Product Specifications

UL924 "OUST"
Emergency Lighting Inverter System
UL 924 listed as "Emergency Lighting Equipment" and "Auxiliary Lighting and Power Equipment". Complies with NFPA 101 Life Safety Code.
(For battery backup times other than 90 minutes)

Guide Specification for FirstLine® P UL924
58.5kW, 72kW, 90kW, 112.5kW,
144kW, 180kW & 225kW

Three-Phase, On-Line
Emergency Lighting Inverter System

1-1-15

301 Gaddis Blvd, Dayton, OH 45403, USA
Telephone: (866) 261-1191, (937) 253-1191 Fax: (937) 253-1723

SECTION 1.0
SCOPE

1.1 Summary

A. This Specification defines the electrical and mechanical characteristics and requirements for the FirstLine P Series Emergency Lighting Inverter System (ELS) as manufactured by Staco Energy Products Co. located in Dayton, OH.

B. The ELS shall a continuous duty; three-phase, uninterruptible power system, hereafter referred to as the ELS designed to operate with the building supply to provide conditioned power as well as power back up for the critical loads.

1.2 Qualifications

The manufacturer shall have a minimum of 20 years' experience in the design, manufacture, and testing of solid-state transistorized UPS/ELS systems of similar capacity.

1.3 Standards

A. The ELS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where conflict arises between these documents and statements made herein, the statements in this specification shall prevail.

1. UL 924 listed as "Emergency Lighting Equipment" and "Auxiliary Lighting and Power Equipment". Complies with NFPA 101 Life Safety Code.
2. CSA 22.2, No. 107.3
3. NEMA PE-1
4. FCC PT 15, Subpart J, Class A
5. National Electric Code
6. OSHA
7. IEEE C62.41-1991
8. ISO 9001
9. Seismic Withstand Certification (IBC Site Specific A – F)

1.4 System Description

A. The ELS shall be a true double conversion, "On-Line" system consisting of the following major components:

1. Rectifier complete with power factor correction
2. Battery charger
3. PWM Inverter utilizing IGBT's (Insulated Gate Bipolar Transistor)
4. Continuous duty rated Static Switch
5. Input Isolation switch (SWIN)
6. Output Isolation switch (SWOUT)
7. Maintenance Isolation switch (SWMB)
8. Bypass Isolation switch (SWBY)
9. Internal Maintenance Bypass
10. DSP Control and Monitoring Panel with Graphic display
11. Line up and Match Battery Cabinets with varying back up times and integral DC Circuit Breaker.

1.5 Warranty

A. ELS Warranty

The ELS warranty shall be in effect for 24 months after initial start-up but no more than 30 months after shipment, whichever occurs first. The warranty shall cover all parts and labor for units commissioned by manufacturer's approved service representative.

B. Battery Limited Warranty

Three (3) Year full limited warranty passed through from the battery manufacturer, controlled environment required @ 77ºF (25ºC).

SECTION 2.0
PRODUCT

2.1 Modes of Operation

A. The ELS shall always starts on Bypass and transfers to inverter after the rectifier and inverter have started. This means that the bypass source must be qualified (voltage, frequency, phase sequence) in order to start the ELS. The rectifier input must be qualified (voltage, frequency, phase sequence) in order to start the rectifier.

B. The ELS shall be designed to operate as an on-line, reverse transfer system in the following modes:

1. **On-Line (Normal)**
   The load shall always powered by the inverter, with stabilized voltage and frequency, using the energy from the mains power supply (INPUT). If there is a fault in the INPUT, the ELS shall switch to the batteries in zero time and the batteries shall supply energy to the inverter to keep the load powered (for the backup time of the batteries). When the INPUT is restored the batteries shall be automatically recharged by the rectifier.

2. **Stand-By or Smart Active**
   The load shall be powered from the by-pass line (if the power supply line is within the specified limits); if there is a fault on the power supply line, the load shall switch automatically onto the inverter, powered by the battery.

   In Stand-By- On mode, the rectifier remains powered and keeps the batteries charged. If the by-pass line voltage or the frequency moves out of the specified limit, the load shall be automatically switched onto the inverter output. With Stand-By On operation, the energy dissipated by the system shall be reduced, leading to considerable savings.

