TECHNICAL GUIDE PECIFICATIONS

OSHPD CERTIFIED SEISMIC SERIES OSP-0501-10

Power Ride 1, Single Phase,
3kW to 17 kW UL924 Central Lighting Inverter

1. SCOPE

This guide provides technical information and specifications for Perfect Power's Power Ride 1 central lighting inverter system.

The Power Wave 1 features high reliability solid-state double conversion digital signal processing and a high frequency pulse-width modulated (PWM) system that harnesses the advantages of IGBTs (**I**nsulated-**G**ate **B**ipolar **T**ransistor) in its design. The Power Wave 1 will provide high quality regulated and conditioned AC power to all types of lighting loads all of the time. It switches to battery power with virtually zero transfer time upon an input power loss or disruption.

The Wave Rider 1 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).

The Power Wave 1 meets UL 924 requirements for emergency lighting system applications and provides the security of 90-minutes of battery backup power. It is 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 Power Wave 1 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 Power Wave 1 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 spaces**.**

2. STANDARDS

The Power Ride 1 complies with the following standards:

- Seismic certified to IBC2015, CBC2016, (SDS level 3.0g)
- OSHPD (California **O**ffice of Statewide **H**ealth **P**lanning and **D**evelopment) 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 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

3.1. OPERATION

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 $\pm$ 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.

To reduce operating cost while it is charging the battery system during normal utility power operation, the design must provide power factor correction close to unity (1.0 pf).

The system shall include the following additional features;

- An automatic, multi-rate, software controlled charger
- Self diagnostic, programmable system testing capabilities
- A microprocessor controlled diagnostic display panel capable of audible alarms
- Visual displays of all alarm
- A DC to AC converter (inverter)
- A battery charger that meets the UL 924 standard
- AC and DC input protection
- A battery bank sized for the system's runtime requirements
- Full KW rating at unity power factor
- An RS232 communication interface

3.2. APPROVED MANUFACTURERS AND PRODUCT

The Inverter shall be an Emergency Central Lighting Inverter and shall be manufactured by:
PERFECT POWERS SYSTEMS
14000 S Broadway, Los Angeles, CA 900610.
Phone: 1 (800)-786-6915, Fax: 1 (800) 246-2346
Power Service – 1 (800) 797-7782

3.3. QUALIFICATIONS AND QUALITY ASSURANCE

3.3.1. Manufacturer's Certification: A minimum of twenty years experience in the design, manufacture and testing of solid-state UPS is required. The manufacturer shall specialize in manufacturing of online, double conversion, high frequency, UPS modules as specified in this document. The manufacturer shall hold a current ISO 9001 certificate shall design the units in accordance with internationally accepted standards.

3.3.2. Materials and Assemblies: All materials and parts in the UPS shall be new, of current manufacture and unused, except for the purpose of factory testing. All active electronic components shall be solid state and designed so as not to exceed the manufacturer's recommended ratings and tolerances for ensuring maximum reliability. All IGBTs and other semiconductor devices shall be sealed. All relays shall have dust covers. All incoming parts, modular assemblies and sheet metal shall undergo detailed receiving quality inspection.

3.3.3. Factory Testing: Every unit shipped will have completed a documented functional test of the UPS module and battery system, including a battery discharge test. A copy of the test report shall be available at the customer's request.

4. SYSTEM DESCRIPTION

4.1. Inverter Design Requirements

- **Output Load Capacity –** The continuous output power rating of the UPS shall be [ ] Kw unit @ 1.0 pf.
- **Output Power Upgrade** – The unit shall be designed to have a min 20% of the rated power capacity upgradeability without having to change the unit option specified when ordering.
- **Input Voltage – [ ]** VAC, – 15% / + 10%
- **Output Voltage – [ ]** VAC**,** 1 phase, 2 wires plus-ground
- **Battery Autonomy –** The UPS shall be capable of operating at full load for a minimum of 90-minutes on battery power at a temperature of 25° C.
- **Efficiency –** Greater than 90%
- **Battery Type –** Valve regulated sealed lead-acid (VRLA) standard; other types of batteries are optionally available.
- **Battery Protection –** Battery CB (Circuit Breaker), for safe UPS battery operation and servicing
- **Cable Installation –** Conduit entries on the top and both sides of enclosure

