

UltraLITE Model ELU Centralized Emergency Lighting Inverter
1.5 KW- 14 KW

General Specification

1.0 General

This specification describes the features and design of an on-line, dual conversion, uninterrupted emergency lighting inverter power system. The UltraLITE emergency lighting inverter system is designed to assure maximum reliability, serviceability, and performance. The system incorporates a microprocessor controlled, high frequency IGBT PWM rectifier/charger, IGBT PWM inverter, high speed automatic bypass transfer device and 90 minute battery pack to provide immunity from all line disturbances and power interruptions with no break in AC output power. The system as described herein includes a normally on uninterrupted AC output power section and provisions to include a normally off AC output power section, thus enabling compatibility with emergency lighting fixtures operating in normally on and standby modes. A self-diagnostic monitoring alarm system continuously advises of system status and battery condition.

2.0 Inverter Output Power Ratings

(1.5 KW) (2.2 KW) (3.0 KW) (3.5 KW) (4.2 KW) (5.0 KW) (6.0 KW) (7.0 KW) (7.5 KW) (8.5 KW) (10 KW) (12.5 KW) (13.5 KW) (14 KW)

3.0 Standards

The systems are designed in accordance with applicable portions of the following standards:

- 3.1 American National Standards Institute (ANSI C57.110).
- 3.2 Institute of Electrical and Electronic Engineers (IEEE 519-2014) (C62.41-2002).
- 3.3 National Electrical Manufacturers Association (NEMA PE-1).
- 3.4 National Electric Code (NEC 2005, Article 700).
- 3.5 National Fire Protection Association (NFPA 70) (NFPA 101) (NFPA 111).
- 3.6 NFPA 101 Section 7.9.3.1.3 – Periodic Testing of Emergency Lighting Equipment.
- 3.7 Underwriters Laboratories (UL) (C-UL to CSA Standards).
- 3.8 Federal Communications Commission (FCC Part 15, Sec. J, Class A).
- 3.9 Federal Aviation Administration (FAA-G 201e).
- 3.10 Listed UL Standards UL 924 Emergency Lighting Equipment, UL 924 Auxiliary Lighting and Power Equipment, UL 1778, C-UL listed to CSA C22.2, No. 107.1-M01, C-UL listed to CSA C22.2 No. 141-15 Emergency Lighting Equipment.

Seismic-rated units are designed and tested in accordance with applicable portions of the following additional standards:

- 3.11 ICC - AC156: “Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components and Systems”
- 3.12 ASCE 7-10
- 3.13 California Building Code – CBC 2016
- 3.14 International Building Code – IBC 2015

4.0 Input Specifications

- 4.1 Input Voltage
 - 1.5 – 2.2 KW: (120) (277)
 - 3.0 – 3.5 KW: (120) (208/120) (240/120) (277)
 - 4.2 – 5.0 KW: (120) (208/120) (240/120) (277) (347) (480) (600)
 - 6.0 – 14 KW: (208/120) (240/120) (277) (347) (480) (600)

- 4.2 Operating Range: +12% to -15% without battery usage.
- 4.3 The unit incorporates the use of variable range logic in conjunction with the load percentage to extend the input range to +12% to -30% without battery usage while maintaining a regulated, usable output voltage.
- 4.4 Frequency Range: 57.5 Hz. to 62.5 Hz.
- 4.5 Power Factor: Self correcting to >0.97 (approaching unity).
- 4.6 System AIC (Amperes Interrupting Current) Rating: 65k AIC.

5.0 Output Specifications

- 5.1 Output Voltage
 - 1.5 – 2.2 KW: (120) (277) (277/120)
 - 3.0 – 3.5 KW: (120) (208/120) (240/120) (277) (277/120)
 - 4.2 – 5.0 KW: (120) (208/120) (240/120) (277) (277/120) (347/120)
 - 6.0 – 14 KW: (208/120) (240/120) (277) (277/120) (347/120)
- 5.2 Sine Wave Voltage Output: Maximum 3% THD under linear load.
- 5.3 Output frequency: 60Hz, plus or minus 0.5 % under full range load while in the battery operation mode.
- 5.4 Harmonic Attenuation: Reflected load generated harmonics are attenuated at the input.
- 5.5 Overload Rating (without use of static bypass): Up 125% for 30 cycles, 150% for 4 cycles when fed from the AC power source, or on battery.
- 5.6 LED Inrush Rating (without use of static bypass): Peak overload capability up to 1400% during a current surge of ¼ cycle, when fed from the AC power source or on battery, to accommodate inrush current from LED fixtures/drivers.
- 5.7 Fault Clearing (with bypass available): 125% for 2 minutes, 150% for 30 seconds and 200% for 15 cycles when fed from AC power source.
- 5.8 Voltage Regulation: ±2%.