   In Smart-Active mode, the ELS autonomously activates On-Line or Stand-By-On operation according to the quality of the power supply. When in Smart-Active mode, the switch from inverter to by-pass line shall be immediate. For the switch to take place, the by-pass line is required to remain within the specified limits for the time set. When Smart-Active mode is activated, the power supply shall be monitored, after which, if the voltage has remained within the pre-set values, the output shall be then switched onto the by-pass line; otherwise the load remains powered by the inverter. After this time, provided there has been no interference, the load shall switch onto the by-pass line; otherwise the logic starts monitoring again, providing for improved efficiency, which is greater than 98%.

3. **Stand-By Off**
   Standby-Off the load shall not be powered. In the event of an input mains failure the ELS shall be powered from the inverter using the energy stored in the batteries.

4. **Battery System**
   The ELS shall draw the energy from its own battery for the duration as specified. At the end of its backup time the ELS shall shutdown. The load shall then remain unpowered if the duration of the power source outage is greater than the backup time of the connected battery system. When the power source is restored the system shall restart automatically. Each ELS shall recharge its own battery system.

5. **Overload**
   If the load condition to the system is not reduced, the ELS system shall switch onto the by-pass line. When the overload is removed, the ELS shall automatically return to normal operation. If the overload is continuous, this shall trigger the external protection devices located at the ELS input on the by-pass line. In this case the load shall remain unpowered.

2.2 Components

A. Rectifier

The IGBT rectifier shall be capable of receiving utility input and rectifying it to produce Direct Current (DC) power at levels sufficient enough to supply the load via the inverter and charge the batteries.

1. **Input Protection**
   The rectifier shall include protection against primary power surges, (except for lightning transients) and under or over voltage conditions. This protection is provided via fuses, Circuit Breakers, and Microprocessor Control of the rectifier.

2. **Filtering**
   Sufficient filtering of the rectifier/charger output shall be provided to prevent damage to the battery. Ripple voltage shall not exceed ≤1% RMS.

3. **In-Rush Limiting**
When the primary power is applied to the rectifier, the current surge shall be limited to no more than nominal input current when the ELS is operating at 480VAC input.

4. **Power Walk-In**
When the utility power is applied to the rectifier, the current shall be <25% of the full load current and shall gradually increase to full load rating within 10 seconds (adjustable 0-30 sec.).

5. **Automatic Restart**
Upon restoration of utility AC power after a power outage, the rectifier shall automatically restart and assume the inverter and battery recharge loads.

6. **Charger**
An integral charging circuit shall be capable of recharging the batteries during normal operation to ensure maximum life from the battery system.

7. **Charger Capacity**
The charger shall have sufficient capacity to recharge a fully discharged battery per UL924 standards.

8. **Battery Test**
The ELS shall periodically check the battery system for an open cell. If the ELS detects an open cell, an alarm condition shall be displayed and an audible alarm shall sound.

B. Inverter

The inverter section of the power converter module shall utilize Insulated Gate Bipolar Transistors (IGBT's). This solid-state device that incorporates digital signal processing (DSP) pulse width modulation (PWM) technology capable of accepting the output of the rectifier or the battery system voltage and delivering AC power within specified limits to the critical load bus. The inverter shall be microprocessor controlled and include all necessary timing logic and control circuits.

C. Inverter Start-Up

The inverter shall automatically startup when a start command is generated and shall be stable and ready to deliver power to the load.

1. **Inverter Protection**
Inverter IGBT's shall be protected by current limiting circuits. The inverter shall be capable of running indefinitely with the batteries disconnected. For rapid removal of the inverter from the critical load, the inverter's control electronics shall instantaneously turn off the inverter when the inverter's capacity is exceeded. Simultaneously, the static transfer switch shall transfer the load to utility power without interruption to maintain continuous power to the critical load.

2. **Inverter Oscillator**
The inverter shall contain an oscillator capable of operating and maintaining the output frequency of the inverter within specified limits. The inverter oscillator shall be capable of frequency synchronization and phase locking to the bypass utility power source frequency. When operating as a slave to the utility power and a failure occurs in the slaving signal, the inverter oscillator shall automatically revert to a free running state and maintain the specified limits. The oscillator shall not drift more than 0.05% while operating at maximum rated operating temperature.