4.2. AC INPUT SPECIFICATIONS

- **Input Voltages –** 120 / 208 / 240 / 277 VAC, 2 wires plus ground
- **Frequency –** 60 Hz +/- 5%
- **Input Current –** Sinusoidal, close to unity capacitance under all line/load conditions (power factor correction)
- **Input Protection –** Contactor and optional input circuit breaker
- **Input Surge Protection** – TVSS (Transient Voltage Surge Suppressor)
- **Transfer Time –** Zero no break transfer (unit static transfer must not switch upon input power loss)

- **Slew Rate –** 0.4 Hz/second, maximum
- **Input Power Connections –** Hard wired terminal block or optional input cable
- **Number of Wires –** Two (2) wires plus ground
- **Cable Installation –** Conduit entries on the top and both sides of enclosure

4.3. AC OUTPUT SPECIFICATION

- **Output Ratings** 3, 5, 6, 8, 10, 12, 15, 17 kW
- **Output Voltages –** 120 / 208 / 240 / 277 / 480 VAC
- **Frequency –** 60 Hz +/- 0.5 Hz
- **Voltage Regulation –** +/- 3% No load to full load, high line to low line (typical)
- **Output Waveform –** Sinusoidal
- **Voltage Distortion –** < 5% THD; < 3% Single Harmonic
- **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 –** 1 to 2
- **Output Power Connections –** Hard wired terminal block or optional output receptacle panel board with NEMA type receptacles and over current protection (max 30 CBs)
- **Output Distribution –** The unit shall have an internal or external load center for customer use to eliminate the need for optional distribution
- **Number of Wires –** Two (2) 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 UPS 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 (optional):

A circuit breaker shall be provided and hard wired at the UPS input for protection from the utility line and associated wiring disturbances. Optionally, a higher KAIC breaker shall be available and should be specified when required.

4.4.3. Input Contactor:

The UPS shall have a line contactor to isolate the rectifier in case of a line problem and allow for a smooth transfer or retransfer to and from bypass.

4.4.4. Input Transformer:

An input transformer shall be factory installed inside the standard UPS cabinet. It shall be located in the lower part of the cabinet with a barrier separating it from the electronics section to provide isolation between the line, rectifier and inverter circuits.

4.4.5. Rectifier:

A solid state circuit designed to convert incoming AC power to regulated DC bus voltage shall provide input to the inverter and battery charger.

4.4.6. Inverter:

The inverter shall feature PWM (**P**ulse-**W**idth **M**odulation) design utilizing high frequency (15 kHz) switched IGBTs. It shall utilize a true double conversion system, generating rated AC output from the utility power or the batteries when in backup mode. The unit shall have a single heat sink and power IGBT assembly tray 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 provide for easy accessibility and maintenance. It shall be located on the electronics shelf to allow direct access when the door is opened and can be replaced in about 15 minutes using only a screwdriver.

4.4.7. Charger:

A separate battery charger circuit shall be provided. It shall use the same IGBTs as the inverter and have constant voltage and current limiting control. The battery float voltage will be microprocessor programmable for the applicable kW and DC bus ratings. The charging current limit shall be temperature compensated for battery protection. Battery recharge design shall be in full compliance with UL 924. To increased ease and

safety of service, a modularly designed Heat Sink Subassembly FRU shall combine the rectifier, inverter, charger, IGBTs and drivers into a single unit.

4.4.8. Static Bypass: A continuous duty, 100% rated 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 will consist of a fully rated, continuous duty static switch for high-speed transfers and feature two back-to-back SCRs to allow make before break transfer. The design shall include a manual bypass switch that is protected within the locked cabinet. It shall be accessible only to authorized personnel, allowing the unit to remain continually in bypass to allow a technician to safely work on the unit. Manual transfer to bypass shall not cause unit trip or transfer to the battery backup mode. To allow redundant input capabilities, the static switch shall be able to safely route power from an optional power source such as a generator or other power supply.

