EON Model EL3
Three Phase Centralized Emergency Lighting Inverter

General Specification
10KW – 33KW Systems

1.0 GENERAL

This specification defines the electrical and mechanical characteristics and requirements for the EON Model EL3, a three phase uninterruptible stored emergency power supply system. The EON, referred to as the "system" in this specification, includes all the components required to deliver reliable, high quality uninterruptible power for emergency illumination and related life safety equipment. The system incorporates an on-line, dual conversion, microprocessor DSP controlled, high frequency, IGBT PWM input PFC converter and output inverter, a high speed automatic bypass transfer device, a battery charger, an energy storage battery platform, an advanced full diagnostic monitor with automatic system testing and a touchscreen color LCD display panel, as well as all the related hardware components and software to facilitate a functional centralized system. The emergency power supply system provides immunity from power line disturbances and power interruptions. The system includes an uninterrupted, normally on output power section and an optional normally off standby output power section, thus enabling compatibility with emergency lighting fixtures operating in normally on and standby modes. A self-diagnostic touchscreen monitor continuously advises of system status and battery condition.

2.0 STANDARDS

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

A. American National Standards Institute (ANSI C57.110)
B. American National Standards Institute (ANSI C62.41 Category B-3)
C. Institute of Electrical and Electronic Engineers (IEEE 519-1992)
D. National Electrical Manufacturers Association (NEMA PE 1-2003)
E. National Electric Code (Latest Revision of NEC Article 700 – Emergency Systems)
F. National Fire Protection Association (NFPA 70) (NFPA 101) (NFPA 111) (NFPA 99)
G. Federal Communications Commission (FCC Class A limits, 47 C.F.R. Part 15, Subparts A, B)
H. Listed ANSI/UL 924 Emergency Lighting and Power Equipment rated with 90 minutes, for use in accordance with NEC Article 700 (ANSI/NFPA 70), the Life Safety Code (ANSI/NFPA 101), and the International Building Code (IBC).
I. Listed UL 924 Auxiliary Lighting and Power Equipment for other than 90 minutes battery backup time, for use in conjunction with a facility emergency lighting and power system.
J. Listed C-UL to CSA C22.2, No. 141-10, compliant to No. 141-15, Emergency Lighting Equipment with 30 minutes battery backup time. (Consult factory for other C-UL listed battery run times.)

3.0 MANUFACTURED SYSTEMS

A. The system is designed and manufactured to assure maximum reliability, serviceability and performance. All control devices and system electronics are accessible via the front of the inverter cabinet for rapid service or replacement. The system's advanced monitor is mounted on the front door of the inverter cabinet for easy observation of system status, electrical measurements and battery condition. The system is furnished with an internally located inverter input circuit breaker, inverter output circuit breaker, and bypass switch. System batteries are provided in a separate standalone front access battery cabinet, matching the height and depth of the inverter cabinet. The batteries and DC conductors are DC circuit breaker protected. Cabinets are floor mounted, constructed of steel, powder-coated, and

NEMA 1 rated for indoor use. The inverter controls, bypass, and breakers are front accessible through a hinged, key lockable door. The inverter cabinet is provided with protective dead front panel that allows the operation of the bypass switch and AC breakers while preventing physical contact with live electrical connections. All conductors and transformer windings are copper constructed.

B. As an option, systems are available with a factory-installed, side-mounted, 14" wide output distribution cabinet designed for front access service. Systems requiring factory-installed output branch circuit breakers and/or an optional standby, normally off AC output bus are provided in this distribution cabinet. The output distribution cabinet is capable of accommodating 1 pole, 2 pole, and 3 pole branch circuit breakers fed from an inverter system output of 208/120 VAC or 480/277 VAC. A total of 12 pole positions per phase (36 poles total) are available for unmonitored breakers, or a total of 8 pole positions per phase (24 poles total) are available for monitored breakers. Circuit breakers can be wired to the normally on AC output bus and/or normally off AC output bus in any combination. The output distribution cabinet includes a hinged, key lockable front door.

C. The system will operate in accordance with requirements as specified herein to support any combination of fluorescent ballast fixtures, incandescent lamps, electronic and high power factor fluorescent ballasts, quartz re-strike HID fixtures, halogen, and LED lighting or other approved loads up to the output rating of the system. The "Normally On" and optional "Normally Off" AC outputs are 100% rated and limited only by the system's maximum KVA/KW output rating.

