

CSI 263353.01EXR – Static Uninterruptible Power Supply Systems
EXR Series

MINUTEMAN UPS
EXR Series
Product Specifications
750VA – 3000VA
Single-Phase Uninterruptible Power Supply Systems

1.0 GENERAL

1.1 SUMMARY

This product specification will outline and define the electrical and mechanical features for line-interactive, true sinewave, solid-state, uninterruptible power supply (UPS) systems. The UPS shall provide high-quality, regulated AC power to sensitive electronic equipment connected to the system.

1.2 STANDARDS

The UPS shall be designed and manufactured in accordance with the applicable sections of the current revision of the following regulatory organizations codes. Where a conflict may arise between these standards made herein, the statements in this specification shall govern.

- cULus (UL1778 5th edition, CSA 22.2 No. 107.3-14 / R:2014 3rd Edition)
- FCC Part 15 Category B
- FCC Part 68, Subpart F
- IEEE C62.41 Category A1
- EN61000-3-2
- EN61000-3-3
- EN62040-2
- IEC61000-2-2
- IEC61000-4-2
- IEC61000-4-3
- IEC61000-4-4
- IEC61000-4-5
- IEC61000-4-6
- IEC61000-4-8
- CE compliance mark
- NOM
- ISO9001 & 14001
- RoHS2 (EU Directive 2011/65/EU & 2015/863/EU)
- Energy Star 2.0

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements – UPS Module

1.3.1.1 Topology: The UPS shall be of a line-interactive design. Utility AC voltage is supplied to connected devices using high-frequency electronics, along with a multi-tap transformer to stabilize and regulate abnormal incoming fluctuations. All batteries will strictly be reserved for use in powering connected devices when utility power is absent.

1.3.1.2 Standard Voltage Settings: Input/output voltage specifications of the UPS, operating in AC mode, shall be: (The voltages in parenthesis are for the high voltage models):

Input: 120/125VAC (208/240VAC), single-phase, two-wire plus ground
Output: 120/125VAC (208/240VAC), single-phase, two-wire plus ground

1.3.1.3 Output Load Capacities: The specified output load capacity of the UPS shall be as follows:

750VA – 675 Watts
1000VA – 900 Watts
1500VA – 1350 Watts
2000VA – 1800 Watts
3000VA – 2700 Watts

1.3.2 Batteries

1.3.2.1 Battery Type: Maintenance-free, sealed, non-spillable, lead-acid, valve-regulated.

1.3.2.2 Reserve Time: Each UPS model must maintain a minimum of 2.5 minutes with a full, non-linear, load at an ambient temperature between 20° and 30° Celsius.

1.3.3 Modes of Operation

The UPS shall be designed to operate as a line-interactive system in the following modes:

1.3.3.1 Normal Mode: The critical AC load is supplied by the input power source to the UPS. Any non-hazardous harmonics and/or anomalies are filtered through internal electronics of the UPS. Internal batteries are simultaneously float-charging through a two-stage process.

1.3.3.2 Boost Mode: During a sag of input utility AC voltage, the internal two-stage transformer of the UPS will supplement the voltage, raising the level of the sag, to a nominal AC voltage output level without the use of internal batteries. The UPS must be able to operate indefinitely in Boost mode until utility AC voltage rises to the minimum nominal levels.

1.3.3.3 Buck Mode: During a surge of input utility AC power, the internal, two-stage buck transformer will suppress, or buck, the surge to nominal AC output voltages without the use of internal batteries. The UPS must be able to operate indefinitely in Buck mode until utility AC voltage returns to maximum nominal levels.

1.3.3.4 Battery Mode: During a complete removal, severe brown-out or extreme overvoltage or spike of input utility AC power to the UPS, the connected AC load will be supplied power by the UPS switching to Battery Mode with the UPS inverter providing output AC power supported with the internal batteries. During the switch to Battery Mode, there shall be a minimum interruption in power lasting, typically, no more than 6 milliseconds. When nominal input utility AC power returns, the UPS will return to Normal Mode with an interruption of, typically, no more than 6 milliseconds.

1.3.3.5 Recharge Mode: Upon restoration of nominal input utility AC power to the UPS, after an input power outage causing the UPS to switch to Battery Mode, the internal charger shall automatically start recharging the internal batteries.

1.3.3.6 DC Cold Start Mode: The UPS shall start and operate without AC utility power applied.

2.0 PERFORMANCE REQUIREMENTS

2.1 INPUT TO UPS

2.1.1 Wiring Configuration for Standard Units: Single-phase, 2-wire plus ground.

- 2.1.2 Input Power Cord:** All UPS will come with a ten-foot input power cord with a standard NEMA input plug attached. 120VAC models will have a strain-relief connection with the UPS and power cord. 208VAC models will have an IEC320 input connection, with a IEC-to NEMA power cord bundled with the unit. The NEMA input plug of the power cord must be rated to tolerate the maximum input current of the UPS per UL1778 regulations:

750VA model – NEMA 5-15P
1000VA model – NEMA 5-15P
1500VA model – NEMA 5-15P (NEMA 6-15P)
2000VA model – NEMA 5-20P
3000VA model – NEMA L5-30P (NEMA L6-30P)

- 2.1.3 Nominal Voltage Range (Non-battery mode):** 80 – 164VAC (150 – 271VAC)

- 2.1.4 Input Voltage Sensitivity Adjustment:** When nominal input utility AC voltage maintains consistent levels at or near the thresholds of the UPS nominal input voltage window, causing to UPS to continuously switch between Boost, Buck and Battery modes, the UPS will have the capability to adjust the nominal input voltage window by +2 /-4 volts. This adjustment setting will be accessible through the LCD front panel.

