



## ZincBlue2 UPS Specification

### 1 SCOPE

This specification defines the requirements of a green uninterruptible power supply (battery backup) system.

### 2 DEFINITIONS

- A. UPS – Uninterruptible Power Supply
- B. GUI – Graphical User Interface
- C. NiZn - Nickel-Zinc
- D. SNMP - Simple Network Management Protocol
- E. SMTP - Simple Mail Transfer Protocol
- F. TCP/IP - Transmission Control Protocol/Internet Protocol

### 3 REQUIREMENTS

#### A. Compatibility

The UPS shall be compatible with the agencies current traffic controller cabinet, controller and cabinet components, including the safety monitor, for full time operation. The UPS shall include all necessary cables to connect the UPS and batteries.

#### B. Run-time

The UPS configured with one 500Wh battery shall provide a 2-amp cabinet load a minimum run-time of two (2) hours of full color operation at ambient temperature of 25°C. Runtime for configurations with more batteries or different loads can be calculated from this baseline.

#### C. Output Capacity

UPS must provide a minimum of 1000W continuous active output capacity, with a 90% typical inverter efficiency while running in battery backup mode. The UPS must have surge output capability of 2000W.

#### D. Output Voltage

When under battery power, the UPS output voltage shall be 120 VAC,  $\pm 3\%$ , pure sine wave output, with  $< 2\%$  total harmonic distortion (THD), and frequency of 60 Hz  $\pm 0.5\%$ .

#### E. Transfer Time



The maximum transfer time allowed, from disruption of utility line voltage to stabilized inverter line voltage from batteries shall be thirty-three (33) milliseconds max. The maximum transfer time when switching from inverter line voltage to utility line voltage after the line-qualifying period shall be thirty-three (33) milliseconds max. The UPS shall be capable of allowing the user to program the line qualifying period as three (3), ten (10) or thirty (30) seconds.

#### **F. Operating Environment**

Operating temperature for the UPS and Power Interface Module (PIM) shall be -35°F to +165°F (-37° to +74°C).

#### **G. Certifications**

The UPS battery cells shall be recognized UL-2054, CSA 22.2 No. 60950-1

#### **H. Power & Control Connections**

##### **1. Power Interface Module (PIM)**

The UPS shall utilize a Power Interface Module (PIM) to connect utility AC input to the UPS and batteries as well as routing UPS output power to the cabinet load.

##### **2. AC Connection**

The AC input and output shall be separate panel mounted plug/receptacles that allow no possibility of accidental exposure to dangerous voltages.

##### **3. Battery Connections**

- i. The batteries shall have digital battery bus connections to the UPS with locking connectors with provision for six battery ports. There shall be AC power connections from the Power Interface Module to the batteries that are separate from the digital battery bus connections.
- ii. The UPS must offer six (6) battery ports that can accommodate a mix of any form-factor NiZn batteries compatible with the UPS system.
- iii. The UPS must be capable of accepting batteries of different capacities at once, giving the user the ability to utilize different battery sizes to achieve required run-times.



- iv. The UPS must allow the user to 'Hot Swap' any of the battery form-factors while on utility power and/or battery backup power.

## I. Battery

1. The standard and XRT UPS batteries must utilize a Sealed Nickel-Zinc (NiZn) battery technology. Lead-Acid or Lithium battery technologies will not be accepted.
2. The standard run-time battery panel(s) must incorporate a bendable design, which allows the battery panel(s) to flex or bend for installation between the 19" EIA rack and the sidewall of the 33X cabinet .
3. The standard run-time module(s) must have the capability of being installed on/under a shelf or be rack mountable within the 19" EIA rack.
4. XRT battery solutions shall come with an intelligent management system that consolidates all battery connections to the UPS and manages the battery string.
5. The charging/battery monitoring circuitry shall be incorporated within the panel, module or extended run time battery solutions.

## J. Charge

The UPS must be able to recharge panel and module batteries from 0% to 100% state of charge (full capacity) within four and one half (4.5) hours of complete discharge at 25°C when AC utility line voltage is available. Extended run time batteries shall be able to recharge batteries from 0% to 100% state of charge (full capacity) within ten (10) hours of complete discharge at 25°C when AC utility line voltage is available. The number of batteries connected to the UPS shall have NO effect on the recharge time. The batteries must be able to charge at up to 50°C ambient temperature. The UPS must not require trickle/float charging.

Wall Charging - The UPS panel, module and extended run time batteries shall be able to be charged using a 120VAC, 15A wall outlet (20A for extended run time) without need of a UPS inverter/controller, battery charger or battery tender.

**K. Unit failure**

The UPS must have a fail-safe utility tie feature (bypass mode) with a visual indicator that automatically cuts back to the utility line in the event of a UPS or battery failure, or complete battery discharge.

**L. Operating Modes**

The UPS shall have intelligent two-stage operation defined as:

Stage One: Line Attenuator, Waveform Monitoring and Switchover to Battery Backup

Stage Two: Waveform Monitoring, Return to AC Power

**M. Oscilloscope Function**

The UPS shall have an oscilloscope function continuously monitoring the incoming utility AC waveform. The oscilloscope function shall continuously evaluate three (3) measures of the incoming utility AC waveform:

1. Voltage: A continuous RMS measurement with user programmable AC voltage thresholds.
2. Waveform Anomalies: Oscilloscope enhanced sensitivity mode compares incoming utility waveform to a mathematically pure sine wave reference waveform.
3. Frequency: Continuously measured with frequency deviation detected as quickly as 1 cycle and a default threshold of 60Hz  $\pm$ 6Hz.