4.0 MODES OF OPERATION

A. Normal Operation: The load is supplied with regulated power derived from the normal AC power input terminals through the input PFC AC/DC converter and output DC/AC inverter. A full load rated DC/DC battery charger is used to charge the batteries.

B. Uninterrupted Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, energy will be supplied by the battery through the output DC/AC inverter and will 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 input AC/DC PFC converter will supply power to the load through the output DC/AC inverter. Simultaneously the DC/DC battery charger will recharge the batteries. There is no break or interruption of power to the load upon failure or restoration of the commercial AC power.

C. Optional Standby Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power or upon a remote input "command on signal", the standby, normally off AC output bus is energized, thus providing emergency power for standby lighting fixtures which are required to illuminate only in the event of emergency. User-adjustable settings are programmable via the touch screen LCD display panel and include transfer on delay time (0 to 8 seconds), transfer off delay time (0 to 15 minutes), and a soft start control (0 to 172 cycles) to accommodate the high inrush current associated with energizing normally off emergency lights.

D. Automatic Restart: If the loss of AC input power exceeds the available battery run time, a low battery shutdown will occur to protect the batteries. Once the AC input power source returns and is within acceptable voltage and frequency limits, the inverter system may be selected to automatically restart or require a manual restart.

E. Manual Restart: The inverter system requires a manual restart from a shutdown resulting from the following events.

1. Remote or local emergency power off activated
2. Inverter system failure
3. Low battery shutdown, if manual restart option is selected

5.0 AUTOMATIC BYPASS OPERATION

A. Automatic Bypass: The system includes an automatic static bypass for fault clearing, instantaneous overload conditions that exceed specified levels and/or to connect the load to the AC input power source in the event of a system fault or failure. The static bypass switch will transfer the load from the inverter output to the AC input power source under the following conditions.

1. Output overload capacity exceeded
2. Inverter output voltage or frequency out of limits
3. Inverter system failure
4. Over temperature
5. DC bus out of limits
6. Manual bypass switch transfer initiated

B. Automatic Bypass Inhibited: The static bypass switch will not transfer the load from the inverter output to the AC input power source if that source is not within limits when a fault condition occurs. If the AC input power source is out of limits (factory set at +8%, -12% of nominal voltage and +/-5% of nominal frequency), the inverter system will shut down and an alarm will sound.

C. Automatic Retransfer from Bypass: The retransfer of the load from the AC input power source to the inverter output is automatically initiated whenever the inverter is capable of assuming the critical load.

D. Automatic Retransfer Inhibited: The retransfer of the load from the AC input power source to the inverter output will be inhibited if any of the following conditions exist.

1. Inverter output not in sync range with AC input power source
2. Voltage difference between inverter output and AC input power source exceeds limits
3. Inverter system failure
4. System in static bypass resulting from an over temperature condition

6.0 MANUAL BYPASS OPERATION

A. Internal Bypass Switch: The inverter system includes a standard push-to-turn, make-before-break bypass switch, accessible behind the front door of the inverter enclosure. Pushing the manual bypass switch will invoke the inverter's static bypass prior to turning the switch to the bypass position. The bypass switch provides complete isolation of the inverter output terminals from external circuits. When the load is supplied from the AC input power source through the bypass switch, the AC supply terminals remain energized to permit operational checking of the system. Returning to normal mode is accomplished by placing the bypass switch in its normal position via the push-to-turn function, without disrupting power to the load. The internal bypass switch is included even when an optional wrap around maintenance bypass is supplied.

B. Optional Break-Before-Make, Wall Mounted Maintenance Bypass: On inverter systems where the nominal input and output voltages are the same, an external, wall mounted, push-to-turn, 4 pole, break-before-make, wrap around maintenance bypass switch is available for field installation. When in bypass mode, the switch will bypass the inverter system and feed the load power directly from the AC input power source. The inverter system's main input breaker, output breaker, and battery breaker may then be opened, allowing the inverter to be fully serviced, including the complete maintenance and replacement of circuit cards or components. The bypass switch includes an auxiliary contact to indicate the position of the switch (normal or bypass) for remote monitoring purposes. The bypass switch is provided with a padlock attachment for lockout/tagout purposes during maintenance.

