Panduit UPS

User Manual v3.5

Uninterruptible Power Supply (UPS)
and External Battery Pack (EBP)

1-3KVA (SINGLE PHASE) LITHIUM-ION & VRLA

Table of Contents

Section 1 – System Overview

The Panduit UPS units in this manual are line interactive or true on-line double conversion systems that deliver highly efficient and reliable power protection for your computer, IT, communications, and automatic equipment. These units have high electrical performance, intelligent monitoring, and network functionality to properly monitor and condition the world's power anomalies (power failures, power sags, power surges, under-voltages, over-voltages, electrical line noises, frequency variations, switching transients, and harmonic distortion).

Each UPS comes equipped with a color display and has multiple options for interfacing with the unit. The UPS is standardly equipped with a network card for remote network monitoring, control, and configuration. The UPS may be optionally ordered without a network card. Additionally, a Network Card or a Dry Contact Relay Card may be ordered as accessories.

These UPS units support Li (Lithium-Ion) or VRLA (Valve Regulated Lead-acid) batteries as the backup power storage system. The UPS topology of these units is either on-line double conversion with a built-in economy (ECO) mode or line interactive.

The on-line double conversion topology supplies the best power conditioning by recreating a true sinewave on the UPS outputs. The on-line double conversion topology converts the input AC power to DC power and then regenerates the AC power on the UPS outputs. This double conversion allows the UPS to eliminate the inconsistencies in the input power provided by the utility company. The UPS may be optionally switched to ECO mode to increase the unit's efficiency when the input power is known to be stable (requires minimal conditioning).

The line interactive architecture supplies good power conditioning by monitoring the input and adjusting the UPS outputs. Like the double conversion topology, line interactive topology allows the UPS to eliminate most inconsistencies in the input power provided by the utility company. The line interactive topology compensates for power failures, power sags, power surges, under-voltages, over-voltages, electrical line noises, switching transients, and harmonic distortion on the input AC power. However, the line interactive topology does not compensate for frequency variations. The line interactive UPS provides good power conditioning with an increased efficiency.

Key Features

- **Integrated data center solution** – All VRLA and some Lithium-Ion UPS units integrate with multiple External Battery Packs (EBP), offering an excellent choice for data center deployment.
- **Easy to Maintain** – Most UPS units support hot swappable battery cartridges. All UPS double conversion units support options to switch to a bypass state.
- **Long Lasting** – UPS units are available with Lithium-Ion battery cartridges for extended battery life.
- **Reliable** - All UPS units are controlled by Digital Signal Processors (DSPs) which increases reliability, performance, self-protection, and self-diagnostics.
- **User Friendly Color Display with Color Status LEDs** - allow the user to easily set operational parameters and get UPS status.
- **Intelligent Monitoring Function** – UPS units are standardly equipped with a Network card for remotely controlling and monitoring the UPS via a user-friendly Web Interface.
- **Load Shedding** – All UPS units with outlets have one or two controllable outlet groups may be used to shed non-critical loads while on battery backup. All UPS units with a network card have the capability to gracefully shut down smart loads.
- **EPO Function** - All UPS units are equipped with an Emergency Power Off (EPO) interface to turn OFF the UPS output via a remote dry contact switch.

Basic Operations

The basic operations of a double conversion UPS are explained through the high-level generic block diagram in Figure 1. The generic diagram is only used for a simple high-level explanation of the UPS working modes and operating states. This block diagram is not the actual block diagram of the UPS units.

The basic operations of a line Interactive UPS are explained through the high-level generic block diagram in Figure 2. The generic diagram is only used for simple high-level explanation of the UPS working modes and operating states. This block diagram is not the actual block diagram of the UPS units.

Double Conversion Overview

The UPS input is connected to an AC power source via an input plug. The output is connected to loads via outlets on the UPS. The load may be powered from the input source (directly or through the rectifier/inverter) or the battery (through the inverter). The UPS power-switching circuitry may be isolated from the power chain while continuing to power the load (ECO Mode or bypass state). The following UPS Modes and UPS States sections use the simplified block diagram to help explain the modes and states of the UPS.

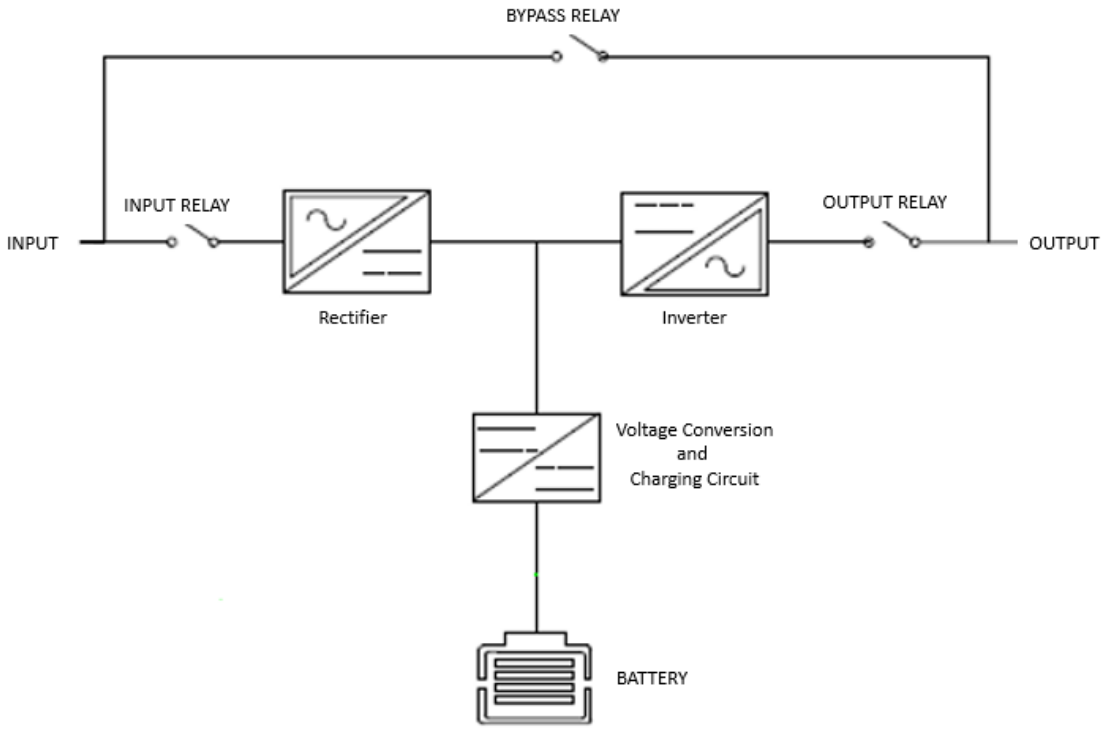


Figure 1: High-Level Generic Double Conversion UPS Block Diagram

Line Interactive Overview

The UPS input is connected to an AC power source via an input plug. The output is connected to loads via outlets on the UPS. The load may be powered from the input source (through the Automatic Voltage Regulation (AVR) – boost/buck circuitry) or the battery (through the inverter). The following block diagram explains the UPS Modes and UPS States described in the sections below.

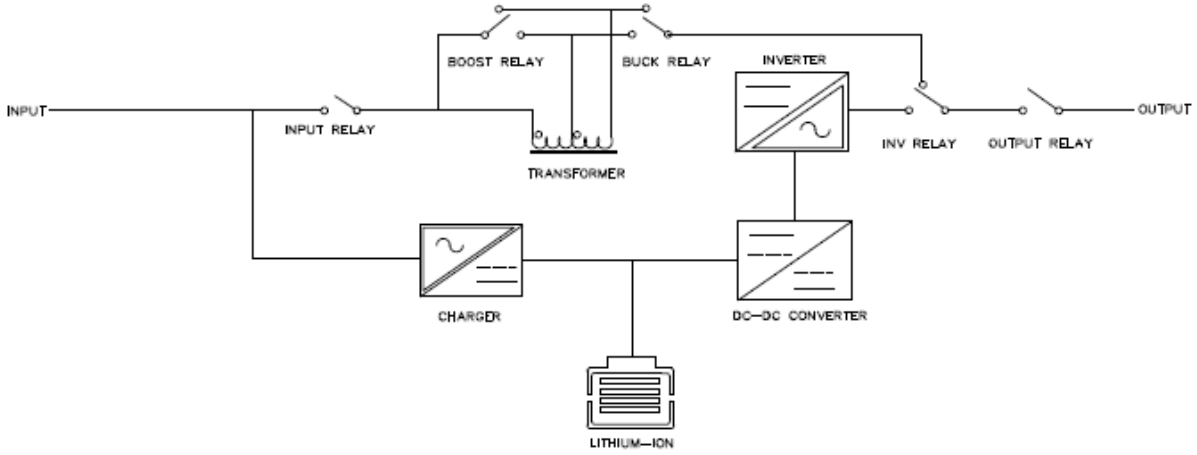


Figure 2: High-Level Generic Line Interactive UPS Block Diagram

UPS Modes

The double conversion UPS may be configured into four different working modes. The line interactive UPS may be configured into two different working modes. This section explains these settable working modes. The UPS working mode is manually configured into the UPS at setup time. The selected mode will become the Default state of the UPS until the working mode is manually changed.

Normal Mode

Double Conversion

Normal mode is the default working mode of the double conversion UPS units. When the UPS is operating in Normal mode, it provides a stable pure sinusoidal AC power output and charges or maintains the charge on the battery. In Normal mode, the input and output relays are closed, and the bypass relay is open. The rectifier/charger derives power from the AC Input and supplies DC power to the inverter while simultaneously charging or maintaining the charge on the battery. The inverter inverts the DC power to AC power and supplies it to the load with a stable pure sinusoidal AC waveform.

If the input power is lost or has anomalies outside of the set ranges while the UPS is operating in Normal mode:

- The batteries will stop charging (input relay will open)
- The bypass relay will remain open
- The output relay will remain closed
- The battery will start providing the DC power to the DC to AC inverter, continuing to provide uninterrupted AC power to the load

The UPS is now in the Battery state and will indicate an alarm; the UPS will continue to provide power to the load for a limited time (runtime of the battery backup system connected to the UPS for the percentage of load connected).

If an internal or an external output power event occurs while operating in Normal mode:

- The input relay may open (depending on the internal event)
- The output relay will open
- The bypass relay will close (assuming the input is not outside of the input bypass range), continuing to provide minimally conditioned AC power to the load.

The UPS is now in the Bypass state and will indicate an alarm. Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

Note: This unit does have short-circuit protection but only when power is being provided to the load through the inverter. If the unit is in ECO mode or in the bypass state when a short-circuit occurs on the output of the UPS, the UPS unit may be damaged.

Line Interactive

Normal mode is the default working mode of the line interactive UPS units. When the UPS is operating in Normal mode it provides a stable AC power output. The battery is always being charged or maintained if there is input power within range. In Normal mode, the input and output relays are closed, and the INV relay is switched away from the inverter. In this state the input power is filtered and provided directly to the load. If the input voltage is surging or sagging, the UPS will transition to the AVR state. In the AVR state, if the input voltage needs to be increased, the boost and buck relays will be in the boost position (up). If the input voltage needs to be decreased, the boost and buck relays will be in the buck position (down).

If the input power is lost or has anomalies outside of the set ranges while the UPS is operating in Normal mode, the INV relay will switch to the inverter and the battery will continue to provide uninterrupted AC power to the load through the inverter. The UPS is now in the Battery state; the UPS will continue to provide power to the load for a limited time (runtime of the battery backup system connected to the UPS for the percentage of

load connected).

If an internal or an external output event occurs while operating in Normal mode, the input relay remains closed, the INV relay may switch to the inverter (depending on the internal or external event), and the output relay may open (depending on the internal or external event). Power may be lost to the load. Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

Note: This unit does have short-circuit protection but only when power is provided to the load through the inverter (from the battery). If the unit is in Bypass mode when a short-circuit occurs on the output of the UPS, the UPS unit may be damaged.

ECO Mode

This mode is only supported on the on-line double conversion UPS units. When the UPS is in Normal mode and the power requirements for the load are not critical and the input source is stable (no power anomalies), the UPS may be set to Energy Savings (ECO) mode to increase the efficiency of the power supplied through the UPS. In ECO mode, all voltage increases and decreases will be passed along to the load. Additionally, any frequency variations on the input will get passed on to the load. When the UPS is manually configured for ECO mode, the output relay opens, and the bypass relay closes. The input relay remains closed, continuing to keep the backup batteries charged. When the UPS is in ECO mode, the source power is minimally conditioned.

If the input power is lost while the UPS is operating in ECO mode:

- The batteries will stop charging (input relay will open)
- The bypass relay will open
- The output relay will close
- The battery will start providing DC power to the DC to AC inverter, continuing to provide uninterrupted AC power to the load.

The UPS is now in the Battery State. When the UPS is operating in ECO mode, if the input power has any anomaly (power sags, power surges, under-voltages, over-voltages, electrical line noises, frequency variations, switching transients, and harmonic distortion) that are outside of the bypass set ranges:

- The input relay will remain closed (continuing to charge the battery – assuming the anomaly is still within the operating range of the UPS)
- The bypass relay will open
- The output relay will close
- The rectifier will start providing the DC power to the DC to AC inverter, continuing to provide uninterrupted AC power to the load.

The UPS is now in the Normal state. If the anomaly is outside of the UPS operating range, then the UPS will transition to the Battery state. Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

If an internal or an external output event occurs while operating in ECO mode, the bypass relays will open, the input relay will open, and the output will shut down. AC power to the load will be lost.

Note: This unit does have short-circuit protection but only when power is being provided to the load through the inverter. If the unit is in ECO mode or in the bypass state when a short-circuit occurs on the output of the UPS, the UPS unit may be damaged.

Convert Frequency (CF) Mode

This mode is only supported on the on-line double conversion UPS units. The UPS may be set to CF mode to increase the allowable input frequency range of the UPS while maintaining the desired output frequency. Setting the UPS to CF mode requires the UPS unit to be derated. The 1-3kVA UPS units in CF mode are derated to 80% of the maximum output but will maintain a 50Hz output frequency with an input frequency from 46Hz to 54Hz, or a 60Hz output frequency with an input frequency from 56Hz to 64Hz. When CF mode is set, the Bypass state is automatically disabled (the unit cannot switch to the Bypass state under any conditions, and frequency conversion is not supported through the bypass path).

If the input power is lost or has any anomalies outside of the set ranges while the UPS is operating in CF mode:

- The batteries may stop charging (input relay will open)
- The bypass relay will remain open
- The output relay will remain closed
- The battery will start providing DC power to the DC to AC inverter, continuing to provide uninterrupted AC power to the load.

The UPS is now in the Battery state; the UPS will continue to provide power to the load for a limited time (runtime of the battery backup system connected to the UPS for the percentage of load connected). Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

If an internal or an external output event occurs while operating in CF mode, the output relay will open and the output will shut down, AC power to the load will be lost.

Generator Mode

Double Conversion

The UPS may be set to Generator mode to enable the UPS to have a wider input frequency range (40Hz to 70Hz). Setting the double conversion UPS to Generator mode requires the UPS unit to be derated. The 1-3kVA double conversion UPS units in Generator mode are derated to 75% of the maximum output but will maintain a 50Hz or 60Hz output frequency over the full input frequency range.

Note: The Generator mode is not saved on the 1-3kVA UPS units; when the 1-3kVA UPS unit is powered OFF and restarted, the units will restart in Normal mode.

If the input power is lost or has input anomalies outside of the operating range of the UPS while the UPS is operating in Generator mode:

- The batteries will stop charging (input relay will open)
- The bypass relay will remain open
- The output relay will remain closed, and the battery will start providing the DC power to the DC to AC inverter, continuing to provide uninterrupted AC power to the load.

The UPS is now in the Battery state; the UPS will continue to provide power to the load for a limited time (runtime of the battery backup system connected to the UPS for the percentage of load connected).

If an internal or an external output event occurs while operating in Generator mode, the input and output relays open and the bypass relay closes (assuming the input is not outside of the input bypass range), continuing to provide unconditioned AC power to the load.

The UPS is now in the Bypass state with no frequency or voltage conditioning. Output frequency and voltage will equal input frequency and voltage. Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

Line Interactive

The UPS may be set to Generator mode to enable the UPS to have a wider input frequency range (40Hz to 70Hz). Setting the line interactive UPS to Generator mode will not require the UPS unit to be derated. The 1-3kVA line interactive UPS units do not perform frequency conversion. The output frequency will be the same as the input frequency.

Note: The Generator mode is not saved on the 1-3kVA UPS units; when the 1-3kVA

UPS unit is powered OFF and restarted, the units will restart in Normal mode.

If the input power is lost or has input anomalies outside of the operating range of the UPS while the UPS is operating in Generator mode:

- The input relay will open
- The INV relay will switch to inverter
- The output relay will remain closed
- The battery will start providing DC power to the DC to AC inverter, continuing to provide uninterrupted AC power to the load.

The UPS is now in the Battery state. The UPS will continue to provide power to the load for a limited time (runtime of the battery backup system connected to the UPS for the percentage of load connected).

If an internal or an external output event occurs while operating in Generator mode, the input relay may open (depending on the internal fault) and the INV relay will switch to inverter (depending on the external fault), continuing to provide conditioned AC power to the load.

The UPS is now in the Battery state. The UPS will continue to provide power to the load for a limited time (runtime of the battery backup system connected to the UPS for the percentage of load connected). If the external fault is an overload, the output replay will open and power to the load will be lost. Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

Note: This unit does have short-circuit protection but only when power is being provided to the load through the inverter. If the unit is in Generator mode or in the bypass state when a short-circuit occurs on the output of the UPS, the UPS unit may be damaged.

UPS States

The UPS automatically transitions to different states based on internal or external events; the user may also force the UPS into some states through one of the user interfaces. There are eight different states that the UPS may be in. Refer to **Appendix C: State Transitions Based on External Events** for State Transitions based on input/output events.

Normal State

The UPS will go into the normal state when the UPS is set to Normal Mode at setup time. This is the default mode and state that the UPS will power up in on new units from the factory. If the UPS is set for Normal Mode, the Normal state is the default state where the UPS will return to after the internal or external event has been cleared or the

forced state has expired.

If an internal or external event occurs while operating in the normal state, the UPS will automatically transition to battery, bypass, fault, or battery test state depending on the event.

ECO State

The UPS will go into the ECO state when the UPS is set to ECO Mode at setup time. If the UPS is set for ECO Mode, the ECO state is the default state where the UPS will return to after the internal or external event has been cleared or the forced state has expired.

If an internal or external event occurs while operating in the ECO state, the UPS will automatically transition to battery, fault, or battery test state depending on the event.

