TrueLITE Model ELS
Three Phase Centralized Emergency Lighting Inverter

General Specification
58.5KW – 112.5KW Systems

1.0 GENERAL

This specification defines the electrical and mechanical characteristics of the TrueLITE Model ELS, a three phase uninterruptible emergency power supply. The TrueLITE, referred to as the "system" in this specification, includes all the components required to deliver reliable, high quality uninterruptible power for emergency lighting 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 static bypass switch, battery charger, and an energy storage battery platform are included, as well as all the related hardware components and software to facilitate a functional centralized system with automatic system testing. An advanced diagnostic monitor with LCD display continuously advises of system status and battery condition. The emergency power supply system provides protection from power interruptions, as well as power line disturbances when in on-line mode.

The system can be selected to operate in on-line mode to provide an isolated, voltage regulated power source, or in standby-on mode (ECO-mode) for increased operating efficiency. A smart active mode is available to automatically define whether to operate in on-line or standby-on mode based on the quality of the incoming power source. In addition, a standby-off mode can be selected for compatibility with normally off emergency lighting fixtures.

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. NFPA 101 Section 7.9.3.1.2 – Periodic Testing of Emergency Lighting Equipment
H. FCC Part 15, Subpart J, Class A
I. 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).
J. 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.
K. Listed C-UL to CSA C22.2, No. 141-15 Emergency Lighting Equipment with 30, 60, or 90 minutes battery backup time.

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

L. ICC - AC156: "Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components and Systems"
M. ASCE 7-10
N. International Building Code – IBC 2015

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 of the inverter cabinet for easy observation of system status, electrical measurements and battery condition. The system is furnished with input and output power switches, a static bypass input switch, and a mechanical bypass switch. System batteries are provided in a separate standalone front access battery cabinet or cabinets. 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 and switches are front accessible through a hinged, key lockable door. The inverter cabinet is provided with a protective dead front panel that allows the operation of all switches, including the mechanical bypass, while preventing physical contact with live electrical connections. Seismic-rated inverters are provided with floor mounting brackets.

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

4.0 MODES OF OPERATION

A. ON-LINE MODE

1. 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.

2. Uninterrupted Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, power will be supplied by the battery through the output DC/AC inverter and will continue to supply power to the load without transfer 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.

3. 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 bypass 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 bypass power source under the following conditions.

    a. Output overload capacity exceeded
    b. Inverter failure
    c. Over temperature
    d. DC voltage out of limits
    e. Transfer to static bypass manually initiated

4. Automatic Bypass Inhibited: The static bypass switch will not transfer the load from the inverter output to the bypass source if that source is not within limits when a fault condition occurs. If the bypass source is out of limits, factory set at +10%, -15% (adjustable to +/-15%) of nominal voltage and +/-5% (adjustable from +/-1% to +/-6%) of nominal frequency, the inverter system will shut down and an alarm will sound.

5. Automatic Retransfer from Bypass: The retransfer of the load from the bypass power source to the inverter output is automatically initiated when the voltage and frequency of the inverter are within acceptable limits and capable of assuming the load.

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

a. Inverter output not in sync range with bypass power source
b. Voltage difference between inverter output and bypass power source exceeds limits
c. Inverter system failure
f. Load current exceeds output rating of the inverter

B. STANDBY-ON MODE (ECO-MODE)

1. Normal Operation: The load is supplied with power from the static bypass source as long as the AC power is within preset voltage and frequency limits. An operating efficiency of up to 98.5% is achieved. In this mode, the normal AC power input feeds the AC/DC converter, and the DC/DC battery charger is used to keep the batteries charged.

2. Emergency Operation: Upon the failure or unacceptable deviation of power from the static bypass source, power will be supplied by the battery through the output DC/AC inverter, and will continue to supply power to the load. When power is restored to the static bypass source and within preset voltage and frequency limits, the load will return to being powered from the static bypass source. Simultaneously, the DC/DC battery charger will recharge the batteries. There is a 2-5 msec switching time at the inverter output upon failure or restoration of the static bypass power source.

C. SMART ACTIVE MODE

Smart active mode automatically defines whether to operate in standby-on (eco-mode) or on-line mode based on the quality of the incoming power source. Smart Active mode allows for an operating efficiency of up to 98.5%, as long as the incoming power source is within preset limits and stable.

