CSI 263353.01PRT – Static Uninterruptible Power Supply Systems
PRO-RT Series

MINUTEMAN POWER TECHNOLOGIES
PRO-RT UPS Series
Product Specifications
750VA – 2000VA
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, pulse-width modulated 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 must 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.

- cTUVus: 2014/35/EU, 2014/30/EU (Conforms to UL1778 5th edition), CSA 22.2 No. 107.3-14/R: 2014
- CE Compliance Mark
- FCC: Part 15 Category B; Part 68, Subpart F
- IEEE/ANSI: 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: 2KVA
  IEC61000-4-6
  IEC61000-4-8
  ISO9001 & 14001
- RoHS2: WEEE 2011/65/EU, 2015/863/EU Directive

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements:

1.3.1.1 Topology – The UPS must be of a line-interactive design with the internal circuitry to filter incoming AC power. The UPS will provide stabilized output voltage through single-stage boost and buck modes, using a transformer to regulate input AC line power during sags and surges without the use of battery power.

1.3.1.2 Standard Voltage Settings – Input/output voltage specifications of the UPS, operating in AC mode, must be:

- Input: 120VAC, single-phase, two-wire plus ground
- Output: 120VAC, single-phase, two-wire plus ground

1.3.1.3 Output Load Capacities – The specified output load capacities of the UPS series must be as follows:

- 750VA – 525 Watts
- 1000VA – 700 Watts
- 1500VA – 1050 Watts
- 2000VA – 1400 Watts

1.3.2 Design Requirements – Batteries

1.3.2.1 Battery Type – The UPS module will utilize multiple maintenance-free, sealed, non-spillable, lead acid, valve-regulated batteries configured in both series and/or parallel as defined for each model.

1.3.2.2 Reserve Time – Each UPS model must have an internal battery configuration sufficient to maintain a full, non-linear load for a minimum of 4 minutes runtime, (based on a full charge reserve at an ambient temperature between 20° and 30° Celsius). The minimum half-load runtime under the same environmental conditions must not be less than 14 minutes.

1.3.2.3 Recharge Time – Internal batteries must recharge to 90% capacity within eight hours after return of nominal AC power from low battery cut-off.

1.3.3 Modes of Operation – The UPS must 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 power starting at 105VAC down to 90VAC, the internal transformer of the UPS will supplement utility AC 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 this mode until utility AC voltage rises to a minimum of 109VAC.

1.3.3.3 Buck Mode – With a surge of input power starting at 136VAC and continuing up to 150VAC, the internal buck transformer will reduce, or buck, the utility AC voltage to nominal AC output voltages without the use of internal batteries. The UPS must be able to operate indefinitely in this mode until utility AC voltage drops to a maximum of 143VAC.

1.3.3.4 Battery Mode – Upon failure, brownout or overvoltage of input power to the UPS, the connected AC load is supplied power by the UPS switching from Normal Mode to the Battery Mode while using the internal batteries. There shall be a minimum interruption in power lasting, typically, no more than 10 milliseconds. When nominal input power returns to the UPS, it will return to Normal Mode with an interruption of, typically, no more than 10 milliseconds.

1.3.3.5 Recharge Mode – Upon restoration of nominal input 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 must start and operate in Battery Mode 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 Nominal Voltage Range (Non-battery mode): 90 - 150VAC

2.1.3 Nominal Frequency: 60Hz, ±6Hz.

2.1.4 Inrush Current:

- 750VA model – 136 Amps for 2.6mS
- 1000VA model – 133 Amps for 2.6mS
- 1500VA model – 127 Amps for 2.5mS
- 2000VA model – 130 Amps for 2.32mS

2.1.5 Current Limit:

- 750VA model – 15 Amp circuit breaker
- 1000VA model – 15 Amp circuit breaker
- 1500VA model – 15 Amp circuit breaker
- 2000VA model – 20 Amp circuit breaker

2.1.6 Current Distortion:

2.1.6.1 Linear loads:

- 750VA model – Not to exceed 8.55% at full load
- 1000VA model – Not to exceed 7.62% at full load
- 1500VA model – Not to exceed 7.31% at full load
- 2000VA model – Not to exceed 6.78% at full load

2.1.6.2 Non-linear loads:

- 750VA model – Not to exceed 94.16% at full load
- 1000VA model – Not to exceed 87.83% at full load
- 1500VA model – Not to exceed 93.29% at full load
- 2000VA model – Not to exceed 87.16% at full load

2.1.7 AC Leakage Current: <1.0mA at full linear load

2.1.8 AC Surge Energy Protection: All UPS models must sustain input transients without damage per the IEEE C62.41 Cat. A1 standard and EN61000-4-5: 2KVA. The UPS must utilize a multistage input transient surge protection system to prevent damage to internal components and connected equipment.

