

LTN SERIES

700VA – 2.1kVA

Uninterruptible Power Supply

General Specification

1.0 GENERAL

1.01 *The System*

This Specification defines the electrical and mechanical characteristics and requirements for a UL1778 listed, single phase, full output isolation, continuous duty, single conversion, Pulse Width Modulated, microprocessor controlled, transistorized, solid-state uninterruptible power supply (UPS). The UPS works in conjunction with the existing electrical system to provide high quality, reliable, clean regulated AC power for critical equipment needing backup emergency power. The UPS constitutes a separately derived source for electrical isolation. The system shall be manufactured in the United States by an ISO9001 registered manufacturer.

The UPS consists of a charger, battery, inverter, protective devices, high speed transfer device, synchronizing and phase lock circuitry and the controls required to provide regulated, continuous, conditioned power to critical loads.

2.0 STANDARDS

2.01 *Applicable Documents*

The UPS is designed in accordance with the applicable sections of the current revision of the following documents:

- UL Standard 1778
- CUL Standard 1778
- NEMA PE-1
- ASA-C-39.1-1984
- FAA-G-201e Power Factor
- FCC Pt 15, Subpart J, Class A
- National Electric Code, NFPA 70
- OSHA
- IEEE 587 ANSI C 62.41 and .45 Category A and B
- IEEE 578B Category B Surge Suppression

2.02 *Wiring*

Wiring practices, materials and coding are in accordance with the requirements of the National Electric Code and other applicable codes and standards.

3.0 RATINGS

3.01 Module Power Ratings

Output Power Ratings:

Series	Model	Load Rating (VA)	Load Rating (watts)
LTN	LTN700	700	500
LTN	LTN850	850	600
LTN	LTN1000	1000	700
LTN	LTN1200	1200	850
LTN	LTN1400	1400	1000
LTN	LTN1600	1600	1200
LTN	LTN1800	1800	1300
LTN	LTN2100	2100	1500

3.02 Components

- a. PWM (Pulse Width Modulated) Inverter
- b. Battery Charger
- c. Input / (Optional) Output Breakers
- d. Microprocessor Control and Diagnostic System
- e. Variable Range Regulator
- f. High Speed Transfer Device
- g. Output Isolation Transformer – Separately Derived Source
- h. Integral Valve Regulated Lead Acid (VRLA) Batteries

3.03 Input Requirements

- a. Voltage: 120, 208, 240 VAC
- b. Voltage Tolerance: +10% to – 15% from nominal voltage at full load (+10% to –40% at reduced load)
- c. Power Factor: Self correcting to > 0.95 approaching unity.
- d. Frequency: 60 Hz: +/- 2.5Hz
- e. Input Harmonics: < 5% THD
- f. Spike Attenuation: 3000:1 Category B-3.

3.04 Output Characteristics

- a. Voltage: 120, 120/208 or 120/240 (separately derived source)

Output Regulation: +/- 3% typical from nominal over the entire operating range of the DC Bus, within limits, and 100% load variations

Output Waveform: Sinusoidal

- b. Frequency: Normal mode – same as utility
Emergency mode – 60 Hz \pm 0.2%
- c. Overload Rating: 125% for 10 minutes
- d. Reactive Power Correction, load power factor: 0.6 lagging corrected to $>.95$ @ input.
- e. K Factor: K30 or better
- f. Harmonic Content: Linear loads: Maximum voltage THD $< 5\%$
- g. Load Peak Factor: 3.5 to 1 (crest ratio)
- h. Normal Operating Efficiency: 82% - 89%

3.05 Charger

- a. 3 amp, two stage, temperature compensated.
- b. Charger Voltage "Float " Operation: 2.27 VDC per cell

3.06 Environmental Conditions

- a. The UPS is capable of continuous operation under the following temperature conditions:
- Functioning: 32°F (0°C) to 104°F (40°C)
 - Storage: 0F (-20°C) to 120°F (50°C)
 - Note: Optimum battery temperature = 77°F (25°C)
- b. Relative Humidity: 95% non-condensing
- c. Altitude: 5,000 feet (1500 meters) without any de-rating
- d. Audible Noise: Shall not exceed 50 dBA when measured at 3 feet in front of the inverter using scale "A" of a standard ASA sound level-measuring device.

4.0 SYSTEM OPERATION AND DESCRIPTION

4.01 Operational Modes

The UPS operates in an uninterrupted output sinewave mode providing conditioned, regulated, isolated power to critical loads.

- a. Normal: The utility source supplies power to the output isolation transformer which continuously supplies the load. The battery charger supplies the energy necessary to maintain the maximum charging level to the battery.
- b. Emergency: Upon failure of the utility supply, the PWM inverter continues to supply the output isolation transformer, using the battery as the source of power.
- c. Return to normal conditions: When the utility supply returns within the tolerance limits, the UPS resumes normal operation. The battery charger automatically recharges the battery to ensure maximum battery run time in the shortest possible time.
- d. Battery Maintenance: If the battery is taken out of service for maintenance via the disconnect device, the inverter continues to function but provides no backup protection.