- 2.1.5 Nominal Frequency:** Auto-Select, Auto-sensing 50/60Hz (+/- 6Hz.).

- 2.1.6 Inrush Current:**

120/125VAC models

750VA model – 65 Amps for 0.2 mS
1000VA model – 75 Amps for 0.3 mS
1500VA model – 80 Amps for 0.3 mS
2000VA model – 60 Amps for 1.3 mS
3000VA model – 50 Amps for 1.3 mS

208/240VAC models

1500VA model – 145 Amps for 0.1 mS
3000VA model – 65 Amps for 1.0 mS

- 2.1.7 Current Limit:**

120/125VAC models

750VA model – 12 Amp input circuit breaker
1000VA model – 15 Amp input circuit breaker
1500VA model – 15 Amp input circuit breaker
2000VA model – 20 Amp input circuit breaker
3000VA model – 30 Amp input circuit breaker

208/240VAC models

1500VA model – 10 Amp input circuit breaker
3000VA model – 20 Amp input circuit breaker

- 2.1.8 Current Distortion:**

120/125VAC models: Not to exceed 5% at 50% linear load.
208/240VAC models: Not to exceed 5% at 50% linear load.

- 2.1.9 AC Leakage Current:** <1.5mA at full rated non-linear load

2.1.10 AC Surge Energy Protection: 120VAC models will sustain input surges without damage per the IEEE C62.41 Cat. A1 standard. All models will support EN61000-4-5: 2KVA

2.1.10.1 Metal Oxide Varistors: The UPS shall have Metal Oxide Varistors for surge energy protection with a rating of:

- 120/125VAC models – 1000 Joules
- 208/240VAC models – 800 Joules

2.1.10.2 Input Common Mode Choke: All units must have an Input common mode choke.

2.1.10.3 Voltage Transient Response: 0ns (instantaneous) Normal mode; <5ns common mode

2.1.10.4 Transient Recovery Time: <1800 mS.

2.1.11 Back-feed Protection: Back-feed protection is provided via an isolation relay.

2.2 OUTPUT OF UPS

2.2.1 Wiring Configuration: Single-phase, 2-wire plus ground

2.2.2 Output Waveform (All Modes): Pure Sinewave

2.2.3 Voltage Regulation:

- 2.2.3.1 Normal Mode:** 101 –136VAC (186 – 236VAC)
- 2.2.3.2 Boost Mode:** 102 – 127VAC (188 – 222VAC)
- 2.2.3.3 Buck Mode:** 102 – 131VAC (196 – 236VAC)
- 2.2.3.4 Battery Mode:** 114 – 126VAC (198 – 218VAC) until Low Battery Warning.

2.2.4 Frequency:

- 2.2.4.1 Normal Mode:** 50/60Hz ±6Hz.
- 2.2.4.2 Boost Mode:** 50/60Hz ±6Hz.
- 2.2.4.3 Buck Mode:** 50/60Hz ±6Hz.
- 2.2.4.4 Battery Mode:** ±0.1Hz unless synchronized to utility line

2.2.5 Voltage Distortion:

2.2.5.1 Normal Mode:	Linear	Non-linear
750VA model	≤0.4%	≤1.8%
1000VA model	≤0.4%	≤1.8%
1500VA model	≤0.4%	≤1.8%
2000VA model	≤0.4%	≤2.1%
3000VA model	≤0.4%	≤2.1%

2.2.5.2 Boost Mode:

750VA model	≤0.5%	≤4.8%
1000VA model	≤0.5%	≤4.8%
1500VA model	≤0.5%	≤4.8%
2000VA model	≤0.5%	≤6.6%
3000VA model	≤0.5%	≤6.6%

2.2.5.3 Buck Mode:

750VA model	≤0.4%	≤2.4%
1000VA model	≤0.4%	≤2.4%
1500VA model	≤0.4%	≤2.4%
2000VA model	≤0.5%	≤2.5%
3000VA model	≤0.5%	≤2.5%

2.2.5.4 Battery Mode:

750VA model	≤3.7%	≤7.3%
1000VA model	≤3.7%	≤7.3%
1500VA model	≤3.7%	≤7.3%
2000VA model	≤4.5%	≤7.9%
3000VA model	≤4.5%	≤7.9%

2.2.6 Current Distortion (All Modes): Not to exceed 5% at full linear load.

2.2.7 Dynamic Response: ±10% at 100% load change in 30ms

2.2.8 Load Power Factor Range (All Modes): 1.0 to 0.9 lagging without de-rating.

2.2.9 Output Power Factor Rating (All Modes): 0.9pf

2.2.10 Current Monitoring: All units will have current monitoring circuitry on the UPS output receptacles to measure the combined total load of all the receptacles. This circuitry shall be used to calculate actual load.