2.1.8.1 Metal Oxide Varistors: (MOVs) must be installed on the input of the UPS. The MOVs are required on Line to Neutral, Line to Ground and Neutral to Ground with a minimum surge energy rating of 960 Joules for all models.

2.1.8.2 Voltage Transient Response: 0nS – Normal mode, <5nS – Common Mode.

2.1.8.3 Transient Recovery Time: <25mS.

2.1.9 Backfeed Protection: A relay must be used to prevent users, service personnel or electricians from unforeseeable or unnecessary exposure to stored or generated energy at the input terminals when the input power cord is disconnected from the wall outlet.

2.2 OUTPUT OF UPS

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

2.2.2 Output Waveform:

- Normal Mode: Sinewave
- Boost Mode: Sinewave
- Buck Mode: Sinewave
- Battery Mode: Pulse-width modulated sinewave

2.2.3 Voltage Regulation:

- Normal Mode: 105 – 136VAC
- Boost Mode: 90 – 109VAC
- Buck Mode: 136 – 150VAC
- Battery Mode: 114 – 126VAC (until low battery warning)

2.2.4 Frequency:

- Normal Mode: 60Hz, ±6Hz.
- Boost Mode: 60Hz, ±6Hz.
- Buck Mode: 60Hz, ±6Hz.
- Battery Mode: 60Hz, ±0.5Hz.

2.2.5 Voltage Distortion:

2.2.5.1 Normal Mode: Not to exceed 1% at full linear load

- 750VA model – Not to exceed 0.237% at full linear load
- 1000VA model – Not to exceed 0.213% at full linear load
- 1500VA model – Not to exceed 0.261% at full linear load
- 2000VA model – Not to exceed 0.420% at full linear load

2.2.5.2 Boost Mode: Not to exceed 1% at full linear load

- 750VA model – Not to exceed 0.295% at full linear load
- 1000VA model – Not to exceed 0.234% at full linear load
- 1500VA model – Not to exceed 0.329% at full linear load
- 2000VA model – Not to exceed 0.391% at full linear load

2.2.5.3 Buck Mode: Not to exceed1% at full linear load

- 750VA model – Not to exceed 0.204% at full linear load

- 1000VA model – Not to exceed 0.163% at full linear load
- 1500VA model – Not to exceed 0.231% at full linear load
- 2000VA model – Not to exceed 0.273% at full linear load

2.2.5.4 Battery Mode: Not to exceed 40% at full linear load

- 750VA model – Not to exceed 27.21% at full linear load
- 1000VA model – Not to exceed 26.97% at full linear load
- 1500VA model – Not to exceed 28.42% at full linear load
- 2000VA model – Not to exceed 33.90% at full linear load

2.2.6 Current Distortion:

2.2.6.1 Normal Mode:

- 750VA model – Not to exceed 0.462% at 100% linear load
- 1000VA model – Not to exceed 0.464% at 100% linear load
- 1500VA model – Not to exceed0.525% at 100% linear load
- 2000VA model – Not to exceed 0.599% at 100%linear load

2.2.6.2 Boost Mode:

- 750VA model – Not to exceed 0.477% at 100% linear load
- 1000VA model – Not to exceed 0.489% at 100% linear load
- 1500VA model – Not to exceed 0.519% at 100% linear load
- 2000VA model – Not to exceed 0.564% at 100% linear load

2.2.6.3 Buck Mode:

- 750VA model – Not to exceed 0.486% at 100%linear load
- 1000VA model – Not to exceed 0.496% at 100% linear load
- 1500VA model – Not to exceed 0.511% at 100% linear load
- 2000VA model – Not to exceed 0.516% at 100% linear load