3. **Phase Balance**
Electronic controls shall be provided to regulate each phase so that an unbalanced load will not cause the output voltage to go outside of the specified voltage unbalance or phase displacement limits.

D. Static Transfer Switch – 100% Rated, Continuous Duty

A internally mounted static transfer switch and bypass circuit shall be provided as an integral part of the ELS. The static switch shall be naturally commutated high speed devices rated to conduct full load current continuously while on bypass power. The static switch shall be designed to avoid back-feed into the utility supply. Failure of one device shall not affect the operation of the ELS and the failure shall be shown on the LCD display.

1. **Bypass Transfer**
The static switch shall automatically and successfully transfer the critical load from the inverter to the bypass source under the following conditions:

- DC voltage out-of-limits
- Inverter failure
- Critical load current exceeds inverter overload rating
- Over-temperature develops within the inverter
- Manual command is given

Transfer shall be automatically inhibited whenever bypass source parameters are outside predetermined (adjustable) limits, or ELS output and bypass are not synchronized and phase locked.

2. Retransfer

The static switch shall automatically and successfully retransfer the critical load from the bypass source to the inverter under the following conditions:

- Inverter output voltage returns to within specified limits.
- Critical load current reduces to within inverter limits.

E. Battery

1. General

The ELS module shall use a valve-regulated sealed lead acid (VRLA) heavy duty industrial battery, designed for auxiliary power service in an ELS application. The primary battery shall be furnished with impact-resistant plastic cases and housed in a line up and match cabinet(s) installed both adjacent to or standalone versions.

2. Protection against Deep Discharge and Self-Discharge

The ELS shall be equipped with a device designed to protect the battery against deep discharge, depending on discharge conditions, with isolation of the battery by a circuit breaker. In particular, a monitoring device shall adjust the battery shutdown voltage as a function of a discharge coefficient to avoid excessive discharge at less than the rated output. A second device shall avoid self-discharge of the battery into the ELS control circuits during an extended shutdown of the ELS (over two hours).

3. Battery Self-Tests

1. The battery monitoring system shall be able to perform the following automatic functions:
   - Battery circuit checks every 12 hours.
   - Open circuit battery test once a month.
   - Partial discharge test every three months.

2. This self-test system shall signal faults via LEDs on the front panel or a message to remote supervision systems.

4. Battery Cycle Monitor

1. The system shall be capable of monitoring and retrieving Battery Cycle information from the Front Display Panel. The information provided shall be:

   a. Hours of normal operation
   b. Hours of operation from bypass
   c. Time spent operating on battery
   d. Number of discharges
   e. Number of full discharges

F. Manual Maintenance Bypass

Bypass switching shall allow the critical load to be fed from the bypass power source, while providing isolation of the static switch during maintenance.

2.3 Electrical Specifications

A. Ratings

1. The ELS shall be available in power ratings of (kVA/kW):

58.5kw 72kw 90kw 112.5kw 144kw 180kw 210kw 225kw

2. Minimum Battery time with Standard Extended Battery Cabinet @ Full Load shall be 90 Minutes or as specified for Category OUST units.

3. AC Input Characteristics

The ELS shall be capable of accepting power from two (2) sources as standard (Dual Input).

a. **Nominal Voltage**: 480Y/277 VAC, 3 Phase, 60Hz, 3 or 4-wire + ground (Standard Voltage)

or

208Y/120 VAC, 60Hz, 3 Phase, 4-wire + ground - with external line up and match transformer cabinet (Optional)

or

208V VAC, 60Hz, 3 Phase, 3-wire + ground - with external line up and match transformer cabinet (Optional)

b. **Nominal Voltage Range:** +15/-10% from nominal voltage during battery recharge.

c. **Voltage Range on battery:** +15% / -40%
c. **Frequency Range:** 45 - 65 Hz)

d. **Power Factor:** > 0.99 at full load, nominal conditions.

e. **Current Harmonic Distortion (THDi):** < 3%

f. **Inrush current:** Less than nominal input current for less than one cycle

g. **Input Surge Protection:** ELS shall be equipped to withstand surges per ANSI/IEEE C62.41.

h. **Rectifier Walk-in:** Progressive from 0 to 30 seconds (adjustable)

i. Rectifier Walk-in Delay Timer: Progressive start of rectifier from 0 to 120 seconds (adjustable.