2.2.11 Overload Capacity: All models and all modes

110% - 124% for 20 seconds until shutdown
 125% - 149% for 10 seconds until shutdown
 ≥ 150% immediate shutdown

2.2.12 Output Voltage in Battery Mode: 120/125VAC (208/240VAC) ±5% until low battery warning

2.2.12.1 Inverter (On-Battery) Output Voltage Adjustment: The Inverter (On-Battery) output voltage setting can be either 120VAC (208VAC) default or 125VAC (240VAC). Changing the Inverter (On-Battery) output voltage to 125VAC will also change the Buck set point. Changing the Inverter (On-Battery) output voltage to 240VAC, will also change the Brownout, Boost, Buck, and Overvoltage set points. The UPS must be in the off position and connected to the AC outlet. Use the scroll buttons on the LCD screen scroll to the Service Mode screen and then press the Enter key. Then scroll to the Output Voltage Setting screen and press the Enter Key. Then scroll to the desired output voltage setting and press the Enter Key. Then press the Escape key to exit the Configuration screen. Now the UPS is ready for Normal operation. Press the On/Off/Test button to turn the UPS on.

2.2.13 Efficiency:

- 2.2.13.1 Normal Mode:** >97 % at full rated non-linear load
- 2.2.13.2 Boost Mode:** > 93 % at full rated non-linear load
- 2.2.13.3 Buck Mode:** > 93 % at full rated non-linear load
- 2.2.13.4 Battery Mode:** > 84 % at full rated non-linear load

2.2.14 Transfer time:

- Normal to Battery Mode: 4-6 ms (max 10 ms)
- Battery to Normal Mode: 2-5 ms (max 10 ms)

- Normal to Boost Mode: 2-5 ms (max 10 ms)
- Boost to Normal Mode: 4-6 ms (max 10 ms)
- Normal to Buck Mode: 3-5 ms (max 10 ms)
- Buck to Normal Mode: 3-5 ms (max 10 ms)

3.0 COMPONENTS

3.1 CHARGER

- 3.1.1 General:** The term charger shall denote the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for battery charging. The charger shall be a pulse-width modulated, switching-type with constant voltage/current limiting control circuitry.
- 3.1.2 DC Filter:** The charger shall have an output filter to minimize ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS. The filter shall be adequate to ensure that the DC output of the charger will meet the input requirements of the inverter.
- 3.1.3 Automatic Restart:** Upon restoration of utility AC power, after a utility AC power outage, the UPS shall automatically restart and resume the battery recharge mode.
- 3.1.4 Battery Recharge:** The charger shall be capable of producing battery-charging current sufficient to replace 90% of the battery-discharged power within eight hours after a full-load discharge. After the battery is recharged, the charger shall maintain the battery at full charge until the next emergency operation.
- 3.1.5 Overvoltage Protection:** There shall be charger over-voltage protection so that if the charger voltage rises to the pre-set limit, the charger will turn off and issue a fault alarm.
- 3.1.6 Charger Voltage:**
- | | |
|----------------|--------------------------|
| 750VA model: | 41.4VDC \pm 3% at 25°C |
| 1000VA model: | 41.4VDC \pm 3% at 25°C |
| 1500VA models: | 41.4VDC \pm 3% at 25°C |
| 2000VA model: | 82.8VDC \pm 3% at 25°C |
| 3000VA models: | 82.8VDC \pm 3% at 25°C |

3.1.7 Charge Current:

Standard charge mode: 0.125 times the Amp-hour rating of the internal batteries. Example: a 7.2Amp-hour battery should have a charge current of 0.90Amps at 25°C.

Float mode: 0.0625 times the Amp-hour ratings of the internal batteries. Example: a 7.2Amp-hour battery should have a charge current of 0.45Amps at 25°C.

- 3.1.8 Temperature Compensation:** The charger voltage will vary according to the internal ambient temperature of the UPS. That variance will be defined as -3.3mV/°C per cell using 12V batteries.

3.2 INVERTER

- 3.2.1 General:** The term inverter shall denote the solid-state equipment and controls to convert DC power from the Converter or the DC/DC Booster circuits to regulated AC power for supporting the critical load.

