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**Illuminator™**

**Series LV**

**GUIDE SPECIFICATIONS**

**And**

**TECHNICAL DESCRIPTION**

175, 350, 550, 750, & 1100W

Single-Phase Uninterruptible Power System

\*Note – LV1100 is only available as a standard system

This description contains all the necessary functional and technical information for the **Illuminator LV** family of uninterruptible power supplies.

This specification also provides electrical and mechanical characteristics and an overall description of the typical operation of an **Illuminator Series LV** uninterruptible line interactive power supply.

For any further information, please contact our Authorized Sales Representative or **Myers Emergency Power Systems, LLC** directly.

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**SECTION 1.0 GENERAL**

**1.1 SPECIFICATION**

This specification defines the electrical and mechanical characteristics and requirements for a line interactive, single-phase, solid-state uninterruptible power supply, and hereafter referred to as the UPS system. The UPS shall provide high quality, computer grade AC power for today’s electronic lighting loads (power factor corrected and self-ballast fluorescent, incandescent, halogen, and LED) during emergency backup.

The UPS shall incorporate a high frequency pulse width modulated (PWM) sine wave inverter utilizing MOSFET technology, a microprocessor controlled inverter and three-stage battery charger, status LED's.

**1.2 DESIGN STANDARDS**

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

1. UL 924 Standard Emergency Lighting and Power Equipment
2. National Electrical Code
3. NFPA-101 (Life Safety Code)
4. OSHA

**1.3 SYSTEM DESCRIPTION**

**1.3.1 Design Requirements - Electronics Module**

**A. Nominal input/output Voltage**

The Input and Output voltage of the UPS is field selectable to match the user specified input and load requirements. Available voltages are 120 or 277 VAC input/output.

**B.** **Output Load Capacity**

The output load capacity of the UPS shall be rated in VA at unity power factor. The

UPS shall be able to supply the rated W from .5 lagging to .5 leading.

Rating: \_\_\_\_\_ VA / W

**1.3.2 Design Requirement - Battery System**

**A. Battery Cells**

The UPS shall be provided with sealed, valve regulated, lead acid batteries.

**B.** **Reserve Time**

The battery system shall be sized to provide the necessary reserve time to feed the inverter in case of a mains failure.

Battery Reserve time: \_\_\_ minutes

**C.** **Recharge Time**

The battery charger shall recharge the fully discharged batteries within a 24-hour period. The charger shall be an integrated 3-step, microprocessor controlled and temperature compensating.

**1.3.3 Modes of Operation**

The UPS shall be designed to operate with less than a 8-millisecond transfer time:

**A.** **Normal**

The UPS Inverter is a line interactive standby system and the commercial AC power continuously supplies the critical load. The input converter (bi-directional transformer) derives power from the commercial AC power source and supplies to the inverter while simultaneously providing floating charge to the batteries.

**B.** **Emergency**

Upon failure of the commercial AC power the inverter instantaneously with a maximum of a 8-millisecond break, switches its power supply from the input converter to the battery system. There shall be no loss of power to the critical load upon the failure or restoration of the utility source.

**C. Recharge**

Upon restoration of commercial AC power after a power outage, the input converter shall automatically restart and start charging the batteries. The critical loads are powered by the commercial AC power again.

**1.3.4 Performance Requirements**

**1.3.4.1 AC Input to UPS**

**A. Voltage:** 120 or 277 VAC,1-phase, 2-wire-plus-ground.

**B.** **Voltage Range:** +10%, -15%

**C.** **Frequency:** 60 Hz (+/- 3%)

**D.** **Power Factor:**  .5 lagging / leading

**E. Inrush Current:** 1.25 times nominal input current, 10 times 1 line cycle for incandescent loads

**F. Current Limit:**  125% of nominal input current

**G. Current Distortion: <** 10% THD (for resistive load)

**H. Surge Protection:** Sustains input surges without damage per standards set in UL 924

**1.3.4.2 AC Output, UPS Inverter**

**A. Voltage Configuration for Standard Units:** 1-phase, 2-wire-plus-ground

**B. Static Voltage Stability:** Load current changes +/- 2%, battery discharge +/- 12.5%

**C.** **Dynamic Voltage Stability:** +/-10% for step load change

**D.** **Dynamic Recovery Time to within 1% of nominal:** 5 cycles (0-100% load step)

**E.** **Output Harmonic Distortion:** < 3% for linear load

**F. Frequency:** 60 Hz (+/-.05Hz during emergency mode)

**G. Load Power Factor Range:**  0.5 lagging to 0.5 leading

**H.**  **Output Power Rating:** VA = W

**I. Overload Capability:**  110% continuous rating, 250% for 16 line cycles

**J. Crest Factor:** <= 3.5

**K.** **Efficiency**  88 - 92%

**1.4 ENVIRONMENTAL CONDITIONS**

The UPS shall be capable to operate within the specified design and performance criteria provided that the following environmental conditions are met:

