OSHPD CERTIFIED SEISMIC SERIES OSP-0501-10

Power Ride 3 Three Phase,
8kW to 50 kW UL924 Central Lighting Inverter

1. SCOPE

This guide provides technical information and specifications for Perfect Power System s's Wave Rider 3 central lighting inverter system.

The Wave Rider 3 is a high reliability, three-phase, solid-state, double conversion, digital signal processing, high frequency pulse-width modulated (PWM) system that harnesses the advantages of IGBTs (Insulated-Gate Bipolar Transistor) in its design. The Wave Rider 3 will provide high quality regulated and conditioned AC power to all types of lighting loads all the time because it switches to battery power with virtually zero transfer time upon any input power loss or disruption.

The Wave Rider 3 meets UL 924 requirements for emergency lighting system applications and provides the security of 90 minutes of battery backup power. These seismic series have been certified to meet the requirement for CBC 2016 and IBC 2015 and have been Shake table tested in accordance to ICC-ES AC156 procedure to SDS level 3.0g. the systems have received special seismic certification form OSHPD (California **O**ffice of **S**tatewide **H**ealth **P**lanning and **D**evelopment).

They are suitable for all lighting loads including any combination for electronic and security systems, power factor corrected self-ballast Fluorescent, Incandescent, quartz re-strike, halogen, HID, HPS and LED lighting during battery backup operation.

The Wave Rider 3 can be operated at 0 to 100% loading for a minimum of 90 minutes. Upon the restoration of power from the AC utility line, the system automatically returns to normal operation without any interruption of power to the load. The Wave Rider 3 meets UL 924 requirements for recharging the battery while utilizing an industry distinctive small footprint for its stackable cabinet design. This allows equipment installation in limited paces.

2. STANDARDS

- The Power Ride 3 complies with the following standards:
- Seismic certified to IBC2015, CBC2016, (SDS level 3.0g)
- OSHPD (California Office of Statewide Health Planning and Development) Certified, shake table tested in accordance to ICC-ES AC156. (OSP-0500-10).
- CSA certified per UL1778,
- UL 924 and CSA 22.2 No. 107.1.
- UL 924/UL 924A – Life Safety for Emergency Back up Lighting
- FCC rules and regulations, Part 15, subpart j, class A
- NEMA PE-1
- NFPA 101 (Life safety code)
- ANSI C62.41 (IEEE 587)
- ANSI C62.42.45 (Cat. A and B)
- TVSS (UL1449 3rd Edition)

3. GENERAL DESCRIPTION

The system shall utilize high frequency pulse width modulation and digital signal processing for control and monitoring. The system's automatic overload and short circuit protection of the inverter in normal and emergency operations shall have 150% momentary surge capability and withstand a 115% overload for 10 minutes. The system's protection shall also include a low battery voltage disconnect to prevent damage to the battery bank. The system shall supply a clean, computer grade, sinusoidal output waveform with less than 5% total harmonic distortion at full rated load. Dynamic brownout protection must maintain the desired voltage without continuously switching to batteries in low voltage situations up to -15%. The system shall maintain output regulation of less than + 5% under all operating condition except overload and short circuit. The system shall be able to protect itself from an internal over-temperature condition and issue an alarm under such conditions.

The Wave Rider 3 system shall feature:

An automatic multi-rate, software-controlled charger
Self-diagnostics
Programmable system testing capabilities
A microprocessor controlled diagnostic display panel capable of audible alarms and visual displays of all warnings
A DC to AC converter (inverter)
A battery charger that meets the UL 924 standard
AC and DC input breakers for protection
A battery-bank sized for the system's runtime requirements and full rating
A RS232 communication interface

APPROVED MANUFACTURERS AND PRODUCT
The Inverter shall be an Emergency Central Lighting Inverter and shall be manufactured by:
PERFECT POWERS SYSTEMS
Los Angeles, CA
Phone: 1 (800)-786-6915, Fax: 1 (800) 246-2346
Power Service – 1 (800) 797-7782