- 3.2.2 Overload Capability:** The inverter shall be capable of supplying current and voltage for overloads exceeding 105% and up to 124% of full load current for 20 seconds. A status indicator and audible alarm shall indicate overload operation.
- 3.2.3 Fault Clearing and Current Limit:** The inverter shall be capable of supplying an overload current of 110% of its full-load rating for 20 seconds. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.
- 3.2.4 Fuse Failure Protection:** Power semiconductors in the inverter unit shall be fused so that loss of any one power semiconductor will not cause cascading failures.
- 3.2.5 Inverter DC Protection:** The inverter shall be protected by the following disconnect levels:
- DC Overvoltage Shutdown.
 - DC Over-current Shutdown
 - DC under-voltage Warning (Low Battery Reserve).
 - DC under-voltage Shutdown (End of Discharge).
- 3.2.6 Over-discharge Protection:** To prevent battery damage from over-discharging, the UPS control logic shall automatically turn off the inverter at a predetermined level as to not damage the batteries.
- 3.2.7 Output Frequency:** The output frequency of the inverter shall be microprocessor controlled. The microprocessor shall regulate the inverter output frequency to +/- 0.1% for steady state and transient conditions. Total frequency deviation, including short time fluctuations and drift, shall not exceed 0.1% from the rated frequency unless synchronized to utility power.

3.3 OUTPUT POWER TRANSFORMER

3.4 DISPLAY AND CONTROLS

- 3.4.1 Monitoring and Control:** The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. The UPS shall have a dot-matrix format, LCD display and four LED displays located on the front panel that provide the following information:
- 3.4.2 LCD Display:** The LCD display will be based on a 5x8 dot matrix icon arranged in two rows of 16 characters. Using the control buttons on the front panel, the User will be able to monitor the status of the UPS, configure the UPS, monitor, and record events related to the UPS and identify specific information about the UPS model and battery information.
- 3.4.2.1 UPS Status:** Through the LCD display, the User will be able to view the condition of the UPS including information about the operating mode, load information battery voltage and capacity, input and output voltage and frequency and the output load bank status.
- 3.4.2.2 UPS Configuration:** Using the LCD display and front panel buttons, the User will be able to configure certain functions and capabilities of the UPS. The configurations include display language and format, alarm formats, load shedding, input and output voltage settings and restore to default settings.
- 3.4.2.3 UPS Event Log:** Through the front panel LCD display, the UPS will be able to report an event log that includes input warnings and a UPS fault log.

- 3.4.2.4 UPS Model and Battery Information:** The LCD display will provide detailed information about the UPS including Model and Serial Number information, Battery configuration and install date and the firmware revision used by the UPS.
- 3.4.3 LED Display:** The UPS will have four LED display icons on the front panel. These LED icons will provide UPS information and warnings which include:
- AC Normal Mode
 - Battery Mode
 - General UPS Fault
 - Replace Battery
- 3.4.4 Alarm Messages:** If a warning or fault occurs on the UPS, a corresponding text string describing the alarm will run through the second line of LCD display. The warning or fault will continue to be displayed until the condition has been properly cleared on the UPS.
- 3.4.5 Physical Controls:**
- 3.4.5.1 ON/OFF/TEST Button:** UPS start-up operations shall be accomplished through the front panel push-button control. Press and release the On/Off/Test Button after one beep to turn the UPS on and supply power to the load. **NOTE:** The input circuit breaker on the rear panel **MUST** be on for the 208V models. The load is immediately powered while the UPS runs a five second self-test. Press and release the On/Off/Test Button after one beep to turn the UPS off. **NOTE:** Turn the input circuit breaker (on the rear panel) off for the 208V models. The UPS will continue to charge the batteries whenever it is plugged into a wall outlet and there is acceptable AC voltage present. **NOTE:** The input circuit breaker (on the rear panel) **MUST** be on for the 208V models.
- 3.4.5.2 Alarm Silence Button:** When the unit is operating in Battery Mode, the audible alarm can be silenced when the Enter button on the front panel is pressed for three seconds. Once the UPS reaches a LBW the alarm will be re-activated and cannot be turned off. The UPS alarm will be reset to its default once the UPS transfers back to the AC mode. During a non-battery alarm or general fault, the UPS alarm silence feature will not be available.
- 3.4.5.3 Scroll Buttons:** The UPS will have a scroll up and scroll down button on the front panel. These buttons are used for moving through the various configuration and informational menus of the UPS operation.
- 3.4.6 Power Monitoring Software:** The UPS shall be compatible with SentryHD Power Monitoring Software. The software will be made available via download from the manufacturer's website. This software will report important status information concerning the UPS and the utility power. The software can also be used to configure and program UPS functions instead of using the front panel controls.
- 3.4.7 Communication Ports:** The UPS will feature two serial-based communication ports on the back panel of the UPS, one RS232 port and one USB port. Both ports will be able to operate simultaneously.
- 3.4.7.1 RS232 Port:** The UPS shall have a 9-pin subminiature D-shell connector on the rear panel of the UPS for connecting a RS232 communication cable between the UPS and the computer for RS232 communications. The 9-pin D-shell connector shall also provide simulated contact closure, for AC Fail and Low Battery Warning alarms.
- 3.4.7.2 USB Port:** The UPS will have a 2.0 Type B female USB port for connecting a USB cable between the UPS and a computer for USB communications.