**A. Storage/Transport Temperature:**

**-**40 to 158 deg. F (-20 to 70 deg. C) without batteries

0 to 104 deg. F (-18 to 40 deg. C) with batteries

Maximum recommended storage temperature for batteries is 77 deg. F for up to six months. Storage at up to 104 deg. F is acceptable for a maximum of three months.

**B. Operating Temperatures:** 32° to 104° F (0° to 40° C ); UL rating 68° to 86° F ( 20° to 30° C ).

**C. Relative Humidity:** 0 to 95% non-condensing:

**D. Audible Noise:** 45 dBA @ 1 meter from surface during Normal Mode

50 dBA @ 1 meter from surface during Emergency Mode

**1.5 SUBMITTALS**

**1.5.1 Proposal Submittals**

Submittals with the proposal shall include the following:

**A.** System configuration with single-line diagrams

**B.** Functional relationship of equipment including weights dimensions and heat

Dissipation

**C.** Descriptions of equipment to be furnished, including deviations from these

specifications

**D.** Size and weight of units to be handled by installing contractor

**1.5.2 UPS Delivery Submittals**

Submittals upon UPS delivery shall include:

## A complete set of submittal drawings

## One set of instruction manuals. Manuals shall include a functional description of the equipment, installation, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

**1.6 WARRANTY**

**1.6.1 UPS Module**

The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 36 months after initial start-up or 42 months after ship date, whichever occurs first.

**1.6.2** **Battery**

The battery manufacturer’s standard warranty shall be passed through to the end user.

Sealed Lead Calcium VRLA, 10-year life expectancy – one-year full replacement warranty plus an additional nine years pro-rated.

**1.7 QUALITY ASSURANCE**

**1.7.1 Manufacturer Qualifications**

A minimum of 35 years experience in the design, manufacture, and testing of emergency power systems is required.

**1.7.2 Factory Testing**

Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

**SECTION 2.0 PRODUCT**

**2.1 FABRICATION**

All materials of the UPS shall be new, of current manufacture, high grade, free from all defects and shall not have been in prior service except as required during factory testing.

The UPS module and batteries shall be housed in a wall-mount unit. Recess or T-Grid available only on 175W units. Front access shall be required only for installation, adjustments and expedient servicing (MTTR: < 15 minutes). All components shall have a modular design and quick disconnect means to facilitate field service. The UPS shall be constructed of replaceable subassemblies. Like assemblies and like components shall be interchangeable.

Cooling of the UPS is by means of convection. No fans are required.

**2.2 COMPONENTS**

The UPS shall be comprised of the following components:

1. **UPS Module** - The UPS module shall contain an inverter, an AC distribution module with a back-feed relay, control, and monitoring subsystems.
2. **Battery Module -** The battery module shall contain the battery plant required to produce the reserve energy to supply the inverter during abnormal AC mains conditions. The 90 - minute battery module shall be contained in same cabinet as electronics regardless of the system VA.

**2.2.1 Battery Charger**

**A. General**

In the standard configuration the charger converts AC voltage to DC voltage. With commercial power present, the inverter power transformer is powered and the MOSFET modules are microprocessor controlled to recharge the batteries via temperature compensated three-stage charging. Once the batteries have received a full recharge, a constant trickle charge maintains batteries at maximum level. Recharge time is 24 hours maximum at nominal AC input voltage. The AC ripple current of the DC output meets the battery manufacturer specification, thus ensuring the maximum battery lifetime.

**B. AC Input Current**

The charger unit is provided with an AC input current limiting circuit whereby the maximum input current shall not exceed 140% of the output full current rating.