4. AC Output Characteristics

a. **Voltage:** 480Y/277 VAC, ± 1% steady state variation phase-to-phase voltage volts AC, 3 Phase, 60Hz, 4 wire plus ground (Standard Voltage).

or

208Y/120 VAC, 3 Phase, 60Hz, 4-wire + ground - with external matching transformer cabinet.

b. **Frequency:** 60Hz, + 2%, 60Hz, + .05% when free running.

c. **Voltage regulation:** ±1% for balanced load, ±3% for 100% unbalanced load.

d. **Voltage Distortion:** Maximum 2% total (THD).

e. **Voltage Transient (Step Load) Response:** + 5% for 100% step load change.

f. **Voltage Recovery Time:** Return to within 1% of nominal value within 20 milliseconds.

g. **Phase Angle Displacement:** 120 degrees + 1º for balanced load; 120º, + 1º for 100% unbalanced load.

h. **Non-Linear Load Capability:** Output voltage total harmonic distortion shall be less than 2% when connected to a 100% non-linear load with a crest factor not to exceed 3%.

i. **Slew Rate:** 1 hertz/second maximum.

j. **Power Factor:** 0.9 at the rated volt amperes (VA).

k. **Inverter Overload Capability:** 110% of rated load for 60 minutes, 150% of rated load for 1 minute.

l. **Bypass Overload Capability:** 110% for 60 minutes, 125% for 10 minutes,150% for 1 minute.

m. **Output Waveform:** Sinusoidal

n. **Efficiency:** (DC-AC): Minimum - 95% at Full Load, (AC-AC): Minimum – 93% at Full Load

5. Battery

a. **Battery Voltage:** 420 volts DC minimum before cutoff, 540 volts float.

b. **Maximum DC Current:** Maximum DC current at cutoff voltage shall be:
58.5kW 159.5 Amps 72kW -196 Amps 90kW – 236 Amps 112.5kW – 296 Amps
144kW – 383 Amps 180kW – 478.7 Amps 210kW & 225kW – 598.4 Amps

2.4 Mechanical Design and Ventilation

A. Enclosure: The ELS shall be housed in a freestanding NEMA 1 enclosure with dead front construction. The mechanical structure of the ELS shall be sufficiently strong and rigid to withstand handling and installation operations without risk and have provisions for forklift handling. The sheet metal elements in the structure shall be protected against corrosion by a suitable treatment, primed and powder coat painted black with a textured finish.

B. Combined Convection and Redundant, forced air-cooling shall be provided to ensure that all components are operated within specification with air entry at the front with 36" clearance, lower sides. At least one of the three side walls, right, left or back, shall be free with 24" top clearance for air exit.

C. Cable Access: The standard ELS shall accommodate bottom entry cables (top or side entry shall be optional).

D. Cabinet Dimensions: The width of the ELS shall be:
1. 58.5 to 125kva: 31.5" (800 mm) Wide x 33.5" Deep (850 mm) x 75" High (1,900 mm).
2. 165kva to 250kva: 39" (1000 mm) Wide x 33.5" Deep (850 mm) x 75" High (1900 mm).

E. Cabinet Weights: The ELS Electronics Module shall have a maximum weight of 1,500 lbs. at 58.5kW and 72kW, 1,610 lbs. at 90kW, 1,750 lbs.at 112.5kW, 2,330 lbs. at 144kW, 2,550 lbs. at 180kW and 2,770 lbs. at 210kW & 225kW.

F. Ventilation and Heat Rejection: The ELS shall be designed for forced air cooling. Air inlets shall be provided from the front and bottom of the UPS enclosure. Air exhaust shall be from the top portion of the unit. Full load heat rejection shall be 15,033 BTU/hr at 58.5kW, 18,500 BTU/hr at 72kW, 23,120 BTU/hr at 90kW, 28,900 BTU/hr at 112.5kVA, 36,980 BTU/hr 144kW, 46,230 BTU/hr at 180kW and 57,780 BTU/hr at 210kW & 225kW..