2.2.6.4 Battery Mode:

- 750VA model – Not to exceed 28.15% at 100% linear load
- 1000VA model – Not to exceed 27.23% at 100% linear load
- 1500VA model – Not to exceed 27.06% at 100% linear load
- 2000VA model – Not to exceed 27.33% at 100% linear load

2.2.7 Dynamic Response: ±10% at 100% load change in 30mS (Linear load)

2.2.8 Load Power Factor Range (All Modes): 1.0 to 0.7 lagging without de-rating.

2.2.9 Output Power Factor Rating (All Modes): 0.7pf

2.2.10 Current Monitoring

All units must 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 – The UPS must be designed to operate for a limited time with a connected load greater than its maximum rated capacity.

2.2.11.1 Normal Mode:

- 101 – 110% of maximum rated capacity will run continuously
- 111 – 120% of maximum rated capacity for 60 seconds until shutdown
- 121 – 149% of maximum rated capacity for 10 seconds until shutdown
- ≥150% of maximum capacity will result in an immediate shutdown

2.2.11.2 Boost Mode:

- 101 – 110% of maximum rated capacity for 30 minutes will go into the fault mode
- 111 – 120% of maximum rated capacity for 60 seconds until shutdown
- 121 – 149% of maximum rated capacity for 10 seconds until shutdown
- ≥150% of maximum capacity will result in an immediate shutdown

2.2.11.3 Buck Mode:

- 101 – 110% of maximum rated capacity for 30 minutes will go into the fault mode
- 111 – 120% of maximum rated capacity for 60 seconds until shutdown
- 121 – 149% of maximum rated capacity for 10 seconds until shutdown
- ≥150% of maximum capacity will result in an immediate shutdown

2.2.11.4 Battery Mode:

- 101 – 110% of maximum rated capacity will run continuously
- 111 – 120% of maximum rated capacity for 10 seconds until shutdown
- 121 – 149% of maximum rated capacity for 5 seconds until shutdown
- ≥150% of maximum capacity will result in an immediate shutdown

2.2.12 Output Voltage in Battery Mode: The output voltage is 120VAC ±5% until LBW

2.2.13 Efficiency:

- Normal Mode: >96% at full-rated, non-linear load
- Boost Mode: >90% at full-rated, non-linear load
- Buck Mode: >90% at full-rated, non-linear load
- Battery Mode: >79% at full rated, non-linear load

2.2.14 Dynamic Response (All Modes): ±10% at 100% load change in 30mS (on a linear load)

2.2.15 Transfer time:

- Normal to Battery Mode: 6 – 10 milliseconds, typical
- Battery to Normal Mode: 6 – 10 milliseconds, typical
- Normal to Boost Mode: 6 – 10 milliseconds, typical
- Boost to Normal Mode: 6 – 10 milliseconds, typical
- Normal to Buck Mode: 6 – 10 milliseconds, typical
- Buck to Normal Mode: 6 – 10 milliseconds, typical

3.0 COMPONENTS

3.1 CHARGER

3.1.1 General – The term charger denotes the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for battery charging. The charger must be a pulse-width modulated, switching-type with constant voltage/current limiting control circuitry.

3.1.2 **DC Filter** – The charger must have an output filter to minimize ripple voltage into the battery. Under no conditions will ripple voltage into the battery exceed 2% RMS. The filter must be adequate to insure 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 must automatically restart and resume the battery recharge mode.

3.1.4 **Battery Recharge** – The charger must be capable of producing battery-charging current sufficient to replace 90% of the battery-discharged power within eight hours from a full load discharge. After the battery is recharged, the charger must maintain the battery at full charge until the next emergency operation.

3.1.5 **Overvoltage Protection** – There must 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: 27.6VDC ±3%
- 1000VA: 41.4VDC ±3%
- 1500VA: 41.4VDC ±3%
- 2000VA: 55.2VDC ±3%

3.1.7 **Charge Current** – In the standard charge mode, the current of the charger must be 0.115 times the Amp-hour rating of the internal batteries.