1. Standby-On Operation: The load is supplied with power from the static bypass source as long as the AC power is within preset voltage and frequency limits. An operating efficiency of up to 98.5% is achieved. In this mode, the normal AC power input feeds the AC/DC converter, and the DC/DC battery charger is used to keep the batteries charged. If the static bypass source preset voltage or frequency limits are exceeded, but power to the input PFC AC/DC converter is acceptable, the system will transfer to on-line mode.

2. On-line 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. The static bypass source is then monitored for a defined timeframe (programmable 30 seconds to 4 minutes). If during this time, the voltage and frequency have remained within the preset limits, the system will transfer to standby-on mode; otherwise the system remains in on-line mode while the static bypass source continues to be monitored. If 2 or more out of limit events occur within the defined timeframe, the system will remain in on-line mode for 60 minutes from the time of the last out of limit event.

3. Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, power will be supplied by the battery through the output DC/AC inverter and will continue to supply power to the load. When power is restored at the AC input terminals of the system, the system will operate in on-line mode for the defined timeframe. When the static bypass source is within preset voltage and frequency limits, the load will be transferred to standby-on operation.

D. STANDBY-OFF MODE

Standby-off mode is used when the output of the inverter is meant to be normally off. It is selected if exclusively feeding normally off emergency lighting that is only meant to be energized in the case of a power outage.

1. Normal Operation: When present, the normal AC power input feeds the AC/DC converter, and the DC/DC battery charger is used to keep the batteries charged. However, the output DC/AC inverter is switch off and no power is supplied to the load. This provides compatibility with normally off emergency lighting loads.

2. Emergency Operation: Upon the failure or unacceptable deviation of commercial AC power, the AC/DC converter is switched off and the output DC/AC inverter is switched on within 200 msec. Power is then

supplied by the battery through the output DC/AC inverter to provide emergency power to normally off emergency lighting loads. When power is restored at the AC input terminals of the system, the AC/DC converter is switched on, and the output DC/AC inverter is switch off. Simultaneously, the DC/DC battery charger will recharge the batteries.

5.0 INVERTER RESTART

A. 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. When automatic restart is enabled, the inverter will automatically restart once the AC input power returns and is within acceptable voltage and frequency limits.

B. Manual Restart: When manual restart is enabled, 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

6.0 MANUAL BYPASS OPERATION

A. Internal Bypass Switch: The inverter system includes a standard internal mechanical bypass switch. This bypass switch is physically connected in parallel with the static bypass switch, but it is operated via rotation of a manual handle, accessible behind the front door of the inverter enclosure. Rotating the bypass switch handle will invoke the inverter's static bypass prior to the switch being in the bypass position. Once in bypass, the inverter can be completely shut down without interrupting power to the load. The system's input and output power switches, static bypass input switch, and battery disconnect breakers can be opened to fully isolate the inverter system. 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 first closing the input and output power switches, and static bypass input switch. The bypass switch can then be returned to its open position, and the system's battery disconnect breakers closed. The internal mechanical bypass switch is included even when an optional external, wall-mounted, wrap-around maintenance bypass is supplied.

B. Optional Make-Before-Break, Wall-Mounted Maintenance Bypass: An external, wall-mounted, 3-circuit breaker wrap-around maintenance bypass is available for field installation, allowing for a make-before-break transition. The main functional components of the maintenance bypass are 3 circuit breakers that are used as disconnect switches. The 3 breakers are defined as the inverter input breaker (UIB), maintenance bypass breaker (MBB), and maintenance isolation breaker (MIB). During normal operation, the UIB is closed and supplies power from the utility source to the bypass input of the inverter. The MIB is also closed and connects the output of the inverter to the load. The MBB is open. When in maintenance bypass, the MBB is closed and the MIB is open. This connects the load directly to the utility power source and isolates the load from the output of the inverter system. To service the system, the UIB breaker can be opened to remove power from the inverter input. There are signals that support an interlock function to prevent the MBB from being closed unless the MIB is open or the inverter is in bypass mode. A Kirk Key interlock system protects the breakers. In addition, an SKRU (solenoid key release) is provided for added security. The maintenance bypass is available with a 14K, 35K, or 65K AIC rating. Adjustable electronic trip circuit breakers are available upon request.