2.5 Environmental Requirements

A. The System shall withstand any combination of the following external environmental conditions without operational degradation.

1. Operating Temperature Range: 32ºF (0ºC) to 104ºF (40ºC) for the electronics, however the batteries should not be exposed to prolonged periods of temperature above 77ºF (25ºC). For every 15ºF (8ºC) above 77ºF battery life is cut in half, and may void the battery warranty.
2. Storage Temperature Range: -25ºF (-32ºC) to 122ºF (50ºC) however batteries should not be exposed to temperatures above 77ºF (25ºC). For every 15ºF (9.5ºC) above 77ºF battery life is cut in half, and may void the battery warranty.
3. Relative Humidity: Continuous operation with a relative humidity up to 90% non-condensing at 77°F (25°C).
4. Altitude: Normal operation without de-rating is 3,281 feet.
5. Audible Noise: Audible noise generated by the UPS shall not exceed 65 dBA when measured at 1 meter in front of the power converter using scale "A" of a standard ASA sound level-measuring device.

2.6 System Controls and indicators

The ELS unit shall incorporate the necessary controls, instruments and indicators to allow the operator to monitor the system status and performance, as well as take any appropriate action. The ELS shall meet, at a minimum the following requirements:

A. Panel Functions

1. LED Control Panel Functions

- Menu Selections
- Mimic Screen
- Function Indicator LED's
- Function Selection Keys
- EPO Button

2. Graphic Display

A graphic display shall be on the ELS door, which provides the user to have a close-up, detailed overview in real time of the status of the ELS. The user shall be able to switch the ELS on and off, consult electrical mains, output, battery measurements and perform the main ELS settings. The display shall be divided into four main areas, each with its own specific role.

a. **General Information:** Area of the display where the set date and time and, according to the screen, ELS model or title of the menu which is active at that moment is displayed permanently.

b. **Data Display/Menu Navigation:** Main display area designed for displaying the ELS measurements (constantly updated in real time) and for consulting the various menus which the user shall select using the designated function keys.

c. **ELI Status/Errors-Faults:** Area where the ELS operating status is displayed. The first line shall always be active and constantly display the status of the ELS at that moment.

The second only becomes active in the presence of an error and/or fault with the ELS and shall display the type of error/fault encountered.

d. **Key Function:** Area divided into four boxes, each relative to the function key below its area. According to the menu which is active at that moment, the display shall indicate the function belonging to the corresponding key in the appropriate box, access main menu, go back to previous menu or display, scroll, confirm selection and silence function keys.

3. Menu Display

- System Diagram
- Measures
- Waveforms
- Commands
  - Battery Test
  - Command
  - Bypass
  - System
  - Stand-By Mode ON
  - Smart Mode ON
- Customizing
  - Date/Time
  - Normal Output Voltage
  - Battery Capacity
- History
- Firmware
- Language

4. LED Status Indication

- Bypass Line
- Main Power
- On Battery
- Load on Bypass
- Normal Output
- Alarm for Internal Fault

5. Alarm Messages/Events

The Display Panel shall provide the following alarm and event messages.

Normal Operation
Disturbances on Bypass Line
Manual Bypass (SWMB) On
Bypass Line Volt, Failure
Main Line Voltage Failure
Pre-alarm, Low Battery Voltage
Low Battery Charge or Closed Disconnect
Low Input Voltage
Output Overload
Internal Fault
Temporary Bypass, Wait
Bypass for Output Overload
Bypass Command ON or OFF
Remote Bypass Command Active
Over-temperature or Fan Failure
Battery test ON
Parallel Cable Fault
Fuse Fault
Battery Discharge Fail
High Battery Temperature
Slave UPS OFF
Fan Fault
Parallel Redundant Lost: High Unit
Input Voltage Sequence not OK
Output Off
System Off Command ON or OFF
Remote System Command ON or OFF
Auto-shutdown Timer ON
System Off
Power
Parallel Redundant Lost: Unit OFF
Break Circuit Fail
Break Circuit Overload
Rectifier Switched Off by Remote Command
UPS Service Required
Battery Service Required
Input Switch Off
Insulation Loss-AC
Insulation Loss-DC
Over-temperature On Bypass Line
Transfer
Inverters Off

B. Control Functions

1. Configurable Alarms

The ELS shall have the following user configurable control functions accessible from the Display Panel.