- 3.4.7.3 Remote Emergency Power Off (REPO) Port:** The UPS shall have a Dinkle ECH350R-02P EPO connector on the rear panel of the UPS for the exclusive purpose of providing a REPO communication port. The REPO port connects the UPS to a user-installed REPO switch. In the AC or Battery mode, short pin1 to pin2 for approximately 0.5 seconds to shut down the UPS. The UPS must be powered off and then back on via the ON/OFF switch located on the front panel to restart the UPS.
- 3.4.8 External Battery Pack Detection Port (EXB):** Connecting the External Battery Detection cable from the UPS to the Battery Pack allows the UPS to automatically detect the External Battery Pack. Once the UPS detects that there is an External Battery Pack connected it will automatically recalculate the estimated runtime based on the number of External Battery Packs detected and the attached load on the UPS. **NOTE:** The External Battery Pack can also be set through the LCD screen, the Power Monitoring Software, or the SNMP card.
- 3.4.9 Output Load Shedding:** All models will have output receptacles electrically wired into three independent circuits. Two of the independent circuits must have the ability to be individually controlled via the LCD display, SentryHD software, and/or the SNMP card. The third circuit will provide continuous output power as long as utility voltage or sufficient battery power is available.

3.4.9.1 Load Bank Configuration:

120/125VAC models:

750VA: (2) programmable receptacle banks of (3) NEMA 5-15R
(1) always-on bank of (2) NEMA 5-15R

1000VA: (2) programmable receptacle banks of (3) NEMA 5-15R
(1) always-on bank of (2) NEMA 5-15R

1500VA: (2) programmable receptacle banks of (3) NEMA 5-15R
(1) always-on bank of (2) NEMA 5-15R

2000VA: (2) programmable receptacle banks of (4) NEMA 5-15/20R
(1) always-on bank of (1) NEMA L5-20R

3000VA: (2) programmable receptacle banks of (3) NEMA 5-15/20R
(1) always-on bank of (1) NEMA L5-30R

208/240VAC models:

1500VA: (2) programmable receptacle banks of (2) NEMA 6-15R
(1) always on bank of (2) NEMA 6-15R

3000VA: (1) programmable receptacle bank of (4) NEMA 6-15/20R
(1) programmable receptacle bank of (2) NEMA 6-15/20R
(1) always-on bank of (1) NEMA L6-30R

3.5 INTERNAL BATTERY SYSTEM

3.5.1 Internal Battery Configurations

750VA Model:	(3) 12V/7.2Ah
1000VA Model:	(3) 12V/7.2Ah
1500VA Model (120 and 208V):	(3) 12V/12V9Ah
2000VA Model:	(6) 12V/7.2Ah
3000VA Model (120 and 208V):	(6) 12V/9Ah

3.5.2 Accepted Battery Manufacturers:

BB Batteries
CSB Batteries
YUASA Batteries

3.5.3 Low Battery Thresholds: UPS runtime in Battery Mode is determined by a combination of connected loads and the voltage of the internal and connected batteries. The Low Battery Warning Alarm can be adjusted by the User by changing the Low Battery thresholds using the SentryHD software or SNMP communication card.

3.5.3.1 Low Battery Warning (Time between LBW and LBCO):

2 minutes (-15sec/+ 4min) with Battery Pack
2 minutes (-15sec/+12min) at output load <10% load

3.5.3.2 Low Battery Cut-off: Greater than 1.6V / Cell and Less than 1.7V / Cell

3.5.4 DC Leakage Current: <30uA (± 10 uA) with no AC applied and the unit in the off position

3.5.5 Battery Module Connector: All UPS models must use a 2-pin Anderson connector for attaching internal battery modules to the electronics of the UPS.

3.5.6 Battery Module Connection: All UPS will ship from the manufacturer with the internal battery modules disconnected. The process to connect the internal modules during installation will require only the removal of the front panel battery door and will not require the use of any tools.

3.5.7 Hot-swappable Batteries: All units must have hot-swappable battery function. When the unit is operating in the normal AC, Boost and Buck modes, the user must be able to replace the batteries without turning off the UPS.

3.5.8 Battery Module Replacement: All battery modules must be removeable and replaceable via the front panel of the UPS. The battery door and module retention bracket must be removeable without the use of any tools.

3.5.9 Independent Battery Bypass: The UPS design must allow it to start-up and operate in Normal, Boost, or Buck Mode with utility AC power available when the internal batteries, (and the external battery packs), have failed, are removed, or produce insufficient power for the UPS to operate in battery mode. The device must provide spike and surge protection during this stage, as well. It shall not be necessary to remove power or unplug the UPS to replace the internal batteries or external battery packs.