6.0 Battery Specifications

- 6.1 Battery Time: Standard battery run time is 90 minutes at full rated kilowatt output, consistent with UL924 standards.
- 6.2 Battery Type: Valve regulated, sealed lead calcium, maintenance free batteries.
- 6.3 Charger: Four stage, temperature compensated, 1% ripple filtered.
- 6.4 Recharge Time: 24 hrs, UL924, NFPA 101, NFPA 111 compliant.
- 6.5 DC Bus voltage: 120 VDC.

7.0 Performance

- 7.1 Compatibility: UltraLITE centralized emergency lighting inverter systems are compatible with all fixture types. Fixture types include, but are not limited to, LED lighting, fluorescent ballasts, incandescent lamps, electronic and high power factor fluorescent ballasts, and HID fixtures. Normally

on and optional normally off AC outputs are 100% rated and limited only by the system maximum kilowatt output rating.

- 7.2 Normal Operation: The load is supplied with regulated power derived from the normal AC power input terminals through the rectifier charger and inverter. The rectifier charger is fully rated to charge the batteries and supply sufficient DC energy for the inverter when under full load. The battery is connected in parallel with the rectifier charger output.
- 7.3 Uninterrupted Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, energy will be supplied by the battery through the inverter and continue to supply power to the load without switching loss or disturbance. When power is restored at the AC input terminals of the system, the rectifier charger continues to supply power to the load through the inverter and simultaneously recharges the batteries.
- 7.4 Standby Emergency Operation (optional): Upon the failure or unacceptable deviation of commercial AC power or upon a remote input command signal, the standby, normally off AC output bus section of the system becomes energized, thus providing emergency power for standby lighting fixtures which are required to illuminate only in the event of emergency. Field adjustable timers are optional for use with on and off delay transition requirements.
- 7.5 Automatic Bypass Operation: The system includes a high speed automatic bypass for fault clearing, instantaneous overload conditions and/or to connect the load to the normal utility source in the event of a system rectifier charger or inverter failure.

8.0 Environmental Specifications

- 8.1 Operating Temperature: UL 924 listed Emergency Lighting Equipment at 20°C (68°F) to 30°C (86°F). C-UL listed to CSA C22.2 No. 141-15 with 30 minutes at 20°C (68°F) to 30°C (86°F).

UL 924 Auxiliary Lighting and Power Equipment, UL 1778, and C-UL listed to CSA C22.2 No.107.1-01 at 0°C (32°F) to 40°C (104°F).

- 8.2 Storage Temperature: -20°C to 50°C.
- 8.3 Relative Humidity: 95% non-condensing.
- 8.4 Elevation: 5000 feet, 1500 meters without de-rating.
- 8.5 BTU/HR Emitted:

<u>Output Rating</u>	<u>BTU's / Hr. (Full Load¹)</u>	<u>BTU's / Hr. (Standby Mode²)</u>
1.5 KW	511	128
2.2 KW	750	188
3.0 KW	1023	256
3.5 KW	1194	298
4.2 KW	2005	358
5.0 KW	2387	426
6.0 KW	2864	512
7.0 KW	3342	597
7.5 KW	3581	639
8.5 KW	4058	725
10 KW	4774	853
12.5 KW	5967	1065
13.5 KW	6445	1151
14 KW	6684	1194

¹ Full load BTU's represent worse case condition. 120V - 120V, 208/120V - 208/120V, and 240/120V - 240/120V models will have a lower BTU output. Consult factory for BTU's / hour ratings on specific models.

² Standby BTU's represent emergency lighting loads that are normally off or turned off via a local control device, used together with a UL 924 listed bypass relay; or emergency lighting loads that switch from normal power to emergency power using a UL 1008 transfer relay device. Stated BTU's for 120V, 208/120V, and 240/120V models. Consult factory for standby BTU's on other models.

8.6 Audible Noise Level: Not greater than 50 dba at 1 meter.

8.7 Enclosure: NEMA 1

9.0 Standard Display Monitor and Diagnostics

9.1 Display Panel – System includes a local, front mounted, LED display panel to indicate system status and battery condition. Display automatically monitors inverter input voltage normal, inverter input voltage high, inverter input voltage low, inverter on bypass, % load, battery in use, battery full, battery low and check battery.