CF State

The UPS will go into CF state when the UPS is set to CF Mode at setup time. If the UPS is set for CF Mode, the CF state is the default state where the UPS will return to after the internal or external event has been cleared or the forced state has expired.

If an internal or external event occurs while operating in the CF state, the UPS will automatically transition to battery, bypass, fault, or battery test state depending on the event.

Gen State

The UPS will go into Gen state when the UPS is set to Generator Mode at setup time. If the UPS is set for Generator Mode, the Gen state is where the UPS will return to after the internal or external event has been cleared or the forced state has expired.

If an internal or external event occurs while operating in the Gen state, the UPS will automatically transition to battery, bypass, fault, or battery test state depending on the event.

AVR State

This state is only supported on the line interactive UPS units. The UPS automatically transitions to the Automatic Voltage Regulation (AVR) state when the input voltage goes outside of the set input voltage range (refer to **Appendix C: State Transitions Based on External Events**). The UPS will automatically return to the default state when the input source recovers.

If an internal or external output event occurs while operating in the AVR state, the UPS will transition to the Battery state and continue to provide power to the load for a limited time (until the battery hits its EOD).

Battery State

The UPS automatically transitions to the battery state with no power interruption to the load when input power is out of the operating range or power is lost. The UPS will automatically return to the default state when the input source recovers.

If an internal or external output event occurs while operating in the battery state, the output will shut down. AC power to the load will be lost.

Bypass State

The UPS may automatically transition to the bypass state with no power interruption when an internal or an external output event occurs (depending on the event). The UPS may also be set to the bypass state by turning the inverter OFF, but the input voltage and frequency must be within the specified upper and lower limits of the bypass as specified during the UPS setup. For 1-3kVA UPS units, press the ON/OFF button on the Front Panel Display to turn off the inverter and force the UPS into the bypass state. While the UPS is in the bypass state, the source power is not fully conditioned as in the Normal, CF, or Gen state; most variations in frequency and voltage will get passed on to the load.

If another internal or an external output event occurs while operating in the bypass state, the UPS will transition to the Fault state, and the output will shut down. AC power to the load will be lost.

Fault State

The UPS automatically transitions into the fault state when the UPS is unable to provide power to the load. The input, output, and bypass relays will all open. If the fault clears, the UPS should transition back to the Default state (depending on the fault that is cleared).

Battery Test State

The UPS may be manually or automatically put into the battery test state, but the UPS will automatically transition back to the default state when the test is complete. The battery test will automatically run when the UPS is powered ON and periodically while the unit is operating. The battery test may also be manually executed at any time. The frequency and duration of the battery test may have an impact on the battery life. All battery tests are preset for a duration of 10 seconds. The user can select the frequency of the test. The battery test may be automated through the network card on all 1-3kVA UPS units.

The 1-3kVA UPS does not go into the battery state when the battery test is run. The UPS stays in the default state for powering the load, but the battery charger is turned OFF and the battery discharges for 10 seconds through an internal load. If the battery is

damaged or disconnected, the UPS presents a No Battery Alarm, which means the user should replace the battery or check the battery connection. The UPS will automatically turn the battery charge back ON when the battery test completes.

UPS Physical Features and Accessories

The following sections provide an overview of the human and electrical interfaces on the UPS unit. All UPS units are rack mountable with a display on the front side of the unit.

Physical Features

UPS Front Panel

The UPS Front Panel for all 1-3kVA Models are the same. Air flow vents occupy ¾ of the front panel and a display module occupies the left ¼ of the front panel. The front panel display module contains four status LEDs, a 2.8-inch segmented color display and four function buttons.

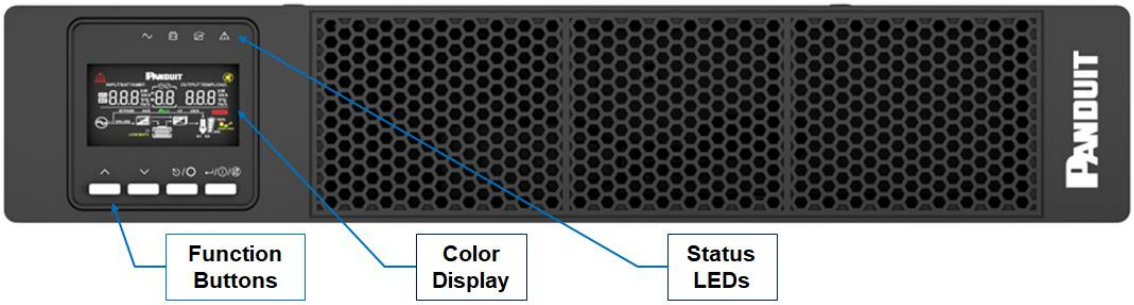


Figure 3: 1-3kVA UPS Front Panel

Air Flow Vents

The air flow vents are critical to the operation of the UPS unit. These vents must remain clean and clear of all objects that may restrict the air flow through the UPS unit.

Status LEDs

Each unit has four Status LEDs, Normal LED (green), Battery LED (yellow), Bypass LED (blue), and Alert LED (red/yellow). These LEDs provide a quick high-level view of the unit's operating conditions. Refer to **UPS Front Panel** section for further details.

Color Display

The unit has a 2.8-inch segment color display. This display is used for monitoring, control, and configuration. The display may be manually rotated to the orientation of the unit. Remove the UPS faceplate, rotate the screen ¼ turn and then reinstall the UPS faceplate.

Function Buttons

The UPS has four function buttons, the UP button, the DOWN button, the CANCEL/OFF button, and the ENTER/ON/MUTE button. These buttons are used to navigate the Monitor and the Setup screens, used to change settings, used to turn ON/OFF the UPS and used to mute/unmute the audio alerts.

UPS Rear Panel

The rear panel varies based on the model of the UPS unit. Refer to the UPS Physical Feature call out table and the Model specific figures in this section for details. The rear panels of models may change, refer to the Customer Drawing for the latest view of the rear panel of a specific UPS unit.

Input Power Cord (INPUT)

Each UPS Model may have a unique power input connector, labeled **INPUT** on the back of the unit. Refer to the corresponding Product Specification Sheet for detailed definition.

Input Circuit Breaker (BREAKER)

All UPS units have an input circuit breaker to protect form overload conditions, labeled **BREAKER** with a line to the input interface on the back of the unit. Refer to the corresponding Customer Documentation for details.

Output Receptacles

Each UPS Model has unique groups of power output connectors, labeled **GROUP 1** and **GROUP 2**. The figures in this section show output receptacle types per SKU. Refer to the corresponding Product Specification Sheet for latest detailed definition.

EBP Connection (+ xxVDC -)

Each VRLA UPS unit and Long Runtime Lithium-Ion UPS units have an External Battery Pack (EBP) power connection, labeled with **+ 24VDC -**, **+ 36VDC -**, **+ 48VDC -**, or **+ 72VDC –** on the back of the unit. These UPS Models have been calibrated to a specific EBP and EBP Operating Voltage. The VRLA EBP units are not interchangeable between UPS units with different KVAs.

Note: The interchangeability restriction does not apply to Long Runtime Li UPS units that support an EBP.

Intelligent Slot (INTELLIGENT SLOT)

UPS units can be standardly equipped with a Network Management Card installed in the intelligent slot, labeled **INTELLIGENT SLOT**, on the back of the unit. Alternatively, the UPS may be ordered with an empty Intelligent Slot, and later updated to add a UPS Network Management Card or a UPS Relay Card.

Network Surge Protection Ports (RJ45 NET SURGE PROTECTION)

Each UPS unit comes equipped with an internal Network/Fax/Modem Surge protection module, labeled **RJ45 NET SURGE PROTECTION** on the back of the unit. The module includes RJ45 pass-through ports, either port may be used for input or output.

EPO Signal Port (EPO)

Each UPS unit comes equipped with an Emergency Power Off Signal Port, labeled **EPO** on the back of the unit. The UPS comes equipped with a 2-pin plug wired to provide a short that results in normal UPS operation.

CAUTION! IF THE PLUG OR SHORTING WIRE IS REMOVED, THE UPS SYSTEM WILL BE COMMANDED TO SHUT DOWN. IN TYPICAL APPLICATIONS, THE PLUG WILL BE WIRED TO A REMOTE NORMALLY CLOSED DRY CONTACT TO PROVIDE A SHORT FOR NORMAL OPERATION. THE REMOTE DRY CONTACT COULD BE OPENED TO COMMAND THE UPS TO SHUT DOWN IN AN EMERGENCY.

DB9 Coms Port (RS232)

All units have a DB9 equipped with RS232 serial communications port, labeled **RS232** on the back of the unit. This serial port is reserved for UPS core Firmware Update.

USB Coms Port (USB)

All units have a USB serial communications port, labeled **USB** on the back of the unit. This communication port is reserved for “Future Use”.

Chassis Ground Connection Point(s) (⏚)

All units have at least one chassis ground connection, labeled with a ground symbol on the back of the unit. This is used to ground the UPS and EBP chassis to the rack/cabinet. For safety and proper grounding procedures, this grounding connection point must be connected to the rack/cabinet ground. Refer to the UPS Installation Manual for proper connections to this ground.

Output Circuit Breakers (BREAKER)

Some UPS units have output circuit breakers to protect from load overload conditions, labeled with **BREAKER** and a line to the outlet group it protects on the back of the unit. Refer to the corresponding Customer Documentation for details.

EBP Communication Port (EBP COM)

The 1-3 kVA Long Runtime Lithium UPS units have a port labeled EBP COM to connect a communications cable (RJ45) from the UPS to the EBP for battery management system (BMS) communication, monitoring, and control. This cable is required for the EBP to function.

1 to 3kVA 1-Phase UPS Physical Feature Call Out Table:

1. Input Power Cord	5. Intelligent Slot	9. USB Communications
2. Input Circuit Breaker	6.Net Surge Protection Ports	10. Chassis Ground Point
3. Output Receptacles	7. EPO Signal Port	11. Output Circuit Breakers
4. EBP Power Connection	8. RS232 Communication	12. EBP Communication Port (RJ45)

Note: This table applies to all the rear panel images below.

1kVA North America Model Rear Panels (U01x11V / U01x13V / U01x11L / U01x14L / U01N16L-N)

The 1kVA North American (NA) UPS units have a permanently connected input power cord with a NEMA 5-15 plug. These units have two groups of outlets. Group 1 (4x 5-15R) outlets are the main outlets that are not switchable. These outlets should contain critical loads. Group 2 (2x-4x 5-15R, model dependent) are switchable outlets. These outlets could contain non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

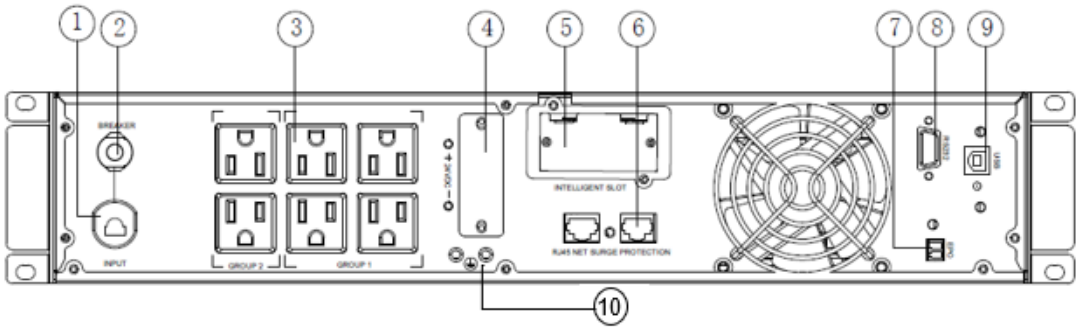


Figure 4: 1kVA VRLA NA Rear Panel View (U01x11V & U01x13V)

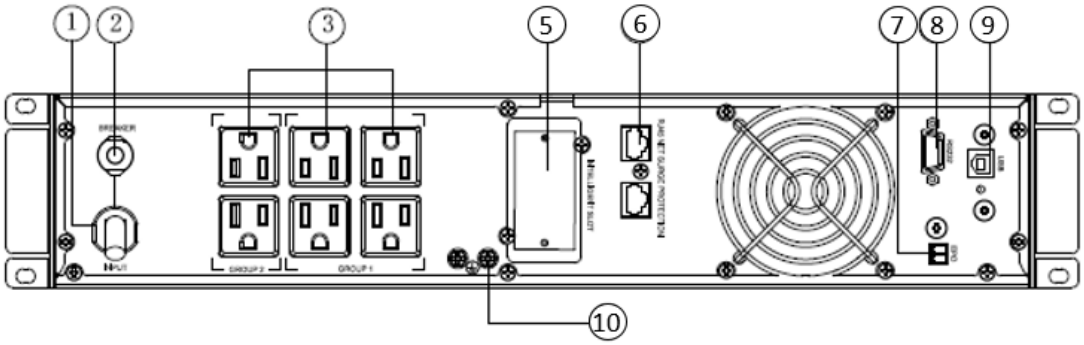


Figure 5: 1kVA Li Line-Interactive NA Rear Panel View (U01x11L)

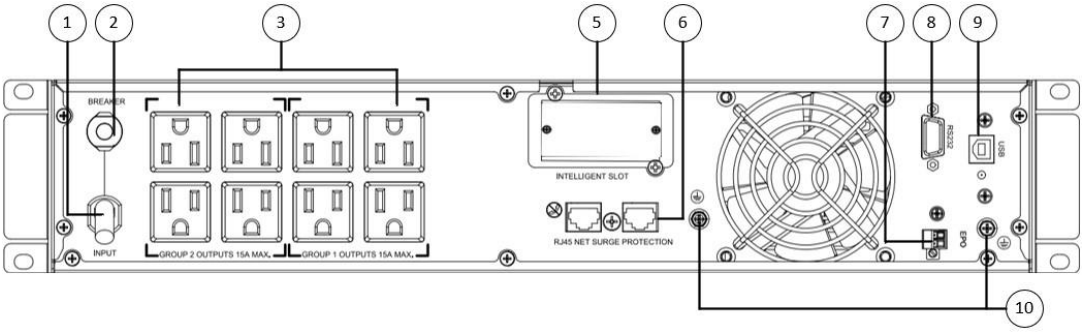


Figure 6a: 1kVA Li Double Conversion NA 120V Rear Panel View (U01x14L)

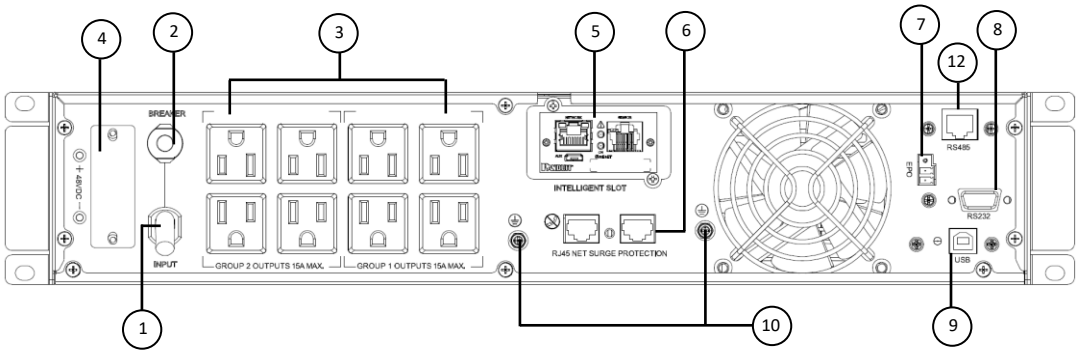


Figure 7b: 1kVA Li Double Conversion Long Runtime NA 120V Rear Panel View (U01N16L-N)

2kVA and 1.5kVA North America Model Rear Panels (U02x11V / U02x11L / U02x14L / U02N16L-N)

The 2kVA VRLA and Li Double Conversion units have a permanently connected input power cord with a NEMA 5-20P plug. The 1.5kVA Li Line Interactive unit has a permanently connected input power cord with a NEMA 5-15P plug. These units have two groups of outlets. For the 2kVA Double Conversion UPS units Group 1 (4x 5-20R) outlets are the main outlets that are not switchable, and Group 2 (2x-4x 5-20R, model dependent) are switchable outlets. For the 1.5kVA Li Line Interactive UPS unit Group 1 (4x 5-15R) outlets are the main outlets that are not switchable, and Group 2 (2x 5-15R) are switchable outlets. Group 1 outlets should contain critical loads and Group 2 outlets could contain non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