3.6 ACCESSORIES (Optional)

3.6.1 SNMP Card: The UPS shall come equipped with an internal SNMP adapter card slot located on the back panel of the unit, which will connect the UPS directly to any I.P. based network using Ethernet communications. The UPS will become a managed device on the network. From a network management station, the system administrator shall be capable of monitoring important system measurements, alarm status, and alarm history data. The network administrator shall also be capable of executing battery tests, observing the results of such tests, and turning the UPS on and off via his SNMP communication network. In the event of a utility failure, the SNMP shall continue with live communication without the requirement of additional or separate UPS equipment until such time as the UPS shuts down for Low Battery. On resumption of utility power, the SNMP card shall resume full SNMP communication automatically. The optional SNMP card shall also be capable of HTTP communications when SNMP management is not available or practical. Using most industry standard web browsers as an interface, the system administrator shall have access to all information available through the web interface. Included with the optional SNMP Card will be SNMP Manager Software. The software will be able to monitor and control an unlimited number of UPS, using installed SNMP cards, through a single management window on a networked computer platform.

3.6.2 Programmable Relay Card: A Programmable Relay Card shall be provided, as an option, to the UPS. The Programmable Relay Card is installed using the internal card slot in the UPS. When

installed, the card will provide a configurable dry-contact closure communication port between the UPS and an attached device. A terminal block with a ground, common and six relay contacts are used for monitoring alarm events on the UPS to an attached device through a user-customized cable. The card is programmed using a Hyper-terminal application. An included feature will be the ability of the card to provide signals to Windows 10/2000/XP/2003/7 for notification of power failure and low battery status on the connected UPS. Up to three computers may be configured for both the power failure and low battery status. Up to six computers may be configured for a single signal.

3.6.3 Rail Installation Kit: For all UPS models under 2000VA, a four-post, sliding rail attachment will be offered as an optional accessory by the manufacturer of the UPS. For UPS models 2000VA and above, the four-post rail attachment will be included as a standard accessory included in the shipping box of the UPS.

3.6.4 Wallmount Installation Kit: All UPS models will be compatible with an optional wallmount kit attachment. This wallmount kit will allow the UPS to be installed horizontally on a wall with the proper wall support as directed by the installation instructions.

3.7 EXTERNAL BATTERY PACKS (Optional)

All UPS models shall have the capability to connect an unlimited number of external battery packs, in daisy-chain fashion, for the purpose of providing extended electrical power support of connected loads to the UPS during prolonged blackouts or extreme brown-out and surge events.

3.7.1 DC Output Connector: All compatible external battery packs will include an 18-inch, strain-relief output connection cord with a 6-pin Anderson 30-Amp connection plug. The Anderson connector on each battery pack will be specifically keyed to only work with a compatible UPS model or a successive, daisy-chained battery pack string, attached to the UPS.

3.7.2 AC Input Connector: All compatible external battery packs will have an IEC320-C14 connection on the rear panel for the purpose of attaching a bundled 6-foot IEC320 C13 to NEMA 5-15P AC input power cord.

3.7.3 DC Input Connector: All compatible external battery packs will include a 6-pin Anderson 30-Amp connection plug for the purpose of attaching additional battery packs in a daisy-chain format. The Anderson connector on each battery pack will be specifically keyed to only work with other compatible battery packs in a string, attached to the UPS.

3.7.4 AC Input Breaker: All compatible external battery packs will include a 10-Amp rated, resettable input circuit breaker.

3.7.5 DC Circuit Breaker: All compatible external battery packs will include a 50-Amp rated, output circuit breaker.

3.7.6 External Battery Pack Detection Port (EXB): Connecting the External Battery Detection cable from the UPS to the Battery Pack allows the UPS to automatically detect the External Battery Pack. Once the UPS detects that there is an External Battery Pack connected it will automatically recalculate the estimated runtime based on the number of External Battery Packs detected and the attached load on the UPS. **NOTE:** The External Battery Pack can also be set through the LCD screen, the Power Monitoring Software, or the SNMP card.

3.7.7 Internal Battery Configurations: All external battery packs will come with pre-assembled, internal battery modules, which can be removed and/or installed by the user without the need of certified electricians. The battery packs will consist of the following individual battery configurations:

BP36CRTXL: (6) 12V/7.2Ah VRLA batteries
BP36V48RTEXL: (12) 12V/12Ah VRLA batteries

BP72CRTXL: (6) 12V/9.0Ah VRLA batteries
 BP72V24RTEXTL: (12) 12V/12Ah VRLA batteries

3.7.8 Internal Battery Module Connector: All external battery pack models must use a 2-pin Anderson connector for attaching internal battery modules to the electronics of the battery pack.

3.7.9 Internal Battery Module Connection: All external battery packs will ship from the manufacturer with the internal battery modules connected.

3.7.10 Internal Battery Pack Charger: All external battery packs will include an independent, internal battery charger. The battery packs will have the capability to charge the internal batteries from the internal charger or the UPS charger.