4.02 Functional Description

4.02.1 Inverter

The inverter is a micro-processor controlled PWM design, capable of delivering AC power within specified limits to the critical load bus. The inverter shall be solid state and includes all necessary protective devices and control circuits.

4.02.2 Output Isolation Transformer

The utility source and inverter output feed the primary side of the computer grade isolation transformer. The transformer classifies the UPS system as a separately derived source, creating an isolated neutral for the critical loads. Common mode noise attenuation shall be 120db. Transverse mode noise attenuation shall be 70db.

4.02.3 Synchronizing Equipment

The UPS includes all necessary logic circuitry for fully automatic frequency synchronization and phase locking of the inverter output to the utility supply. This assures in phase, uninterrupted, output "load-side" power to be transferred, either from normal to emergency mode and emergency to normal mode.

4.02.4 Variable Range Regulator

The UPS incorporates Variable Range Regulation, allowing a wider range of acceptable input voltage variation, conserving the batteries for true brown out conditions or complete utility power failure. The input voltage variation range is an inverse function of the connected load, i.e. as the connected load decreases, the allowable input voltage variation becomes greater, (up to +10% to -40%), while maintaining the output voltage within usable levels.

5.0 MECHANICAL

5.01 Cabinets

The UPS comprised of the charger, inverter, high speed transfer device, input circuit breaker, optional output circuit breaker(s) and batteries are housed in a freestanding floor mounted enclosure. Circuit Breakers and controls are secured by locking the cabinet doors to prevent unauthorized access.

NEMA 2 cabinet is Standard, NEMA 3-R (Optional)

Dimensions: 39.0”H x 31.0”W x 16.6”D

5.02 Material

All materials and components are new, and of current manufacture, and have not been in prior service except as required during factory testing. All bus bars are copper.

5.03 Thermal

5.03.1 Air Flow

The UPS incorporates forced air-cooling into its design. Air enters at the base and exits at the left side of the cabinet.

5.03.2 Heat Rejection of the UPS

UPS SIZE (KW)	HEAT REJECTION (Btu/hr)
700VA	256
850VA	307
1000VA	359
1200VA	435
1400VA	512
1600VA	614
1800VA	665
2100VA	767

5.04 Serviceability

The UPS is constructed of replaceable subassemblies. The main power conversion module is of modular design with quick connect electrical terminals for rapid replacement.

5.05 *Finish*

The UPS cabinet is cleaned, primed and painted off-white.

6.0 MONITORING AND CONTROLS

6.01 *General*

The UPS incorporates the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance, as well as take any appropriate action.

6.02 *Controls*

The following minimum operator controls are available.

- a. AC input circuit breaker, AC output circuit breakers (optional)
- b. Battery Test, Audible Alarm

6.03 *Status Panel*

6.03.1 Status Panel

The Status Panel incorporates 3 bright LED indicating lamps to indicate the system status:

System On (Green) System on Battery (Yellow) Low Battery Warning (Red)

6.03.2 Alpha-Numeric Display

The Status Panel features Light Emitting Diodes (LED) that operate in conjunction with the Alpha-Numeric Status Display. These define the parameter active on the three digit display; Input Voltage, Output Voltage, % Load, % Battery Capacity, % Battery Charger

6.03.3 Alarms

The Status Panel provides a visual (Red) and Audible Alarm notification for the following conditions:

Low Output	High Output
Overload	Frequency Fault
Over Temperature	Shorted SCR Shutdown
Low Battery Shutdown	Check Battery
Output Shutdown	Inverter On
Low Battery	Remote/Emergency Power Off Shutdown

6.04 Remote Monitoring

Full Duplex ASCII, RS232 Serial Port: Provided with the UPS is an RS232 Serial Port, which will provide over 60 operating, diagnostic and performance characteristics.

7.0 BATTERY

A VRLA, Sealed Lead Calcium high discharge rate batteries are provided, as part of the system. The batteries are non-gassing, maintenance free with no gel contaminant.

8.0 FACTORY TESTING

Before shipment, the UPS is fully tested to factory standards to assure compliance with the specification. Each subassembly undergoes thorough testing prior to installation in the system. The total system is exposed to a functional load test.

A complete test report shall be available for each unit and kept on file for future reference.

9.0 QUALITY

9.01 Materials

All materials, parts, and components used are new and of the highest grade.

9.02 System Reliability

The UPS Mean Time Between Failure (MTBF) is not less than 100,000 hours.

10.0 INSTALLATION AND OPERATION MANUAL

The UPS is supplied with one copy of the User's Manual. Additional copies are available from the factory