4.4.8.1. **Transfer to Bypass** will initiate automatically under the following conditions:

- Critical bus voltage out of limits
- Total battery discharge (for specified backup time without damaging batteries)
- Over temperature period expired
- UPS problem

4.4.8.2. **Automatic Re-transfer** occurs whenever the inverter is capable of handling the critical load. It shall be inhibited for the following conditions:

- When transfer to bypass is activated manually or remotely
- When there is a UPS problem

4.4.8.3. All Transfers to bypass shall be inhibited under the following conditions:

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

4.4.9. Control Logic: UPS operation shall be regulated by the microprocessor controlled logic. All operations, parameters, diagnostics, test and protection routines will be firmware controlled, compensating component drift and changes in operating environment to ensure stable and consistent performance. A self-test and diagnostic subroutine shall assist in troubleshooting the unit. The Control PCBA shall be located on the front door and be isolated from power wiring and switching devices. This arrangement shall minimize EMI and allow hot board swap in the manual bypass mode.

4.4.10. Manual Maintenance Bypass Switch (Optional): An auto/manual MBS switch may be provided in the UPS 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 shall be strictly restricted to authorized personnel using a cabinet access key. The MBS shall have an auxiliary position that ensures full synchronization and prevents inrush current during transfer.

4.4.11. Output Transformer: An output isolation transformer shall be utilized to provide specified output voltage and separate the UPS rectifier and inverter sections from load disturbances and conducted noise

4.4.12. Manual Inverter Test Switch: The unit shall have a momentary contact test switch to allow the user to accomplish a manual system test without the need to operate any breakers or shut down the system. The test switch shall be in compliance with UL924 specifications, well marked, accessible only after opening a locked front cabinet door and further protected from accidental activation. The Power Ride 1 shall resume normal operation after the test switch is released.

4.4.13. Battery Subsystem: Sealed, maintenance-free VRLA (**V**alve-**R**egulated **L**ead–**A**cid) batteries shall be provided. The batteries shall have an expected life of 10 years or a minimum of 250 complete discharge cycles. The batteries shall be contained in a separate battery cabinet with a dedicated circuit breaker (no fuses) for battery protection and convenient power cut-off, and servicing. The 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 AND ALARMS

4.5.1. Front Panel LCD Display: A standard 4 line x 20 character back lit, blue front panel LCD display shall be used for instant indication of UPS status, metering, alarms and battery condition. The display will provide easy readout on two standard and two optional screens and provide continuous information with scrolling updates.

4.5.2. Status Display

4.5.2.1. System Status

- **Standby –** System is performing a self diagnostic
- **Start-up –** Inverter is starting
- **Normal –** All parameters are acceptable
- **Problem –** Loss of utility power or overload
- **Failure –** System requires service

4.5.2.2. System Rating in Kw,

- See tables on page 15 of 15

4.5.2.3. Battery Buss Voltage Status

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

4.5.2.4. Input Voltage Status

- **Input OK –** Input voltage and frequency are within an acceptable range
- **Input bad –** Input voltage and/or frequency is outside the acceptable range

4.5.2.5. Battery Charger Status

- **Charger on –** Battery charger is charging or maintaining the battery at float voltage
- **Charger off –** Battery is not being charged

4.5.2.6. System Internal DC Buss

- **DC OK –** DC buss is within the acceptable range
- **DC bad –** DC buss is out of the acceptable range

4.5.2.7. 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

4.5.2.8. Inverter Output Status

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

4.5.3.Metering Display

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

4.5.4.Events and Alarms screen – Optional

- UPS Events Time/Date stamp up to 50 scrolling events with freeze function
- Auxiliary Output CB Trip – up to 20 circuit breakers trip alarm on first priority trip screens

4.5.5.System Information Screen – Optional

- Minutes on Battery – Shows UPS battery backup mode accrued time
- System Hours – UPS in operation; total accrued time
- Battery Event – The number of times the UPS operated in backup mode
- Temp – The UPS cabinet temperature

4.5.6.Alarm Relays: Standard dry contact signal relays close for each of the **f**ollowing alarm conditions: Input Fail, On Bypass, Inverter ON, Low Battery, Summary Alarm

4.5.7.Communication Ports: The standard configuration will include two com ports configured for RS232 and one for RS485 data transfer. All parameters displayed on the front panel shall be available on these ports for remote monitoring.

4.5.8.Power Flow Mimic: An optional laminated overlay with embedded color LEDs combine information on the front panel display with a graphic power flow visualization for instant load power status recognition.