7.0 OUTPUT POWER RATINGS

System Power Output Capability: (58.5kW) (72kW) (90kW) (112.5kW)

8.0 INPUT SPECIFICATIONS

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

NOTE: If an output neutral is not required, the input / output may be 480 VAC, three phase (delta), 60Hz.

B. Input Configuration: Single input feeding the AC/DC converter and static bypass, or dual input with one source feeding the AC/DC converter and a second source feeding the static bypass input. In a dual input configuration, the AC/DC converter input connection does not require a neutral conductor.

C. Input Voltage Operating Range: +15% to -10% at full load without battery usage. +15%, -30% voltage tolerance, load dependent or with battery assistance.

D. Frequency Range: 57 hertz to 63 hertz.

E. Power Factor: 0.99 at nominal voltage and battery charge from 25% to 100% of the load.

F. Input Current Harmonics: $\leq$ 3% THD (total harmonic distortion) at 100% load.

G. Rectifier Power Walk-In: Progressive from 0 to 30 seconds (programmable). Factory preset at 5 seconds.

H. Rectifier Power Walk-In Start Delay: Progressive from 0 to 120 seconds (programmable). Factory preset at 0 seconds.

9.0 OUTPUT SPECIFICATIONS

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

NOTE: If an output neutral is not required, the input / output may be 480 VAC, three phase (delta), 60Hz.

B. Frequency: 60 Hz, +/- 0.05% when free running (on battery).

C. Line Synchronization Range: 60 Hz, +/- 5% (adjustable from +/-1% to +/-6%) with inverter synchronized to bypass input.

D. Slew Rate: 1 Hz/second

E. Voltage Regulation: +/-1% with balanced load; +/-3% with 100% unbalanced load.

F. Voltage (Step Load) Response: +/- 5% for a 100% step load change.

G. Voltage Recovery Time: 20 msec to within +/-1% of nominal output voltage.

H. Voltage Distortion: 2% THD maximum with linear load; 3% THD with non-linear load.

I. Crest Factor (Ipeak/Irms): 3:1

J. Phase (Angle) Imbalance: 120° +/- 1°

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

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

M. Overload Rating (without use of static bypass): Up to: 110% for 60 minutes, 125% for 10 minutes, 150% for 1 minute.

N. Short Circuit Current (On Battery): 180% phase to phase for 1 second with current limiting, 300% phase to neutral for 1 second with current limiting.

O. LED Inrush Rating (without use of static bypass): Peak overload capability of 1200% 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.

P. Efficiency: On-Line Mode 93%; Standby-On / Smart Active Mode 98.5%.

10.0 BATTERY SPECIFICATIONS

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

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

30, 60, or 90 minutes at full rated kilowatt output, listed C-UL to CSA C22.2, No. 141-15 Emergency Lighting Equipment. (Consult factory for other C-UL listed battery run times).

B. Battery Type: Integral, valve regulated, sealed lead acid, maintenance free.

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

D. Recharge Time: 24 hours recharge for runtimes not exceeding 90 minutes, UL 924 and CSA compliant.

E. Bus Voltage: 480VDC.

11.0 ENVIRONMENTAL SPECIFICATIONS

A. Operating Temperature:
20°C to 30°C for ANSI/UL 924 Emergency Lighting and Power Equipment listed 90 minute models.

20°C to 30°C for 30, 60, or 90 minute models C-UL listed to CSA C22.2 No. 141-15, Emergency Lighting Equipment.

0°C to 40°C for models listed to UL 924 Auxiliary Lighting and Power Equipment, UL 1778, and C-UL listed to CSA C22.2 No.107.1-0. Note: 40°C maximum temperature for 8 hours a day; 35°C average temperature for 24 hours. Optimum battery performance and life is achieved at 25°C. Batteries exposed to higher ambient temperatures will reduce their life expectancy.

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 1000 meters (3,281ft). Systems installed at elevations greater than 1000 meters require de-rating of 1% for each 100 meters between 1000 and 4000 meters.