4. SYSTEM DESCRIPTION

4.1. INVERTER DESIGN REQUIREMENTS

- **Output Load Capacity:** The continuous output power rating of the Inverter shall be
- [ ] kVA at 0.8 power factor.
- **Input Voltage:** [ ] VAC, 3 phase, 4 wires plus-ground
- **Output Voltage:** [ ] VAC, 3 phase, 4 wires plus-ground
- **Battery Autonomy:** The Inverter shall be capable of operating at full load for 90 minutes on battery power, at a temperature of 25 C.
- **Battery Type:** Valve regulated sealed lead-acid (VRLA) standard, other types are optional
- **Battery Protection:** Battery Breaker, for each string or cabinet for ease of battery operation and servicing
- **Cable Installation:** Conduit entries on the top and both sides of enclosure

4.2. AC INPUT SPECIFICATIONS

- **Input Voltages:** 208Y/120 VAC, 480Y/277 VAC, 4 wires plus ground
- **Frequency:** 60 Hz +/- 5%, or 50 Hz +/- 5%
- **Power Factor:** 0.8 PF
- **Slew Rate:** 1 Hz/second, maximum
- **Input Protection:** Circuit breaker, contactor
- **Input Surge Protection:** Optional Transient Voltage Surge Suppressor (TVSS)
- **Transfer Time:** Zero, no break transfer (unit static transfer must not switch upon input power loss)
- **Input Power Connections:** Hard wired terminal block
- **Number of Wires:** 4 wires plus ground
- **Cable Installation:** Conduit entries on the top and both sides of enclosure

4.3. AC OUTPUT SPECIFICATIONS

- **Output Ratings:** 10 kVA / 8 kW, 15 kVA / 12 kW, 20 kVA / 16 kW, 25 kVA / 20 kW, 30 kVA / 24 kW, 40 kVA / 32 kW, 50 kVA / 40 kW, 50 kW
- **Output Voltages:** 208Y/120 VAC, 480Y/277 VAC
- **Frequency:** 60 Hz +/- 0.5 Hz (when on inverter)
- **Voltage Regulation:** +5% Regulated within CBEMA curve
- **Output Waveform:** Sine Wave < 3% THD
- **Efficiency:** Greater than 90%
- **Inverter Overload Capability:** 125% for 10 minutes, 150% surge for 10 seconds
- **Bypass Overload Capability:** 150%
- **Protection:** Fault current limited
- **Non-Linear Load Capability:** 100%
- **Crest Factor:** 3:1 typical
- **Output Power Connections:** Hard wired terminal block
- **Output Distribution:** Unit shall have an option for internal output circuit breaker(s) or an external load center for 208Y/120V systems attached to the unit and stand alone for 408Y/277V for customer use.
- **Number of Wires:** 4 wires plus ground

4.4. COMPONENT DETAIL

4.4.1. INPUT TERMINAL BLOCK: For ease of installation, an input terminal block shall be hard wired, and located in the Inverter close to knockouts for incoming power cables. The conduit entries shall be located on the top and both sides of the cabinet.

4.4.2. INPUT CIRCUIT BREAKER: A circuit breaker shall be provided and hard wired at the Inverter input for protection from the utility line and associated wiring disturbances.

An optional, higher KAIC breaker shall be available, and should be specified when required.

4.4.3. **INPUT CONTACTOR:** The Inverter shall have a line contactor to isolate the rectifier in case of a line problem and allow for a smooth transfer/retransfer to and from bypass.

4.4.4. **INPUT TRANSFORMER:** An input transformer shall be factory installed inside the standard Inverter cabinet. It shall be in the lower part of the cabinet, with a barrier separating it from the electronics section, to provide isolation between the line and the rectifier/inverter circuit.

4.4.5. **RECTIFIER:** A solid state circuit design, converting incoming AC power to regulated DC bus voltage for the input to the inverter and battery charger.