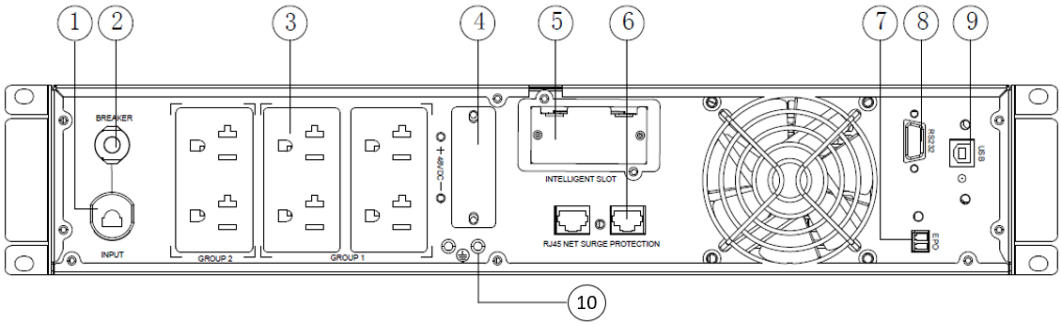


Figure 8: **2kVA VRLA NA Rear Panel View (U02x11V)**

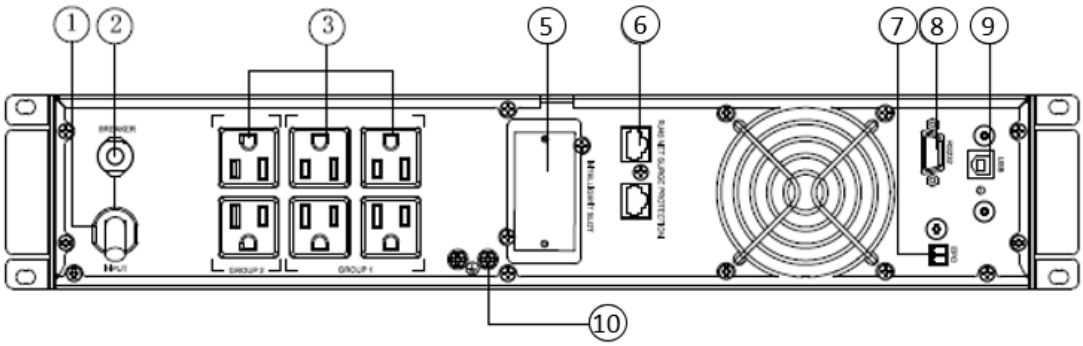


Figure 9: **1.5kVA Li Line-Interactive NA Rear Panel View (U02x11L)**

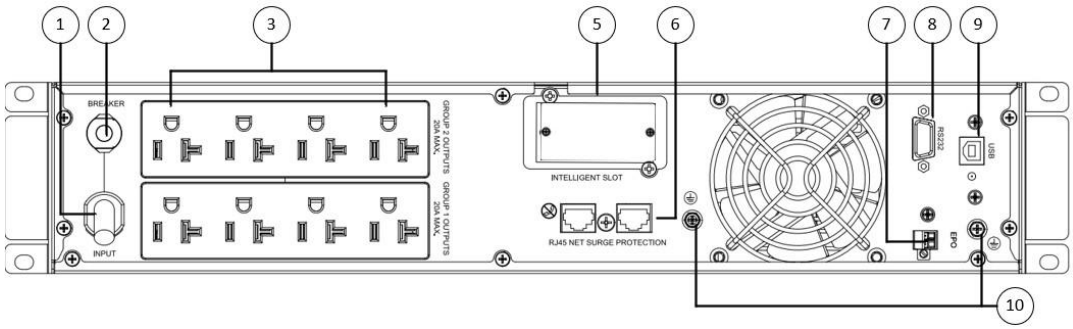


Figure 10a: **2kVA Li Double Conversion NA 120V Rear Panel View (U02x14L)**

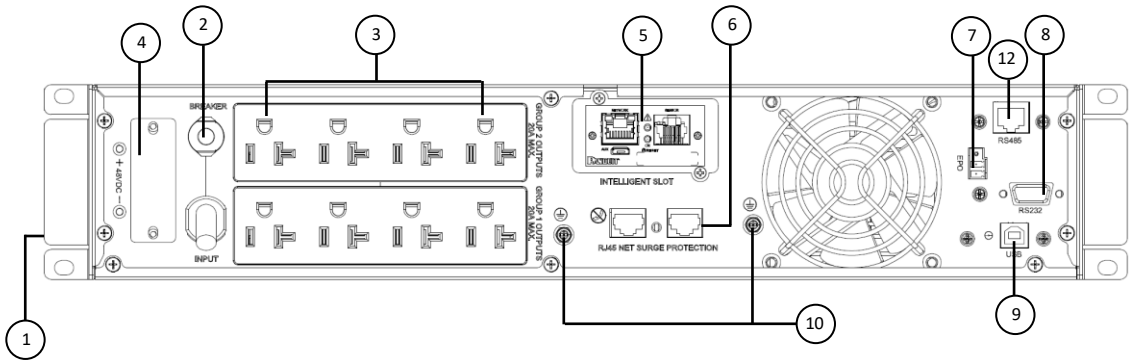


Figure 11b: **2kVA Li Double Conversion Long Runtime NA 120V Rear Panel View (U02N16L-N)**

3kVA North America 120V Model Rear Panels (U03x11V / U03x11L / U03x14L / U03N16L-N)

The 3kVA NA UPS units have a permanently connected input power cord with a NEMA L5-30 plug. These units have two groups of outlets. Group 1 (2x 5-20R and 1x L5-30R) outlets are the main outlets that are not switchable. These outlets should contain critical loads. Group 2 (2x 5-20R) outlets are switchable. These outlets could contain non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

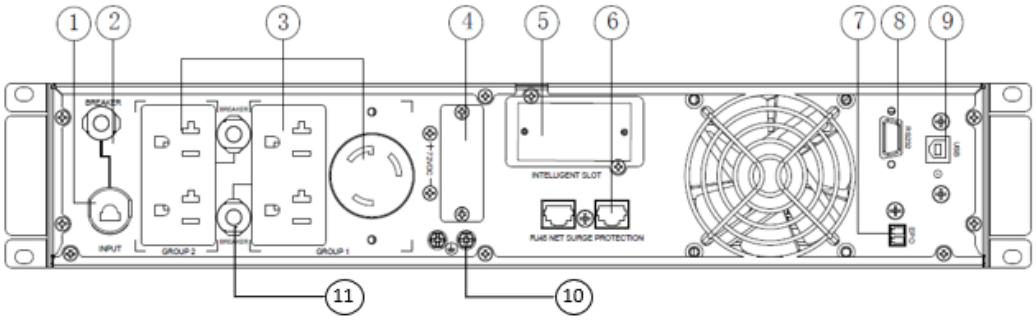


Figure 12: **3kVA VRLA NA Rear Panel View (U03x11V)**

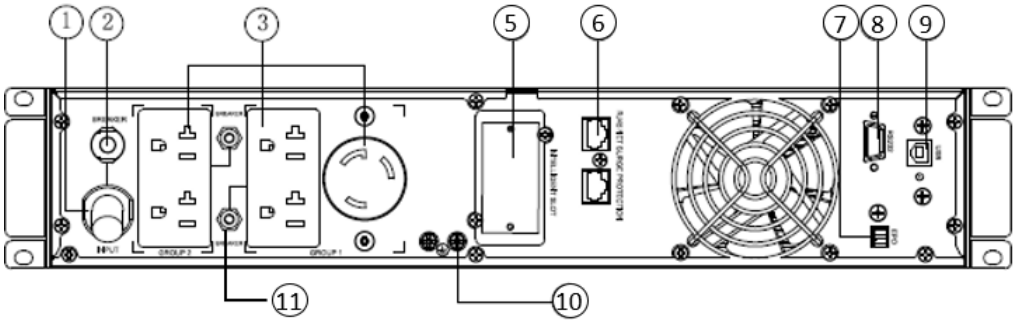


Figure 13: **3kVA Li Line-Interactive NA Rear Panel View (U03x11L)**

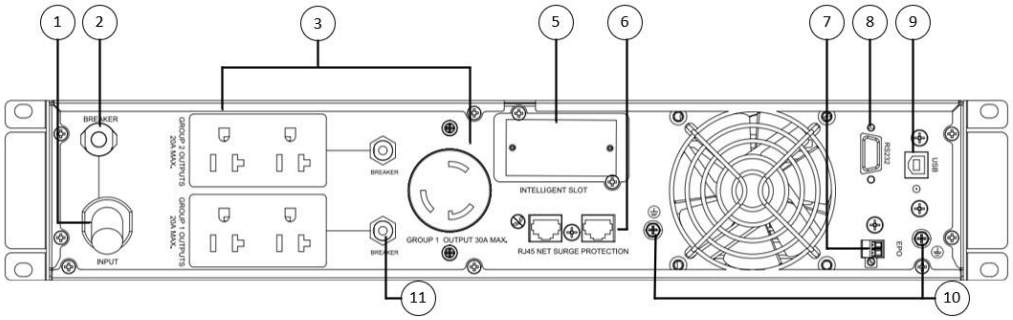


Figure 14a: **3kVA Li Double Conversion NA 120V Rear Panel View (U03x14L)**

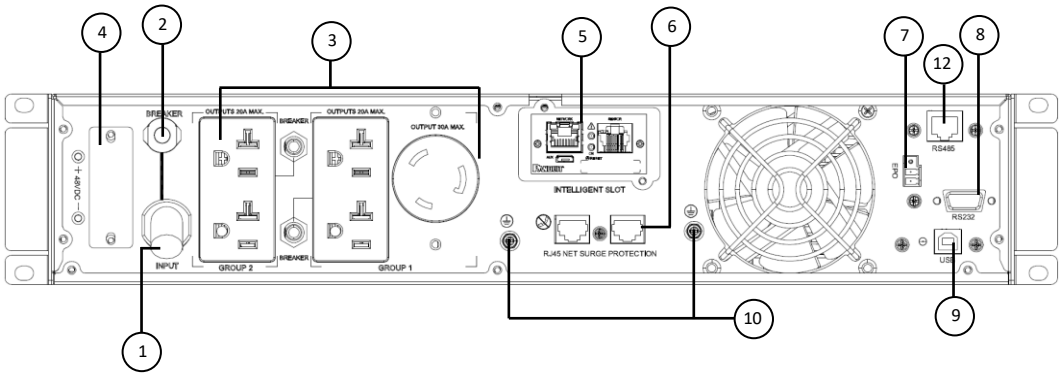


Figure 15b: **3kVA Li Double Conversion Long Runtime NA 120V Rear Panel View (U03N16L-N)**

3kVA North America 208V Model Rear Panels (U03x15L)

The 3kVA NA UPS 208V units have a permanently connected input power cord with a NEMA L6-20 plug. These units have two groups of outlets. Group 1 (1x L6-30R) outlets are the main outlets that are not switchable. These outlets should contain critical loads. Group 2 (2x L6-20R) outlets are switchable. These outlets could contain non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

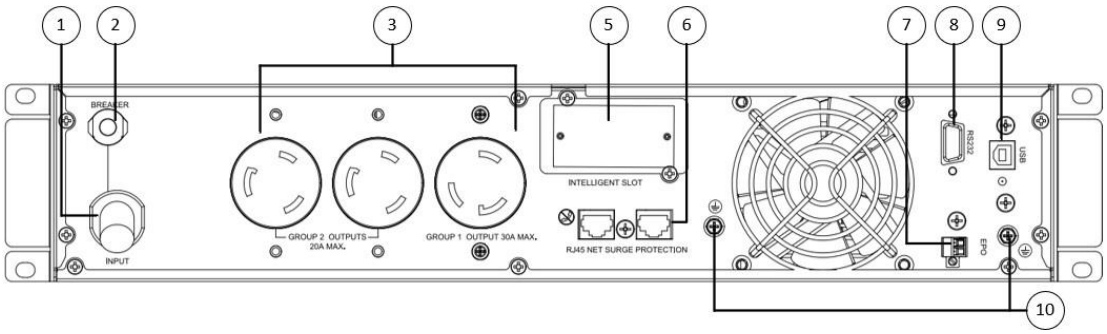


Figure 16: **3kVA Li Double Conversion NA 208V Rear Panel View (U03x15L)**

1kVA Europe Models Rear Panel (U01x12V / U01x12L / U01N18L-N)

The 1kVA European (EU) UPS units ship with two removable power input cords, a Schuko CEE 7/EU1-16P and a BS1363A input plug with a C13 connector on the other end. Either one of these input cords may be plugged into the input C14 plug on the back of the UPS unit. This unit has two groups of outlets. Group 1 (4x C13) is the main non-switchable output. These outlets should contain critical loads. Group 2 (4x C13) are switchable outlets. These outlets could contain non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

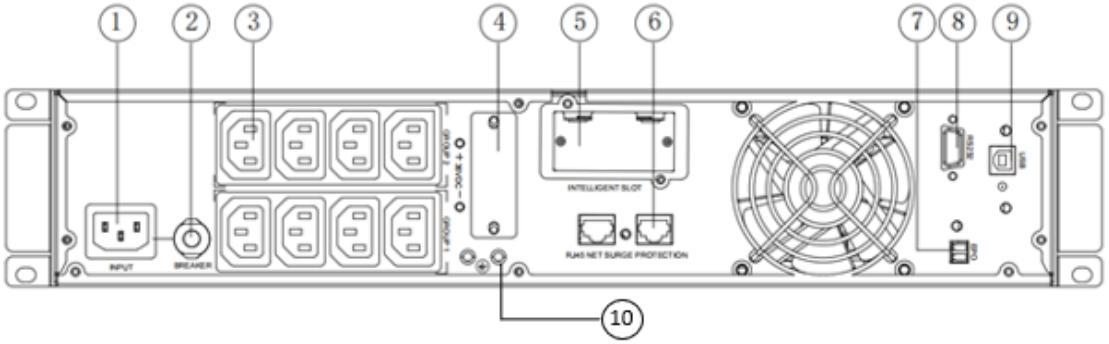


Figure 17a: **1kVA VLRA/Li EU Rear Panel View (U01x12V / U01x12L)**

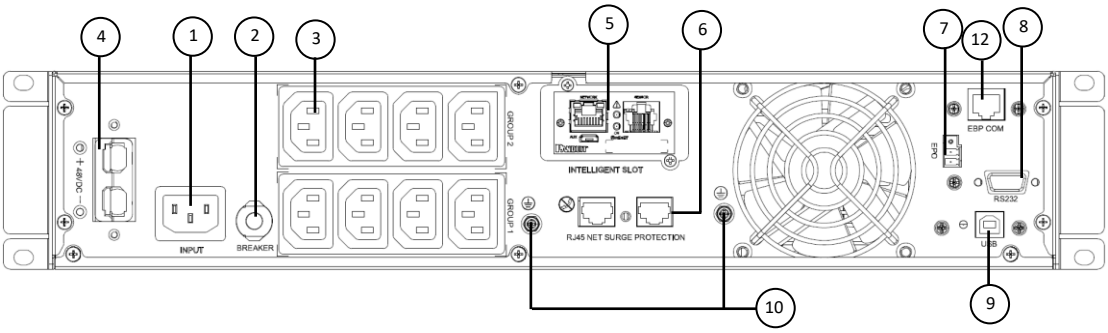


Figure 18b: **1kVA Li Long Runtime EU Rear Panel View (U01N18L-N)**

2kVA Europe Models Rear Panel (U02x12V / U02x12L / U02N18L-N)

The 2kVA EU UPS units ship with two removable power input cords, one with a Schuko CEE 7/EU1-16P and the other with a BS1363A input plug and a C19 connector on the other end. Either one of these input cords may be plugged into the input C20 plug on the back of the UPS unit. This unit has two groups of outlets. Group 1 (4x C13) is the main non-switchable output. These outlets should contain critical loads. Group 2 (4x C13) are switchable outlets. These outlets could contain non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

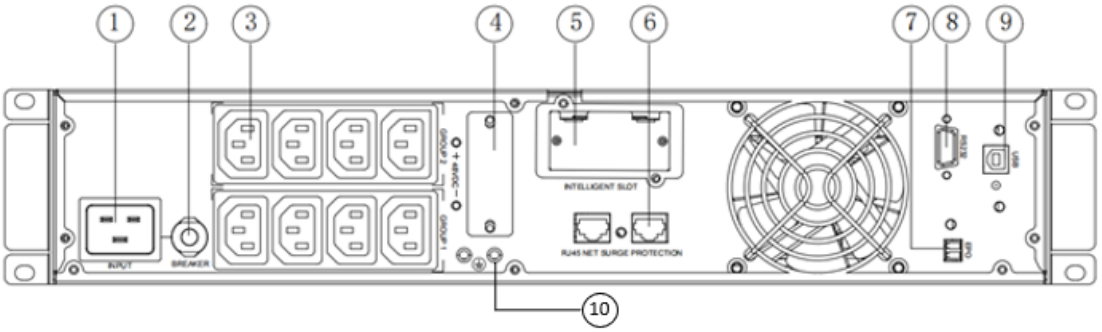


Figure 19a: **2kVA VRLA/Li EU Rear Panel View (U02x12V / U02x12L)**

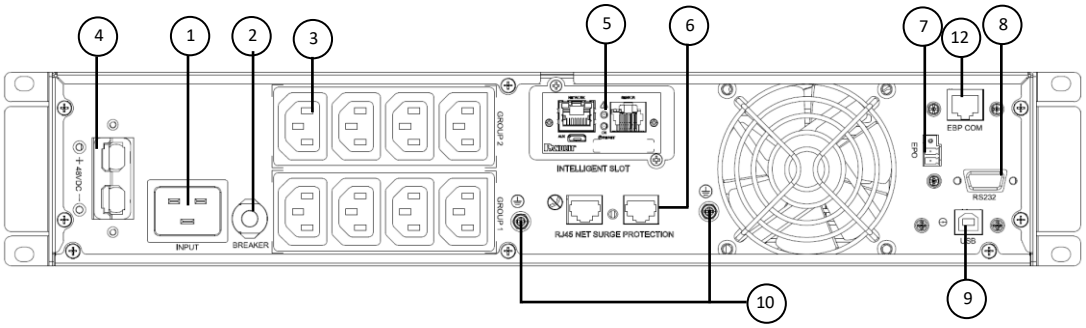


Figure 20b: **2kVA Li Long Runtime EU Rear Panel View (U02N18L-N)**

3kVA Europe Models Rear Panel (U03x12V / U03x12L / U03N18L-N)

The 3kVA EU UPS unit ships with two removable power input cords, one with a Schuko CEE 7/EU1-16P and the other with a BS1363A input plug and a C19 connector on the other end. Either one of these input cords may be plugged into the input C20 plug on the back of the UPS unit. This unit has two groups of outputs. Group 1 (4 xC13 and 1x C19) is the main non-switchable output. These outlets should contain the critical loads. Group 2 (4x C13) are switchable outlets. These outlets could contain the non-critical loads. When the UPS is operating in the battery state, Group 2 outlets may be programmed to turn off earlier to conserve battery capacity for the Group 1 outlets.

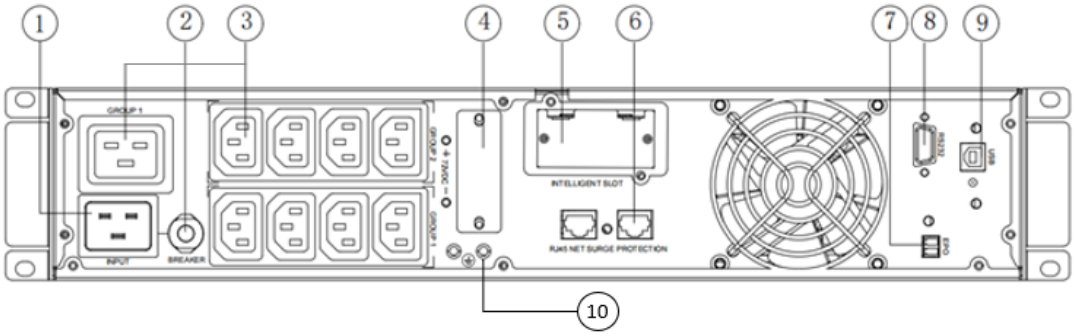


Figure 21a: **3kVA VRLA/Li EU Rear Panel View (U03x12V / U03x12L)**

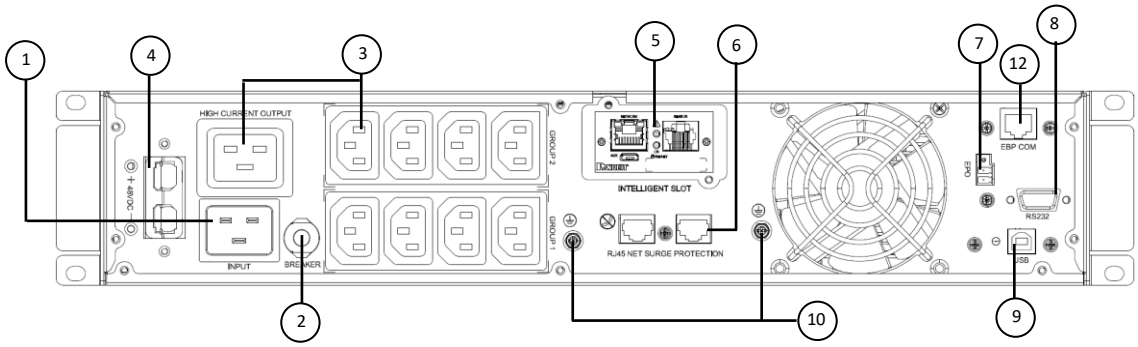


Figure 22b: **3kVA Li Long Runtime EU Rear Panel View (U03N18L-N)**

UPS Accessories

VRLA External Battery Pack [EBP] (UVP024, UVP036, UVP048, UVP072)

Additional VRLA External Battery Packs (EBPs) may be connected to the UPS to extend the runtime of the UPS when operating in the battery state. The single-phase 1-3kVA VRLA UPS units support up to 4 VRLA EBPs.