3.2 INVERTER

3.2.1 **General** – The term inverter denotes 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 must be capable of supplying current and voltage for overloads exceeding 100% and up to 110% of full load current for 60 seconds. A status indicator and audible alarm will indicate overload operation.

3.2.3 **Fault Clearing and Current Limit** – The inverter must be capable of supplying an overload current of 110% of its full-load rating for up to 20 seconds. For greater currents or longer time duration, the inverter will have electronic current-limiting protection to prevent damage to components. The inverter must be self-protecting against any magnitude of connected output overload. Inverter control logic will 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 must be fused so that loss of any one power semiconductor will not cause cascading failures.

3.2.5 **Inverter DC Protection** – The inverter must 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 must 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 must be microprocessor controlled. The microprocessor will regulate the inverter output frequency to ±0.83% for steady state and transient conditions. Total frequency deviation, including short time fluctuations and drift, must not exceed 0.83% from the rated frequency unless synchronized to utility power.

3.3 OUTPUT POWER TRANSFORMER

A dry-type power transformer must be provided for the AVR AC output. It will have copper wiring exclusively. The transformers hottest winding spot temperature must not exceed the temperature limit of the transformer insulation class of material when operating at full load at maximum ambient temperature.

3.4 DISPLAY AND CONTROLS

3.4.1 Monitoring and Control – The UPS must be microprocessor-based for the internal processing that control the monitoring, communication and management of the UPS.

3.4.2 LCD Display – The UPS must have a LCD display located on the front panel that provides real-time information on the UPS status and various input power and output power values. The LCD will consist of three separate sections:

3.4.2.1 LCD Icon Display – The LCD display will include a section that will include dedicated display icons for the following information:

- AC Normal
- AVR Mode (Boost and Buck) – The AC Normal icon will flash off and on
- On Battery
- Overload

3.4.2.2 The LCD Numeric Display – The LCD display will include a section that will have a real-time meter to display, in numeric fashion, multiple input and output values, (Selection of the items can be made from the scroll button on the front panel), and three Fault conditions:

- Input Voltage
- Input Frequency
- Output Voltage
- Output Frequency
- Connected Load Capacity
- Estimated runtime in the AC and DC modes
- Bad Battery (display Error code and warning icon)
- Site Wiring Fault (display SWF icon)
- Fault (display Error code and Warning icon)

3.4.2.3 Load and Battery Metering - The LCD Display will have two bar graphs for measuring load and battery status:

- The Load capacity bar graph will display the amount of the load (percent) on the Battery Backup output receptacles when the UPS is operating in AC mode.
- The Battery capacity bar graph will display the percent of charge in the AC mode. It will display the Battery capacity (percent) remaining in the Battery mode.

3.4.3 Alarm Messages – The following alarm messages will be displayed via the LCD display located on the front panel:

- While operating in the battery mode, the AC Normal Icon will turn off and the On-Battery Icon will turn on and the alarm will sound once every 10 seconds until the unit reaches Low Battery Warning (LBW). The alarm will turn off if utility power returns.

- When the unit reaches a Low Battery Warning, the LCD will display an error code and the alarm will sound 2 beeps every 5 seconds until the unit reaches Low Battery Cut-off (LBCO) then the alarm will turn off.

- The alarm will sound continuous and the LCD will display corresponding error code, if the unit senses an internal fault. The alarm will remain on until the unit is turned off.

- The alarm will sound continuous, the Overload icon will flash off and on and the LCD will display corresponding error code, if the unit senses an overload on the output. The alarm will turn off if the overload load is removed.

- The alarm will sound 3 beeps every five minutes, the Weak/Bad/Disconnected battery icon will turn on, and the LCD will display corresponding error code if the battery is Weak/Bad or disconnected. The alarm will remain in this state until the battery is recharged, replaced, or reconnected.

3.4.4 Physical Controls – Start-up, monitoring, and management operations of the UPS must be performed using three front panel pushbutton controls.

3.4.4.1 ON/O FF/TEST Button – Pressing the On/Off/Test button until a single beep is sounded will startup and/or shutdown the UPS. The On/Off/Test button can also be used to initiate a 10-second battery test by holding the button down for four seconds. When performing a complete shutdown of the UPS, the input power cord must be removed from AC utility power after powering off the unit.