C. Optional Make-Before-Break, Wall Mounted Maintenance Bypass: On inverter systems where the nominal input and output voltages are the same, an external, wall mounted, push-to-turn, 4 pole, make-before-break, wrap around maintenance bypass switch is available for field installation. When in bypass mode, the switch will bypass the inverter system and feed the load power directly from the AC input power source. The inverter system's main input breaker, output breaker, and battery breaker may then be opened, allowing the inverter to be fully serviced,

including the complete maintenance and replacement of circuit cards or components. The bypass switch includes an auxiliary contact to indicate the position of the switch (normal or bypass) for remote monitoring purposes. A second auxiliary contact must be wired to the inverter and will invoke the system's static bypass before the switch is turned to the bypass position. The bypass switch is provided with a padlock attachment for lockout/tagout purposes during maintenance.

7.0 OUTPUT POWER RATINGS

System Power Output Capability: (10kW) (13kW) (14kW) (15kW) (16kW) (17kW) (20kW) (22kW) (24kW) (26kW) (28kW) (30kW) (32kW) (33kW).

8.0 MAIN CIRCUIT BREAKERS

A. System Input Breaker Rating: The inverter input breaker is sized to accommodate full rated load, low line input, and maximum recharge current simultaneously. Consult factory for input breaker rating for specific models.

B. System Output Breaker Rating: The inverter output breaker is sized to accommodate full rated load continuously. Consult factory for output breaker rating for specific models, and monitored breaker option.

9.0 INPUT SPECIFICATIONS

A. Input Voltage: (208/120 VAC) (480/277 VAC) (600/347 VAC), three phase (wye), 60Hz.

B. Input Voltage Operating Range: +10% to -15% at full load without battery usage.

C. Frequency Range: 57 hertz to 63 hertz.

D. Power Factor: Self-correcting to >0.98 (approaching unity).

E. Input Current Harmonics: <10% THD (total harmonic distortion) at 100% load.

F. System AIC (Amperes Interrupting Current) Rating: (10kAIC) (65kAIC).

10.0 OUTPUT SPECIFICATIONS

A. Output Voltage: (208/120 VAC) (480/277 VAC) (600/347 VAC), three phase (wye), 60Hz

B. Sine Wave Voltage: 3% THD (total harmonic distortion) maximum with linear load.

C. Frequency: 60 Hz, +/- 0.5 Hz under full load while in the battery operation mode.

D. Voltage Regulation: +/-3% typical

E. Phase (Angle) Imbalance: 120° +/- 0.5°

F. Transient Voltage Response:
   1. 100% load step: +/- 10% for 1 cycle, then +/-3% for 2-3 cycles maximum
   2. Loss or return of AC input power: +/-3% for 2-3 cycles maximum
   3. Manual transfer of 100% load: +/- 10% for 1 cycle, then +/-3% for 2-3 cycles maximum

G. Transient Voltage Recovery Time: 1 cycle to within 3% of nominal output voltage.

H. Output Power Rating: KVA at 1.0 power factor (unity). KVA = KW

I. Load Power Factor Range Permitted: 0.7 leading to 0.7 lagging (not exceeding full kVA/KW output rating).

J. Overload Rating (without use of static bypass): Up to: 110% for 2 minutes, 125% for 30 seconds, 150% for 10 seconds, 400% for 4 cycles when fed from the AC power source, or on battery.

K. LED Inrush Rating (without use of static bypass): Peak overload capability of 1700% 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.

L. Fault Clearing (with bypass available): 150% for 1 minute, 500% for 1 second, 1000% for 1 cycle.

M. Efficiency: 90% typical, kW and model dependent.

11.0 BATTERY SPECIFICATIONS

A. Battery times:
90 minutes at full rated kilowatt output, listed ANSI/UL 924 Emergency Lighting and Power Equipment.

15, 30, 60, 120, or 240 minutes at full rated kilowatt output, listed UL 924 Auxiliary Lighting and Power Equipment.

30 minutes at full rated kilowatt output, listed C-UL to CSA C22.2, No. 141-10, compliant to No. 141-15, Emergency Lighting Equipment. (Consult factory for other C-UL listed battery run times).

B. Battery Type: Integral, valve regulated, sealed lead calcium, maintenance free, with front access terminals for ease of installation and maintenance.