The single-phase 1-3kVA VRLA UPS units support a 24Vdc, 36Vdc, 48Vdc, or 72Vdc battery pack depending on the UPS part number the VRLA EBP connects to. Each VRLA external battery pack contains two battery cartridges connected in parallel;

therefore, adding one EBP to a VRLA UPS will increase the runtime by at least 3 times. Each battery cartridge holds 2, 3, 4, or 6 12Vdc batteries connected in series depending on the battery cartridge voltage. A total of three wires are connected to the UPS unit from the EBP unit: The positive and negative ends of the battery pack and a ground.

When an additional VRLA EBP is connected to the UPS, the total battery amp hours must be appropriately set. All relevant setting changes may be performed through the WebUI or the Front Panel Display.

Warning! Ensure that the polarities are correctly connected to the UPS unit and to subsequent EBP units. The battery cartridges cannot be mixed. Please use the Panduit recommended battery cartridges sets (P/N UVD024, UVD036, UVD048 or UVD072) for the appropriate EBP. Battery cartridges must be changed in sets. Do not mix old and new battery cartridges.

Battery Cartridge (VRLA & Lithium-ion)

Battery cartridges are the replaceable batteries for the UPS systems. The cartridges come in two different types (VRLA or Lithium-Ion), four different voltages (24V, 36V, 48V and 72V), two different Amp hours (6Ah and 9Ah), and in different sizes (depending on the voltage, Ah, and use). The appropriate battery cartridge or battery cartridge set must be used with the appropriate UPS or EBP unit.

NOTE: Lithium Long Runtime UPS units and corresponding EBPs do ***not*** contain user-replaceable batteries.

UPS Battery Cartridge (UVCxxx, ULCxxx)

The battery cartridge for the UPS units is a single cartridge that has the appropriate voltage and is sized for the specific UPS unit. Panduit recommends changing all the battery cartridges in a system at the same time. Do not mix new battery cartridges with old battery cartridges. If you need to replace the battery cartridge in the UPS, then you should also replace the battery cartridge sets for all EBP units connected to the UPS. The following table provides the battery cartridge part number that must be used with the specific UPS part number.

UPS Battery Type	UPS Unit SKU	Battery Cartridge SKU
VRLA	U01N13V, U01S13V	UVC024
	U01N11V, U01N12V, U01S11V, U01S12V	UVC036
	U02N11V, U02N12V, U02S11V, U02S12V	UVC048
	U03N11V, U03N12V, U03S11V, U03S12V	UVC072
Lithium-ion	U01N11L, U01N12L, U01S11L, U01S12L, U01N14L, U01S14L	ULC024
	U02N11L, U02S11L	ULC048
	U02N12L, U02S12L, U02N14L, U02S14L	ULC272
	U03N11L, U03N12L, U03S11L, U03S12L, U03N14L, U03S14L, U03N15L, U03S15L	ULC372
	U01N16L-N, U01N18L-N, U02N16L-N, U02N18L-N, U03N16L-N, U03N18L-N	N/A

VRLA EBP Battery Cartridge Sets (UVDxxx)

The battery cartridge sets for the VRLA EBP units are a pair of cartridges that have the appropriate voltage and are sized for the specific EBP unit. Panduit recommends changing all the battery cartridges in a system at the same time. Do not mix new battery cartridges with old battery cartridges. That is why the battery cartridges for VRLA EBP units come as a set of two cartridges. The following table provides the battery cartridge set part numbers that must be used with the specific EBP part numbers.

EBP Unit SKU	Battery Cartridge Set SKU
UVP024	UVD024
UVP036	UVD036
UVP048	UVD048
UVP072	UVD072

Lithium-Ion External Battery Pack (UVPL50H)

The Panduit single-phase 1-3kVA Lithium Long Runtime UPS units support a connection with the Panduit 48 Vdc Lithium-Ion external battery pack (UVPL50H). This EBP contains 15 sets of LiFePO4 cells connected in series for a total voltage of 48 Vdc and an energy capacity of 50Ah per EBP.

Note: The Lithium EBP does ***not*** contain replaceable internal cartridges. When a new battery is required, the entire EBP must be replaced. Replacement of the Lithium EBP must be with the same part number.

The EBP Power Cable consists of two power wires (positive and negative) that connect to the UPS unit from the EBP unit and between additional EBP units. Additionally, an RJ45 cable for BMS communication is connected between the EBP COM port on the UPS and a COM port on the rear panel of the EBP.

The front panel of the EBP contains status LEDs indicating the running status, warning alarms, and capacity.

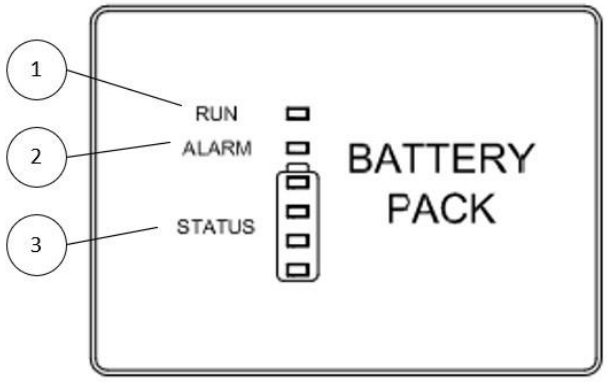


Figure 17: **1-3kVA EBP Front Panel View (UVPL50H)**

1. RUN – displays as green if the EBP is running normally.
2. ALARM – Off when in normal operation. Displays as RED if there is an issue with the EBP or configuration.
3. STATUS – Indicates the charged capacity of the EBP. If the battery is fully charged all four lights will be illuminated with solid green. As a discharged battery becomes charged, these lights will illuminate from the bottom to the top approximating 25% intervals. (0-25%, 26-50%, 51-75%, 76-100%)

UPS Model	Maximum Number of EBPs Supported (per unit)
U01N16L-N, U01N18L-N, U02N16L-N, U02N18L-N, U03N16L-N, U03N18L-N	8

The 1-3kVA Long Runtime Lithium UPS models do NOT include an EBP unit and at least one is required for operation. A total of eight EBP units may be connected to the UPS to extend the runtime when operating in the battery state.

Additional EBPs are connected to the last EBP in the chain through the battery connector as well as the COM and CAN ports to synchronize the controls and BMS systems as shown in Figure 18a. Each EBP includes one RJ45 COM and one RJ45 CAN cable. Each EBP added to the system must have a unique specific ID assigned to it through configuration of the DIP switches labeled ADD on the rear panel (*Ref. Figure 18c*). This DIP switch represents the binary address for the assigned EBP ID number. The Battery Group number setting in the UPS must then be set to the correct number of EBPs connected to the system.

Note: After initial installation and powering of the UPS it may take a few moments for the EBPs to synchronize communication with the UPS and engage the internal power relay to begin charging. The front panel LEDs will illuminate to indicate when the EBPs are active.

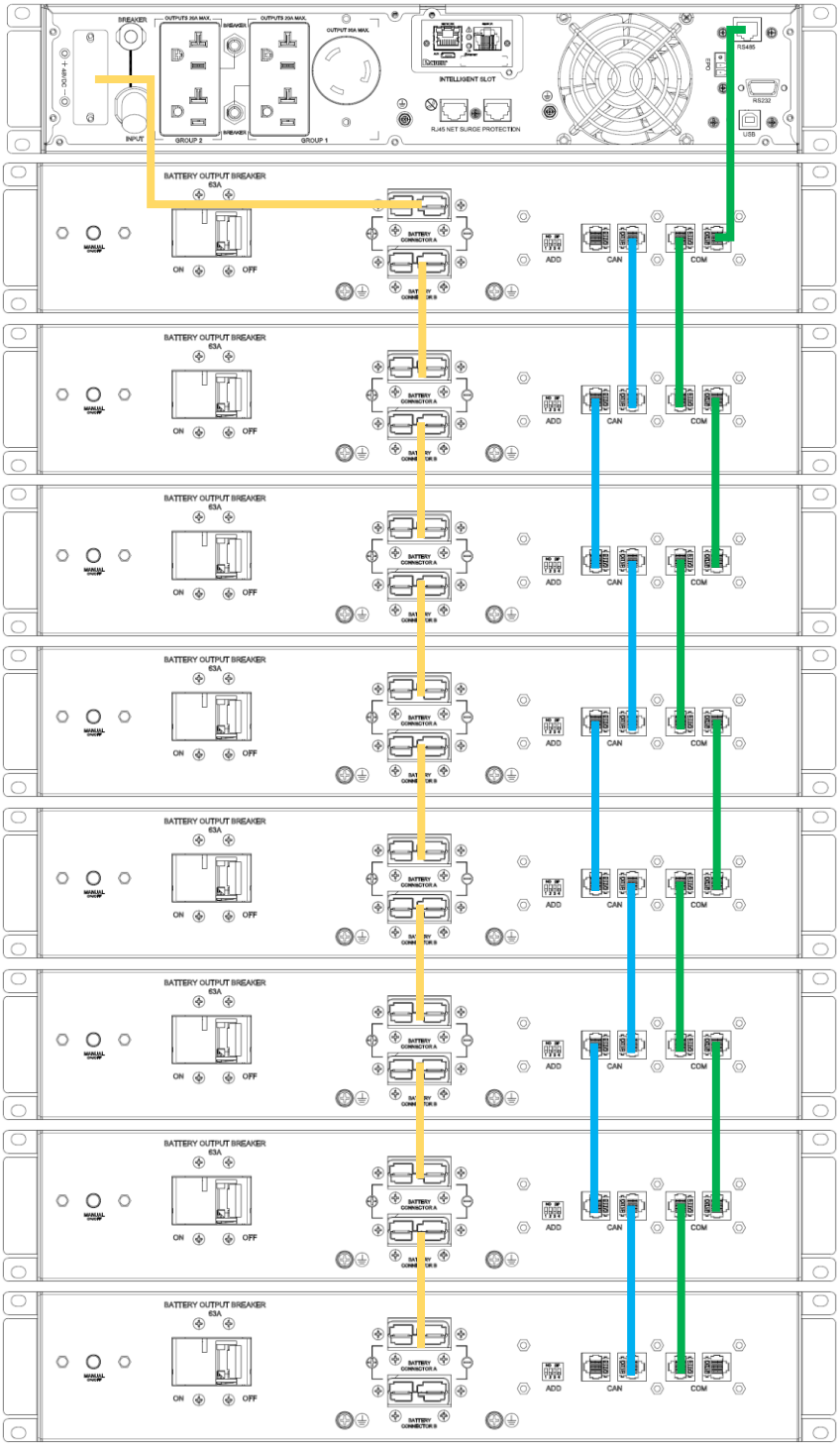


Figure 18a: 1-3kVA Lithium UPS with Eight EBPs Connection Diagram

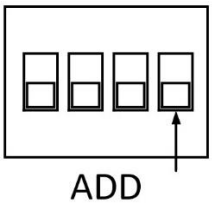


Figure 18b: Lithium EBP Address DIP switch (Shown Above: Address '0000')

EBP Number	DIP Address Number	Position (Left) *0 = Down 1= Up*	Position *0 = Down 1= Up*	Position *0 = Down 1= Up*	Position (Right) *0 = Down 1= Up*
1	"0"	0	0	0	0
2	"1"	0	0	0	1
3	"2"	0	0	1	0
4	"3"	0	0	1	1
5	"4"	0	1	0	0
6	"5"	0	1	0	1
7	"6"	0	1	1	0
8	"7"	0	1	1	1

Figure 18c: Lithium EBP DIP Address Reference Table

Extended EBP Power Cable (UVP1T3VCBL) for UVP024, UVP036, UVP048, UVP072, UVPL50H

This EBP Power Cable accessory for the 1-3kVA VRLA and Lithium-ion EBP SKUs is 5 meters (16.4 ft) in length for applications requiring extended connections such as separate battery cabinets. This cable is only compatible with the SKUs listed above.

Network Card (UNCP01, UNCP02)

The network card comes pre-installed in the “N” type model UPS units (ex. U01N11V, U02N12V, U03N11V, U01N12L, U02N11L, U03N12L, etc.). Refer to the Panduit UPS Network Management Card User Manual for monitoring and controlling the UPS through the Network card. The “S” type model UPS units (ex. U01S11V, U02S12V, U03S11V, U01S12L, U02S11L, U03S12L, etc.) may be field upgradable with a network card or a relay card.

CAUTION! DO NOT TOUCH THE NETWORK CARD WITHOUT PROPER ESD PROTECTION.

To install or remove the Network card, remove and retain the two #0 Phillips screws in the mounting holes labeled 7 in the figure below. If no network card is in the unit, the Intelligent Slot will have a blanking plate over the slot. Remove the blanking plate or pre-installed card.

Note: There are card slide guides in the slot that the card must be slid into for proper installation of the card. After installing the card, secure with the two #0 Phillips screws that were removed.

Network Card Hardware Features

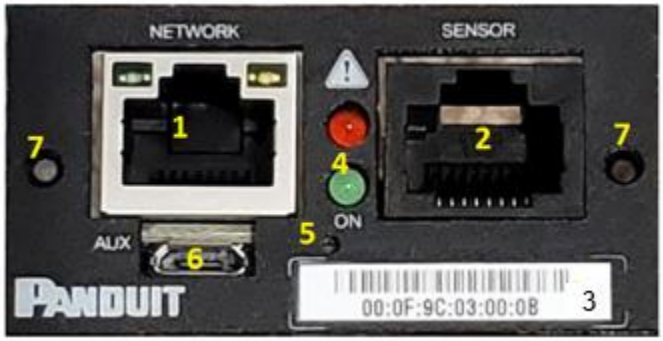


Figure 19: Network Card Front View

1. Ethernet Connection	4. Status LEDs	7. Mounting holes
2. Sensor Connection	5. Reset button	
3. MAC ID Label	6. Micro USB Connection	

Ethernet Connection

Connect the ethernet port on the Network card to an ethernet switch or router using a standard Cat 5E or Cat 6 ethernet patch cord.

Sensor Connection

Sensor connection supports Panduit environmental sensors and/or the sensor hub with the cables provided in the sensor installation kit.

Note: This port is for Panduit sensor accessories only.

MAC ID Label

The MAC ID of the wired ethernet port is listed on the label on the Network card's faceplate. The MAC ID is unique to the specific Network card. The above figure shows an example of the MAC ID.

Status LEDs

The red status LED turns on automatically as soon as power is applied. After the Network card initializes, the firmware in the Network card takes control of these LEDs. In general, the green LED indicates power to the Network card and the red LED indicates a fault or initialization of the Network card.

Reset Button

A pin hole is provided in the faceplate of the Network card to access the reset button using a paper clip or similar device. The reset behavior of the Network card is provided below and is dependent on the duration of the button press.

Reset the NMC when it does not respond: Hold the reset button for 2 seconds and release when green LED starts flashing. This will cause a reset of the NMC controller, but the entire configuration will be retained.

Reset all configurations to a factory default setting: Hold the reset button for at least 20 seconds and release when green LED starts flashing fast. This will cause a reset of the NMC controller and all configurations to be erased, including the usernames and passwords.

Micro-B USB Connection

The USB connector provides a COM port connection for configuration via a command line interface (CLI) to the Network card.

Refer to the Network card User's Manual for more details on the operations of the Network card.

Relay Card (URC005)

The intelligent slot on the UPS unit may accept either the Relay card or the Network card, not both. Follow the steps in the Network Card (UNCP01, UNCP02) section to install or remove the Relay card from the UPS unit.

The 12-pin relay card allows the user to monitor a specific status on the UPS. The predefined monitoring contact points on the relay card change state when the status in the UPS changes state.

Terminal Number	Terminal Function	Description
1	Common source	Common point for all contacts on the relay card
2	UPS ON = Open	When the UPS is switched ON, Pin 1 to Pin 2 would change from NC (Normal Closed) to Open.
3	AC fail = Open	When the input utility power fails, Pin 1 to Pin 3 would change from NC (Normal Closed) to Open.
4	AC fail = Close	When the input utility power fails, Pin 1 to Pin 4 would change from NO (Normal Opened) to Close.
5	Batt low = Open	When the battery voltage is low, Pin 1 to Pin 5 would change from NC (Normal Closed) to Open.
6	Batt low = Close	When the battery voltage is low, Pin 1 to Pin 6 would change from NO (Normal Opened) to Close.
7	UPS alarm = Open	When the UPS has an alarm, Pin 1 to Pin 7 would change from NC (Normal Closed) to Open.
8	UPS alarm = Close	When the UPS has an alarm, Pin 1 to Pin 8 would change from NO (Normal Opened) to close.
9	Bypass active = Open	When the UPS is working in the Bypass state, Pin 1 to Pin 9 would change from NC (Normal Closed) to Open.
10	Bypass active = Close	When the UPS is working in the Bypass state, Pin 1 to Pin 10 would change from NO (Normal Opened) to Close.
11	UPS fault = Open	When the UPS has a fault, Pin 1 to Pin 11 would change from NC (Normal Closed) to Open.
12	UPS fault = Close	When the UPS has a fault, Pin 1 to Pin 12 would change from NO (Normal Opened) to Close.

The relay card contains eleven dry contact outputs plus a common lead. The outputs are factory programmed according to the functions listed in the table above.

The replay card must be removed from the UPS intelligent slot to access the screws for connecting the remote monitoring devices.