F. Audible Noise Level (ECO-mode): $\leq$ 65 dba at 1 meter for 58.5kW – 90kW models; $\leq$ 68 dba at 1 meter for 112.5kW model.

12.0 MECHANICAL

A. Cabinet Dimensions (Bottom Cable Entry):

90 Minute Runtime	# of Battery Cabinets	Total Weight
58.5kW: 111.5”W x 33.5”D x 78.7”H	2	10,460
72kW: 163.5”W x 33.5”D x 78.7”H	3	15,210
90kW: 163.5”W x 33.5”D x 78.7”H	3	15,320
112.5kW: 203.5”W x 33.5”D x 78.7”H	4	19,932
60 Minute Runtime		
58.5kW: 111.5”W x 33.5”D x 78.7”H	2	8,540
72kW: 111.5”W x 33.5”D x 78.7”H	2	10,460
90kW: 163.5”W x 33.5”D x 78.7”H	3	12,440
112.5kW: 163.5”W x 33.5”D x 78.7”H	3	15,452
30 Minute Runtime		
58.5kW: 71.5”W x 33.5”D x 78.7”H	1	5,980
72kW: 71.5”W x 33.5”D x 78.7”H	2	7,190
90kW: 111.5”W x 33.5”D x 78.7”H	2	8,650
112.5kW: 111.5”W x 33.5”D x 78.7”H	2	10,702

NOTES:
A field-installed DC landing cabinet is included whenever 3 or 4 battery cabinets are provided, and reflected in the above dimensions and weights. The DC cable connections from each battery cabinet’s circuit breaker are landed on the positive and negative bus bars within the landing cabinet. A single DC connection is then made from the landing cabinet to the inverter’s DC input.

An optional 12” wide side cabinet is available for installations requiring top cable entry.

B. Enclosure: Powder-coat painted steel construction, NEMA 1 rated for indoor installation.

13.0 CONTROL PANEL AND DISPLAY MONITOR

A. Control Panel: The control panel located on the front of the inverter is used to monitor and control all the parameters of the system. The operating status of the inverter is shown on a liquid crystal display (LCD), with two rows of 40 characters. In addition, status LEDs are provided with three operating states: On (steady), On (flashing), and Off. The LED status indications include main input power present, bypass input power present, output normal, on battery, on bypass, and alarm condition. Eight (8) function selection keys are provided below the display for easy navigation through display screens.

B. Display Monitor: A wide graphic display is located on the inverter door, which allows the user to have a close-up, detailed overview of the inverter status in real-time, and features a one-line operational diagram. The user can switch the inverter on and off, view electrical parameters and battery measurements, and access user-programmable settings. The display indicates operational status and alarm messages, % load, % battery charge, audible alarm status, and identifies the model inverter and rated kVA.

C. Emergency Power Off (EPO) – A guarded EPO push button is standard, and located directly below the control panel and display monitor.

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

Input Voltage L-N (% of rated voltage)
Input Voltage L-L
Input Frequency
Input Current (% of rated current)
Input Bypass Voltage L-N, L-L
Output Voltage L-N, L-L

Output Frequency
Output Current (% of rated current)
Output Peak Current (% of rated current)
Output Watts (% of rated watts)
Battery Voltage
Battery Charge/Discharge Current
Sinewave view of the following signals :
Input Current /Output Current
Input Voltage/ Output Voltage

E. Temperature Measurements – The three phase monitor displays the following temperature measurements:

System Board Temperature
Rectifier Heatsink Temperature
Inverter Heatsink Temperature
Battery Cabinet Temperature

F. Event/Alarm Messages – The three phase monitor displays the following status and event/alarm messages:

Disturbance On Bypass Line
Manual Bypass Switch Closed
Incorrect Bypass Voltage (or static bypass input switch is open)
Incorrect Voltage Supply (to main input, or input power switch is open)
Low Battery Warning (adjustable)
Battery Test Active
Battery Test Passed
Battery Test Failed
Battery Supply Voltage Low (factory preset limit)
Output Overload
Internal Fault (fault code provided)
Load Temporarily On Bypass (due to inrush current or inverter startup)
Load On Bypass Due To Output Overload (steady state)
Bypass Command Active (static bypass manually initiated)
Remote Bypass Command Active (static bypass remotely initiated)
Over Temperature Warning (or fan failure)
High Battery Temperature
Input Phase Sequence Incorrect
Missing Output Voltage (no voltage present, or output power switch and bypass switch are open)
Inverter Service Required
Battery Service Required