C. Charger: 3 stage, temperature compensated, smart charge.

D. Recharge Time: UL 924, NFPA 101, NFPA 111, and C22.2 No. 141-15 compliant.

E. Bus Voltage: Factory-programmable from 216 - 384 VDC, or from 132 - 168 VDC, kW rating, model, and battery run time dependent.

12.0 ENVIRONMENTAL SPECIFICATIONS

A. Operating Temperature:
20°C to 35°C for ANSI/UL 924 Emergency Lighting and Power Equipment listed 90 minute models.

20°C to 35°C for UL 924 Auxiliary Lighting and Power Equipment listed 15, 30, 60, 120, or 240 minute models.

20°C to 35°C for 30 minute models compliant to CSA C22.2, No. 141-15, Emergency Lighting Equipment.

20°C (10°C optional) to 40°C for 30 minute models C-UL listed to CSA C22.2, No. 141-10, Emergency Lighting Equipment.

Optimum battery performance and life is achieved at 25°C.

Note: To satisfy ANSI/UL 924 requirements for a 35°C listing and C-UL / CSA requirements, UL and C-UL testing was performed in a 40°C environment, with the inverter system tested under full load and at low line input voltage.

B. Inverter Storage Temperature: -20°C to 50°C.

C. Battery Storage Temperature: 25°C for 6 months before charging is required. For each 9°C rise, reduce storage time by half.

D. Relative Humidity: 95% non-condensing.

E. Elevation: 0 to 6600 ft. (2000 meters). Units installed at elevations greater than 6600 ft. require de-rating.

F. Audible Noise Level: Not greater than 60 dba at 1 meter.

13.0 MECHANICAL

A. Cabinet Dimensions (ANSI/UL 924 Listed models with 90 Minutes):

10kW – 14kW (208/120 VAC input and output): 52”W x 33”D x 77”H
10kW – 14kW (all other voltage configurations): 63”W x 33”D x 77”H
15kW – 17kW: 63”W x 33”D x 77”H
20kW (480/277 VAC and 600/347 VAC outputs): 63”W x 33”D x 77”H
20kW (208/120 VAC output): 70”W x 33”D x 77”H
22kW – 33kW: 70”W x 33”D x 77”H

B. Cabinet Dimensions (CU-L Listed models with 30 Minutes):

10kW – 14kW (208/120 VAC input and output): 52”W x 33”D x 77”H
10kW – 14kW (all other voltage configurations): 63”W x 33”D x 77”H
15kW – 24kW: 63”W x 33”D x 77”H
26kW – 33kW: 70”W x 33”D x 77”H

NOTE: Add 14” to width if optional output distribution cabinet is required to accommodate branch circuit breakers and/or a normally off output bus. Contact the factory for cabinet dimensions using other battery run times.

C. Enclosure: NEMA 1, powder-coat painted steel construction, and sealed prohibiting rodent entry.

D. Optional Drip Shield: Drip shield assembly designed to cover the inverter and battery cabinets, and the optional output distribution cabinet if provided. The assembly extends 2 inches beyond the EON cabinetry width and depth, and is shipped loose for field installation.

14.0 DISPLAY MONITOR AND DIAGNOSTICS

A. Display Monitor: An advanced display monitor is included to uphold NFPA and CSA guidelines for emergency illumination, emergency backup time and unattended, periodic and annual testing of the centralized emergency power system. The monitor includes a local, front mounted, sealed, touch screen, color LCD display to verify system electrical and temperature measurements, inform/alarm for abnormal system status, allow programming of user specified set points, and inform of periodic system and battery test results.

B. Electrical Parameters – The three phase monitor displays the following electrical parameters:

Input Voltage L-N
Input Frequency
Input Current L-N
Input VA L-N

Input Watts L-N
Input Power Factor L-N
Input KVA Total
Input KW Total
Output Voltage L-N
Output Frequency
Output Current L-N
Output VA L-N
Output Watts L-N
Output Power Factor L-N
Output KVA Total
Output KW Total
Output Percent Load L-N (% KVA)
Output Percent Load Total (% KVA)
Battery Voltage
Battery Charge/Discharge Current