A. Basic Functions

- Output Voltage – Selects the rated output voltage
- Operating Mode – Selects the operating Mode: On-Line, Stand-By ON, Smart Active
- Auto Off – If bypass line is present and the load is < of the set value than the load will be supplied from the bypass line. If the bypass line in not preset and the load is < of the set value than the load will not be supply (configurable 0 to 99%).
- Battery Low Warning – Estimated battery time remaining for low battery warning (configurable).
- Battery Capacity – Sets the Amp Hour Battery installed.

- Audible Alarm – Audible alarm operating mode: Enable/Disable
- Language – Selects area Language – English, Italian, German, French, Spanish, Polish or Turkish.

B. Advanced Functions

- Input Frequency Tolerance Range – Selects the acceptable range for the input frequency for switching to the bypass and for the synchronization of the output: +/- 1 to +/- 6 in !% stages.
- Bypass Voltage Thresholds – Selects the acceptable voltage range for switching to the bypass: +/- 5 to +/- 25 in 1% stages.
- Bypass Voltage Threshold for ECO – Selects the acceptable voltage range for operation in ECO Mode: +/- 5 to +/- 25 in 1% stages.
- Switch-On Delay – Waiting time for automatic power-on after the return of power source voltage:
- Disable or configurable 1 to 255 in 1 second stages.
- Power Walk-In – Activates the gradual return to power source mode: Activated or Deactivate.
- Power walk-In Duration – Sets the duration of the gradual return to power source voltage (only if Power Walk-In is activated: Minimum 0 seconds to maximum 125 seconds in 1 second stages.
- Inverter Synchronization Speed to Bypass Line – Selects the synchronization speed of the inverter to the bypass line: 0.1 to 1 Hz/sec (parallel units), 0.1 to 3 Hz/sec (single units).

C. Remote Emergency Power Off (EPO)

The ELS shall be equipped with provisions for local and remote emergency power off and Dry Contact input that shall be used to command UPS shutdown remotely.

D. DB-9 Connector: One DB-9 connector with serial output shall be provided for field diagnostics.

E. Dry Contacts: The ELS shall be provided standard with a programmable input/output Relay board. This board shall have 5 dry contacts (i.e., 3 for input signals and 2 for output signals).

1. Contacts shall be programmed as:
    a. Bypass
    b. Battery Discharging
    c. End of battery Discharge
    d. Inverter Off (input).
    e. EPO (input).
2. The contacts shall capable of switching up to 30 V AC or DC at UP 1 Amp.
3. In place of the three standard ALARM functions above, the unit shall have the capability to be reprogrammed to any (3) of the customized alarms below:

    a. Disturbances on Bypass Line
    b. Manual Bypass ON
    c. Bypass Line Voltage Fail
    d. Main Line Voltage Fail
    e. Pre-alarm , Low Battery Voltage
    f. Output Overload
    g. Internal Fault
    h. Bypass for Output Overload
    i. Over Temperature or Fan Failure
    j. Input Voltage Sequence OK
    k. Output OFF

2.7 Options

A. ELS Options

1. Top or Side Cable Entry

Standard cable entry shall be from the bottom with provisions for top or side entry using a matching side car cabinet not to exceed 75” high x 15.75” wide x 33.35” deep.

2. Output Distribution Unit (PDU)

The ELS shall have provisions to provide a 208Y/120 VAC output distribution unit (PDU) to distribute power to the load. The PDU shall contain (1) or two (2) branch circuit distribution panel boards accepting any combination of 1, 2 or 3 pole branch circuit breakers housed in a matching cabinet not to exceed 75” high x 22” wide x 33.35” deep. Branch circuit breakers shall be provided by others.

3. Output Sub-Feed Distribution Unit (Sub-Feed PDU)

The ELS shall have provisions to provide a 208V output distribution unit to distribute power to existing distribution panels. The Sub-Feed PDU shall contain (1) one, (2) two or (3) 225 Amp sub-feed distribution circuit breakers housed in a matching cabinet not to exceed 75” high x 22” wide x 33.35” deep.