3.7.10.1 The internal battery pack chargers will support utility input. The rated input voltage range of each battery pack will be:

BP36CRTXL: 90 - 264VAC
 BP36V48RTEXTL: 75 - 140VAC
 BP72CRTXL: 90 - 264VAC
 BP72V24RTEXTL: 75 - 140VAC

3.7.10.2 Charge Current: The internal battery pack chargers will provide charge current to its internal batteries and any connected downstream battery packs that are not using utility power and internal battery pack chargers. The rated charge current of each battery pack will be:

BP36CRTXL: 1.8Amps +/-15%
 BP36V48RTEXTL: 4.0Amps +/-15%
 BP72CRTXL: 1.1Amps +/-15%
 BP72V24RTEXTL: 2.0Amps +/-15%

3.7.11 Construction and Mounting: All battery packs will be manufactured using a metal case with a plastic front panel, including a removeable battery door cover. Battery packs will come with 19-inch rackmount ears installed as standard for installation in a cabinet and/or rack. Vertical (Tower), floor-mount installation is possible with optional hardware included in the original packaging.

3.7.12 Physical Characteristics:

3.7.12.1 Dimensions (H x W x D):

– BP36CRTXL: 3.5" x 18.96" x 17.3"
 – BP36V48RTEXTL: 5.2" x 17.3" x 26.8"
 – BP72CRTXL: 3.5" x 18.96" x 17.3"
 – BP72V24RTEXTL: 5.2" x 17.3" x 26.8"

3.7.12.2 Physical Weights:

– BP36CRTXL: 49.8 lbs.
 – BP36V48RTEXTL: 130.7 lbs.
 – BP72CRTXL: 52.5 lbs.
 – BP72V24RTEXTL: 130.5 lbs.

4.0 PRODUCT FABRICATION

4.1 MATERIALS

All materials of the UPS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.

The maximum working voltage, current, and di/dt of all solid-state power components and electronic devices shall not exceed 90% of the ratings established by their manufacturer. The operating temperature of solid-state component sub-assembly shall not be greater than 90% of their ratings.

- 4.1.1 Case:** All UPS will be manufactured using a metal case with a two-piece plastic front panel, including a removeable battery door. Each UPS will come with 19-inch rackmount ears installed as standard for installation in a cabinet and/or rack. Vertical (Tower), floor-mount installation is possible with optional hardware included in the original packaging.
- 4.1.2 Front Panel:** The front panel assembly of the UPS will be manufactured of ABS plastic. The assembly will include a removeable battery door and LCD display and control panel insert. The battery door shall be removeable without the use of any tool. The LCD and control panel insert shall be rotatable, without the use of tools, to appropriately orient it based on horizontal or vertical installation.
- 4.1.3 Rear Panel:** The rear panel of the UPS will be constructed of a metal panel and must include the following connections:
- Output receptacles
 - Input power cord
 - Input circuit breaker
 - External battery pack connection
 - Grounding lug
 - Option card slot
 - 1Gbit-rated RJ45 network surge protection
 - RS232 serial communication port (DB9 connector)
 - Female USB Type B connector
 - Dinkle 2 Pin remote emergency power off port
 - Dinkle 3 Pin External Battery Pack detect port (EXB)
 - Internal cooling fan opening

4.2 APPEARANCE

- 4.2.1 Color:** The metal portion of the UPS case shall be powder-coated using Pantone color process number B. The front panel ABS plastic assembly shall be of the same color.
- 4.2.2 Printing:** The front and rear panels of the UPS shall contain white silkscreened printing.
- Front Panel: The front panel will contain the Manufacturer's logo, model number and LED icon and control button descriptions.
 - Rear Panel: The rear panel will contain silkscreen descriptions for all ports and connectors
- 4.2.3 Labels:** All UPS will contain the following product labels:
- A yellow Battery Disconnect warning label across the top cover of the UPS
 - Model Information/Ratings label on top cover of UPS
 - Regulatory/Warning label on top cover of UPS
 - Scannable serial number on rear panel of UPS

4.3 WIRING

Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (ANSI/NFPA 70).

4.4 CONSTRUCTION

The UPS shall be constructed of replaceable subassemblies, including internal battery modules. Battery modules must be replaceable by removal the front bezel and detaching the retaining bracket without the use of tools.

4.5 MOUNTING

The UPS enclosure shall be adaptable for mounting vertically or horizontally with the appropriate installation hardware. Variations of installation formats include:

- 4.5.1 Two-post Rack/Cabinet Installation:** The UPS will come standard with attached ears for front-mounting the unit in a standard 19-inch rack or cabinet. The ears must be relocatable on the UPS to center-mount on a two-post rack.
- 4.5.2 Four-post Rack/Cabinet Installation:** The UPS must be compatible with four-post cabinet and/or rack installations. For UPS models $\geq 2000\text{VA}$, a four-post rail kit will be included with the UPS. UPS models $\leq 1500\text{VA}$, the four-post rail kit can used as an optional installation assembly.
- 4.5.2 Floor Mount:** All UPS models will include brackets to allow for vertical installation on a floor or platform. The brackets must be expandable when the UPS is partnered with external battery packs.
- 4.5.3 Wallmount:** All UPS models must be wallmountable, using an optional compatible bracket from the manufacturer.