**4. Functionality and Operational Requirements****A. LCD Display**

The UPS shall have a 64 x 128 Pixels LCD display with white LED backlight. From the main screen, the LCD display shall provide the following information;

1. Utility line voltage
2. UPS status
3. Cabinet consumption in watts
4. Most recent AC power outage duration
5. Battery capacity State of Charge percentage

**B. LCD Display Menu**

The LCD Display Menu shall provide the user the ability to program and monitor all UPS parameters;

**C. Local User Interface**

The UPS shall include a navigational dial to allow users the ability to navigate the menu to setup the UPS.



#### **D. Voltage Thresholds**

1. The UPS shall allow the user to set high and low AC line voltage thresholds to determine parameters to transfer from utility line power to battery backup power.
2. The UPS shall bypass utility line power if the utility line voltage is outside of the set high and low voltage parameters.
3. The UPS shall have a programmable utility AC qualification time after restoration of utility AC power to within specified voltage thresholds with choices of 3, 10 or 30 seconds.

#### **E. Notifications**

All alarm functions shall be available on SNMP, SMTP and Programmable Relay.

#### **F. Programmable Relays**

The UPS Inverter/Controller shall include eight (8) Class 2 programmable relays, which can be triggered by power line conditions, and user selected settings of the UPS. Each relay shall have the ability to trigger by multiple conditions simultaneously. The programming options are as follows;

1. Power Fail without delay / Power fail with delay
2. Time of Day
3. Battery Capacity
4. System Fault

#### **G. Event Log**

The UPS shall provide an event log with a 1000 event capacity, which will allow the user to view the event type, date, time and duration of a given event. UPS configuration changes shall also be defined as an event and captured in the event log. The data shall be recorded in a FIFO format, so the oldest event is purged as the newest is entered.

#### **H. Automatic Bypass Switch**

The UPS shall have an automatic bypass function with a visual indicator to bypass the UPS and allow the utility line voltage through to the cabinet.

#### **I. Circuit Breakers**

The UPS system shall include a Power Interface Module (PIM) equipped with a 20A circuit breaker and automatic bypass capability.

#### **J. Cold Start**

The UPS shall be equipped with "Cold Start" capabilities, which provides the user the ability to turn the UPS on and supply battery backup power when no utility line voltage is available. This allows the user the ability to



install a UPS and provide backup AC power at an intersection that has no utility line voltage available.

#### **K. Audible Indicators**

The UPS shall have audible indicators for the following parameters:

1. System Startup
2. Cold Start
3. Inverter On/Off
4. Inverter Output Over Current
5. AC Mis-wire
6. Rotating Navigation Dial with Press to Select and Back Button use
7. UPS Fault

#### **L. Tilt Sensor**

The UPS shall have a built in Tilt Sensor that, when enabled, automatically shuts off battery power for safety reasons when the unit is sitting an angle of more than 15 degrees from level.

#### **M. Maintenance**

There shall be no battery maintenance requirements for the life of the batteries including no battery rotation, maintenance discharge or cell balancing.

#### **N. Visual Indicators**

The UPS shall have visual indicators on its front panel for the following:

1. Red indicator - UPS Fault
2. Solid Green indicator - Backup Mode On
3. Flashing Green indicator - Batteries are below 10% capacity
4. Yellow - Relay Triggered

The batteries shall have the following visual indicators through a multi-color LED providing battery status and alarms

- Green = Backup Mode
- Blue = Charging Mode
- Red = Battery Fault
- White Blinking = Charged, battery at rest

### **5. Communication**

- A.** The UPS must have the capability to provide Ethernet and IP addressing communications with the capability for remote monitoring and programming as well as remote firmware updating capability. This capability must be provided through embedded webserver software within the UPS.



- B. The UPS shall be equipped with an Ethernet port. The Ethernet port shall be an RJ45, EIA 568B pin out type connector. The Ethernet port shall be 10/100Mbps, TCP/IP capable.
- 6. Graphical User Interface**
- A. The embedded webserver will provide a Graphical User Interface (GUI) that shall be password protected and require a user ID, password and the UPS IP address to access.
  - B. The GUI shall have a status area that details the UPS status, location, available AC line voltage status and real-time cabinet power consumption. When in backup mode, the GUI shall display the most recent power failure duration. The status area must be displayed on every page.
  - C. The GUI shall have a Home screen with clickable icons and tabs, which will allow the user to navigate the GUI with ease. The home screen shall allow the user to view real-time graphical charts of the cabinet power consumption and AC line voltage status. The home screen must allow the user the ability to view a live waveform from the AC utility line in the cabinet.
  - D. The GUI shall have an Event Log page to allow the user to view the event type, date, time and duration of a given event. The GUI must provide the user the capability of viewing the waveform of the given event.
  - E. The GUI shall have a relay Configuration page to allow the user to program the relay contacts.
  - F. The GUI shall have a System Configuration page that allows the user to configure all the setup parameters of the UPS.
  - G. The GUI shall communicate notification and alerts through SNMP and SMTP protocols.
- 7. Warranty**

The UPS, as a complete system including batteries, must be warranted to be free from defects in material and workmanship for a minimum of 5 years for the battery cells and 2 years for the electronics from the date of shipment.