B. Battery System Options

1. External Battery Cabinet System (non-90 minute requirements, Category OUST)

Extended run time battery cabinet(s) shall be furnished in both adjacent or standalone versions. The battery cabinet shall be capable of accepting VRLA Maintenance Free Cell type batteries, wired and installed. Interconnecting cables and lugs shall be provided by others.

2. String and Cell Level Battery Monitoring

The battery system shall have provisions to accept a Wireless Battery Monitoring System (BMS) that monitors each battery and or string. It shall also monitor the battery cabinet internal temperature and provide cycle data and other reports and graphs.

C. External Maintenance Bypass

1. Wrap-Around System Maintenance Bypass Switch

An External Maintenance Bypass (MBPS), (make-before-break) shall be provided on all M Models: The MBPS shall provide a means to isolate the load for removal of the ELS. The maintenance bypass shall provide for three (3) circuit breakers mounted in a matching cabinet not to exceed 75" high x 15.75" wide x 33.35" deep for 58.5kW – 112.5kW systems and 75" high x 30" wide x 33.35" deep for 144kva - 225kW systems.
The total enclosure shall provide a wrap-around bypass configuration for total UPS isolation during maintenance or removal of the ELS. Maintenance bypass transfers shall be without interruption and shall have interlocks to protect the UPS from damage in the event of out-of-sequence transfers. Electronic interlocks shall be included.

D. Communications

A. Monitoring and Shutdown Software

The ELS shall have Monitoring and Shutdown Software available to provide communication across a LAN networks:

FLU-Powershield: Communication Software shall provide efficient, user-friendly ELS management using bar chart displays to show major operational information such as the input voltage, ELS load percent and batteries charge percent. The software also provides detailed information on fault conditions and ELS operating characteristics. PowerShield has been developed with a client/server architecture that makes it flexible and easy to use, and provides multi-lingual and on-line support.

Operating systems supported include Windows 2000, 2003Server, XP, Vista, 2008 Server, 7, Linux, Novell Netware, Mac OS X and most common UNIX operating systems such as: IBM AIX, HP, SUN Solaris INTEL and SPARC, SCO Uniware and Open Server, Silcon Graphics IRIX, Compaq Tru64 UNIX and DEC UNIX, Open BSD UNIX and FreeBSD UNIX, NCR UMIX, HP Open VMS VMWare ESX and VSPHERE.

FLU-PowerNETGuard Supervision software shall centralize ELS management using network interface (SNMP) communications. It is ideal for Data Centre managers and medium to large sized networks. PowerNETGuard uses the RFC1628 standard Management Information Base (MIB) and ensures standardized UPS management wherever they are located.

Operating systems supported include Windows (98, ME, NT, 2000, 2003, XP and Vista), Kinux, MacOSX, Solaris 8, 9 and 10 and Silcon Grapics IRIX.

B. Communication Cards

Open slots shall be available to accept any (2) of the following:

FLU-Netman: Internal SNMP Card (external model shall be available) allows ELS management across a LAN using any of the main network communication protocols - TCP/IP, HTTP and network interface (SNMP). NetMan Plus enabled ELS integrate easily into medium and large sized networks and provide reliable communications between the ELS and management systems employed.

FLU-MultiCOM1: Internal MODBUS/JBUS Card (external model shall be available), Protocol converter shall be used to monitor the ELS using the MODBUS/JBUS protocol on RS232 or RS485 serial lines. It can also manage a second independent RS232 serial line that can be used to connect to other devices such as the Netman or a PC using PowerShield software.

FLU-MultiCOM2: Internal Serial/USB Card shall provide the ELS with an additional RS232 serial interface or USB port. The USB port allows the ELS to communicate with Apple Macintosh computers as well as Windows and Linux operating systems.

FLU-Multi I/O: Internal Protocol converter Card shall have a configurable input and output signal contacts to allow ELS integration with control systems. It can be used to connect two devices to a single ELS serial communication port. It can also communicate using the MODBUS/JBUS protocol on RS485 lines.