4.4.6. **INVERTER HEAT SINK ASSEMBLY:** The inverter shall feature pulse-width modulation (PWM) design utilizing high frequency (15 kHz) switched IGBTs. It shall use a true double conversion system, generating rated AC output from the utility power or the batteries when in back up mode. The unit shall have a heat sink and power IGBT's assembly for reduced switching noise and maximum reliability. The assembly shall come as a FRU (**F**ield **R**eplaceable **U**nit) and its design and mounting location shall facilitate easy maintenance. It shall be located on the electronics shelf with direct access when the door is open and should be replaceable using only a screwdriver within 15 minutes.

4.4.7. **CHARGER:** A separate battery charger circuit shall be provided. It uses the same IGBT's as in the inverter and provides constant voltage and current limiting control. The battery float voltage is programmable for the applicable kVA and DC bus ratings. Full recharge of the batteries shall be in accordance with UL 924. The battery charger will be part of the Heat Sink Assembly FRU to increase the ease and safety of service. The Heat Sink Assembly FRU will also include the power circuit board, rectifier, inverter, IGBTs and driver subassemblies.

4.4.8. **STATIC BYPASS:** 100% rated, Continuous Duty

The bypass serves as an alternate source of power for the critical load when an input line failure or abnormal condition prevents operation in inverter mode. It consists of a fully rated, continuous duty static switch for high speed transfers and features two back-to-back SCRs to allow make before break transfer. The design shall include a manual bypass switch, protected within the locked cabinet. It shall be accessible only to authorized personnel, allowing the unit to stay in bypass at all times for safe work on the unit. Manual transfer to bypass shall not cause unit trip, nor transfer into battery backup mode. The static switch shall be able to be powered up by an optional separate power source such as a generator or other power supply for dual input capabilities.

4.4.9. Transfer to Bypass: **Will initiate automatically under the following conditions:**

- Critical DC bus voltage out of limits
- Low Battery
- Over temperature
- Inverter problem

4.4.10. **All Transfers to Bypass shall be inhibited for the following conditions:**

- Bypass voltage out of limits (+/- 10 % of nominal)
- Bypass frequency out of limits (+/- 3 Hz)

4.4.11. **CONTROL LOGIC:** The entire inverter operation shall be performed by microprocessor controlled logic. All operations, parameters, diagnostics, test and protection routines are firmware controlled. The firmware also compensates for component drift and changes in operating environment to ensure stable and consistent

performance. A self-test and diagnostics subroutine shall assist in troubleshooting the unit. The Control PCB shall be located on the front door to isolate it from power wiring and switching devices. This arrangement shall minimize EMI and allow hot board swaps, in the manual bypass mode.

4.4.12. **MANUAL MAINTENANCE BYPASS SWITCH:** An auto-manual MBS (**M**aintenance **B**ypass **S**witch**)** shall be provided in the Inverter cabinet for connecting power to the critical load through the external maintenance bypass line. It shall be used when the unit needs to be de-energized for maintenance, without disrupting power to the load. Operating the switch must be strictly restricted to authorized personnel who have cabinet access via the key. The MBS shall be operated in conjunction with the S-1 synchronization switch, ensuring full synchronization without inrush current during transfer.

4.4.13. **OUTPUT TRANSFORMER:** An isolation output transformer shall be utilized to provide specified output voltage and separate the inverter rectifier/inverter section from the load disturbances and conducted noise.

4.4.14. **MANUAL INVERTER TEST SWITCH:** The unit shall have a momentary test switch to allow the user a manual system test without the need to operate any breakers or shutting down the system. The test switch shall be in compliance with UL924 rules, well marked, accessible only after opening a locked front cabinet door and further protected from accidental activation. The **Power Ride** 3 shall resume normal operation after the test switch is release.

4.4.15. **BATTERY SUBSYSTEM:** Sealed, maintenance free VRLA (**V**alve-**R**egulated **L**ead–**A**cid battery) batteries shall be provided. The batteries shall have an expected life of 10 years. The batteries shall be contained in a separate battery cabinet with a dedicated circuit breaker for battery protection, convenient power cut-off, and servicing.

