

Model LTN Uninterruptible Power System Single Phase

General Specification 700VA – 2100VA Systems

1.0 GENERAL

This specification defines the electrical and mechanical characteristics of the Model LTN uninterruptible power system (UPS). The Model LTN is a single phase, continuous duty, microprocessor-controlled UPS, providing tight voltage regulation and power purification with its integral constant voltage transformer. The UPS constitutes a separately derived source for electrical isolation. The Model LTN consists of a battery charger, batteries, inverter, protective devices, high speed transfer device, synchronizing and phase lock circuitry, and the controls required to provide regulated, continuous, conditioned power to critical equipment needing backup emergency power.

2.0 STANDARDS

The system is designed in accordance with applicable portions of the following standards:

- A. National Electrical Manufacturers Association (NEC 2005, NFPA70)
- B. National Electrical Manufacturers Association (NEMA PE-1)
- C. ANSI/IEEE C57.110 Nonsinusoidal Load Currents
- D. ANSI/IEEE C84.1 Electrical Power Systems and Equipment – Voltage Ratings (60Hz)
- E. ANSI/IEEE C62.41 and C62.45 Category A and B Surge Capability
- F. IEEE 519 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- G. FCC Class A Limits, 47 C.F.R. Part 15, Subparts A, B
- H. Listed UL / C-UL 1778 Uninterruptible Power Supply Equipment
- I. C-UL listed to CSA Standard C22.2 No. 107.1-01 General Use Power Supplies

3.0 OUTPUT POWER RATINGS

700 VA / 500 Watts	1400 VA/ 1000 Watts
850 VA / 600 Watts	1600 VA/ 1200 Watts
1000 VA / 700 Watts	1800 VA/ 1300 Watts
1200 VA / 850 Watts	2100 VA/ 1500 Watts

4.0 STANDARD SYSTEM COMPONENTS

- A. PWM (Pulse Width Modulated) Inverter
- B. Integral 3 Amp Battery Charger
- C. Input Breaker and One (1) Output Breaker
- D. Microprocessor Control and Diagnostic System
- E. Variable Range Regulator
- F. High Speed Transfer Device
- G. Output Constant Voltage Isolation Transformer – Separately Derived Source
- H. Integral Valve Regulated Lead Acid (VRLA) Batteries
- I. Internal Status and Alarm Panel
- J. NEMA 2 Designed Steel Enclosure

5.0 OPTIONAL SYSTEM COMPONENTS

- A. Output Circuit Breakers – Up to six (6) pole positions are available to accommodate 1 pole and/or 2 pole, 15 amp circuit breakers. Monitored breakers require an additional pole position.
- B. Output Circuit Breaker Monitor
- C. Integral 8.5 Amp, Temperature Compensated Battery Charger
- D. Status and Alarm Relay Contacts – Four (4) isolated sets of relay contacts for remote monitoring of status and alarm conditions
- E. NetMinder Communications Module – Ethernet TCP/IP, MODBUS TCP, or MODBUS RS485
- F. Wall Mounting Kit

6.0 INPUT SPECIFICATIONS

- A. Voltage: 120VAC, 208VAC, or 240VAC
- B. Voltage Tolerance: +10% to – 15% from nominal voltage at full load without battery usage
- C. Extended Range: The UPS incorporates the use of variable range regulation in conjunction with the load percentage to extend the input range up to +10% to -40% without battery usage while maintaining a regulated, usable output voltage.
- D. Power Factor: Self-correcting to > 0.95, approaching unity
- E. Frequency: 60 Hz: +/- 2.5Hz
- F. Input Harmonics: < 8% THD
- G. Spike Attenuation: 3000:1 Category B-3

7.0 OUTPUT SPECIFICATIONS

- A. Voltage: 120VAC, 120/208VAC, or 120/240VAC
- B. Output Regulation: +/- 3% typical
- C. Output Waveform: Sinusoidal

- D. Frequency: Normal mode – same as utility; Emergency mode – 60 Hz +/- 0.2 Hz
- E. Overload Rating: 125% for 10 minutes
- F. Surge Capability: 150% of rated output without need of static bypass
- G. Isolation: NEC article 250-5d, complies with this standard that specifies a separately derived power source.
- H. Common Mode Noise Attenuation: 120 dB (10⁶ : 1 ground noise attenuation)
- I. Transverse Mode Noise Attenuation: 70 dB (3160 : 1 line noise attenuation)
- J. Reactive Power Correction: Load at .6 PF corrected to > 0.95 at input (self-correcting).
- K. Harmonic Content: Voltage THD < 5% with linear load
- L. K Factor: K30 or better
- M. Load Peak Factor: 3.0 to 1 (crest ratio)
- N. Normal Operating Efficiency: 89% typical at full load

8.0 BATTERY CHARGER

- A. Integral 3 amp, two stage, filtered is standard. An integral 8.5 amp, temperature compensated battery charger is optional.
- B. Charger Voltage Float Operation: 2.27 VDC per cell

9.0 BATTERY SPECIFICATIONS

- A. Battery Type: 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.
- B. Bus Voltage: 24 VDC, float 2.27 VDC per cell, cut-off 1.75 VDC per cell.

10.0 BATTERY RUNTIMES / BTU'S

Various battery runtime options are available within the minimum and maximum runtimes listed below; consult factory.