C. Alarm Conditions – The three phase monitor displays the following status and alarm conditions:

Input Over Voltage L-N
Input Under Voltage L-N
Improper Phase Rotation
Input Frequency High
Input Frequency Low
Output Over Voltage L-N
Output Under Voltage L-N
Output VA L-N High (output overload)
Output VA L-N Low (user-programmable limit referenced during automatic battery test, to verify integrity of egress lighting)
Output Frequency High
Output Frequency Low
Battery Voltage High
Battery Voltage Low
Battery Charger Current High
System On Battery
Low Battery Warning
Low Battery Shutdown
Over-Temperature Shutdown
- Inductors (if static bypass source is not available)
- IGBT (if static bypass source is not available)
- Transformer
- SCR

Input Fuse Failure
DC Link Over Voltage
DC Link Under Voltage
DC Charger (Rectifier) Failure / DC Open
IGBT Fault
Output Circuit Breaker Open
REPO Shutdown
System in Static Bypass
Static Bypass Input Out of Range
Static Bypass Fault
Excessive Auto Retransfers Attempted
Manual Restart Required
Battery Test Fail

D. Operational Conditions – The three phase monitor displays the following operational conditions:

System Normal
System Alarm
System Shutdown
Battery Time Remaining (expressed in minutes)
Battery Test In Process (including a "countdown" of time remaining in test)
Off Bus Connecting (optional)
Off Bus Returning (optional)
System in Manual Bypass
System in Static Bypass

E. System Control – The three phase monitor allows for the following system control via the touch screen display:

Start Up
Shutdown

F. User-programmable Set Points – The three phase monitor allows for the following user-programmable set points:

High/low alarm thresholds
Low output VA level referenced during periodic and annual battery testing to verify egress lighting integrity
Off bus transition delays (optional)
Periodic battery test duration with date and time in compliance with NFPA 101 and C22.2 No. 141-15
Annual battery test duration with date and time in compliance with NFPA 101 and C22.2 No. 141-15

G. Periodic Testing – The three phase monitor incorporates system diagnostics and provides for automatic and manual testing of the system/batteries as follows:

1. Features a factory-set 5 minute battery discharge test every 30 days or 90 days, and a user-programmable (enable/disable) annual battery discharge test, factory-set for either 30 minutes, 60 minutes, 90 minutes, 120 minutes or 240 minutes. Dates and times of tests are user-programmable. Note: Battery discharge test set at 30 seconds for runtimes less than 30 minutes.

2. Reports the battery test results with a pass/fail indication, time and date stamped, via the local monitor panel and optionally via BACnet/IP or BACnet MS/TP, Ethernet TCP/IP, MODBUS TCP, or MODBUS RS485.

3. During the battery test, the monitor will perform a user programmable egress lighting integrity test. The egress lighting integrity test measures the KVA load on the output of the system, and if the output load falls below the customer defined value, the inverter provides an audible and visual alarm, indicating fixture maintenance or component replacement.

4. A manual, proprietary password protected "Push to Test" feature is provided to initiate NFPA 101-compliant system test. An "Abort Test" feature is included.

H. Data-Logging – The three phase monitor provides the following data-logging:

1. Maintains a historic log that sequentially records a minimum of 25 battery tests which indicate time, date and pass/fail results. The log is available through the local monitor display and via optional BACnet/IP or BACnet MS/TP, Ethernet TCP/IP, MODBUS TCP, or MODBUS RS485 communications.

2. Maintains a historic log that sequentially records 50 of the most recent alarms, indicating the time and date of abnormal occurrences. The log is available through the local monitor display and via optional BACnet/IP or BACnet MS/TP, Ethernet TCP/IP, MODBUS TCP, or MODBUS RS485 communications.

15.0 COMMUNICATIONS INTERFACE

A. System includes an RS232 serial communications port for authorized access to electrical parameters, system status, alarms, system set point programming, and the test and alarm logs.

B. Optional Status / Alarm Relay Contacts are available with isolated, potential free (Form C) relay contacts accessible via a terminal strip for customer's hardwired connection to building monitoring and security systems. Contacts are rated for 1A at 120VAC and 2A at 28VDC. Status / alarm contacts include inverter on, on battery power, low battery, general alarm, battery test pass, battery test fail, output circuit breaker open, in bypass, and periodic or annual system test activated.

C. Optional Remote Emergency Power Off (REPO) interface is available for customer's normally open relay contact, which will shut down the inverter system when the relay contacts close.