**C. Automatic Restart**

Upon restoration of utility AC power after a utility AC power outage, and after full UPS automatic end-of-discharge shutdown, the UPS will automatically restart, performing normal UPS start up.

**D. DC Filter**  
The charger shall have an output filter to minimize AC ripple voltage into the battery.

Under no conditions shall ripple voltage into the battery exceed 2% RMS.

**E. Battery Recharge**

The charger is capable of producing battery-charging current sufficient enough to recharge the fully discharge battery bank within a 24-hour period. After the battery is recharged, the charger shall maintain full battery charge until the next emergency operation.

**F. Over-voltage Protection**

The charger is equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger shuts down automatically and initiates an alarm condition.

**2.2.2 Inverter**

**A. General**

The inverter converts dc voltage supplied by the battery to ac voltage of a precisely stabilized amplitude and frequency that is suitable for powering most sophisticated electrical equipment.

The inverter output voltage is generated by sinusoidal pulse width modulation (PWM). The use of a high carrier frequency for PWM and a dedicated ac filter circuit consisting of a transformer and capacitors, ensure a very low distortion of the output voltage (THD <3% on linear loads).

**B. Overload Capability**

The inverter during emergency modes shall be capable of supplying current and voltage for overloads up to 250% of full load current for 16 line cycles, and 110% continuously.

**C. Output Power Transformer**

A dry type power transformer provides the inverter AC output. The transformer is built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the temperature limit of the transformer insulation class of material at ambient temperature.

**2.2.3 Display and Controls**

Standard interface consists of indicator LEDs when charging, ready, and on inverter, as well as a switch for running momentary tests.

**2.2.4 Testing**

Standard systems perform an automatic self-test every 28 days, and one extended yearly runtime test. These test features are imbedded in the system electronics. An LED indicator light will specify the results of each test upon completion. There is also a switch the user can toggle to manually test the system.

Advanced systems run monthly self-tests and one extended yearly self-test that include an audible alarm and data logging. The 25 most recent tests are stored in the system's internal log. The dates and times of these tests are programmable by the end user.

**2.2.5 Battery Assembly**

The batteries are a sealed, lead-acid valve regulated battery cells with a one-year full, nine year prorated warranty. Batteries shall be interconnected via cables and will be provided with shelf interconnects where required. A disconnect means shall be included for isolation of battery assembly from the UPS module.

**2.2.6 System Options**

**Enclosure Color:**

Red (standard), white, grey, black.

**Model Type:**

- Standard

- Internal meter panel and advanced testing and logging (UL924 & NFPA101)

- Advanced testing and logging (UL924 & NFPA101)

\*Note: LV1100W model only available in a standard configuration.

**Variable Time Delay:**

Allows for programmable delay of inverter retransfer to continue supplying power to the normally off output for up to 15 minutes after the return of power.

**Output Circuit Breakers:**

Distribution circuit breakers are for output load protection - Protection for the normally on/off loads. Output circuit breakers not available for 175W. A maximum of 3 1-pole circuit breakers are available for 350/550W, and 6 1-pole breakers available for 750/1100W. All circuit breakers are rated for 10,000 AIC @120VAC.

**BACnet MS/TP:**

Allows for communication of data from the inverter over RS-485 using BACnet MS/TP protocol. See Communication Interfaces specification.

**BACnet IP and SNMP:**

Allows for communication of data from the inverter over a LAN using BACnet IP protocol or SNMP protocol. See Communication Interfaces specification.

**MODBUS Serial:**

Allows for communication of data from the inverter over RS-485 using MODBUS RTU or MODBUS ASCII protocols. See Communication Interfaces specification.

**MODBUS TCP and SNMP:**

Allows for communication of data from the inverter over a LAN using MODBUS TCP protocol or SNMP protocol. See Communication Interfaces specification.

**IoT:**

Allows for communication of data from the inverter over the Internet using a web-based cloud application and receiving notifications over SMS or email. See Communication Interfaces specification.

**USB Mass Storage:**

Provides additional storage capabilities for up to 3000 alarms and 60 test logs. USB option allows for system logs to be copied to USB flash drive for import data management program (software included). This option expands the capabilities of internal data and alarm logging.

**Fast Charge:**

A battery charger upgrade which decreases the time to recharge a fully discharged battery bank to a full charge. The recharge time is decreased from the standard 24-hour period to a 12-hour period.