4.6. MODES OF OPERATION:

The UPS module shall be designed to operate as an on line, high frequency (minimum 10 kHz), high precision PWM conversion, fully automatic system with "no break" transfer time in the following modes:

4.6.1. Normal: During normal operation, utility (or generator) power is rectified to DC, drawing sinusoidal input AC current at unity power factor under all load conditions. The DC Rectifier supplies DC power to the Inverter and Battery Charger sections. Using high frequency PWM (minimum10 kHz) power technology, the inverter shall continuously support the load without using energy stored in the battery.

4.6.2. Emergency: Upon loss of input power or when power exceeds the specified input limits, the control logic shall allow the inverter to draw energy from the battery without interruption to the load and disconnect the input line. The transfer to the battery shall be uninterrupted; a "no break" power transfer. The inverter shall supply power from the batteries to the critical load. The output voltage shall be sinusoidal and within the specified limits of 5% regulation. If power is not restored before the batteries have been exhausted, the UPS shall completely shutdown to protect the batteries from possible damage.

4.6.3. Recharge: When utility power is restored and before the batteries are completely exhausted, the UPS shall automatically return to normal operation. This retransfer to normal operation shall be uninterrupted. The battery charger shall automatically recharge the batteries to full capacity. Recharge characteristics must strictly comply with UL924 requirements.

4.6.4. Bypass: In the event of a component malfunction in either the Rectifier/Charger or the Inverter sections, the unit's static bypass switch shall transfer the load to the utility without interruption of power. Activation of the bypass mode shall cause an alarm indication and initiate output relay dry contact closure (for customer use).

4.6.5. Off-Battery: When the battery is removed for maintenance or the battery breaker is off, the unit will continue to function, meeting all the specified performance parameters with the exception of the power backup time capability.

4.7. BATTERY SPECIFICATIONS

- **Standard Run Time –** 90 minutes at full load
- **Extended Run Time –** As required
- **Battery Type –** Sealed, maintenance-free, lead-acid, VRLA (Standard); other types are of batteries are optionally available
- **Expected Life –** 10 years
- **Charger Ampacity –** Per UL 924
- **Float Voltage –** 2.25 V per cell
- **Protection –** circuit breaker in each battery cabinet
- **Wiring:** Power cables from the UPS to the battery cabinet shall be provided by the customer in accordance with local code. With multiple battery cabinets, interconnecting cables shall be provided**.**
- **Nominal DC Link Voltage:** kW, (dependent on the number of batteries). See chart on the last pages.
- **Battery Cabinets:** Matching battery cabinets, UL 924 listed**,** NEMA 1, consult factory for other types. The specific UPS and batter cabinet shall be a CSA listed system per UL924, with a minimum of 90 minutes of battery operation under full load conditions.

4.8. SYSTEM DIAGNOSTICS/ALARM

4.8.1. Front Panel LCD Display: Standard, 4 lines x 20 characters back lit, blue LCD display on the UPS for instant indication of UPS status, metering, alarms and battery condition. The display provides easy read-out on 2 standard and 2 optional screens, providing continuous information with scrolling update**.**

4.8.2. Status Display

4.8.2.1. System Status

- **Standby:** System is performing self-diagnostic
- **Start up:** Inverter is being started
- **Normal:** All parameter are acceptable
- **Problem:** Loss of utility power or overload
- **Failure:** System requires service

4.8.2.2. System Rating in Kw

4.8.2.3. Battery Buss Voltage Status

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

4.8.2.4. Input Voltage Status

- **Battery C Input ok:** Input voltage and frequency are within acceptable range

- **Input bad:** Input voltage and/ or frequency is within acceptable range

4.8.2.5. Charger Status

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

4.8.2.6. System Internal DC Buss

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

4.8.2.7. Static By-Pass Status

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

4.8.2.8. Inverter Output Status

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

4.8.3. Metering Display

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

4.8.4. Events and Alarms screen (Optional)

- Events Time/Date stamp up to 50 scrolling events with freeze function
- Aux. Output CB Trip – up to 20 circuit breakers trip alarm on first priority trip screen.

4.8.5. UPS System Information Screen - Optional

- Minutes on Battery: UPS in battery backup mode, accrued time
- System Hours: UPS in operation, accrued time
- Battery Event: number of times UPS operated in backup mode
- Temp: UPS cabinet temperature

4.8.6. Alarm Relays (Standard): Dry contact signal relays close for each of the **f**ollowing alarm conditions: Input Fail, On Bypass, Inverter ON, Low Battery and Summary Alarm.