- Battery run time (based on 100% full load) shall be no less than the specified time.
- Runtime shall comply with UL924 providing a minimum of 90 minutes at full load.
- Specified extended runtimes shall be provided only as an option.

4.5. SYSTEM DIAGNOSTICS/ALARM

4.5.1. **FRONT PANEL LCD DISPLAY – STANDARD:** The backlit LCD shall have a four line by 20-character display for instant indication of the unit's status, metering, alarms and battery condition. The display provides easy read-out on two standard and two optional screens, providing continuous information with scrolling updates.

4.5.2. **STATUS DISPLAY**

4.5.2.1. **SYSTEM STAUS**

- Standby: System is performing self-diagnostic
- Start up: Inverter is being started
- Normal: All parameters are acceptable
- Problem: Loss of utility power over load
- Failure: System requires service

4.5.3. **System Rating in KVA**

4.5.4. **Battery Buss Voltage Status**

- Battery ok: Battery voltage is within an acceptable range
- Battery bad: Battery voltage is out of range

4.5.5. Input Voltage Status

- Input ok: Input voltage and frequency are within the acceptable range
- Input bad: Input voltage and/or frequency is within an acceptable range

4.5.6. Battery Charger Status

- Charger on: Battery charger is charging or keeping batteries at float voltage
- Charger off: Battery is being charged

4.5.7. System Internal DC Buss

- DC ok: DC buss is within the acceptable range
- DC bad: DC buss is out of the acceptable range

4.5.8. Static Bypass Status

- On inverter: Critical load is being powered and protected by the inverter
- On by pass: Critical load is being powered from utility power

4.5.9. Inverter Output Status

- Out ok: Output is within an acceptable range; critical load is being powered by the inverter
- Out bad: No output is available from the inverter and the critical load is being powered from utility power

4.5.10. METERING DISPLAY

- Output voltage
- Output power
- Input voltage
- Input current
- DC buss
- Battery voltage
- Battery current (+) Charging (-) Discharging

4.5.11. EVENTS AND DATA LOGGING – OPTIONAL

- UPS Events time and date stamp of up to 50 scrolling events with freeze function
- Aux. Output CB Trip – up to 20 circuit breakers; Trip alarm on 1st priority trip screen

4.5.12. SYSTEM UTILIZATION SCREEN – OPTIONAL

- Minutes on Battery: Accrued time for UPS in battery backup mode
- System Hours: Accrued time for UPS in normal operation
- Battery Event: The number of times the UPS operated in the backup mode
- Temp: The UPS cabinet temperature

4.5.13. **ALARM RELAYS – STANDARD:** Dry contact signal relays closing for each of the following alarm conditions: Input Fail, On Bypass, Low Battery and Summary Alarm.

4.5.14. **COMMUNICATION PORTS – STANDARD:** Three communication ports are available; two configured for RS232 protocol and one for RS485 data transfer. All parameters displayed on the front panel shall be available on these ports for remote monitoring.

4.5.15. **POWER FLOW MIMIC – OPTIONAL:** A laminated overlay with embedded color LEDs combines information on the front panel display with a graphic power flow visualization for instant load power status recognition.

4.6. OPERATING MODES

4.6.1. STANDBY MODE

After power is applied, the system is placed in STANDBY mode and a self-check ensues. During this period, the start subroutine checks for the input voltage and proper operation of the inverter and bypass SCRs. After the routine is completed and check confirmed OK, the system goes into the NORMAL mode.

4.6.2. NORMAL MODE

The input contactor K1 receives a closing signal and connects the input power to the DC supply transformer. The DC rectifier supplies the battery charger, Control Board and the DC/AC inverter circuits. The battery charger is then activated allowing the batteries to be continuously charged. The on-line DC/AC inverter converts the DC voltage to a **P**ulse-**W**idth-**M**odulation) waveform. This waveform is filtered and reconstructed back to clean AC output power for critical loads regardless of whether the unit is powered by the utility or battery backup.