9.2 Automatic Self-Testing – System provides a 5 minute automatic battery test programmable for every 7, 30, or 90 days.

9.3 Manual Battery Testing – System provides a push to test feature in the event that a manual battery test is required.

9.4 Audible Alarm – The display panel includes an audible alarm with alarm silence for system on battery, low battery, check battery, over temperature warning, system fault, and inverter overloaded.

9.5 Control Functions – The display panel includes a push button for inverter on, fail safe dual push buttons for inverter off, alarm silence push button and push button for system battery testing.

9.6 Electrical Measurements (RS232) – Electrical measurements include: Input voltage L1-neutral, Input voltage L2- neutral, Input voltage L1-L2, output voltage L1-neutral, output voltage L2-neutral, output voltage L1-L2, output current (amps) L1-neutral, output current (amps) L2-neutral, output watts L1- neutral, output watts L2-neutral, output watts L1-L2, output volt amperes L1-neutral, output volt amperes L2-neutral, output volt amperes L1-L2, % load L1-neutral, % load L2-neutral, battery voltage and DC charging current, and output frequency. Note that “L2” parameters are measured when applicable.

9.7 System Set Points (RS232) – Systems include a provision to program the following via computer interface: The percentage point at which the display panel indicates the low battery alarm, sag point at which battery usage is to occur, surge point at which battery usage is to occur, and points at which automatic battery tests are to be performed (7 day intervals, 30 day intervals, or 90 day intervals).

9.8 System Log (RS232) – Systems also include provisions to log power outages with date and time and system overloads with date and time.

10.0 Remote Communications

10.1 Communications Port (RS232) – A communications port for remote monitoring access to electrical measurements, system set point programming and the system's log is furnished for computer interface.

10.1.1 The communications port features Status / Alarm relay interface normally open contacts rated at 30VDC 2A. Contacts are provided for optional remote annunciator panel, automatic message dialer or TCP/IP adapter. Available contacts are: On Battery, Low Battery, Battery Test Activated, and General Alarm.

- 10.2 Relay Contact Terminal Strip – Systems include a terminal strip with potential free, 500mA, 120 volt rated, relay contacts for system alarm monitoring.
- 10.2.1 The following normally open relay contact alarms are available via the terminal strip:
On Battery, Low Battery, and General Alarm.
- 10.2.2 The following normally closed relay contact alarm is available via the terminal strip:
Battery Test Active. This contact may be used to signal one or more UL924 listed shunt relays to bypass local control devices during periodic and annual NFPA-mandated tests, in order to provide emergency power to designated emergency lighting fixtures.

11.0 Optional Intellistat Monitor

- 11.1 Intellistat Monitor Panel – Systems include a local, front mounted, sealed, touch screen, LCD display monitor panel with battery back-up memory. The Intellistat displays electrical parameters, system status and alarm conditions.

- 11.1.1 The monitor displays the following electrical parameters. Note that “L₂” parameters are displayed when applicable:

Input Voltage
Output Voltage L₁-N
Output Voltage L₂-N
Output Current L₁-N
Output Current L₂-N
Output Volt-Amperes L₁-N
Output Volt-Amperes L₂-N
Output Volt-Amperes Total
Output Watts L₁-N
Output Watts L₂-N
Output Watts Total
Output Power Factor L₁-N
Output Power Factor L₂-N
Output Power Factor Total
Output Percent Load L₁-N
Output Percent Load L₂-N
Output Percent Load Total
Output Frequency
Battery Voltage
Battery Charge Current

- 11.1.2 The monitor displays the following system status / alarm conditions. Note that “L₂” alarm conditions are displayed when applicable:

Input Voltage High/Low
Output Voltage L₁-N High/Low
Output Voltage L₂-N High/Low
Output Volt-Amperes High - Overloaded
Output Volt-Amperes Low
Output Frequency High/Low
Battery Voltage High/Low
Battery Charger Current High
General Alarm
System on Battery
Low Battery Warning
Low Battery Shutdown
DC Charger Failure / DC Open

- Inverter Over-temperature Warning
- Output Circuit Breaker Open
- REPO Shutdown
- System in Manual Bypass
- System in Static Bypass
- Battery Test Pass
- Battery Test Fail

11.1.3 The monitor displays the following operational conditions:

- System Normal
- Percent Battery Time Remaining
- Battery Test In Process
- Off Bus Connecting
- Off Bus Returning

11.2 The monitor incorporates into its design, user programmable set points for the following:

- Status and Alarm Conditions – User Programmable for all High/Low threshold alarm set points.
- Off Bus Delay Time – User programmable for off bus delay timing adjustments.
- Periodic Battery Test Duration – User programmable for periodic battery test duration.
- Annual Battery Test Duration – User programmable for annual battery test duration.

