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
13	Over current protection (discharge)	Major	Level4 $ \text{current} \geq 600$ A	1	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level3 $ \text{current} \geq 540$ A	10	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level2 $ \text{current} \geq 495$ A	30	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
		Major	Level1 $ \text{current} \geq 470$ A	60	OFF	$ \text{Current} < 10$ A and press the reset switch	3	ON
14	Communication lost (module ↔ cabinet)	Major	No communication	30	OFF	Communication reestablished and press the reset switch	-	ON
15	Communication lost (cabinet ↔ system)	Minor	No communication	30	ON	Communication reestablished and press the reset switch	-	ON
16	SW failure - battery breaker	Minor	Battery breaker OFF and $ \text{current} \geq 2.4$ A	3	ON	(Battery breaker OFF and $ \text{current} < 2.4$ A) and press the reset switch	-	ON
17	SW sensor failure - battery breaker	Minor	Battery breaker contact ON = battery breaker trip ON	3	ON	(Battery breaker contact \neq battery breaker trip) and press the reset switch	-	ON

15. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

Protection Protocol for Battery Cabinet with 10 Battery Modules (Continued)

No	Item	Level	Set condition	Software set time (sec)	Battery breaker status ¹⁶	Release condition	Time (sec)	Battery breaker status
18	Current sensing error	Minor	No communication with Current IC	3	ON	Communication with current IC OK	-	ON
19	Fuse failure	Minor	Fuse blown	10	ON	Fuse ON and press the reset switch	-	ON

16. The battery breaker status will switch from ON to OFF within three seconds after the software set time.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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