3.4.4.2 Alarm Silence Button - Pressing the alarm silence button during battery mode will turn off the audible alarm. When the UPS reached a Low Battery Warning state, or a secondary event occurs, the alarm will return and cannot be turned off until the UPS is completely shut down or returns to AC Normal mode.

3.4.4.3 Scroll Button - Allows the User to scroll through a list of input and output data on the LCD display panel.

3.4.5 Power Monitoring Software – The UPS supplier must provide a Power Monitoring Software suite created to work exclusively with the submitted UPS. The software can be used to configure the UPS operation, create logs for reporting important status information concerning the UPS and the utility power and creating alarm notifications for important events related to the UPS or utility power. The Power Monitoring Software must be provided, free of charge, from the UPS supplier website.

3.4.6 Communications Port – The UPS must have a USB 2.0 Type B port and must be HID compliant. The port will be used for communications between the Power Monitoring Software, running on a computer/managing device, and the UPS.

3.4.7 Option Card Slot – The UPS shall come equipped with an internal option card slot located on the back panel of the unit. This card slot shall be compatible with either an SNMP card or a programmable relay card. Any card inserted into the option slot must be compatible with the standard Minuteman protocol.

3.4.8 Remote Emergency Power Off (REPO) Port –– All UPS models must have an RJ11 connector for REPO (Remote Emergency Power Off) communication. The emergency power off command will be initiated by shorting pin4 to pin5 for approximately 0.5 seconds. In order to restart the UPS, the unit must be powered on by pressing the front panel On/Off button. When activated, the LCD panel will display EPo.

3.4.8.1 AC Mode – Initiating an emergency power off command in AC mode will not completely shut the unit down. Only the output of the UPS is shut off. The LCD and the charger will remain active. EPo will be displayed on the LCD panel and will continue to be displayed until the unit is powered back on by pressing, and holding, the ON/OFF button until an audible beep occurs.

3.4.8.2 DC Mode – Initiating an emergency power off command in DC mode will completely power off the UPS. EPo will be briefly displayed, (for approximately 3-seconds), and the LCD will power off. To restart the UPS, AC power must be first disconnected and reapplied. Once AC is reapplied, the LCD panel will turn on and EPo will be displayed, however, there will be no output from the UPS until the unit is powered on by pressing, and holding, the ON/OFF button until an audible beep occurs.

3.5 INTERNAL BATTERY SYSTEM

3.5.1 Internal Battery Configurations – All UPS will utilize a removable plastic container module for all internal batteries. The battery modules must be accessible via the front panel of the UPS. All battery wiring within the modules must use 10AWG. The minimum internal battery configuration of the UPS must be as follows:

- 750VA – 24VDC with (2) 12V7.2Ah batteries
- 1000VA – 24VDC with (2) 12V8.5Ah batteries
- 1500VA – 36VDC with (3) 12V8.5Ah batteries
- 2000VA – 48VDC with (4) 12V8.5Ah batteries

3.5.2 Accepted Battery Manufacturers

- China Storage Battery
- BB Battery
- YUASA
- LEOCH

3.5.3 Low Battery Thresholds

3.5.3.1 Low Battery Warning: 1.75V per cell

3.5.3.2 Low Battery Cut-off: 1.60V per cell

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

3.5.5 Battery Module Connector – The internal battery module will connect to the UPS using an 40A easy-replacement connector located behind the front battery panel. The connector is two poles, positive and negative fool proof design.

3.5.6 Battery Module Connection – The UPS will ship with the internal battery module disconnected. The installer must remove the front battery panel and connect the battery module prior to powering on the UPS.

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 – Battery modules must be replaceable through the front panel of the UPS. If installed in a rack or cabinet, the battery modules must be replaceable without uninstalling the UPS.

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 have failed, are removed, or produce insufficient power for the UPS to operate in battery mode. The UPS must provide spike and surge protection during this stage, as well. It will not be necessary to remove power or unplug the UPS in order to replace the internal batteries.