11.3 The monitor maintains a log that records all system alarms, events and battery system test results. The logs are made available through the LCD display of the monitor. The system log capacity is:

- Event and Alarm Log: 25 Alarms
- Battery System Test Log: 25 Battery Tests

11.4 The monitor features a manual, proprietary, password protected “Push to Test” feature.

11.5 The monitor features automatic battery testing that records test data to comply with NEC, NFPA requirements:

11.5.1 It features a monthly or quarterly 5 min discharge test and a programmable annual discharge test of either 30 minutes, 60 minutes, 90 minutes, 2 hours or 4 hours.

11.5.2 It reports the Time, Date, and a Pass/Fail indication via the local monitor panel and/or via E-mail, SNMP, MODBUS, BACnet, or Ethernet TCP/IP. This information is also available via fax, voice messaging and or web page generation via an optional multifunction communications modem.

11.5.3 During the battery test, the monitor performs an egress lighting integrity test. The egress lighting integrity test measures the load on the output of the system and if the output is below the customer’s programmed / defined value, the inverter will sound an audible alarm indicating possible deficiencies in emergency illumination candela.

11.6 The monitoring system includes a 9 pin status / alarm port and a terminal strip with potential free, 500mA, 120 volt rated contacts.

11.6.1 Alarms monitored from the Intellistat status/alarm port:

- On Battery
- Low Battery
- General Alarm
- System On Bypass

11.6.2 Status / Alarm port contact ratings: 24 VAC and/or 24 VDC, 500 mA.

11.6.3 The following alarms are monitored from the Intellistat terminal strip:

- On Battery
- Low Battery
- General Alarm
- System On Bypass
- Battery Test Pass
- Battery Test Fail

12.0 Reliability

12.1 MTBF Electronic / Electrical System: 100,000 hours.

12.2 MTTR: One hour.

13.0 Standard Equipment

13.1 Terminals for hard wired input and output.

13.2 Normally on, uninterrupted A.C. output bus.

13.3 Single control module design.

13.4 Static bypass switch.

13.5 Make before break secure bypass switch.

13.6 Front mounted diagnostic monitor panel.

13.7 Batteries (90 minute).

13.8 Thermal magnetic A.C. input circuit breaker.

13.9 D.C. battery fuse and Anderson connector with interconnect cable.

13.10 Output distribution circuit breaker panel.

13.11 Copper conductor construction.

13.12 Functional steel cabinet enclosure with hinged, removable, lockable front door.

13.13 Off white powder coat finish.

14.0 Optional Equipment

14.1 Normally off AC output bus.

14.2 Timed normally off AC output bus with field programmable timers.

14.3 Pre-installed, output circuit breakers for use with normally on, normally off or timed normally off AC output bus. (Maximum of 20 pole positions.)

14.4 System output circuit breaker open or tripped alarm contacts. (Adds ½ pole position to each breaker at 120 VAC to 277 VAC; therefore, a maximum of 13 pole positions. Adds 1 pole position to each breaker at 347 VAC; therefore, a maximum of 10 pole positions.)

- 14.5 Drip shield assembly.
- 14.6 Automatic message dialer.
- 14.7 Remote annunciator panel.
- 14.8 Control device(s) override.
- 14.9 Zone sensing device(s).
- 14.10 Fax/Voice/Web multifunction communications modem.
- 14.11 Network communications via SNMP / Ethernet TCP/IP / MODBUS TCP.
- 14.12 Network communications via MODBUS RTU or ASCII over RS485.
- 14.13 Network communications via BACnet/IP or BACnet MS/TP.

15.0 Warranty

- 15.1 All power components and system electronics are guaranteed to be free from defects in material and workmanship for a period of 2 years following shipment from the factory.
- 15.2 Batteries are warranted for 1 year full replacement, and for 14 years pro-rated.
- 15.3 Extended warranty and maintenance contracts are available.

16.0 Serviceability

Each inverter system contains one front-accessible electronics module subassembly. Batteries are positioned and wired to facilitate rapid replacement.