D. Optional remote monitoring and reporting of electrical parameters, system status, alarms, event logs, and automatic battery test results are available via BACnet/IP or BACnet MS/TP, Ethernet TCP/IP, MODBUS TCP, or MODBUS RS485 communications.

16.0 ACCESSORIES (OPTIONAL EQUIPMENT)

A. Output Distribution Cabinet: Factory-installed, side-mounted output distribution cabinet as defined in section 3 B of this specification to accommodate factory-installed output branch circuit breakers and/or the standby, normally off AC output bus as defined in section 4 C of this specification.

B. Standby Emergency Operation: A normally off AC output bus as defined in section 4 C of this specification.

C. Wall Mounted Maintenance Bypass: An external wrap around maintenance bypass for field installation as defined in section 6 B and C of this specification.

D. Status / Alarm Relay Contacts: Isolated, potential free (Form C) relay contacts as defined in section 15 B of this specification.

E. Remote Emergency Power Off (REPO) Interface: REPO interface as defined in section 15 C of this specification.

F. Remote Monitoring Communications: Remote monitoring and reporting as defined in section 15 D of this specification.

G. Remote Annunciator Panel: Remote annunciator panel for remote status indication of inverter on, on battery power, low battery, general alarm, and test active. The annunciator panel is provided with an interface cable of (50) (100) (150) (200) feet to connect to the inverter's status / alarm terminal strip.

H. External Load Control Relay: ZoneSaver-2 emergency lighting control unit is a UL 924 listed load control relay wired to shunt around local control devices (i.e. dimmer control, wall switch, occupancy sensor) powered from the inverter's normally on output, in order to provide full illumination to designated emergency lights upon the failure or loss of commercial AC power.

I. External Zone Sensing: ZoneSaver-2 emergency lighting control unit is a UL 924 listed load control relay wired for zone sensing and control of normally off (standby) emergency lighting fixtures. The relay senses the voltage at an individual zone lighting panel. When loss of normal power is detected, emergency power is made available to illuminate emergency fixtures within that specific zone.

J. Branch Output Breakers: 1 pole, 2 pole, and 3 pole branch circuit breakers are available and located within the optional output distribution cabinet when fed from an inverter system output of 208/120 VAC or 480/277 VAC.

A total of 12 pole positions per phase (36 poles total) are available for unmonitored breakers, or a total of 8 pole positions per phase (24 poles total) are available for monitored breakers. Single pole breaker ratings include 15, 20, 25, and 30 amp. 2 pole and 3 pole breaker ratings include 15, 20, 25, 30, 40, 50, and 60 amps.

Branch circuit breakers can be wired to the normally on AC output bus and/or normally off AC output bus in any combination. If a monitored branch circuit breaker is open, the system's local monitor will sound an alarm. If the Status / Alarm Relay Contacts Option is specified, "output circuit breaker open" form C alarm contacts are provided for remote monitoring.

K. Monitored Inverter Output Breaker: The inverter's main output circuit breaker may be provided with an auxiliary contact to signal if the breaker is open. If opened or tripped, the system's local monitor will sound an alarm. If the Status / Alarm Relay Contacts Option is specified, "output circuit breaker open" form C alarm contacts are provided for remote monitoring.

L. Drip Shield: Drip shield assembly designed to cover the inverter system cabinetry as defined in section 13 D of this specification.

17.0 SERVICEABILTY

The inverter's power section, including all control cards and system electronics, are front-accessible and located behind a secure hinged access door for ease of service or component replacement. An internal inverter bypass switch is provided. A DC circuit breaker and DC Anderson connector are incorporated into the design to facilitate rapid replacement of the batteries via the front of the system enclosure. No side access is required. To facilitate inverter diagnostics and programming, a RS232 serial communications port shall be provided for access to electrical measurements, system set points, and system logs.

18.0 WARRANTY

A. Controlled Power Company guarantees the inverter's power components and system electronics to be free from defects in material and workmanship for a period of 2 years following shipment from the factory. Inverter systems installed within the contiguous United States (lower 48 states) and Canada include start up service, after which a first year factory-authorized on-site labor warranty is provided. Optional 2 and 3 year factory-authorized on-site labor warranties are available.

B. Battery warranty is 1 year full replacement, 14 year prorated.