3.6 ACCESSORIES (Optional)

3.6.1 **SNMP Card** – The insertion of a Simple Network Management Protocol (SNMP) card into the Option Card Slot will allow the UPS to connect directly to an IP-based network using Ethernet communications. With the SNMP Card properly installed and connected, the UPS will then become a managed device on a Local Area Network (LAN). The UPS shall be accessible over the network to all authorized individuals either through a Network Management System (NMS) or via a standard web browser. Authorized individuals shall be able to monitor all aspects of the UPS operation, including important system measurements, alarm status, and alarm history data. Additionally, authorized users shall able to execute battery tests, observe the results of such tests, and turn the UPS on and off via LAN. In the event of a utility failure, the SNMP card shall continue with live communications without the requirement of additional or separate UPS equipment until such time as the UPS shuts down for Low Battery Cut-Off. On resumption of utility power, the SNMP card shall automatically resume full communications over the LAN.

The optional SNMP card shall also be capable of HTTPs communications when SNMP management is not available or practical. Using most industry-standard web browsers as an interface, authorized users 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 (50-100) 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, installed using the Option Card Slot in the UPS, 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 NT4/2000/XP/2003/7/8/10 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** – The UPS manufacturer must provide an optional rail kit for 19-inch rack or cabinet installations. All UPS models must be compatible with the optional rails.

3.6.4 **Wallmount Installation Kit** – The UPS manufacturer must provide an optional bracket kit for wallmount installations. All UPS models must have pre-bored holes in the UPS case that are compatible with the optional brackets.

4.0 PRODUCT FABRICATION

4.1 MATERIALS

All materials of the UPS must be new, of current manufacture, high grade and free from all defects and will 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 will not exceed 90% of the ratings established by their manufacturer. The operating temperature of solid-state component sub-assembly will not be greater than 90% of their ratings.

4.1.1 **Case** – The UPS must be constructed entirely of aluminum except for the front panel and LCD display. The case will have pre-bored holes for attachment of the rack ears, as well as, optional rail kits and wallmount kits as offered by the manufacturer.

4.1.2 **Front Panel** – The front panel of the UPS will be constructed of ABS plastic. The battery door must be removable without use of any tools for the purpose of connecting and replacing batteries.

4.2 APPEARANCE

4.2.1 **Color** – The UPS must use Pantone color number process Black C on the top, bottom, sides and front of the metal case. The rear panel of the case will be a base steel gray.

4.2.2 **Printing** – All printing on the UPS must be completed using a silk-screening process. All lettering, except for the back panel, must be white in color and use Architectural font. Printing on the rear panel will be silkscreened in a black color.

4.2.3 **Labels**

- Battery Disconnect on the top panel
- Information/Ratings label on the top panel
- Regulatory/Warning label on the top panel
- Scannable serial number label on the rear panel

4.3 WIRING

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

4.4 CONSTRUCTION AND MOUNTING

The UPS enclosure must be adaptable for standing vertically or mounting on a wall with appropriate mounting hardware supplied by the manufacturer of the UPS. The UPS enclosure can be mounted horizontally on the floor using brackets supplied by the manufacturer. It shall also be capable of mounting within a 19” or 23” wide rack or cabinet structure with the appropriate mounting hardware supplied by the manufacturer.

The UPS must be constructed of replaceable subassemblies. Any internal battery modules shall be replaceable by removing the battery door and detaching the retaining bracket.

4.5 PHYSICAL CHARACTERISTICS

4.5.1 **Dimensions (H x W x D):**

- 750VA: 3.4 inches x 18.9 inches x 16.1 inches
- 1000VA: 3.4 inches x 18.9 inches x 16.1 inches
- 1500VA: 3.4 inches x 18.9 inches x 20.1 inches
- 2000VA: 3.4 inches x 18.9 inches x 20.1 inches

4.5.2 **Physical Weights:**

- 750VA: 31.3 lbs.
- 1000VA: 35.7 lbs.
- 1500VA: 48.7 lbs.
- 2000VA: 62.8 lbs.