4.6.3. RESPONSE TO INPUT POWER ABNORMAL CONDITION

If the system controller senses a change in input frequency of more than +3 Hz or an out of range input voltage, it will consider it an input failure and will immediately open the input contactor, isolating the UPS from the facility. At the same time, the charger is turned off and the battery bank becomes a DC supply source to the inverter circuit, maintaining an uninterrupted AC supply to the protected load without switching static bypass to prevent any glitches or risking the load. The LCD screen will display an alarm message. When the facility power returns and is in phase with inverter, the system controller closes the input contactor and the system returns to NORMAL automatically.

4.7. BATTERY and BATTERY CHARGER SPECIFICATIONS

- **Standard Run Time:** 90 minutes at full load
- **Extended Run Time:** As required (optional)
- **Battery Type:** Sealed, Maintenance free, lead-acid, VRLA (standard); other types are optional
- **Expected Life:** 10 years
- **Charger Ampacity:** Per UL 924
- **Float Voltage:** 2.25 volts per cell
- **Protection:** Circuit breaker in each battery cabinet
- **Wiring:** Factory shall provide battery interconnecting cables. Power cables from the Inverter to the battery cabinet shall be provided by the customer based on local code.
- **Nominal DC Link Voltage:** kVA/kW dependent.
- **Battery Cabinets:** Matching battery cabinets, UL 924 listed, NEMA 1, consult factory for other types. The specific Inverter and battery cabinet shall be a CSA listed system per UL924, with a minimum of 90 minutes of battery operation under full load conditions.

4.8. GLOBAL MONITORING SYSTEM (GMS)

All GMS items are optional. The GMS shall allow for flexibility in remote communications, metering, measurements, data logging, and system status including internet access.

4.8.1. LOCAL ON INVERTER DISPLAY

- **Event Log:** A monitoring circuit acquires system data and displays up to 50 of the most recent date and time stamped events on the front panel display. Its key selectable menu provides access to events, system information, display, and delete functions.
- **Auxiliary Circuit Breaker Trip Monitor with Event Log:** In addition to the event log and system data, this option registers trips of up to 20 auxiliary output circuit breakers for monitoring of dedicated circuits. Trip signals from the breakers are displayed on a CB trip screen. Trip modules mount easily on a DIN rail with auxiliary circuit breakers**.**
- **DEDICATED PC MONITORING - VIA RS232 OR RS485 PORT:** This option requires a PC (customer supplied) and monitoring software on a Windows platform. When the Power Ride 3 is connected to the PC using an RS232 cable, the maximum cable length should be 25 to 150 feet. By using an RS485 cable, the range can be increased to about 1000 feet.
- **WEB/SNMP CARD:** This option is a web enabled monitoring device for a unit with an Internet or network connection. The internal IP Internet address can be pre-installed in firmware to match the customer's network settings. The SNMP/Web card can monitor the inverter on the network through a standard web browser.

4.9. ACCESSORIES/OPTIONS

4.9.1. EXTERNAL MAINTENANCE BYPASS SWITCH: If specified by the customer, the bypass switch, enclosed in a box, could be field mounted on the outside of the inverter cabinet or an adjacent wall. This box includes a rotary switch with make before break contacts to provide a single control for transferring to and from maintenance bypass with no load support interruption.

4.9.2. AUDIO ALARM WITH SILENCE SWITCH: Provides an audible warning signal, acknowledge and reset for Input Fail, On Bypass, Inverter On, Low Battery and Summary Alarm for any of the foregoing alarm conditions.

4.9.3. REMOTE UNIT STATUS DISPLAY: The Remote Unit Status Display is available in a console mount style box. It can also be wall mounted and comes with a 10-foot long "DB" connector signal cable or optional cable that can be up to 1000 feet long. The Remote Status Panel Display may require 120 VAC power, comes with 6 ft power cord, Silence, LED /Horn test switches. It includes following LEDs: Input Fail, On Bypass, Low Battery, Summary Alarm.