**Mounting:**

- Wall mount (standard)

- Recessed wall mount and plenum rated grid mount (175W)

- Floor mount (350/550/750/1100W).

**Switched Output Circuit Breakers:**

Up to three separate switched 10 amp output circuit breakers. The number of switched outputs will reduce available contact relays.

**Status Monitoring Contacts Available:**

- On battery

- Charger failure

- Overcurrent

- AC present

- Inverter on/off

- Monthly/Yearly test failure

- Load reduction alarm

- Input voltage high/low

- Output current

- System overload

- High ambient temperature

- High battery temperature

- Inverter on/off

- Near low battery

- Blown fuse indicator

**Zone Monitoring:**

Monitors AC power presence in a specific zone (area , distribution panel, etc.). Upon loss of power in the zone(s), the inverter will turn on, activating all normally off (emergency only) circuits. All normally on loads will remain on. When primary power returns in the zone(s), inverter will turn off after its preset delay and normally off loads will turn off.

**Alarms:**

For advanced models, audible alarm will activate with any of the following conditions:

- Monthly/yearly test fault

- Output voltage low/high

- Low voltage disconnect

- Heatsink over temperature

- Input fuse failure

- Overload fault

- Load reduction fault

- Charger fault

**Additional Alarms Available:**

- Input frequency low/high

- Input voltage low/high

- Battery voltage low/high

- Battery temp low/high

- Ambient temp low/high

- On inverter timer

**2.2.7 Accessories**

**Meter Panels:**

- System mounted

- Remote mounted (one panel per unit, requires Advanced Testing and Logging model)

- Handheld (one panel can be used for multiple units)

Meter panels include an OLED display and a keypad for user interface. The display will be menu driven. The system will have a continuous scrolling display of statuses and any system faults. Monitoring and control are microprocessor-based for accuracy and reliability. To ensure only authorized personnel can operate the unit, the system is multi-level password protected for all control functions and parameter changes.

Metering enables access to data including: Input voltage, Input current, Input frequency, System output voltage, System output current, System output power, Battery voltage, Battery current, Battery power, Battery temperature, Ambient temperature, Heatsink temperature, UPS events, Date & time, System Days

**2.2.8 Communication Interfaces**

**2.2.8.1 IoT (Internet of Things) Cloud Interface**

The system shall be equipped with an RJ-45 Ethernet port, which when provided with a connection to the Internet (whether dedicated or shared), shall enable remote monitoring of inverter telemetry, and email and SMS push notifications of alarms.

**2.2.8.2.1 Secure, Scalable Multi-User Web Interface Hosted on Cloud**

The IoT cloud application shall provide a secure web interface (HTTPS with TLS 1.3 encryption) such that it can be securely accessed and fully utilized from any web-enabled device (whether smartphone, tablet or PC) running any web-enabled operating system (Windows, Linux, macOS, iOS, Android, etc). The application shall be hosted on a cloud service on the Internet, such that the web-enabled device can access the application from anywhere as long as it has an Internet connection (whether from the same LAN as the inverter, or outside, anywhere on the Internet). The application shall support multiple users sharing access to the same inverter(s) as desired, with no limits on number of concurrent users accessing the system, and no corresponding service delays. Users shall be able to enter user friendly names for their inverters, organize their inverters into a hierarchy of areas (folders), and if desired, share their inverters with other users of the cloud application on an inverter-by-inverter basis.

**2.2.8.2.2 IoT Overview Dashboard**

The IoT cloud application shall provide an Overview dashboard through which the system state (healthy, warning, or alarm) of all IoT inverters associated with the logged in User’s account is summarized and can be understood within a few seconds of loading the page. The Overview dashboard shall include a color-coded summary of all inverters, a map view showing the geographic locations of all inverters (each inverter being color-coded green, orange or red) overlaid on a map that allows ‘street view’ or ‘satellite view’, and a list of outstanding alarms – if any – describing which specific inverter has generated that alarm. The map view shall allow ‘zoom in’ at least up to a 1:200 scale (where one inch on the device screen corresponds to about 17’, and where building outlines are clearly visible), and ‘zoom out’ up to a continental scale, where an entire continent is visible on the device screen. When the Overview dashboard page loads, the map view shall be initialized to the correct zoom level to show all inverters associated with the logged in user account.