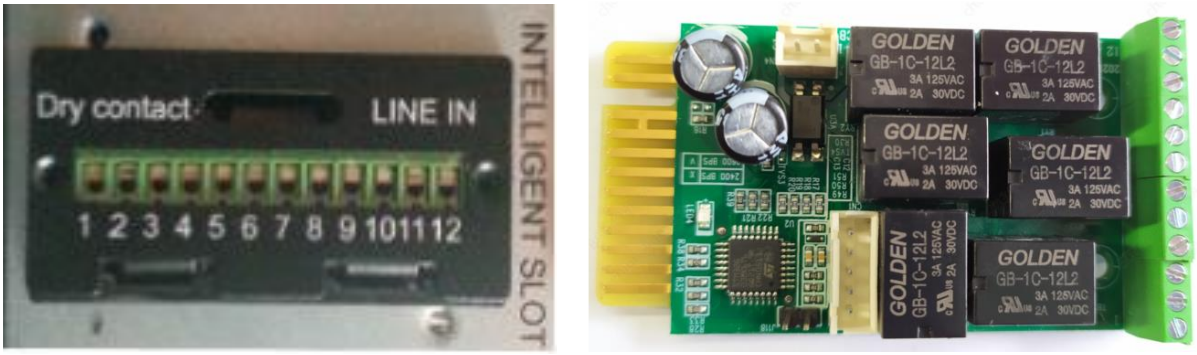


Figure 20: Relay Card Front and Top View (showing connection points)

Section 2 – Front Panel Display (FPD)

All UPS 1 to 3kVA UPS Models have the same front panel. The front panel contains four status LEDs, a 2.8-inch segmented color display, and four function buttons. See Figure 22 for a detailed description of all the color display fields.

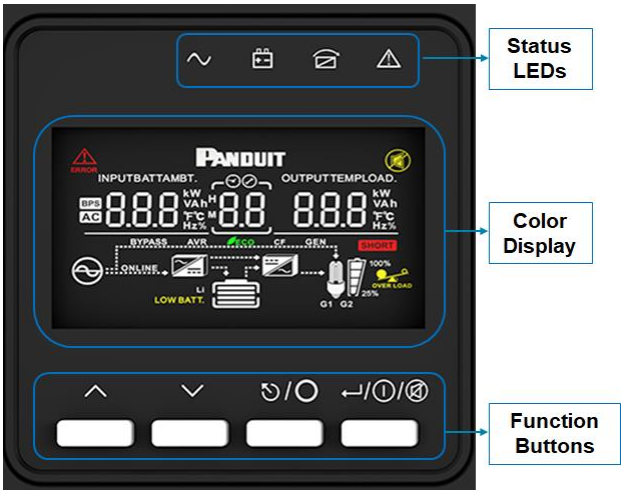


Figure 21: UPS Front Panel Display (FPD)

Status LEDs

Each unit has four Status LEDs that provide a quick high-level view of the unit's operating conditions.

LED Icon	LED Name	Color - Operating Condition
	Alert LED	Yellow – Unit has an Active Warning Alert Red - Unit has an Active Critical Alert
	Bypass LED	Blue - UPS is operating in Bypass state
	Battery LED	Yellow - UPS operating in Battery state
	Normal LED	Green - UPS is operating in Normal state (Unit has AC input power and is providing power to the load via the normal power path)

Function Buttons

Button Icon	Button Name	Function Description
	UP	• Monitor Operation: press to display previous page. • Setup Operation: press to display previous page or previous setup value.
	DOWN	• Monitor Operation: press to display next page. • Setup Operation: press to display next page or next setup value. • Setup Operation: press past the last setup page to save the settings selected, and exit the Setup Operation.
	CANCEL / OFF	• Setup Operation: press to exit Setup Operation without changing any settings. • Monitor Operation while in Battery state: press for 3-6 seconds (first audio beep) to turn the UPS OFF. • Monitor Operation while in Normal state: press for 3-6 seconds (first audio beep) to turn the invertor OFF and change to Bypass state.
	ENTER / ON/MUTE	• Setup Operation: press to enter/confirm setup value and move back to Setup pages. • Monitor Operation while in Normal state: press for 3-6 seconds (first audio beep) to manually run a battery test. • Monitor Operation while in Bypass state: press for 3-6 seconds (first audio beep) to change to Normal state. • Monitor Operation: press for 6-10 seconds (second audio beep) to toggle the audible alarms OFF or ON.

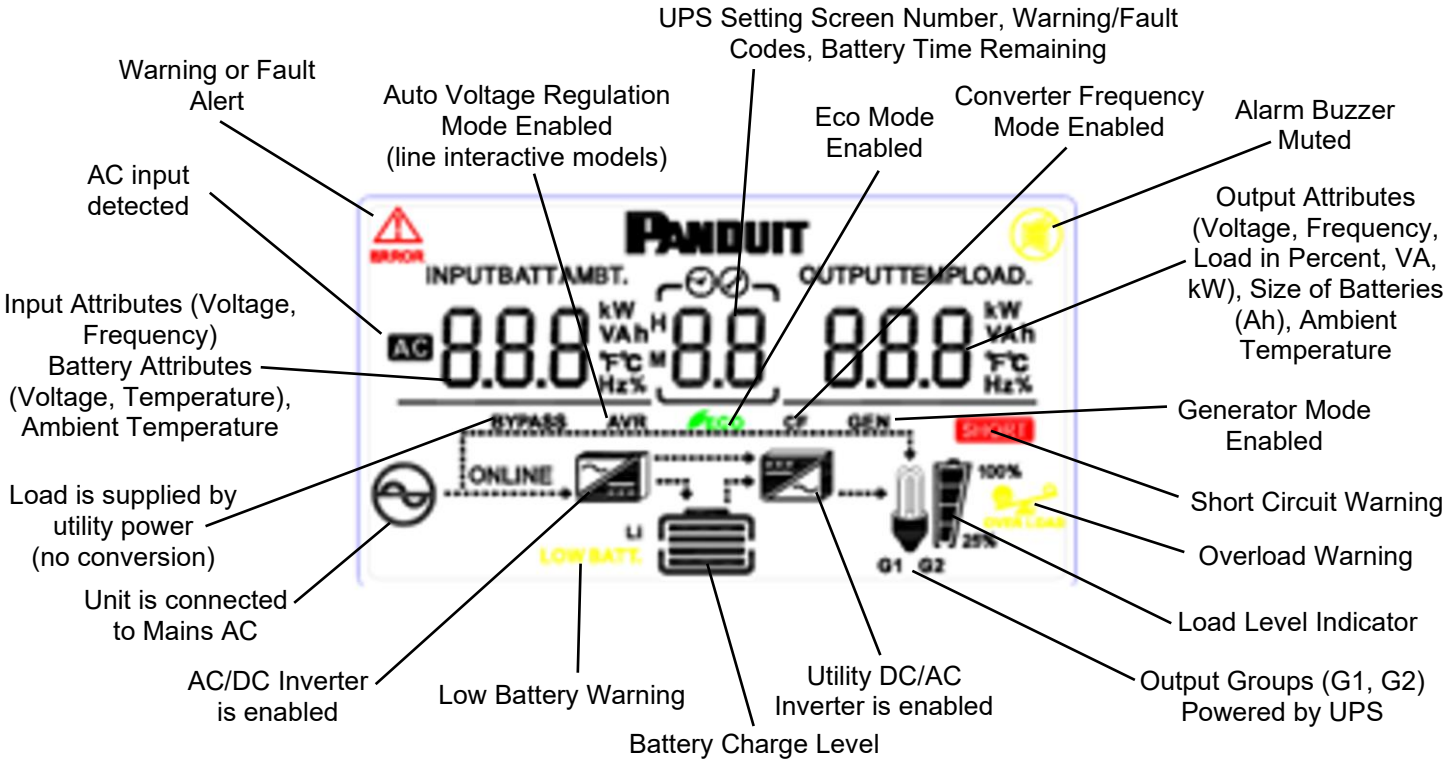


Figure 22: UPS Front Panel Display Color Display Callouts

Turning ON/OFF the UPS

Starting the UPS on Main Input Power:

CAUTION! MAKE SURE GROUNDING IS PROPERLY CONNECTED!

- Remove the front faceplate from the UPS unit (if currently installed).
  - Press in the two ends of the faceplate to release the tabs.
- Ensure that the internal battery cartridge is plugged into the UPS.
- Replace the front face plate of the UPS.
  - Position the faceplate around the display and snap unto the front of the UPS.
- Connect the optional EBP unit(s) as shown in the Installation Manual.
  - Ensure that all connected EBP breakers are turned on by switching the Breaker to the ON position.
  - For Lithium-ion EBP units, hold the “ON/OFF” button for five seconds after switching the breaker ON to power up the EBP.
- Plug the input cord into a known good power source.
- The UPS will automatically start the power up initialization process.
- After about 30 seconds the UPS should be fully powered up.

- Manually execute a battery test to ensure the internal battery and/or EBP is properly connected.
  - Press and hold the ENTER/ON/MUTE button until the first audio beep is heard (about 3-6 seconds).
- When the test passes, the UPS unit is ready to be set up for service.
- Upon initial powerup it is recommended to fully charge the battery and/or EBP to supply the full rated backup time.

Cold Starting the UPS (Start the UPS on Battery):

 **CAUTION**! MAKE SURE GROUNDING IS PROPERLY CONNECTED!

- Remove the front faceplate from the UPS unit (if currently installed).
  - Press in the two ends of the faceplate to release the tabs.
- Ensure that the internal battery cartridge is plugged into the UPS.
- Replace the front face plate of the UPS.
  - Position the faceplate around the display and snap unto the front of the UPS.
- Connect the EBP unit(s) as shown in the Installation manual.
  - Ensure that all connected EBP breakers are turned on by switching the Breaker to the ON position.
  - For Lithium-ion EBP units, hold the “ON/OFF” button for five seconds after switching the breaker ON to power up the EBP. Confirm the LEDs are powered on the front of the EBP.
- Cold start the UPS.
  - Press and hold the ENTER/ON/MUTE button until the first audio beep is heard (about 3-6 seconds).
  - This will manually start the UPS and then execute a battery test after the unit has powered up and initialized.
- When test passes the UPS unit is ready to be set up for service.

Note: Ensure a known good power source is connected to the input of the UPS before putting into service.

Properly Shutting Down the UPS:

- Unplug the input cord from the power source.
- The UPS will automatically transition to the Battery state.
- Manually turn off the inverter.
- Press and hold the CANCEL/OFF button until the first audio beep is heard (about 3-6 seconds).
- The UPS has now been properly shut down.
- For Lithium-ion EBPs, hold the “ON/OFF” button for five seconds to turn off the

EBP. The front LEDs should go dark.

- For both Lithium-ion & VRLA EBPs, switch the Breaker to OFF to fully shut down the EBP.

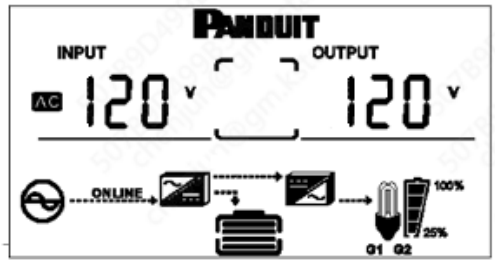
Note: Ensure to follow the above step in the above order to properly shut down the UPS. Not following these steps in this order could result in the UPS being powered from the battery until the battery is fully depleted.

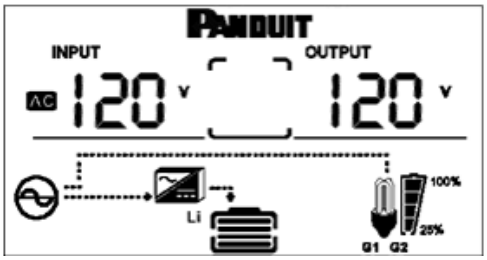
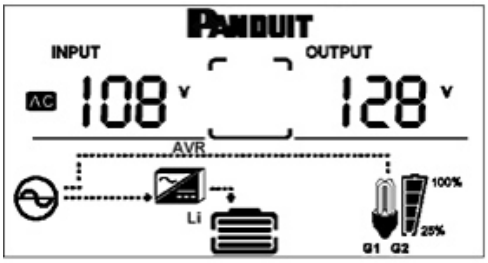
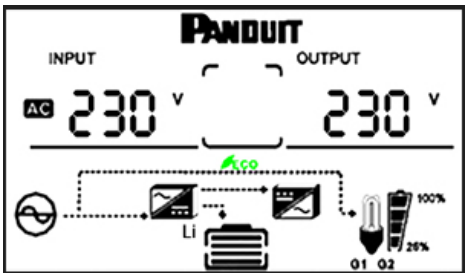
Color Display Operation

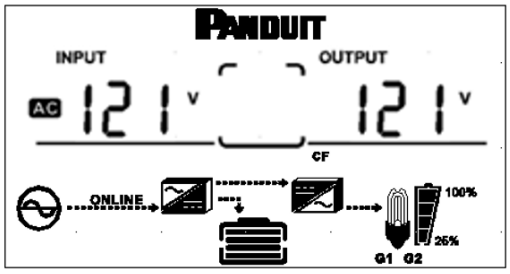
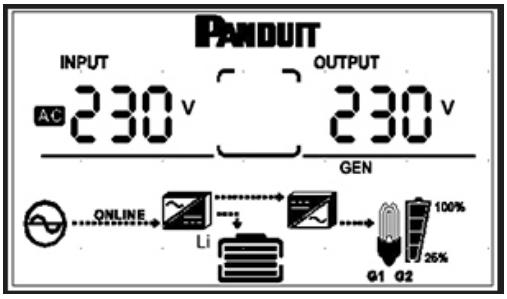
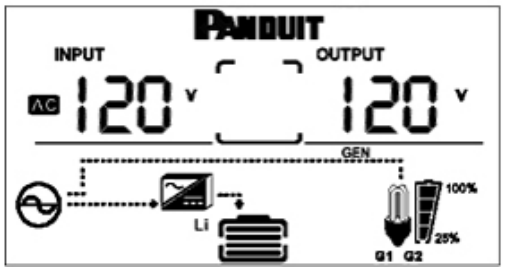
The display has two modes of operation: the Monitor Operation mode and the Setup Operation mode. Use the function buttons from above to transition between the two modes of operation.

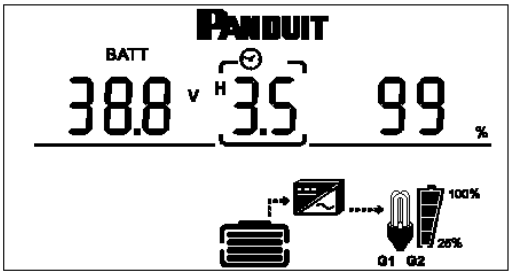
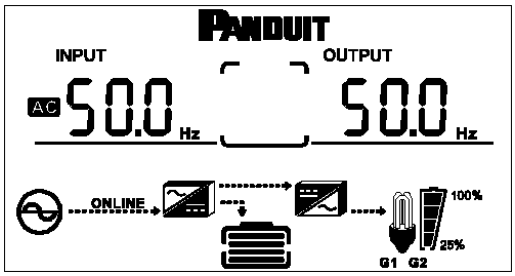
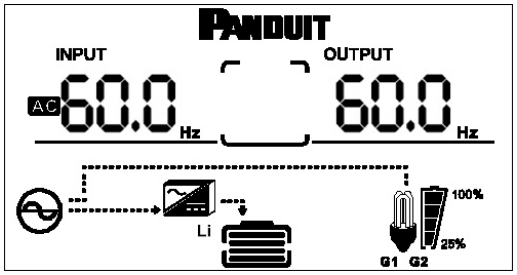
Monitor Operation (Double Conversion [DC] / Line Interactive [LI])

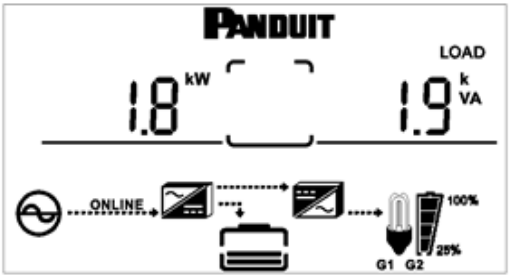
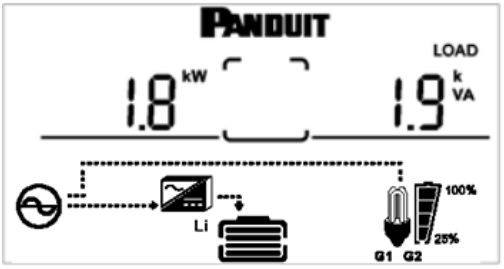
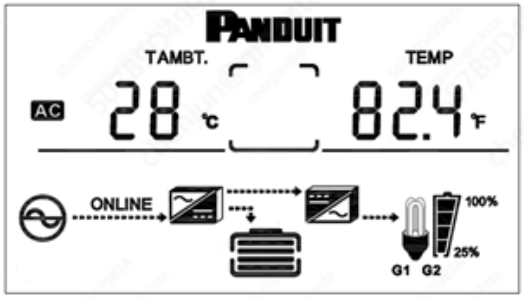
There are seven Monitor Operation pages. Monitor Operation mode is default screen mode that the UPS will always return to. When leaving the Setup Operation mode, the UPS returns to the Monitor Operation mode page that it exited. The (DC) under the Screen # in the tables below means this is a Double Conversion unit. The (LI) under the Screen # means this is a Line Interactive unit. VRLA in the page description means a lead acid battery system. Li in the page description means a Lithium-ion battery system.

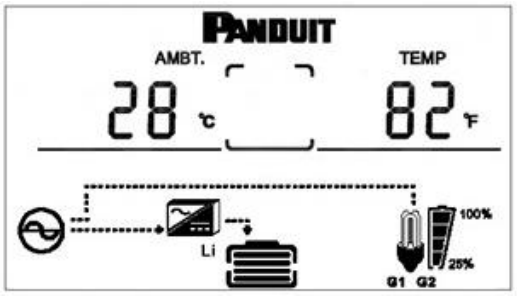
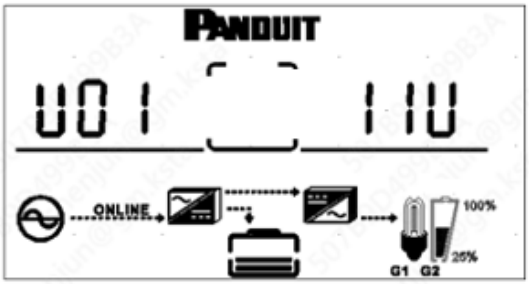
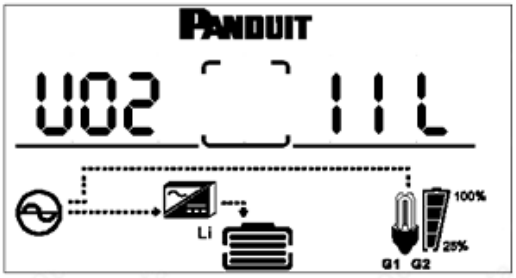
Screen #	Parameter(s) Name(s)	Example Display Content
M-01A (DC)	Input Voltage & Output Voltage (Normal Mode)	
The above page is an example of a VRLA 120V voltage monitoring page for the double convertion UPS system. The power diagram shows that the unit is operating in the Normal state.		