4.9.4. FORM "C" N/O (NORMALLY/OPEN) CONTACTS FOR ALARMS: Terminal strip TB is provided with the optional alarm relay board for user connection to the individual alarm contacts. The Remote Contact Board includes isolated Form C contacts for the same signals as on the Remote Unit Status Panel.

4.9.5. INPUT TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS): TVSS is a DIN rail mounted device, connected to the Inverter input. Its plug-in phase modules are easily replaceable. The device contains energy absorbing components and has two-stage protection. When a protection component is damaged by an absorbed transient, the module will display a flag indicating a need for replacement. At this time the device is still operational, due to redundant circuits. After the second spike, the device shows an alarm condition indicating need for replacement. An additional remote indication contact "TS" is available to allow remote monitoring of the protection status.

4.9.6. External Status Indicator: The N/O dry contacts are compatible with the IBM AS400 standard from a terminal block and allow the customer to monitor the Low Battery, On Bypass, Summary, and Input Fail alarms.

4.9.7. **NORMALLY ON OR NORMALLY OFF OUTPUT AUXILIARY CIRCUIT BREAKERS:** These single/ 3 pole circuit breakers switch and protect the critical load distribution.

4.9.8. **High KAIC Norm On/Off Output Circuit Breaker:** The 3 pole circuit breakers feature a higher KAIC rating then our standard circuit breakers**.**

4.9.9. **EXTERNAL OUTPUT AUXILIARY CIRCUIT BREAKERS IN PANEL BOARD:** Up to 42 single pole circuit breakers can be located on an external panel board that can be mounted on a side wall of the cabinet (for 208V only) or on a wall that is adjacent to the cabinet.

4.9.10. **10% INPUT CURRENT HARMONIC FILTER**

4.9.11. **5% INPUT CURRENT HARMONIC FILTER**

4.9.12. **EMI FILTER: Complies with:** EN55022, 1998 Class "B" Radiated Emission EN55022, 1998 Class "B" conducted emission. FCC Part 15 Class "B" radiated emission; FCC Part 15 Class "B" conducted emission.

4.9.13. **DUAL INPUT POWER SOURCE**

- WYE/WYE
- DELTA/WYE
- DELTA/DELTA

4.9.14. **OUTPUT TRANSFORMER WITH HARMONIC TOLERANCE (up to K-50)**

4.9.15. **SEISMIC MOUNTING BRACKETS: Left / Right seismic floor mounting brackets**

4.9.16. **STACKABLE RACK: Floor space saving solution (1 rack per 2 cabinets)**

4.9.17. **BATTERY MONITORING SYSTEM:** Single jar, string and entire system monitoring on local, remote or web enabled PC. Assessment of actual remaining charge and jars deterioration for maximum battery life and total backup safety.

4.9.18. **EMERGENCY CIRCUIT CONVERTER (ECC):** Wall mountable plate with manual test switch

4.9.19. **EMERGENCY CONTROL MODULE (ECM):** Modular to be installed inside (light fixture or wall).

4.9.20. **Battery Cabinet exhaust fan only (optional)**

4.9.21. **Battery Cabinet exhaust fan with local alarm, indicator and dry contact for remote monitoring (optional).**

4.9.22. **Battery Thermal Runaway Control and dry contact for remote monitoring (optional):**
Provides protection in case of over temperature condition in each battery cabinet (s) by shutting off the charger**, it allows remote monitoring of the condition** and will resume charging when temperature has return to normal.