VA	WATTS	BATTERY RUNTIMES (FULL / HALF LOAD)		BTU'S / HOUR
		MINIMUM	MAXIMUM	
700	500	22.5m / 1h	7h / 14h	256
850	600	18m / 48m	5h 30m / 10h 30m	307
1000	700	13m / 30m	3h 48m / 7h 55m	359
1200	850	12m / 27m	3h 36m / 7h	435
1400	1000	8m / 23m	2h 49m / 5h 50m	512
1600	1200	7m / 17.5m	2h 26m / 5h 7m	614
1800	1300	9.5m / 26m	2h 18m / 4h	665
2100	1500	7.5m / 21.5m	2h 5m / 3h 47m	767

11.0 ENVIRONMENTAL CONDITIONS

- A. UL Listed Operating Temperature: 0°C to 40°C
- B. Storage Temperature: -20°C to 50°C (Batteries to be stored in ambient temperature > 0°C)
- C. Altitude: 5,000 feet (1500 meters) without any de-rating

12.0 SYSTEM OPERATION AND DESCRIPTION

OPERATIONAL MODES: The UPS modes of operation provide an uninterrupted, no break output providing conditioned, regulated, isolated power to critical loads.

- A. Normal Mode: The utility source supplies power to the output constant voltage isolation transformer, which continuously supplies power to the load. The battery charger supplies the energy necessary to maintain the maximum charging level to the battery.
- B. Emergency Mode: Upon failure of the utility supply, the PWM inverter continues to supply the output constant voltage isolation transformer, using the battery as the source of power.
- C. Return to Normal Mode: 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 DC disconnect device, the inverter continues to function but provides no backup protection.

13.0 FUNCTIONAL DESCRIPTION

- A. INVERTER: The inverter is a micro-processor controlled PWM design, capable of delivering AC power within specified limits to the critical load. The solid state inverter includes all necessary protective devices and control circuits.
- B. OUTPUT CONSTANT VOLTAGE ISOLATION TRANSFORMER: The utility source or inverter output feeds the primary side of the computer grade constant voltage isolation transformer. This transformer classifies the UPS system as a separately derived source, creating an isolated neutral for the critical loads. Common mode noise attenuation is 120dB. Transverse mode noise attenuation is 70dB.
- C. 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 or emergency to normal mode.

- D. 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.

14.0 MECHANICAL

- A. CABINET: The UPS system is housed in a freestanding, floor mounted, NEMA 2 designed enclosure constructed of 14 gauge steel. The exterior of the enclosure is powder coat painted. Circuit breakers and controls are secured by locking the cabinet doors to prevent unauthorized access.
- B. DIMENSIONS: 31” W x 16.6” D x 39” H
- C. AIR FLOW: The UPS incorporates forced air-cooling into its design. Air enters at the base and exits on the left side of the enclosure.

15.0 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. All replacement of components and batteries is done via the front of the UPS enclosure.

16.0 MONITORING AND CONTROLS

- A. 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.
- B. STATUS & ALARM PANEL: The Status & Alarm Panel is located behind the UPS’s hinged, key-lockable front door. The panel incorporates 3 bright LED indicating lamps to indicate the system status:
 - 1. System On (Green)
 - 2. System On Battery (Yellow)
 - 3. Low Battery Warning (Red)

- C. ALPHANUMERIC DISPLAY: The Status & Alarm Panel features Light Emitting Diodes (LED) that operate in conjunction with the alphanumeric status display. These define the individual parameter active on the three digit display. Parameters include:
1. Input Voltage
 2. Output Voltage
 3. % Load
 4. % Battery Capacity
 5. % Battery Charger
- D. ALARMS: The Status & Alarm Panel provides a visual (Red) and Audible Alarm notification for the following conditions:
1. Low Output
 2. High Output
 3. Overload
 4. Frequency Fault
 5. Over Temperature
 6. Shorted SCR Shutdown
 7. Low Battery Shutdown
 8. Check Battery
 9. Output Shutdown
 10. On Battery
 11. Low Battery
 12. Remote/Emergency Power Off Shutdown

17.0 REMOTE COMMUNICATIONS INTERFACE

- A. COMMUNICATIONS PORT (RS232): A communications port is provided for remote monitoring access to general alarm conditions, and electrical measurements including:
1. AC Input Voltage
 2. AC Output Voltage
 3. Output Amps
 4. % Load
 5. % Battery Voltage
 6. Output Watts
 7. Output VA
 8. Power Factor
 9. Input Line Frequency
 10. Number of Power Outages
 11. Number of Overloads

- B. **ALARM SIGNALS:** Status / Alarm open collector transistor interface is provided for use with optional remote annunciator panel or for customer's remote monitoring. UPS on, utility AC power failure (system using battery power), low battery warning, and general alarm signals are included. Open collector transistor ratings: 40 VDC maximum, 300mA. Power supply included for +/- 10 VDC, 1 mA.
- C. **STATUS & ALARM RELAY CONTACTS (OPTIONAL):** Four (4) isolated sets of relay contacts are provided in an external enclosure that plugs into the UPS control module with a single cable. Standard relay contacts are normally open. Normally closed or form C relay contacts are optional. Relay contacts are rated for 24VAC and 24VDC at 0.5 amps. Connections to relay contacts are made via four (4) DB25 pin connectors, or via a hardwired terminal strip. Relay contacts communicate the following conditions: UPS on, utility AC power failure (system using battery power), low battery warning, and general alarm.
- D. **NETMINDER COMMUNICATIONS (OPTIONAL):** External module providing user-access to system status, alarm conditions, electrical measurements, and system logs via an Ethernet TCP/IP, MODBUS TCP, or MODBUS RS485 network connection. Remote notification of alarms and status conditions also available via e-mail and/or text messaging.

18.0 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. Test results are recorded and an electronic copy is maintained.

19.0 WARRANTY

All power components, system electronics, and batteries are guaranteed to be free from defects in material and workmanship for a period of one (1) year following shipment from the factory. Batteries are warranted with a 1 year full replacement warranty, and an optional 4 year pro-rate with applicable maintenance contract. Optional extended warranties and maintenance contracts are available.