**2.2.8.2.3 IoT Device Details Dashboard**

The IoT cloud application shall provide access to the following inverter details and telemetry. Inverter telemetry shall be updated no less than once every 15 minutes.

* Serial Number
* Location
* Ratings (input voltage, output voltage, output power, battery voltage)
* A color-coded summary of the inverter’s state (green, orange or red)
* The state of the inverter’s battery and utility power
* The results of the inverter’s last auto-run self-test (monthly test or yearly test)
* An event history table for events that have occurred in the last 90 days, with the ability for Users to input textual comments on each event.
* Total Output Power (with time-series chart and tracked min/max)
* Ambient Temperature (with time-series chart and tracked min/max)
* Current Input Voltage(s)
* Current Output Voltage(s)
* Current Output Current(s)
* Current Battery Voltage
* Current Battery Current
* Total Time On Battery
* Days of Operation
* Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, ‘load reduction’ activated, ambient temperature high, and battery charger fault).

**2.2.8.2.4 IoT ‘Push’ Notifications**

The IoT cloud application shall provide the ability to push notifications by SMS (text message) or email – to User provided phone numbers or email addresses – whenever the inverter generates an alarm. The notifications shall be generated within no more than one minute of the alarm being detected by the inverter. The notifications shall contain clickable hyperlinks to access the cloud application page in question for more information.

**2.2.8.2.5 IoT Network and System Security and Reliability**

The IoT cloud application shall communicate securely over encrypted channels, both between inverter and the cloud, and between the cloud and the end device. The IoT interface on the inverter shall accept no inbound connections; all communication is outbound from the IoT interface to the trusted endpoint on the cloud. Inverter access shall be ‘read only’, allowing no possible physical path for ‘writing’ to the inverter in a way that would corrupt or otherwise affect its emergency backup power provision capabilities. The IoT cloud application shall be hosted on a redundant and reliable platform such as AWS (Amazon Web Services) with little to no downtimes.

**2.2.8.2.6 Ease of Network Setup**

The IoT interface shall support network configuration via DHCP (automatic assignment of IP address, subnet mask, default gateway, and DNS servers).If no DHCP server is available on the network, the IoT interface shall support static IP settings. The IoT interface shall only communicate to the cloud via the same network ports used for web traffic (ports 80 and 443). This way, no exceptions shall need to be made for the vast majority of corporate firewalls (which are usually set up to always allow outbound web traffic)

**2.2.8.3 BACnet MS/TP Interface**

The system shall be equipped with an RS-485 serial port for remote communications to a Building Management System (BMS) via BACnet MS/TP protocol. The BACnet interface shall support standard baud rates (9600, 19200, 38400, 57600, 115200) and MAC addressing (0-127), and have a programmable systemwide Device Instance number. The BACnet interface shall support standard BACnet discovery. The BACnet interface shall provide read-only access to the following inverter telemetry:

* Input Voltage(s)
* Output Voltage(s)
* Output Current(s)
* Total Output Power
* Ambient Temperature
* Battery Voltage
* Battery Current
* Total Time On Battery
* Days of Operation
* The results of the inverter’s last auto-run monthly self-test
* The results of the inverter’s last auto-run yearly self-test
* Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, ‘load reduction’ activated, ambient temperature high, and battery charger fault).
* Event logs, Alarm logs and Test logs, as text files downloadable via BACnet file transfer

**2.2.8.4 BACnet IP Interface**

The system shall be equipped with an RJ-45 Ethernet port for remote communications to a Building Management System (BMS) via BACnet IP protocol. The BACnet IP interface shall support standard IP network settings (DHCP or static IP address, subnet mask, default gateway, programmable port number) and shall have a programmable systemwide Device Instance number. The BACnet IP interface shall provide read-only access to the following inverter telemetry:

* Input Voltage(s)
* Output Voltage(s)
* Output Current(s)
* Total Output Power
* Ambient Temperature
* Battery Voltage
* Battery Current
* Total Time On Battery
* Days of Operation
* The results of the inverter’s last auto-run monthly self-test
* The results of the inverter’s last auto-run yearly self-test
* Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, ‘load reduction’ activated, ambient temperature high, and battery charger fault).