4.8.7. Communication Ports (Standard): Two com ports are available; one configured for RS232 and one for RS485 data transfer. All parameters displayed on the front panel shall be available on these ports for remote monitoring.

4.8.8. Power Flow Mimic (Optional): A laminated overlay with embedded color LED's combines information on the front panel display with a graphic power flow visualization for instant load power status recognition.

4.9. ACCESSORIES (OPTIONAL COMPONENTS)

4.9.1. **External Manual Bypass Switch:** If specified by the customer, the bypass switch can be mounted in a separate enclosure and field mounted in the UPS cabinet or on 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 without load support interruption.

4.9.2. **Audio Alarm with Silence Switch**: This option provides an audible warning signal acknowledge and reset for Input Fail, On Bypass, Inverter On, Low Battery and Summary Alarm for any of the previously mentioned alarm conditions.

4.9.3. **Remote UPS Status Panel:** The Remote Status Panel is available in a console mount style box in a black finish. 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 requires 120 VAC power, comes with a 6-foot power cord and Silence and LED /Horn test switches. It includes the following LEDs: Input Fail, On Bypass, Inverter On, Low Battery and Summary Alarm.

4.9.4. **Form "C" Relay Contacts:** Terminal strip TB is provided on the optional Alarm Relay Board for user connection to the individual alarm contacts. The Remote Contact Board includes isolated Form C contacts for Input Fail, On Bypass, Inverter On, Low Battery and Summary Alarm.

4.9.5. **External Status Indicator** (for customer use): N/O volt-free contacts compatible with IBM AS400 standard shall be provided on a plug-in standard connector for the following signals: Low Battery, On Bypass, Summary Alarm and Input Fail.

4.9.6. **Normally On/Normally Off Output Auxiliary Circuit Breakers:** These circuit breakers are single pole, 20 Amp devices for protection of the customer's load circuits.

4.9.7. **External Auxiliary Output Circuit Breaker Panel Board**: This option provides up to 42 single-pole, 20 Amp output circuit breakers, which are located on an external panel board mounted on the side of the UPS cabinet.

4.9.8. **EMI Filter**: The EMI filter complies with the following standards:

- **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**

4.9.9. **Higher KAIC Norm On/Off Output Circuit Breaker**: The single-pole, 20 A circuit breaker with higher KAIC can be mounted on a DIN rail or installed in a molded case.

4.9.10. **Seismic Mounting Brackets**: Left and right seismic floor mounting brackets are available.

4.9.11. **Stackable Rack**: This floor space saving accessory allows stacking of two racks in a single cabinet.

4.9.12. **Battery Monitoring System:** This accessory provides single jar, string and entire system monitoring on a local, remote or web enabled PC. It provides for assessment of actual remaining charge and jars deterioration for maximum battery life and total backup safety.

4.9.13. **Global Monitoring System (GMS)**: All GMS items are optional. The GMS allows for flexibility in local and remote communications including internet access.

4.9.13.1. Local On UPS Display

- **Event Log:** Monitors the microprocessor circuit by acquiring system data. It displays up to fifty of the most recent date and time stamped events on the front panel display. It's key selectable menu provides access to events, system information, display, freeze 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 circuit breaker trip screen. Auxiliary circuit breakers with trip modules mount easily on a DIN rail.

4.9.13.2. Local On PC - Via RS232 or RS485 Port: This option requires a PC and LabView monitoring software on a Windows platform. Data sent to the PC are displayed as a control room panel for real-time monitoring. The distance from the PC for RS232 cable should be limited to between 25 and 150 feet. By using the RS485 port, the range can be extended to 1000 feet.

4.9.13.3. Web/SNMP Card: The optional Web/SNMP Card is a web enabled monitoring device for units with Internet or network connections. The internal IP internet address can be pre-installed in firmware to fit the customer's network settings. The Web/SNMP Card can monitor the UPS over a network using a standard web browser. Network management system software with an alarm viewer utility provides monitoring of multiple units on a single console.