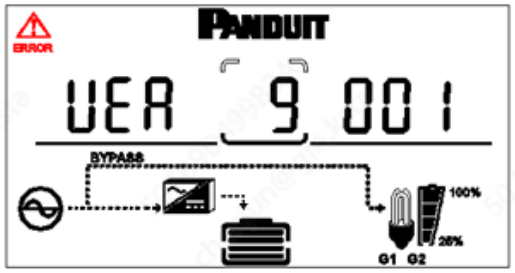
Screen #	Parameter(s) Name(s)	Example Display Content
M-01A (LI)	Input Voltage & Output Voltage (Normal Mode)	
The above page is an example of a Li 120V voltage monitoring page for the Line Interactive UPS system. The power diagram shows that the unit is operating in Normal state with no Automatic Votlage Reulation (AVR). **Note:** Normal state for the Line Interactive UPS is to bypass the rectifiy and invertor circuitry.		
M-01A (LI)	Input Voltage & Output Voltage (Normal Mode with AVR Active)	
The above page is an example of a Li 120V voltage monitoring page for the Line Interactive UPS system. The power diagram shows that the unit is operating in the Normal state with Automatic Voltage Regulation (AVR).		
M-01B (DC)	Input Voltage & Output Voltage (ECO Mode)	
The above page is an example of a Li 230V voltage monitoring page for the double conversion UPS system. The power diagram shows that it is operating in the ECO State.		

Screen #	Parameter(s) Name(s)	Example Display Content
M-01C (DC)	Input Voltage & Output Voltage (CF Mode)	
The above page is an example of a VRLA 120V voltage monitoring page for the double conversion UPS system. The power diagram shows that it is operating in the CF State.		
M-01D (DC)	Input Voltage & Output Voltage (Generator Mode)	
The above page is an example of a Li 230V voltage monitoring page for the double conversion UPS system. The power diagram shows that it is operating in the Generator State.		
M-01D (LI)	Input Voltage & Output Voltage (Generator Mode)	
The above page is an example of a Li 120V voltage monitoring page for the Line Interactive UPS system. The power diagram shows that it is operating in the Generator state.		

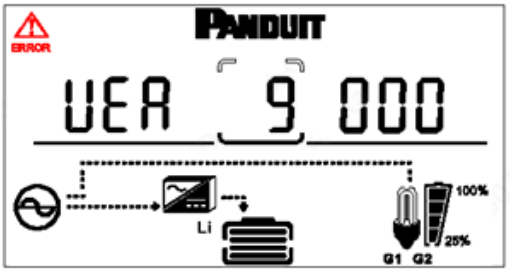
Screen #	Parameter(s) Name(s)	Example Display Content
M-02	Battery Voltage, & Battery Hold Time & Battery Capacity %	
The above page is an example of the Battery monitoring page on a VRLA system. The power diagram show that it is operating in the Battery state. The Battery Hold Time in the center brackets, may appear on any Monitor Operation page when the UPS is in the Battery state.		
M-03 (DC)	Input Frequency & Output Frequency (Normal Mode)	
The above page is an example of the frequency monitoring page on a 50Hz VRLA Double Conversion UPS system that is operating in the Normal state.		
M-03 (LI)	Input Frequency & Output Frequency (Normal Mode)	
The above page is an example of the frequency monitoring page on a 60Hz Li Line Interactive UPS system that is operating in the Normal state.		

Screen #	Parameter(s) Name(s)	Example Display Content
M-04 (DC)	Actual Power (kW) & Apparent power (kVA) (Normal Mode)	
The above page is an example of the output power monitoring page on a VRLA Double Conversion UPS system that is operating in the Normal State.		
M-04 (LI)	Actual Power (kW) & Apparent power (kVA) (Normal Mode)	
The above page is an example of the output power monitoring page on a Li Line Interactive UPS system that is operating in the Normal State.		
M-05 (DC)	Ambient Temperature (°C) & Ambient Temperature (°F) (Normal Mode)	
The above page is an example of the temperature monitoring page on a VRLA Double Conversion system that is operating in the Normal State.		

Screen #	Parameter(s) Name(s)	Example Display Content
M-05 (LI)	Ambient Temperature (°C) & Ambient Temperature (°F) (Normal Mode)	
The above page is an example of the temperature monitoring page on a Li Line Interactive system that is operating in the Normal State.		
M-06 (DC)	UPS Partial Part Number (Normal Mode)	
The above page is an example of the Part Number monitoring page on a VRLA Double Conversion system that is operating in the Normal State.		
M-06 (LI)	UPS Partial Part Number (Normal Mode)	
The above page is an example of the Part Number monitoring page on a Li Line Interactive system that is operating in the Normal state.		

<table>
<tr><th>Screen #</th><th>Parameter(s) Name(s)</th><th>Example Display Content</th></tr>
<tr><td>M-07
(DC)</td><td>Base UPS Core FW Version & Alert Code (Alarm/Faults) (Normal Mode)</td><td> 
</td></tr>
<tr><td colspan="3">The above page is an example of the Core Firmware Version monitoring page on a VRLA Double Conversion system that is operating in the Bypass state.

The Alert Code in the center brackets, (refer to Appendix A: 1 to 3kVA Fault Codes & Alert LEDs) may appear on any Monitor Operation page when the UPS has an active alert. The error icon will also light in the upper left corner of the page, in most cases (if there is an internal error) the UPS will also transion to the Bypass state.

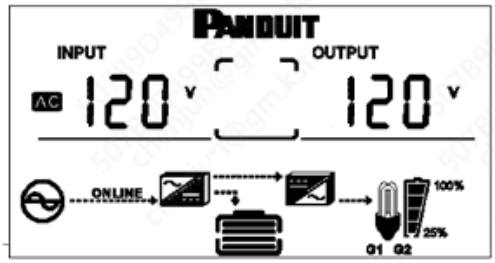
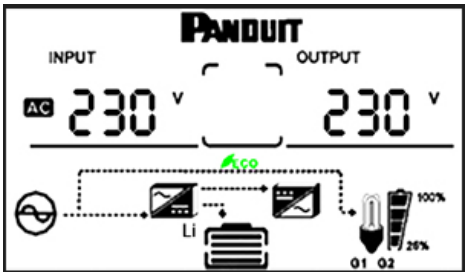
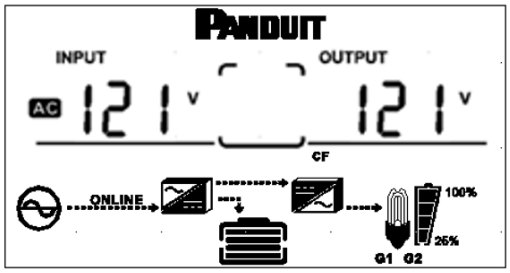
Note: When there is no active alert, the center brackets may be populated with an estimated run-time should the unit enter the Battery state. This feature is not available on all firmware versions.</td></tr>
<tr><td>M-07
(LI)</td><td>Base UPS Core FW Version & Alert Code (Alarm/Faults) (Normal mode)</td><td> 
</td></tr>
<tr><td colspan="3">The above page is an example of the Core Firmware Version monitoring page on a Li Line interactive system that is operating in the Normal State.

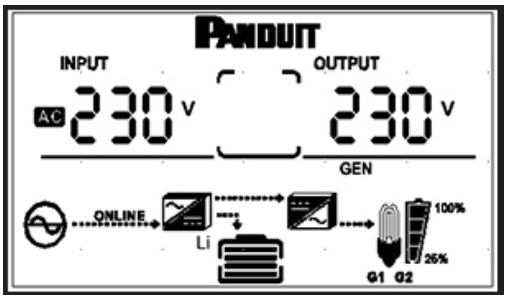
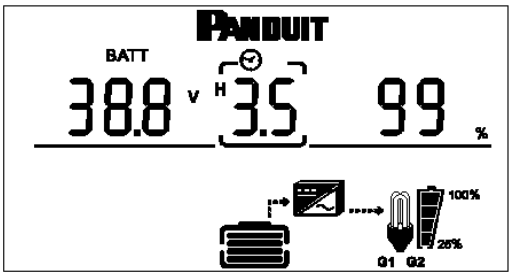
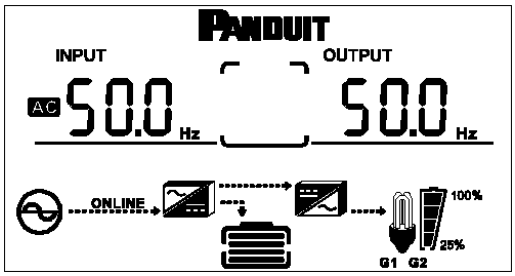
The Alert Code in the center brackets, (refer to Appendix A: 1 to 3kVA Fault Codes & Alert LEDs) may appear on any Monitor Operation page when the UPS has an active alert. The error icon will also light in the upper left corner of the page.

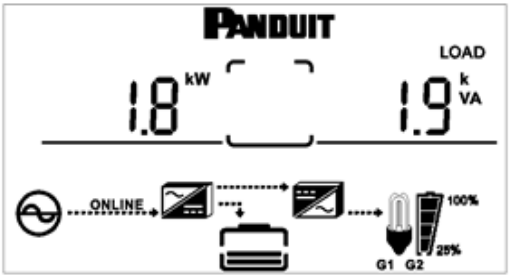
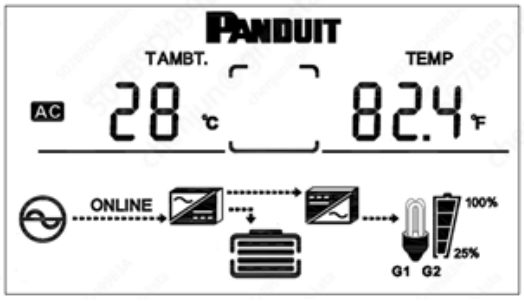
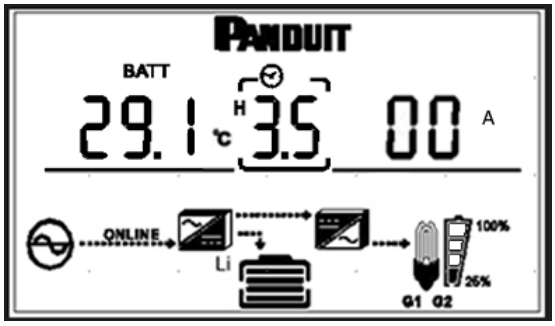
Note: When there is no active alert, the center brackets may be populated with an estimated run-time should the unit enter the Battery state. This feature is not available on all firmware versions.</td></tr>
</table>

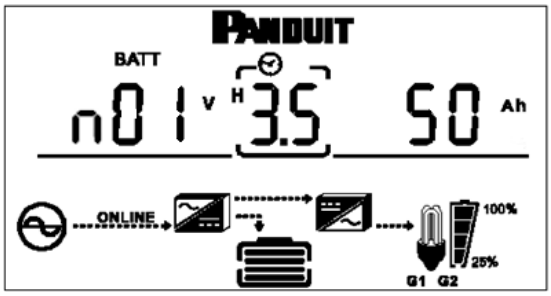
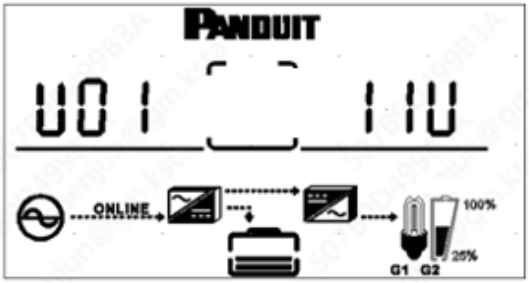
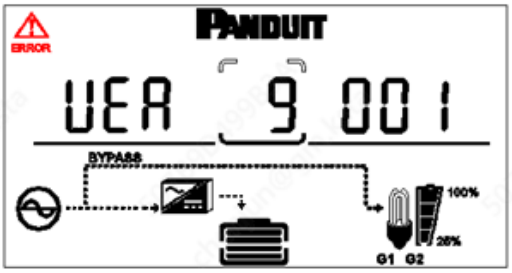
Monitor Operation (Long Runtime [LRT] Double Conversion [DC])

There are nine Monitor Operation pages for Long Runtime UPS models. Monitor Operation mode is default screen mode that the UPS will always return to. When leaving the Setup Operation mode, the UPS returns to the Monitor Operation mode page that it exited.

Screen #	Parameter(s) Name(s)	Example Display Content
M-01A	Input Voltage & Output Voltage (Normal Mode)	
The above page is an example of a 120V voltage monitoring page for the double convertion UPS system. The power diagram shows that the unit is operating in the Normal state.		
M-01B	Input Voltage & Output Voltage (ECO Mode)	
The above page is an example of a Li 230V voltage monitoring page for the double conversion UPS system. The power diagram shows that it is operating in the ECO State.		
M-01C	Input Voltage & Output Voltage (CF Mode)	
The above page is an example of a 120V voltage monitoring page for the double conversion UPS system. The power diagram shows that it is operating in the CF State.		

Screen #	Parameter(s) Name(s)	Example Display Content
M-01D	Input Voltage & Output Voltage (Generator Mode)	
The above page is an example of a Li 230V voltage monitoring page for the double conversion UPS system. The power diagram shows that it is operating in the Generator State.		
M-02	Battery Voltage, & Battery Hold Time & Battery Capacity %	
The above page is an example of the Battery monitoring page on a system. The power diagram show that it is operating in the Battery state. The Battery Hold Time in the center brackets, may appear on any Monitor Operation page when the UPS is in the Battery state.		
M-03	Input Frequency & Output Frequency (Normal Mode)	
The above page is an example of the frequency monitoring page on a 50Hz Double Conversion UPS system that is operating in the Normal state.		

Screen #	Parameter(s) Name(s)	Example Display Content
M-04	Actual Power (kW) & Apparent power (kVA) (Normal Mode)	
The above page is an example of the output power monitoring page on a Double Conversion UPS system that is operating in the Normal State.		
M-05	Ambient Temperature (°C) & Ambient Temperature (°F) (Normal Mode)	
The above page is an example of the temperature monitoring page on a Double Conversion system that is operating in the Normal State.		
M-06	Battery temperature (°C) & Battery Output Current (A)	
The above page is an example of the battery temperature & battery output current page on a Li Long Runtime Double Conversion system that is operating in the normal state with no load.		

Screen #	Parameter(s) Name(s)	Example Display Content
M-07	Number of External Batteries Connected & Overall Battery Capacity	
The above page is an example of the External Battery screen showing the number of EBPs configured (01) and the total Amp hours (50) of the system.		
M-08	UPS Partial Part Number (Normal Mode)	
The above page is an example of the Part Number monitoring page on a VRLA Double Conversion system that is operating in the Normal State.		
M-09	Base UPS Core FW Version & Alert Code (Alarm/Faults) (Normal Mode)	
The above page is an example of the Core Firmware Version monitoring page on a VRLA Double Conversion system that is operating in the Bypass state. The Alert Code in the center brackets, (refer to **Appendix A: 1 to 3kVA Fault Codes & Alert LEDs**) may appear on any Monitor Operation page when the UPS has an active alert. The error icon will also light in the upper left corner of the page, in most cases (if there is an internal error) the UPS will also transion to the Bypass state. **Note**: When there is no active alert, the center brackets may be populated with an		

Screen #	Parameter(s) Name(s)	Example Display Content
estimated run-time should the unit enter the Battery state. This feature is not available on all firmware versions.		

Setup Operation

One must intentionally get into the Setup Operation mode by a sequence of function button operations. Press and hold the UP and DOWN buttons at the same time until the unit a Setup page appears. Once in the Setup Operation mode, use the UP or DOWN button to scroll up through the Setup pages or down through the Setup pages.

Note: Using the DOWN button to transition out of the last Setup page will automatically save any settings changed during the Setup Operation mode session and transition back to the Monitor Operation mode, so do not scroll down past the last page before all the desired settings have been changed.

Scroll to the desired Setup page that needs to be changed, by pressing the UP or DOWN button.

Note: The Setup page number appears in the center brackets on the Setup pages. Press the ENTER button. The changeable Setup value will start to blink. Scroll through the Setup values, by pressing the UP or DOWN button. When the desired Setup value is present, press the ENTER button to lock in that value. Move to another Setup page if desired, by pressing the UP or DOWN button. Repeat the above process for that Setup value.

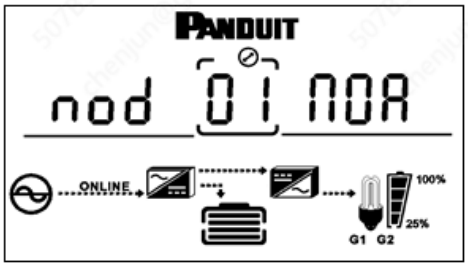
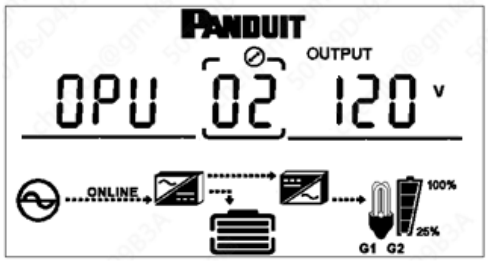
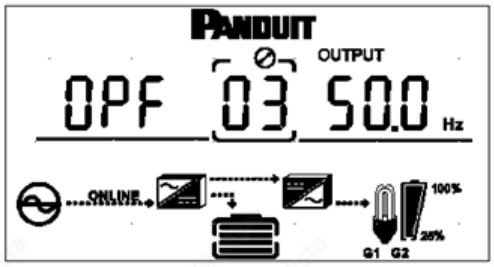
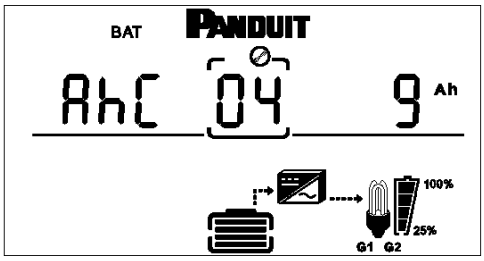
Note: The Setup Operation mode will automatically close and not save any Setup value changes after 30 seconds of no button presses.