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

System Normal
System Alarm
System On Battery
Battery Test Active
Mode of Operation (on-line, standby-on / smart active, standby-off)
System in Manual Bypass
System in Static Bypass
System Off

H. Operational History – The three phase monitor displays the following historical operating conditions:

Hours of Normal Operation
Hours of Operation On Bypass
Time Spent Operating On Battery

Number of Battery Discharges
Number of Battery Full Discharges

I. System Control – The three phase monitor allows for the following system control via the control panel:

Start Up
Shutdown

J. User-programmable Set Points – The three phase monitor allows for the following user-programmable settings:

Bypass voltage and frequency range
Mode of operation selection: on-line, standby-on / smart active, standby-off
Voltage and frequency range for eco-mode (standby-on / smart active) operation
Low battery warning (minutes remaining)
Time and date of periodic battery test in compliance with NFPA 101 and C22.2 No. 141-15

K. 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 2 minute battery discharge test every 30 days. Date and time 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 Ethernet TCP/IP, BACnet/IP, MODBUS TCP/IP, or MODBUS RS485.

3. A manual test feature is provided to initiate NFPA 101-compliant system test. An “abort test” feature is included.

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

Maintains a historic log that sequentially records 120 of the most recent events/alarms, indicating the time and date of each occurrence. The log is available through the local monitor display and via optional Ethernet TCP/IP, BACnet/IP, MODBUS TCP, or MODBUS RS485 communications.

14.0 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 events/alarm log.

B. Three (3) user-programmable (Form C) output relay contacts are accessible via a terminal strip for customer’s hardwired connection to building monitoring and security systems. Contacts provided are dry type and rated for 1A at 24VDC. Output relay contacts are factory programmed to reflect On Static Bypass, Battery Discharging, and End of Battery Discharge. Relay contacts are user-programmable to reflect any 3 of the event/alarm messages listed in 13.F of this specification.

C. A Remote Emergency Power Off (REPO) input is available for customer’s dry type normally closed relay contact or push button, which will shut down the inverter system when the relay contact opens. An “inverter off command” input is also available to shut off the inverter output and send the system to static bypass. The input signal provided must be a dry type isolated relay contact, rated for a minimum 12V DC, 80mA.

D. Optional Expansion Relay Card provides six (6) user-programmable (Form C) output relay contacts. Contacts provided are dry type and rated for 5A at 250V. Relay contacts are user-programmable to reflect any 6 of the event/alarm messages listed in 13.F of this specification. The card also accommodates two (2) input command relay contacts which must be dry type and isolated, rated for a minimum of 12V DC, 80mA. Contacts may be normally open or normally closed. Input command functions are user-programmable via the control panel display. Up to two (2) Expansion Relay Cards can be added.

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

15.0 ACCESSORIES (OPTIONAL EQUIPMENT)

A. Wall Mounted Maintenance Bypass: An external, wall mounted, 3-circuit breaker wrap-around maintenance bypass is available for field installation, allowing for a make-before-break transition as defined in section 6 B of this specification.

B. Top Cable Entry: Field-installed side cabinet allowing for top cable entry of input and output AC conductors. Cabinet dimensions: 12”W x 32.8”D x 78.7”H; Weights: 185 lbs.

C. Expansion Relay Card: Relay card providing six (6) user-programmable (Form C) output relay contacts and two (2) input command functions as defined in section 14 D of this specification.

D. Remote Monitoring Communications (Ethernet connection): Slot card allowing for remote monitoring and reporting of electrical parameters, system status, alarms, event logs, and automatic battery test results via Ethernet TCP/IP, BACnet/IP, or MODBUS TCP.

E. Remote Monitoring Communications (Serial connection): Slot card allowing for remote monitoring and reporting of electrical parameters, system status, alarms, event logs, and automatic battery test results via MODBUS RS485.

16.0 WARRANTY

A. Trystar 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.