4.9.14. Battery Thermal Runaway Control (optional): Provides protection in case of over temperature condition in battery compartment by shutting off the charger and will resume charging when temperature has return to normal.

4.10. Maintenance, Service and Enhanced Warranty Plans:

4.10.1. Service Personnel: The UPS manufacturer shall employ a nationwide service organization, with factory trained Customer Service Engineers dedicated to the startup, maintenance and repair of UPS and power equipment. The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel scheduling. One toll free number shall reach a qualified support person 24-hours a day, 7-days a week and 365-days a year. For emergency service calls, response time from a local Customer Engineer shall be approximately 15-minutes.

4.10.2. 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 24-hours a day, 7-days a week and 365-days a year for immediate parts dispatch. Parts shall be delivered to the site within 24-hours.

4.10.3. Maintenance Training: In addition to the basic operator training conducted as a part of the system start-up, classroom courses for customer's employees shall be made available by the manufacturer. The course shall cover UPS safety, theory of operation, location of subassemblies, battery considerations and UPS 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 with an emphasis on interpretation.

4.10.4. 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.

4.10.5. **Site Testing:** The manufacturer's field service personnel shall provide site testing if requested. The testing shall consist of a complete test of the UPS 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 the Construction Specification Institute guidelines per CSI MP-2-1, MP-2-2. It is subject to change without notice 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 if you have any further questions or special requirements.

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

4.10.6. **WRRANTY**

4.10.6.1. **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 a one (1) year period beginning from the startup 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.

4.10.6.2. **Battery**: The battery manufacturer's standard warranty shall be transferred and assigned to the end user. It will have a minimum period of one (1) year.

4.11. MECHANICAL DESIGN AND CONSTRUCTION

4.11.1. **Enclosure**: All system components shall be housed in a single floor mounted freestanding NEMA 1 enclosure. The cabinet should have front access only with two doors, allowing easy component access 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.

4.11.2. **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, a Heat Sink Assembly with IGBTs and drivers and a Control PCBA shall be used for maximum reliability and ease of servicing. All printed circuit assemblies shall have plug connections. Like assemblies and like components shall be interchangeable.

4.11.3. **Earthquake Protection:** The cabinet shall be evaluated and shake table tested and certified to IBC2015, CBC2016, (SDS level 3.0g). It must bear OSHPD (California **O**ffice of Statewide **H**ealth **P**lanning and **D**evelopment) Certification.

4.12. INSTALLATION CONSIDERATIONS

4.12.1. **Wiring Installation**: The UPS 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.

4.12.2. **Wiring Termination**: The UPS input and output power connections shall be hard wired within the cabinet. Optional input line cable and output receptacle panels 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 the UPS and battery cabinets.

4.12.3. **System Operation**: The system shall allow connection of either "normally on" or "normally off" loads. Connected loads shall be carried via the transfer circuit by the utility during normal operation or by the system inverter during utility failures without interruption.

4.12.4. **Connected Loads:** The OnLine Central Lighting Inverter system shall be designed to maintain the normal operation and performance integrity of all connected loads continually conditioned sinusoidal output. Refer to plans for type and location of loads served by the system.

4.12.5. **Factory Startup:** Provides a factory service representative to perform the initial startup of the Central Lighting Inverter System.

4.12.6. **Drawings and manuals:** Drawings and manuals supplied with each unit shall include:

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

4.12.7. **Installation:** The Central Lighting Inverter shall be installed in accordance with all appropriate manufacturer's installation instructions and in compliance with all appropriate codes.

4.13. ENVIRONMENTAL REQUIREMENTS

Operating Temperature: 0°C to 40°C (32°F to 104°F)

Storage Temperature: - 20°C to +45°C (- 4°F to 113°F)

Maximum Recommended Storage Temperature For Batteries: 25°C (77°F) for up to six months. Storage at up to 40°C (104°F) is acceptable for a maximum of three months.