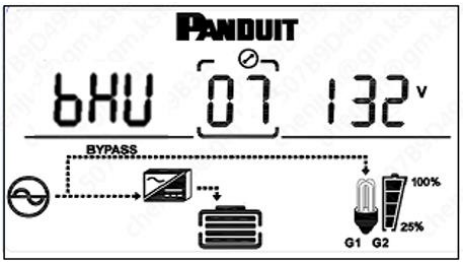
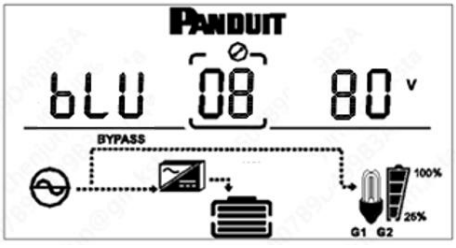
Note: Pressing the CANCEL button at any time while in the Setup Operation mode will automatically close and not save any Setup value changes. To save all Setup value changes in the current session, press the DOWN button several times to scroll down through the last Setup page, then the UPS will save all the settings and transition to a Monitor Operation mode.

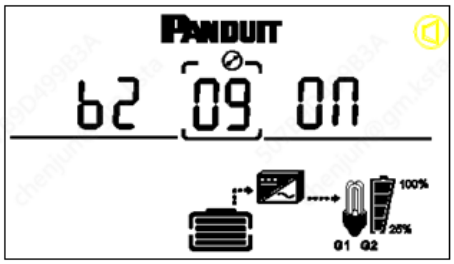
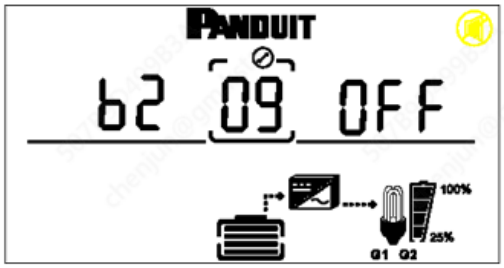
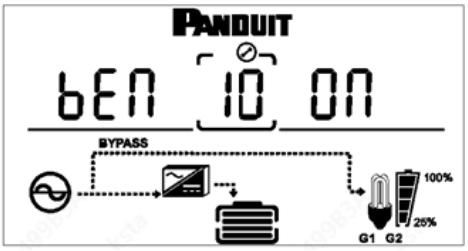
Double Conversion VRLA UPS

The double conversion VRLA UPS has the following Setup pages. Remember that scrolling down through the last Setup page will automatically save any settings changed during the Setup session and transition back to the Monitor Operation mode.

The following table shows an example and description of each Setup page in the double conversion VRLA UPS unit.

Screen #	DC VRLA Settings	Content display
S-01	**Mode setting** (*Nor*, Gen, CF, ECO)	
The default mode setting is Normal mode for all Double Conversion UPS units.		
S-02	**Output Voltage setting** (100, 110, 115, *120*, 125) NA (220, 230, 240) EU	
The default Output Voltage setting is 120V for North American UPS units and 230V for European UPS units. For maximun efficiency set the output voltage to the input source voltage.		
S-03	**Frequency setting** (*50*, 60)	
The default Frequency setting is 60Hz for North American UPS units and 50Hz for European UPS units.		
S-04	**Battery Capacity setting** (*9*-198)	

Screen #	DC VRLA Settings	Content display
The default Battery Capacity setting is 9Ah for the internal UPS battery cartridge. Increase this number by 18Ah for each EBP unit connected to the UPS unit.		
S-05	**Group 2 Battery EOD Voltage setting** (1.75, *1.84*, 1.92)	
Group 2 is the switchable outlet group. This outlet group may be utilized to power non-critical loads. The default Group 2 Battery End of Discharge (EOD) voltage setting is 1.75v. This group of outlets may be configured to turn OFF before the Group 1 outlets. The lower the voltage setting, the longer outlet Group 2 will stay ON while the UPS is running on battery. However, the longer this outlet group stays ON, the less runtime there is for outlet Group 1 which may contain the critical loads. If all outlets are used for critical loads, then set Group 2 voltage equal to the Group 1 at 1.75v.		
S-06	**Bypass Voltage Upper Limit setting** (120 - *132*) NA (230 – 264) EU	
The default Bypass Voltage Upper Limit setting is 132Vac for North American UPS units and 264Vac for European UPS units. These values my be changed in 1Vac increments/decrements. This value should be set to the maximum voltage that the connected loads will tolorate. Decreasing this voltage may limit the UPS from switching to bypass (when the input voltage is high).		
S-07	**Bypass Voltage Lower Limit setting** (*80* - 110) NA (176 – 220) EU	

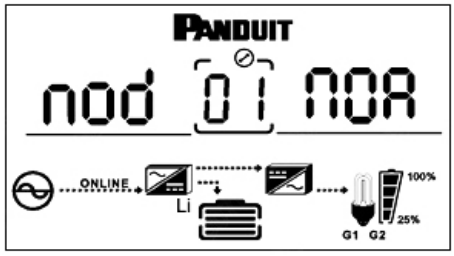
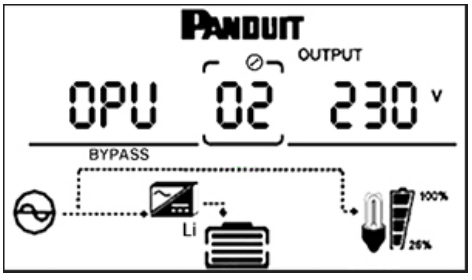
Screen #	DC VRLA Settings	Content display
The default Bypass Voltage Lower Limit setting is 80Vac for North American UPS units and 176Vac for European UPS units. These values my be changed in 1Vac increments/decrements. This value should be set to the minimum voltage that the connected loads will tolorate. Increasing this voltage may limit the UPS from switching to bypass (when the input voltage is low).		
S-08A	**Buzzer setting** (*ON*, OFF)	
The default Buzzer setting is ON.		
S-08B	**Buzzer setting** (ON, *OFF*)	
To mute all audiable alarms, set this to OFF. The Buzzer will be muted, even with new Alerts. A speaker with a line through it will be illuminiated in the upper right corner of all pages.		
S-09A	**BYPASS Enable setting** (*ON*, OFF)	
The default Bypass Enable setting is OFF. This setting, when set to ON, allows the UPS to switch to the Bypass State if it needs to.		

Screen #	DC VRLA Settings	Content display
S-09B	**BYPASS Setting** (ON, *OFF*)	
To disable the bypass, set this to OFF. The UPS will not be allowed to transition to the Bypass State under any circumstances.		

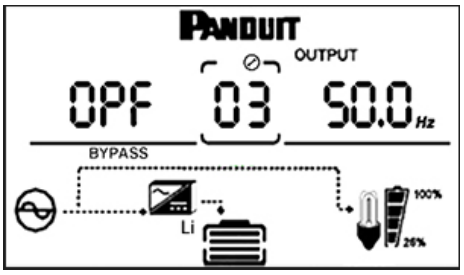
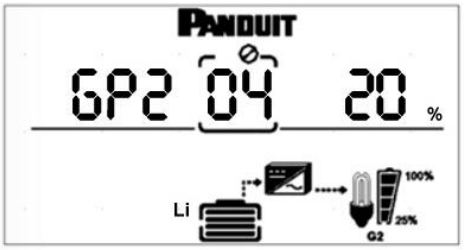
Double Conversion Li UPS (includes Long Runtime models)

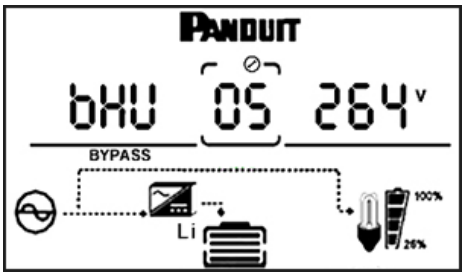
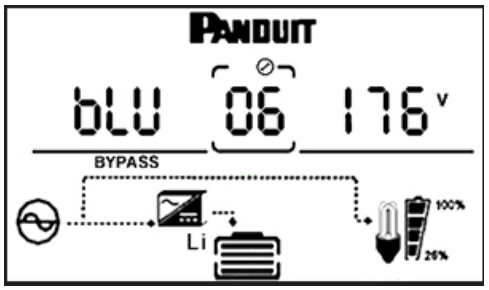
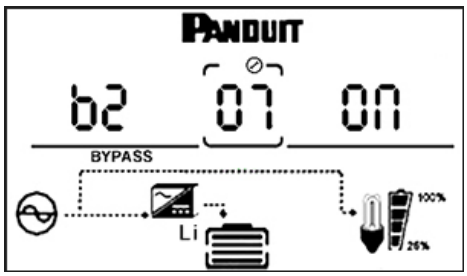
The double conversion Li UPS has the following Setup pages. Remember that scrolling down through the last Setup page will automatically save any settings changed during the Setup session and transition back to the Monitor Operation mode.

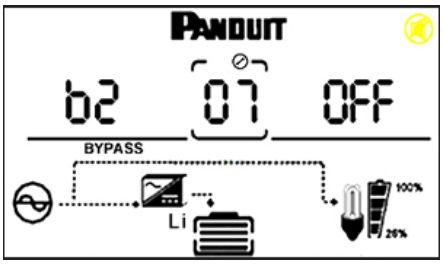
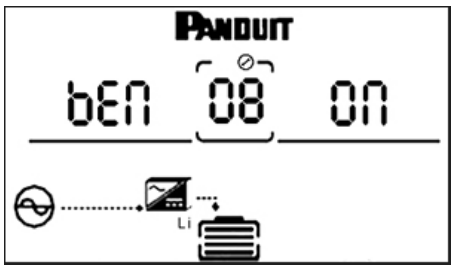
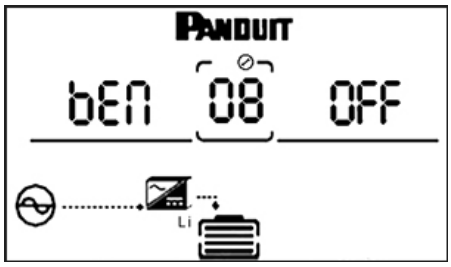
The following table shows an example and description of each setup page in the double conversion Li UPS unit.

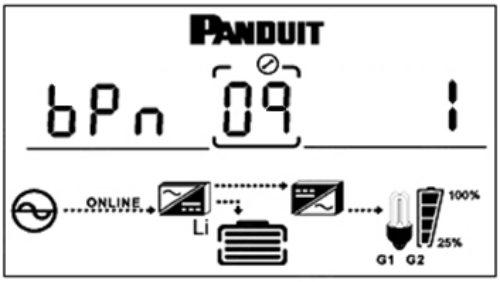
Screen #	DC Li Settings	Content display
S-01	**Mode setting** (*Nor*, Gen, CF, ECO)	
The default mode setting is Normal mode for all Double Conversion UPS units.		
S-02	**Output Voltage setting** (220, *230*, 240) EU (100, 110, 115, 120, 125) NA 120V (208, 240) NA 208V	

<table>
<tr><th>Screen #</th><th>DC Li Settings</th><th>Content display</th></tr>
<tr><td colspan="3">The default Output Voltage setting is 230V for European UPS units.
The default Output Voltage setting is 120V for the NA 120V rated UPS units.
The default Output Voltage setting is 208V for the NA 208V rated UPS units.

For maximun efficiency, set the output voltage to the input source voltage.</td></tr>
<tr><td>S-03</td><td>Frequency setting
(50, 60)</td><td> 
</td></tr>
<tr><td colspan="3">The default Frequency setting is 50Hz for European UPS units.
The default Frequency setting is 60Hz for North American UPS units.</td></tr>
<tr><td>S-04</td><td>Group 2 Battery EOD setting
(00, 20, 30)</td><td> 
</td></tr>
<tr><td colspan="3">Group 2 is the switchable outlet group. This outlet group may be utilized to power non-critical loads.
The default Group 2 Battery End of Discharge (EOD) setting is 0%.
This group of outlets may be configured to turn OFF before the Group 1 outlets. This setting is the percentage of battery capacity left when the outlet group turns OFF. The lower the percentage setting, the longer outlet Group 2 will stay ON while the UPS is running on battery. However, the longer this outlet group stays ON, the less runtime there is for outlet Group 1, which may contain the critical loads.
If all outlets are used for critical loads, then set Group 2 capacity equal to the Group 1 at 0%.</td></tr>
</table>

Screen #	DC Li Settings	Content display
S-05	**Bypass Voltage Upper Limit setting** (230 – *264*) EU (120 – 132) NA 120V (220 – *264*) NA 208V	
The default Bypass Voltage Upper Limit setting is 264Vac for European UPS units. The default Bypass Voltage Upper Limit setting is 132Vac for NA 120V UPS units The default Bypass Voltage Upper Limit setting is 264Vac for NA 208V UPS units. These values may be changed in 1Vac increments/decrements. This value should be set to the maximum voltage that the connected loads will tolerate. Decreasing this voltage may limit the UPS from switching to bypass (when the input voltage is high).		
S-06	**Bypass Voltage Lower Limit setting** (*176* – 220) EU (80 – 110) NA 120V (*176*-195) NA 208V	
The default Bypass Voltage Lower Limit setting is 176Vac for European UPS units. The default Bypass Voltage Lower Limit setting is 80Vac for NA 120V UPS units. The default Bypass Voltage Lower Limit setting is 176Vac for NA 208V UPS units. These values my be changed in 1Vac increments/decrements. This value should be set to the minimum voltage that the connected loads will tolerate. Increasing this voltage may limit the UPS from switching to bypass (when the input voltage is low).		
S-07A	**Buzzer setting** (*ON*, OFF)	

Screen #	DC Li Settings	Content display
The default Buzzer setting is ON.		
S-07B	**Buzzer setting** (ON, *OFF*)	
To mute all audiable alarms set this to OFF. The Buzzer will be muted, even with new Alerts. A speaker with a line through it, will be illuminiated in the upper right corner of all pages.		
S-08A	**BYPASS Enable setting** (*ON*, OFF)	
The default Bypass Enable setting is OFF. This setting, when switched to ON, allows the UPS to switch to the Bypass state if it needs to.		
S-08B	**BYPASS Setting** (ON, *OFF*)	
To disable the Bypass set this to OFF. The UPS will not be allowed to transition to the Bypass state under any circumstances.		

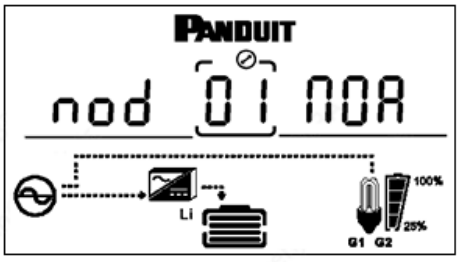
Screen #	DC Li Settings	Content display
S-09	**(External) Battery Pack Number** (*1*, 2, 3, 4, 5, 6, 7, 8)	
To set the number of External Battery Packs (EBPs) connected to the UPS. The default value is 1 (50 Ah). **NOTE:** This setting is only shown on Long Runtime Li UPS models.		

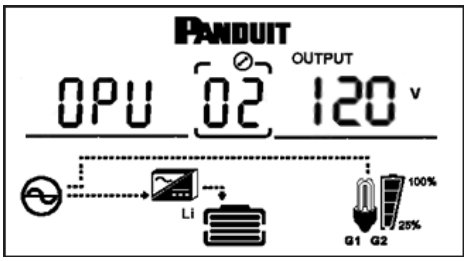
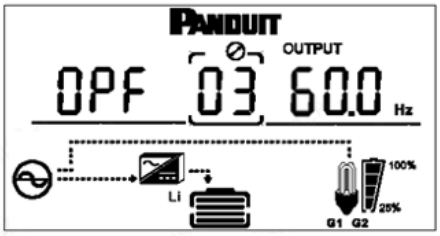
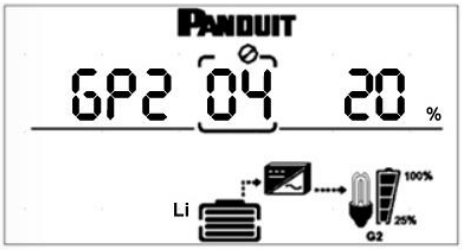
Line Interactive Li UPS

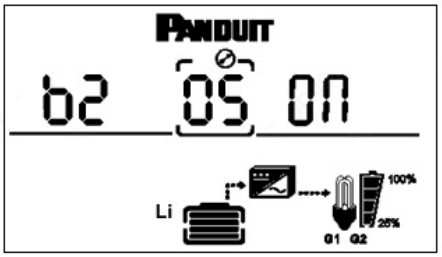
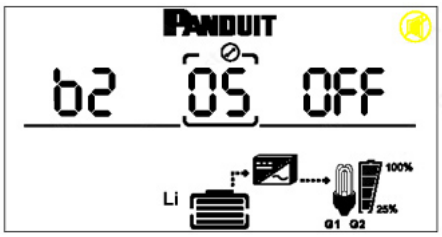
These UPS units are for the North American markets only.

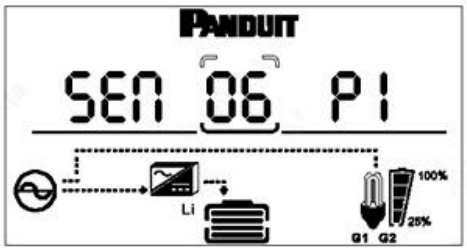
The Line Interactive Lithium-Ion UPS has the following Setup pages. Remember that scrolling down through the last Setup page will automatically save any settings changed during the Setup session and transition back to the Monitor Operation mode.

The following table shows an example and description of each setup page in the Line Interactive Li UPS unit.

Screen #	LI Li Settings	Content display
S-01	**Mode setting** (*Nor*, Gen)	
The default mode setting is Normal mode for all Line Interactive UPS units.		

Screen #	LI Li Settings	Content display
S-02	**Output Voltage setting** (100, 110, 115, *120*, 125)	
The default Output Voltage setting is 120V for North American UPS units. For maximun efficiency set the output voltage to the input source voltage. **Note:** The output voltage must be set to a voltage that is within the operating range of all the loads connected to the UPS.		
S-03	**Frequency setting** (50, *60*)	
The default Frequency setting is 60Hz for North American UPS units.		
S-04	**Group 2 Battery EOD setting** (0, *20*, 30)	
Group 2 is the switchable outlet group. This outlet group may be utilized to power non-critical loads. The default Group 2 Battery End of Discharge (EOD) setting is 0%. This group of outlets may be configured to turn OFF before the Group 1 outlets. This setting is the percentage of battery capacity left when the outlet group turns OFF. The lower the percentage setting, the longer outlet Group 2 will stay ON while the UPS is running on battery. However, the longer this outlet group stays ON, the less runtime there is for outlet Group 1 which may contain the critical loads. If all outlets are used for critical loads, then set Group 2 capacity equal to the Group 1 at 0%.		