4.6 PHYSICAL CHARACTERISTICS

4.6.1 Dimensions (H x W x D):

750VA Model:	3.5" x 18.96" x 17.3"
1000VA Model:	3.5" x 18.96" x 17.3"
1500VA Model (120 and 208V):	3.5" x 18.96" x 17.3"
2000VA Model:	3.5" x 18.96" x 24.0"
3000VA Model (120 and 208V):	3.5" x 18.96" x 24.0"

4.6.2 Physical Weights:

750VA Model:	41.7 lbs.
1000VA Model:	41.7 lbs.
1500VA Model (120 and 208V):	43.0 lbs.
2000VA Model:	71.9 lbs.
3000VA Model (120 and 208V):	77.6 lbs.

4.7 COOLING

Cooling of the UPS shall be by forced air. High-quality, variable speed, (which is based on internal UPS temperature), fans shall be used to minimize audible noise.

5.0 ENVIRONMENTAL CONDITIONS

5.1 AMBIENT TEMPERATURE RANGE

5.1.1 Operating Temperature:

UPS Module: 32°F to 104°F (0°C to 40°C).
 Battery Module: 32°F to 104°F (0°C to 40°C).

5.1.2 Storage/Transport Temperature: 5°F to 113°F (-15°C to +45°C).

5.2 RELATIVE HUMIDITY

0 to 95% non-condensing.

5.3 ELEVATION LIMITS

5.3.1 Operating Maximum: 0 to 3,000 meters (0 to 10,000 feet).

5.3.2 Storage Elevation: 0 to 15,000 meters (0 to 50,000 feet).

5.4 AUDIBLE NOISE

750/1000/1500VA: <45dBA at 1 meter (3ft.) at the front side of the UPS.

2000/3000VA: <50dBA at 1 meter (3ft.) at the front side of the UPS.

5.5 UPS HEAT DISSIPATION

5.5.1 Normal Mode:

750VA Models: (53 – 59) BTUs
1000VA Models: (71 – 79) BTUs
1500VA Models: (151 – 167) BTUs
2000VA Models: (214 – 236) BTUs
3000VA Models: (340 – 376) BTUs

5.5.2 Boost Mode:

750VA Models: (134 – 148) BTUs
1000VA Models: (207 – 229) BTUs
1500VA Models: (340 – 376) BTUs
2000VA Models: (454 – 502) BTUs
3000VA Models: (681 – 752) BTUs

5.5.3 Buck Mode:

750VA Models: (146 – 161) BTUs
1000VA Models: (194 – 215) BTUs
1500VA Models: (326 – 360) BTUs
2000VA Models: (454 – 502) BTUs
3000VA Models: (671 – 742) BTUs

5.5.4 Battery Mode:

750VA Models: (365 – 403) BTUs
1000VA Models: (480 – 530) BTUs
1500VA Models: (681 – 752) BTUs
2000VA Models: (1037 – 1146) BTUs
3000VA Models: (1556 – 1720) BTUs

6.0 MANUFACTURERS WARRANTY AND SERVICE

6.1 STANDARD WARRANTIES

6.1.1 UPS and Electronics: The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 36 months from purchase date or 42 months from date of manufacture, whichever period expires first.

- 6.1.2 Battery Modules:** The UPS manufacturer shall warrant the UPS battery module(s) against defects in materials and workmanship for 36 months from purchase date or 42 months from date of manufacture, whichever period expires first.

6.2 EXTENDED WARRANTIES

A complete offering of optional, extended replacement and parts and labor maintenance warranties for both the UPS system and the battery system shall be available. An extended warranty package shall be available to either replace the defective equipment or repair it for a total of sixty months from the date of purchase.

6.3 MANUFACTURERS WARRANTY PROCEDURE

Within the first thirty-six (36) months, any defect or malfunction of the UPS device shall require contact with the manufacturer for diagnosis. If required the manufacturer will provide the customer with a Return Materials Authorization, (RMA), number to send the defective product to the factory for repair or replacement, at the discretion of the manufacturer. It will be the responsibility of the customer to provide transportation of the unit to the factory. Once repaired, or replaced, the manufacturer will incur ground freight expense to return the product to the customer.

7.0 QUALITY ASSURANCE

7.1 MANUFACTURER QUALIFICATIONS

A minimum of thirty years' experience in the design, manufacture, and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world-class quality standards. All production manufacturing facilities shall be ISO9001 and ISO14001 certified.

7.2 FACTORY TESTING

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

7.3 MEAN TIME BETWEEN FAILURE

The UPS shall have a mean time between failure, (excluding batteries), of 100,000 hours.

8.0 SUBMITTALS

8.1 PROPOSAL SUBMITTALS

Submittals with the proposal shall include:

- System configuration and description.
- Functional relationship of equipment including weights, and dimensions.
- Descriptions of equipment to be furnished, including deviations from these specifications.
- Size and weight of shipping units to be handled by installing contractor.

8.2 UPS DELIVERY SUBMITTALS

Submittals upon UPS delivery shall include one (1) User's manual that shall include a functional description of the equipment, safety precautions, instructions, operating procedures, and battery replacement instructions.