FLU-IBM AS400: Communication Kit shall have a single-level memory management feature that makes it compulsory for the system to be shutdown in a controlled and orderly manner. Without ELS protection an AS/400 is not protected from mains failures. A momentary loss of power can cause hardware damage, data corruption and a lengthy reboot period.

FLU-I/O Expansion: Internal Card shall provide addition remote alarm functions as identified below. The card shall contain 6 outputs: potential-free contacts for alarms (programmable from the display panel) (and capable of switching up to 30 V AC or DC at UP 1 Amp) , 2 inputs (programmable from the panel) and 1 12V DC maximum 100mA auxiliary input. 2 additional slots shall be available for a total of 12 additional contacts.

- Disturbances on Bypass Line
- Manual Bypass ON
- Bypass Line Voltage Fail
- Main Line Voltage Fail
- Pre-alarm , Low Battery Voltage
- Low Input Voltage
- Output Overload
- Internal Fault
- Bypass for Output Overload
- Over Temperature or Fan Failure
- Input Voltage Sequence OK
- Output OFF

C. Environmental Sensors Modules (ESM)

ESM modules shall be available to monitor and record environmental conditions.

FLU-Sensor: Environmental Sensor Module shall monitor and record environmental conditions as well as activities in protected areas and at the premises where the ELS is installed. Environmental sensors monitor and record environmental conditions and activities within a designated building area. The sensors provide extensive management and control, triggering cooling fans and locks in response to changes in temperature and humidity. Remote monitoring and control can be provided via the internet, SNMP and PowerShield software. NetMan Plus can support up to 6 separate sensors. The environmental sensors are easy to install and do not need a separate external power supply.

D. Remote Monitor Alarm Panel (RMAP)

The RMAP shall be available for monitoring the ELS from remote locations.

FLU-MultiPanel: Remote Monitoring Panel device shall provide a detailed ELS status overview in real time. It shall be compatible with all ELS and can display values for ELS specific input and output supplies, and battery set measurements. MultiPanel has a high-definition graphical display and can report in 7 languages: English, Italian, German, French, Spanish, Russian and Chinese.
It shall have 3 independent serial ports, one of which allows for ELS monitoring via the MODBUS/JBUS protocol (on either an RS485 or RS232 serial line). The others can be used with devices such as the Netman Plus or a PC running PowerShield software.

E. IBC Seismic Withstand Certification

Site specific Seismic Withstand Certification per IBC (International Building Code) Areas A through F. Bracing hardware with drawings shall be available.

F. Harsh Environment Enclosure

The ELS and any accessory cabinet(s) shall have the capability to be mounted and completely wired internal to, include AC cooling, inside any NEMA type enclosure (NEMA 12, 3R, 4X) by the manufacturer.

G. Spare Parts

Shall be available in three levels, Level 1. Minor, Level 2. Medium and Level 3. Major.

H. Service Agreements

Multi level service and maintenance agreements shall be available.

Section 3.0
Execution

3.1 Factory Testing

Before shipment, the manufacturer shall fully and completely test the system to factory standards to assure compliance with the specification. Each subassembly shall undergo thorough testing prior to installation in the system. The total system shall be exposed to a functional load test and shall be subjected to a minimum of 8 hours "burn-in" test prior to shipment.

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

3.2 Site Start-Up

Site start-up and testing shall be provided by the manufacturer's field service representative during normal working hours (M/F- 8/5). Individual scheduling requirements shall be met with ten working days advance notice.
Site testing shall consist of a complete test of the ELS and accessories by the ELS manufacturer in accordance with manufacturer's standards. Commissioning must be performed by manufacturer's approved service representative for warranty to apply.

3.3 Field Engineering Support

The ELS manufacturer shall have available a nationwide field service organization staffed by factory trained Field Service Engineers dedicated to the start-up, maintenance and repair of ELS/UPS equipment. The manufacturer shall have a toll free service telephone number answered 24 hours a day / 365 days a year.

Staco Energy Products Co.
2425 Technical Dr.
Miamisburg, OH 45342
(866) 261-1191 Toll Free
(937) 253-1723 Fax
Sales@StacoEnergy.com
www.stacoenergy.com