Screen #	LI Li Settings	Content display
S-05A	**Buzzer setting** (ON, OFF)	
The default Buzzer setting is ON.		
S-05B	**Buzzer setting** (ON, OFF)	
To mute all audiable alarms, set this to OFF.The Buzzer will be muted, even with new Alerts. A speaker with a line through it will be illuminiated in the upper right corner of all pages.		

Screen #	LI Li Settings	Content display
S-06	Input Sensitivity setting (*P1*, P2, P3)	
The Input Sensitivity setting is available on LI-Li UPS units with Core firmware V023 and later. This setting may be changed depending on the quality of the input voltage waveform. If the UPS is experiencing frequent abnormal input warnings, this setting may be adjusted to help restore normal operation. P1 (default) – High sensitivity (Transfer time: 10.5 ms) P2 – Medium sensitivity (Transfer time: 11.9 ms) P3 – Low sensitivity (Transfer time: 13.3 ms) **Note**: Lowering the sensitivity also increases the average transfer time by a small amount. This is the time it takes for the output load to be transferred to battery power if input power is lost.		

Appendix A: 1 to 3kVA Fault Codes & Alert LEDs

The following Alert Code Table lists the available Alarm and Fault codes that may appear on the display of the 1 to 3kVA 1-Phase UPS units. If the Buzzer is enabled, it will either make a continuous beep or periodic beep (about 1 per second). The Alert LED will either illuminate Yellow for Warning Alarm or Red for Critical Alarm.

If the Alert Code cannot be cleared, then contact Panduit Customer Technical Support at techsupport@panduit.com or techsupportemea@panduit.com with the following information:

- Product SKU and serial number.
- Detailed explanations of the fault, such as LCD display info, LED lights status, etc.

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
2	Inverter Fault	Critical	Continuous	Red Alert On	Reboot the UPS unit.
9	Fan Fault	Critical	Continuous	Red Alert On	Remove ventilation obstructions. Reboot the UPS unit.
12	Initialization Fault	Critical	Continuous	Red Alert On	Reboot the UPS unit.
13	Battery Charger Fault	Critical	Continuous	Red Alert On	Reboot the UPS unit.
15	DC Bus Over Voltage	Critical	Continuous	Red Alert On	Reboot the UPS unit
16	DC Bus Under Voltage	Critical	Continuous	Red Alert On	Reboot the UPS unit
17	DC Bus Unbalanced	Critical	Continuous	Red Alert On	Reboot the UPS unit.
18	Soft Start Error	Critical	Continuous	Red Alert On	Reboot the UPS unit
19	UPS Over Temperature	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or below 40°C. Reduce load (if overload). Remove ventilation obstructions. Reboot the UPS unit.
20	Heatsink Over Temperature	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or below 40°C. Reduce load (if overload). Remove ventilation obstructions. Reboot the UPS unit.
26	Battery Over Voltage	Warning	Periodic	Yellow Alert	Ensure that the EBP and

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
				On	battery cartridge match the UPS battery voltage.
27	Input Voltage Reversed	Warning	Periodic	Yellow Alert On	Ensure that the input source Line and Neutral are not reversed.
28	Bypass Voltage Reversed	Warning	Periodic	Yellow Alert On	Ensure that the input source Line and Neutral are not reversed.
29	Output Short-circuit	Warning	Periodic	Yellow Alert On	Remove the loads and add back one at a time to detect load that is short-circuited.
30	Input Current Limit	Warning	Periodic	Yellow Alert On	Reduce the output load.
31	Bypass Over Current	Warning	Periodic	Yellow Alert On	Reduce the output load.
32	Output Overload	Warning	Periodic	Yellow Alert On	Reduce the output load.
33	No Battery Detected	Warning	Periodic	Yellow Alert On	Ensure that the battery connector is properly seated and making a good connection. Allow the Battery to recharge.
34	Battery Depleted	Warning	Periodic	Yellow Alert On	Allow battery to recharge.
35	Battery Low	Warning	Periodic	Yellow Alert On	Allow battery to recharge.
36	Output Overload Time Out	Warning	Periodic	Yellow Alert On	Reduce the output load.
37	DC Component Over Limit Error	Critical	Continuous	Red Alert On	Reboot the UPS unit.
39	Input Voltage Abnormal	Warning	Periodic	Yellow Alert On	Ensure that the source input voltage is within the UPS operating range.
40	Input Frequency Abnormal	Warning	Periodic	Yellow Alert On	Ensure that the source input frequency is within the UPS operating range.
41	Bypass Not Available	Warning	Periodic	Yellow Alert On	Ensure that the source input voltage and frequency are within the UPS operating range.
42	Bypass Unable to Trace	Warning	Periodic	Yellow Alert On	Ensure that the source input voltage and

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
					frequency are within the UPS operating range.
45	EPO Activated	Warning	Continuous	Red Alert On	Ensure that the EPO port on the back of the UPS is plugged in and shorted together. The UPS must then be power cycled to restart.

For Lithium-ion Long Runtime 1-3kVA UPS units, use the table below for additional faults that only apply to these models.

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
50	BMS Communication Lost	Warning	Periodic	Yellow Alert On	Confirm all cables are connected between the EBP and UPS. Check DIP switches on EBPs. Reboot EBP
51	BMS Protection	Critical	Continuous	Red Alert On	Reduce load (if overload). Reboot the UPS & EBP units.
52	BMS Alarm	Warning	Periodic	Yellow Alert On	Refer to detailed alarm code
53	Firmware Version Inconsistent	Warning	Periodic	Yellow Alert On	Confirm all UPS and EBP units are on a compatible firmware level.
54	Incorrect Number of EBP	Warning	Periodic	Yellow Alert On	Adjust the number of EBP units in the UPS settings to match the connect number of EBPs connected. Confirm all wiring (EBP, COMM, CAN Cables) between the EBP and UPS units is correct.
55	Present Signal Loss	Critical	Continuous	Red Alert On	Check if COMM cable between UPS and first EBP is damaged
57	EBP Cell Over Voltage	Warning	Periodic	Yellow Alert On	Discharge EBP or wait; the EBP can self-recover

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
58	EBP Cell Low Voltage	Warning	Periodic	Yellow Alert On	Charge the battery; EBP can self-recover
59	Charging Over Temperature	Warning	Periodic	Yellow Alert On	Ensure that the ambient operating temperature is at or below 40°C. Battery will self-recover.
60	Charging Low Temperature	Warning	Periodic	Yellow Alert On	Ensure that the ambient operating temperature is at or above 0°C. Battery will self-recover.
61	Charging Over Current	Warning	Periodic	Yellow Alert On	Reboot the UPS unit
62	Discharging Over Current	Warning	Periodic	Yellow Alert On	Reboot the UPS unit
64	MOSFET Over Temperature	Warning	Periodic	Yellow Alert On	Ensure that the ambient operating temperature is at or below 40°C. Battery will self-recover.
65	Discharging Over Temperature	Warning	Periodic	Yellow Alert On	Ensure that the ambient operating temperature is at or below 40°C. Battery will self-recover.
66	Discharging Low Temperature	Warning	Periodic	Yellow Alert On	Ensure that the ambient operating temperature is at or above 0°C. Battery will self-recover.
70	Safety Low Voltage Protection	Critical	Continuous	Red Alert On	Contact Panduit Technical Support for further guidance.
71	Relay Failure	Critical	Continuous	Red Alert On	Contact Panduit Technical Support for further guidance.
72	Battery address conflict	Critical	Continuous	Red Alert On	Check if the EBP DIP switch is set correctly.
74	Discharging Over Temperature Critical	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or below 40°C. Battery will self-recover.
75	Discharging Low Temperature Critical	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or above 0°C. Battery will self-recover.
76	Cell Over Voltage Critical	Critical	Continuous	Red Alert On	No action required; Battery will self-recover.
77	Cell Low Voltage Critical	Critical	Continuous	Red Alert On	Charge the EBP

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
78	Charging Overtemperature Critical	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or below 40°C. Battery will self-recover.
79	Charging Low Temperature Critical	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or above 0°C. Battery will self-recover.
80	Charging Over Current Critical	Critical	Continuous	Red Alert On	Reboot the battery pack.
81	Discharging Over Current Critical	Critical	Continuous	Red Alert On	Reboot the UPS unit
82	Internal Communication Fault Critical	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit technical support.
83	Internal Communication Alarm	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit technical support.
84	MOSFET Over Temperature	Critical	Continuous	Red Alert On	Ensure that the ambient operating temperature is at or below 40°C. Battery will self-recover.
85	Permanent fail	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit technical support.
86	Charging Over Current overflow	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit technical support.
87	Discharging Over Current overflow	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit technical support.
88/89	Fuse damage	Critical	Continuous	Red Alert On	BMS is damaged; contact Panduit technical support.
90	Analog front-end protection	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit technical support.
91	Hardware Circuit Protection	Critical	Continuous	Red Alert On	Reboot the UPS unit. If unit does not recover, contact Panduit

Fault Code	Fault Description	Fault Type	Buzzer	LED	Action to Take
					technical support.

Appendix B: Troubleshooting

If the UPS is not properly functioning, it may be related to improper installation, wiring or operation. Follow the below troubleshooting procedures as a first pass analysis of the problem.

No.	Problem	Possible Reason	Solution
1	The source is connected but the UPS will not power ON.	Input power source is not providing power.	Make sure the panel breaker feeding the source is ON.
		Input voltage and/or frequency is too low or too high.	With a multimeter measure the source voltage and frequency connected to the UPS input to ensure it is within the input operating range of the UPS.
		The input breaker of the UPS is not turned ON (if applicable).	Turn ON the input breaker (if applicable).
2	The source is in range, but the Normal LED does not light on the UPS, and the UPS is operating in the battery state.	The input breaker of the UPS is not turned ON (if applicable).	Turn ON the input breaker (if applicable).
		The input cable is not securely connected.	Make sure the input cable is securely connected.
3	The UPS does not indicate any failure, but there is no output voltage.	The output breaker is not turned ON (if applicable).	Turn ON the output breaker (if applicable).
		The output cable is not securely connected.	Make sure the output cable is securely connected.
		The Inverter is off, and Bypass is not Enabled upon initial bootup.	Press and hold the Inverter enable button until a beep is heard, then release. Check that the user setting for Bypass Enable ('bEn') is set to ON. (Double Conversion units only.)
4	Buzzer beeps every second and the display shows "output overload".	The load on the output of the UPS exceeds the capability of the UPS.	Remove some load. Use a higher kVA rated UPS for this deployment.
5	The Alert Critical LED is ON and there is no battery charge voltage and current.	The battery is not connected or not securely connected.	Make sure the battery is securely connected.
6	The alarm code shown is 9 and Alert led is ON.	The UPS fan may be stuck by another object.	Remove the object stuck in the fan.
		The fan sensor signal could be lost.	Shut down the UPS and restart.
7	The alarm code shown is 29 and Alert led is ON.	The UPS shuts down automatically because a	Check output wiring or if connected loads are in short circuit status.

No.	Problem	Possible Reason	Solution
		short circuit occurred on the UPS output.	
8	UPS cannot cold start (LCD does not light)	Battery overcurrent protection was triggered when plugging in the battery for the first time	Remove and plug the battery back in and reboot the UPS.
		Battery short circuit protection was triggered	Check if the battery terminals are reversed or short circuit (measure the voltage).
		Battery over discharged, battery voltage is too low	Check the battery terminal voltage, if the voltage is too low, charge the battery.
		Battery over temperature protection was triggered, battery output voltage was disabled	Wait for a while, reboot the UPS after battery cool down.
		External Battery Pack is not connected to the UPS	Confirm the External Battery Packs are properly wired between the UPS and EBP. Ensure the EBP is on by confirming front LEDs are lit. If the LEDs are not on, check the EBP circuit breaker is set to “on” and that the ON/OFF button is held for 5 seconds to activate the EBP.
9	Battery charging speed is too slow or cannot be charged	Battery low temperature protection was triggered	Ensure that the UPS and EBP are operating in an environment at or above 0°C.
		Battery over temperature protection was triggered	Ensure that the UPS and EBP are operating in an environment at or below 40°C.
10	Battery backup time is shorter than nominal	The battery cartridge is not fully charged at start of the battery state.	May need more battery capacity to support frequent source power loss. Allow proper time for battery cartridges to fully recharge.
		The battery is at its end-of-life expectancy.	Replace all battery cartridges (never mix old and new battery cartridges in a system for maximum battery life).
11	The UPS is frequently cycling between normal operation and battery mode. Alarm code 39 is displayed.	The UPS is detecting anomalies from input voltage at a rapid rate and attempting to transfer to battery mode to protect the load.	Set the UPS to GEN mode (all models) or adjust the input sensitivity to a lower setting (Li-LI models with V023 FW or later).
12	On UPS start-up, the EBP is not able to charge and Code 50 and/or 54 are displayed on the screen.	If one or more EBPs have been added or removed since last start-up, the UPS will not charge the battery.	Confirm the correct number of EBP units connected to the UPS is configured on the UPS.

If the troubleshooting procedures do not solve the problem, contact Panduit Customer

Support at cs@panduit.com or 1-800-777-3300 with the following information:

- Product SKU and serial number.
- Detailed explanation of the fault, such as LCD display info, LED lights status, etc.

Appendix C: State Transitions Based on External Events

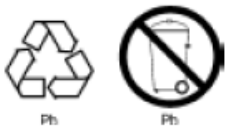
1-3 kVA Double Conversion				
UPS Operating State	**EU - Range**	**NA 120V - Range**	**NA 208V - Range**	**Comments**
Normal, CF, or Gen state Voltage Range	Full load: 176 ~ 264 Vac Half load: 110 ~ 300 Vac	Full load: 95 ~ 150 Vac Half load: 55~ 150 Vac	Full load: 176 ~ 264 Vac Half load: 110 ~ 300 Vac	If the input voltage goes outside of the range, the UPS will transition to Battery state.
ECO state Voltage Range	Upper limit: 230 ~ 264 Vac (Settable) Lower limit: 176 ~ 220 Vac (Settable)	Upper limit: 120 ~ 132 Vac (Settable) Lower limit: 80 ~110 Vac (Settable)	Upper limit: 220 ~ 264 Vac (Settable) Lower limit: 176 ~ 195 Vac (Settable)	If the input voltage goes outside of the settable range, the UPS will transition to the Normal state.
Bypass state Voltage Range	Upper limit: 230 ~ 264 Vac (Settable) Lower limit: 176 ~ 220 Vac (Settable)	Upper limit: 120 ~ 132 Vac (Settable) Lower limit: 80 ~110 Vac (Settable)	Upper limit: 220 ~ 264 Vac (Settable) Lower limit: 176 ~ 195 Vac (Settable)	If the input voltage goes outside of the settable range, the UPS will shut down the output.
Normal or ECO state Frequency Range	50/60 ± 4Hz			If the input frequency goes outside of this range, the UPS will transition to the Battery state.
CF state Frequency Range	50/60 ± 4Hz			If the input frequency goes outside of this range, the UPS will transition to the Battery state.
Bypass state Frequency Range	50/60 ± 4Hz			If the input frequency goes outside of this range, the UPS will shut down the output.
Gen state Frequency Range	40 ~ 70 Hz			This range is exclusive. If the input frequency goes outside of this range, the UPS will transition to the Battery state.
Normal or Gen state Overload	105% ~ 125% : 1 min 125% ~ 130% : 30 secs > 130% : 200 msecs			Overload Alarm for time specified and then the UPS will transition to the Bypass state.
CF state Overload	105% ~ 125% : 1 min 125% ~ 130% : 30 secs > 130% : 200 msecs			In CF Mode, the UPS is derated to 80%. Overload Alarm (based on derate value) for time specified and then the UPS will shut down the output.
Battery state Overload	105% ~ 125% : 1 min 125% ~ 130% : 10 secs > 130% : 200 msecs			Overload Alarm for time specified and then the UPS will shut down the output.
ECO or Bypass state Overload	105% ~ 130% : 10 min 130% ~ 200% : 1 min > 200% : 200ms			Overload Alarm for time specified and then the UPS will shut down the output.

1-3kVA Line Interactive		
UPS Operating State	**Range**	**Comments**
Normal or Gen state Voltage Range	100Vac: 90 ~ 110Vac 110Vac: 99 ~ 121Vac 115Vac: 104 ~ 126Vac 120Vac: 108 ~ 132Vac 125Vac: 113 ~ 137Vac	If the input voltage goes outside of this range, the UPS will transition to the AVR state.
AVR state Voltage Range	100Vac: 75 ~ 93(Boost)/107 ~ 117(Buck) 110Vac: 83 ~ 103(Boost)/117 ~ 133(Buck) 115Vac: 86 ~ 107(Boost)/123 ~ 139(Buck) 120Vac: 90 ~ 112(Boost)/128 ~ 145(Buck) 125Vac: 94 ~ 117(Boost)/133 ~ 151(Buck)	If the input voltage goes above the Boost range and below the Buck range, then the UPS will transition back to the Normal or Gen state. If the input voltage goes below the Boost range or above the Buck range, then the UPS will transition to the Battery state.
CF, ECO Mode Voltage Range	NA	NA
Normal state Frequency Range	50/60 ±4Hz	If the input frequency goes outside of the this range, the UPS will transition to the Battery state.
Gen state Frequency Range	40 ~ 70Hz	If frequency is with in the range, the frequency variation will get passed to the load. If the frequency goes outside of this range, the UPS will transition to the Battery state.
CF, ECO Mode Frequency Range	NA	NA
Normal, Gen, or Battery state Overload	105% ~ 110%: overload alarm indefinitely; 110% ~ 120%: 10 secs; >120%: 0 secs;	Overload Alarm for time specified and then the UPS will shutdown.

Appendix D: Maintenance and Storage

Maintenance

The repair and replacement of any components in the UPS system must be performed by qualified personnel. If the battery cartridge has exceeded its service life (VRLA about 3-5 years and Li about 5-10 years at 25°C), contact Panduit Sales for qualified replacements.



Used battery cartridges should be properly disposed per local regulations. Refer to the Panduit Support Website at: https://www.panduit.com/en/support/ups-battery-recycling.html

Storage/Transportation

Before storing or transporting the UPS or EBP units with battery cartridges or replacement battery cartridges, charge the cartridge for 5 hours with no load. Disconnect the battery cartridge(s) from the system (see Installation Manual). Store/transport the product in the upright orientation in normal packaging in a dry environment. During storage, recharge and maintain according to the following table:

Storage temperature	Charging interval	Charging time
-25°C - 40°C	Every 3 months	1-2 hours
40°C - 45°C	Every 2 months	1-2 hours

Note: Environmental factors affect battery life. High ambient temperature, high humidity, low-voltage, and frequent, short-term discharges will shorten the battery life.