4.10. MECHANICAL DESIGN AND CONSTRUCTION

4.10.1. **Enclosure:** All system components shall be housed in a single floor mounted small footprint (46" x 18") freestanding NEMA 1 enclosure. The cabinet should have front access only with two doors and a depth of no more than 18 inchs, allowing easy component reach from the front. The enclosure shall have shelves for component separation and clear and accessible layout. Cabinet doors shall require a key for gaining access. Front access only shall be required for safety and expedient servicing, adjustments and installation. The cabinets shall be structurally adequate and have provisions for hoisting, jacking and forklift handling. Enclosure design shall fully comply with UL 1778 for locked door, unauthorized access protection and UL 924 for accidental or unauthorized unit shutdown.

4.10.2. **CONSTRUCTION:** Only quality, unused material shall be used to build the unit under strict observance of standards and quality workmanship. The cabinets shall be cleaned, primed and painted matt black. The unit shall be constructed with rigorously tested, burned-in, replaceable subassemblies. Only two electronic subassemblies: Heat Sink Assembly with IGBTs and drivers and Control PCBA shall be used for maximum reliability and simple servicing. All printed circuit assemblies shall have plug connections. Like assemblies and like components shall be interchangeable**.**

4.10.3. **EARTHQUAKE PROTECTION**: The cabinet (Battery and Inverter) shall be evaluated and shake table tested and certified to IBC2015, CBC2016, (SDS level 3.0g). It must bear OSHPD (California Office of Statewide Health Planning and Development) Certification.

4.11. INSTALLATION CONSIDERATIONS

4.11.1. **WIRING INSTALLATION:** The inverter cabinet conduit entry arrangement shall allow for flexibility of user wiring installation. The wiring shall be routed thru the top or either side of the cabinet**.**

4.11.2. **WIRING TERMINATION:** The Inverter input and output power connections shall be hard wired within the cabinet. Optional input line cable and output distribution panel shall be available (limited range of units only, please consult factory for details). Input and output terminal blocks shall be provided for easy field wiring of Inverter and battery cabinets.

4.11.3. **FACTORY STARTUP:** Provides a factory service representative to perform the initial startup of the Central Lighting Inverter System.

4.11.4. **DRAWINGS AND MANUALS:**

Drawings and manuals supplied with Each unit shall include:

- Complete set(s) of drawings showing physical dimensions, mounting information and wiring diagrams.
- Installation Manual(s) with complete instructions for locating, mounting, interconnection and wiring of the system.
- User Manual(s) outlining complete operating and preventive maintenance procedures.

4.11.5. **INSTALLATION:** The Central Lighting Inverter shall be installed in accordance with all appropriate manufacturers' installation instructions and in compliance with all appropriate codes.

4.11.6. **ENVIRONMENTAL REQUIREMENTS:**

4.11.6.1. **Temperature:**

- Operating - 0°C to 40°C (32°F to 104°F)
- Storage - 20°C to +60°C (- 4°F to 140°F)
- The maximum recommended storage temperature for batteries is 77°F (25°C) for up to six months. Storage at up to 104°F (40°C) is acceptable for a maximum of three months.

4.11.7. **Humidity:** Operating and storage humidity must be maintained within 0 to 95% relative humidity; non-condensing.

4.11.8. **Altitude:** Up to 10,000 feet (3,048 meters)

4.11.9. **Audible Noise:** 57 dB typical on "response curve A".

4.11.10. **Physical Specifications:**

- Cabinet shall be double door, floor mountable, fork liftable, black painted with max 18" depth to maximize front accessibility.
- Cabinet shall be no more than 46" (including anchoring brackets) wide for best layout (book shelf style).
- Cabinet height shall not exceed 80 inches to allow pass through standard door.