**2.2.8.5 MODBUS Serial (RTU or ASCII) Interface**

The system shall be equipped with an RS-485 serial port for remote communications to a Building Management System (BMS) via MODBUS RTU or MODBUS ASCII protocol (selectable). The MODBUS Serial interface shall support standard baud rates (9600, 19200, 38400, 115200), parity (no parity or even parity) and device addressing (1-247). The MODBUS Serial interface shall support setting a custom Device/User ID string (via Function Code 0x15) and retrieving it (via Function Code 0x11 – Report Server ID – or Function Codes 0x2B/0x0E – Encapsulated Interface Transport ‘Read Device Identification’). The MODBUS Serial interface shall provide read-only access to the following inverter telemetry (via MODBUS Function Codes 0x01 through 0x04, and 0x14 for retrieving log files):

* Input Voltage(s)
* Output Voltage(s)
* Output Current(s)
* Total Output Power
* Ambient Temperature
* Battery Voltage
* Battery Current
* Total Time On Battery
* Days of Operation
* The results of the inverter’s last auto-run monthly self-test
* The results of the inverter’s last auto-run yearly self-test
* Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, ‘load reduction’ activated, ambient temperature high, and battery charger fault).
* Event logs, Alarm logs and Test logs, as text files downloadable via MODBUS Read File Record function code 0x14

**2.2.8.6 MODBUS TCP Interface**

The system shall be equipped with an RJ-45 Ethernet port for remote communications to a Building Management System (BMS) via MODBUS TCP protocol. The MODBUS TCP interface shall support standard IP network settings (DHCP or static IP address, subnet mask, default gateway, programmable port number). The MODBUS TCP interface shall provide read-only access to the following inverter telemetry:

* Input Voltage(s)
* Output Voltage(s)
* Output Current(s)
* Total Output Power
* Ambient Temperature
* Battery Voltage
* Battery Current
* Total Time On Battery
* Days of Operation
* The results of the inverter’s last auto-run monthly self-test
* The results of the inverter’s last auto-run yearly self-test
* Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, ‘load reduction’ activated, ambient temperature high, and battery charger fault).

**2.2.8.7 SNMP Interface**

The system shall be equipped with an RJ-45 Ethernet port for remote communications to a Building Management System (BMS) or Network Manager via SNMP protocol. The SNMP interface shall support standard IP network settings (DHCP or static IP address, subnet mask, default gateway).The SNMP interface shall support SNMP v1 and v2c. The SNMP interface shall support the programming of SNMP traps when user defined alarm conditions are met. The SNMP interface shall support standard ‘SNMP Get’, as well as standard SNMP MIB walking via ‘SNMP Get Next’. The SNMP interface shall provide read only objects (OIDs) for the following inverter telemetry:

* Input Voltage(s)
* Output Voltage(s)
* Output Current(s)
* Total Output Power
* Ambient Temperature
* Battery Voltage
* Battery Current
* Total Time On Battery
* Days of Operation
* The results of the inverter’s last auto-run monthly self-test
* The results of the inverter’s last auto-run yearly self-test
* Alarm states (no utility, on battery, battery low, input voltage high or low, inverter failure detected, inverter overloaded and overload shutdown, ‘load reduction’ activated, ambient temperature high, and battery charger fault).

**SECTION 3.0 EXECUTION**

**3.1 WIRING**

All wiring shall be installed in conduit. Input and output wiring shall enter the cabinet in separate conduits.

**3.2 UNIT START-UP and SITE TESTING**

Site start-up and testing shall be provided by the manufacturer’s field service representative during normal working hours (Mon. - Fri. 8 a.m. - 5 p.m.). Individual scheduling requirements can usually be met with 7 working days advance notice. Site testing shall consist of a complete

test of the UPS and accessories by the UPS manufacturer in accordance with manufacturer’s

standards. Manufacturer’s approved service representative must perform commissioning for two-year warranty to apply.

**3.3 REPLACEMENT PARTS**

Parts shall be available through Field Service Centers throughout the country. Recommended spare parts shall be fully stocked by local field service personnel with back up available from manufacturing location.

**3.4 MAINTENANCE CONTRACTS**

A complete offering of preventive and full-service maintenance contracts for both the UPS

system and batteries shall be available. An extended warranty and preventive maintenance

packages shall be available. Factory-trained service personnel shall perform warranty and preventive maintenance service. A five-year maintenance contract will include a unit start-up and site testing.