4.6 UPS HEAT DISSIPATION

4.6.1 Normal Mode:

- 750VA: (51) BTUs
- 1000VA: (68) BTUs
- 1500VA: (102) BTUs
- 2000VA: (137) BTUs

4.6.2 Boost Mode:

- 750VA: (51) BTUs
- 1000VA: (68) BTUs
- 1500VA: (102) BTUs
- 2000VA: (137) BTUs

4.6.3 Buck Mode:

- 750VA: (51) BTUs
- 1000VA: (68) BTUs
- 1500VA: (102) BTUs
- 2000VA: (137) BTUs

4.6.4 Battery Mode:

- 750VA: (269) BTUs
- 1000VA: (334) BTUs
- 1500VA: (502) BTUs
- 2000VA: (669) BTUs

4.7 COOLING

Cooling of the UPS must be by forced air. High-quality fans shall be used to minimize audible noise.

4.8 GROUNDING

The UPS chassis must provide proper grounding to all output receptacles for reducing the risk of electrical shock hazard.

4.9 INPUT POWER CORD

The UPS must come included with a power cord of no less than ten (10)-feet in length. The cord for all models will be connected to the UPS using a strain-relief assembly. The size of the power cords must meet the minimum requirements:

- 750VA: 14AWG
- 1000VA: 14AWG
- 1500VA: 14AWG

- 2000VA: 12AWG

4.10 INPUT POWER PLUG

- 750VA: NEMA 5-15P straight blade plug.
- 1000VA: NEMA 5-15P straight blade plug.
- 1500VA: NEMA 5-15P straight blade plug.
- 2000VA: NEMA 5-20P straight blade plug.

4.11 OUTPUT RECEPTACLES

All output receptacles must provide battery backup and surge protection.

- 750VA: (8) NEMA 5-15R
- 1000VA: (8) NEMA 5-15R
- 1500VA: (8) NEMA 5-15R
- 2000VA: (6) NEMA 5-15/20R, (1) NEMA L5-20R

4.12 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 management software or SNMP card. The third circuit will provide continuous output power as long as utility voltage or sufficient battery power is available.

4.12.1 Load Bank Configurations

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

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

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

- 2000VA: (2) programmable receptacle banks of (3) NEMA 5-15/20R
  always-on bank of (1) NEMA L5-20R

4.13 TELEPHONE/NETWORK PROTECTION

The UPS must have an RJ11/45 connector on the rear panel for protecting a single line phone/fax/modem or 10/100/1000-baseT network. The protection rating must meet or exceed 5.8V/5W TVS for network protection and 185V/5W TVS for phone/fax/modern protection

4.14 COAXIAL CABLE PROTECTION

The UPS must have an input/output coaxial connection, providing spike and surge protection with a minimum rating of 27V/5W TVS and 4A fuse.

4.15 OPTION CARD SLOT

The UPS will come with an internal option card slot for additional communication options including an SNMP card and Programmable Relay card.

5.0 ENVIRONMENTAL CONDITIONS

5.1 OPERATIONAL ENVIRONMENT

The UPS must be designed for use in a dust-free, environmentally-controlled, indoor environment and must be able to withstand these conditions without damage or degradation of operating characteristics throughout it warranty period.

5.2 AMBIENT TEMPERATURE RANGE

5.1.1 Operating Temperature: +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).

5.3 RELATIVE HUMIDITY

All Models: 5% to 95% non-condensing.

5.4 ELEVATION LIMITS

5.4.1 Operating Maximum: 0 to 10,000 ft. (0 to 3,000m)

5.4.2 Storage Elevation: 0 to 50,000 ft. (0 to 15,000m)

5.4 AUDIBLE NOISE

All Models: ≤45dBA at 1 meter

6.0 MANUFACTURERS WARRANTY AND SERVICE

6.1 STANDARD WARRANTIES

6.1.1 UPS and Electronics – The UPS manufacturer must 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 must 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

The manufacturer must offer optional, extended warranties for both the UPS system and the battery system. 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 of purchase or forty-two months from date of manufacture, whichever occurs first, 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 must fully and completely test the system to assure compliance with the specification.

7.3 MEAN TIME BETWEEN FAILURE

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

8.0 SUBMITTALS

8.1 PROPOSAL SUBMITTALS

Submittals with the proposal must 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 must include one (1) Quick Install Guide, USB cable and installation hardware for tower orientation. A Product Manual, Warranty Statement and Connected Equipment Guarantee will be made available for download from the manufacturer's website.