kVA/kW	Input – Output Voltage	kVA Model Number	DC Volts	BTU/ Hr	Inverter	
					Weights (lbs)	Cabinet Dim: W" X H" X D"
10/8	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD010B05LHT3-VA SV-PD010H09LHT3-VA SV-PD010H05LHT3-VA SV-PD010B09LHT3-VA	192	3032	1083	**46 x 68 x 18**
15/12	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD015B05LHT3-VA SV-PD015H09LHT3-VA SV-PD015H05LHT3-VA SV-PD015B09LHT3-VA	192	4549	1446	
20/16	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD020B05LHT3-VA SV-PD020H09LHT3-VA SV-PD020H05LHT3-VA SV-PD020B09LHT3-VA	192	6066	1679	
25/20	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD025B05LHT3-VA SV-PD025H09LHT3-VA SV-PD025H05LHT3-VA SV-PD025B09LHT3-VA	288	7582	1679	
30/24	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD030B05LHT3-VA SV-PD030H09LHT3-VA SV-PD030H05LHT3-VA SV-PD030B09LHT3-VA	288	9098	1719	
40/32	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD040B05LHT3-VA SV-PD040H09LHT3-VA SV-PD040H05LHT3-VA SV-PD040B09LHT3-VA	312	12131	2066	
50/40	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD050B05LHT3-VA SV-PD050H09LHT3-VA SV-PD050H05LHT3-VA SV-PD050B09LHT3-VA	552	15164	2463	
50kw	208Y/120 - 208Y/120 480Y/277 - 480Y/277 480Y/277 - 208Y/120 208Y/120 - 480Y/277	SV-PD050B05LHT3-KW SV-PD050H09LHT3-KW SV-PD050H05LHT3-KW SV-PD050B05LHT3-KW	552	18000	2565	

4.12. Maintenance, Service, and Enhanced Warranty Plans:

4.12.1. **SERVICE PERSONNEL**: The Inverter manufacturer shall employ a nationwide service organization, with factory-trained Customer Service Engineers dedicated to the start-up, maintenance, and repair of Inverter and power equipment. The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24hrs/day, 7days/week and 365 days/year. For emergency service calls, response time from a local Customer Engineer shall be approximately 15 minutes.

4.12.2. **REPLACEMENT PARTS:** Parts shall be available through an extensive network to ensure around- the-clock parts availability throughout the country. Customer Support Parts Coordinators shall be on-call 24hrs/day, 7days/week, 365 days a year for immediate parts dispatch. Parts shall be delivered to the site within 24 hours.

4.12.3. **MAINTENANCE TRAINING:** In addition to the basic operator training conducted as a part of the system start-up, classroom courses for customer employees shall be made available by the manufacturer. The course shall cover Inverter theory, location of subassemblies, safety, battery considerations and inverter operational procedures. It shall include AC/DC and DC/AC conversion techniques as well as control and metering, Troubleshooting and fault isolation using alarm information and internal self-diagnostics interpretation shall be stressed.

4.12.4. **MAINTENANCE CONTRACTS:** A comprehensive offering of preventive and full service maintenance contracts shall be available. An extended warranty and preventive maintenance package shall be available. All services shall be performed by factory trained Service Engineers.

4.12.5. **SITE TESTING:** The manufacturer's field service personnel shall provide site testing if requested. The testing shall consist of a complete test of the Inverter system and the associated accessories supplied by the manufacturer. A partial battery discharge test shall be provided as part of the standard start-up procedure. The test results shall be documented, signed, and dated for future reference.

NOTE: This Guide Specification follows Construction Specification Institute guidelines per CSI MP-2-1,MP-2-2. It is subject to change due to product improvement and/or enhancement.

Please use this document as a guide specification, and do not hesitate to contact our application engineering department, should you have any further questions or special requirements.

You can contact us at: (800) 786-6915 or via e-mail: sales@perfectpowersystems.com

4.12.6. WARRANTY

4.12.6.1. **Inverter Module:** The Inverter manufacturer shall warrant the Inverter against defects in materials and workmanship for a period of twenty-four (24) months. The warranty shall cover all parts and labor for one (1) year period beginning from the start up, or 18 months from the ship date, whichever comes first. Optional 1 year extended warranty and maintenance contract packages shall also be available at the end of the factory maintenance period.

4.12.6.2. **Battery:** Battery manufacturer's standard warranty shall be transferred and assigned to the end user. It will have a minimum period of ten year.