Humidity (operating and storage): 0 to 95% RH, non condensing

Altitude: Up to 6000 ft (1,829 meters)

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

4.14. PHYSICAL SPECIFICATIONS

- Cabinet shall be double door, floor mountable, fork liftable and painted black with a maximum depth of 18" to maximize front accessibility.
- Cabinet shall be no more than 46" for up to 8kW and 59" 10-17kW (including anchoring brackets) wide for best layout (book shelf style).
- Cabinet height shall not exceed 80" to allow pass through standard door

kW	Input / Output Voltage	Model Number	DC Volts	Inverter / Battery	
				Weights (lbs)	Mounting Dim W" X H" X D
3.0	120 / 120	SV- PD3.0A0100N1	96	**1,284**	**46" x 68" x 18"**
	120 / 120, 208, 240, 277	SV- PD3.0A5800T1			
	208 / 208	SV- PD3.0B1300N1			
	208 / 120, 208, 240, 277	SV- PD3.0B5800T1			
	240 / 240	SV- PD3.0D0400N1			
	240 / 120, 208, 240, 277	SV- PD3.0D5800T1			
	277 / 277	SV- PD3.0R2500N1			
	277 / 120, 208, 240, 277	SV- PD3.0R5800T1			
	480 / 480	SV- PD3.0H1100T1			
	480 / 277	SV- PD3.0H2500T1			
	480 / 120, 208, 240, 277	SV- PD3.0H5800T1			
	277 / 480	SV- PD3.0R1100T1			
5.0	120 / 120	SV- PD5.0A0100N1	120	**1,284**	
	120 / 120, 208, 240, 277	SV- PD5.0A5800T1			
	208 / 208	SV- PD5.0B1300N1			
	208 / 120, 208, 240, 277	SV- PD5.0B5800T1			
	240 / 240	SV- PD5.0D0400N1			
	240 / 120, 208, 240, 277	SV- PD5.0D5800T1			
	277 / 277	SV- PD5.0R2500N1			
	277 / 120, 208, 240, 277	SV- PD5.0R5800T1			
	480 / 480	SV- PD5.0H1100T1			
	480 / 277	SV- PD5.0H2500T1			
	480 / 120, 208, 240, 277	SV- PD5.0H5800T1			
	277 / 480	SV- PD5.0R1100T1			
6.0	120 / 120	SV- PD6.0A0100N1	144	1,340	
	120 / 120, 208, 240, 277	SV- PD6.0A5800T1			
	208 / 208	SV- PD6.0B1300N1			
	208 / 120, 208, 240, 277	SV- PD6.0B5800T1			
	240 / 240	SV- PD6.0D0400N1			
	240 / 120, 208, 240, 277	SV- PD6.0D5800T1			
	277 / 277	SV- PD6.0R2500N1			
	277 / 120, 208, 240, 277	SV- PD6.0R5800T1			
	480 / 480	SV- PD6.0H1100T1			
	480 / 277	SV- PD6.0H2500T1			
	480 / 120, 208, 240, 277	SV- PD6.0H5800T1			
	277 / 480	SV- PD6.0R1100T1			
8.0	120 / 120	SV- PD8.0A0100N1	**192**	**1,795**	
	120 / 120, 208, 240, 277	SV- PD8.0A5800T1			
	208 / 208	SV- PD8.0B1300N1			
	208 / 120, 208, 240, 277	SV- PD8.0B5800T1			
	240 / 240	SV- PD8.0D0400N1			
	240 / 120, 208, 240, 277	SV- PD8.0D5800T1			
	277 / 277	SV- PD8.0R2500N1			
	277 / 120, 208, 240, 277	SV- PD8.0R5800T1			
	480 / 480	SV- PD8.0H1100T1			
	480 / 277	SV- PD8.0H2500T1			
	480 / 120, 208, 240, 277	SV- PD8.0H5800T1			
	277 / 480	SV- PD8.0R1100T1			

kW	Input / Output Voltage	Model Number	DC Volts	Inverter / Battery	
				Weights (lbs)	Mounting Dim W" X H" X D
10.0	120 / 120	SV- PD010A0100N1	**192**	**2,438**	**58.75" x70"x 30.5"**
	120 / 120, 208, 240, 277	SV- PD010A5800T1			
	208 / 208	SV- PD010B1300N1			
	208 / 120, 208, 240, 277	SV- PD010B5800T1			
	240 / 240	SV- PD010D0400N1			
	240 / 120, 208, 240, 277	SV- PD010D5800T1			
	277 / 277	SV- PD010R2500N1			
	277 / 120, 208, 240, 277	SV- PD010R5800T1			
	480 / 480	SV- PD010H1100T1			
	480 / 277	SV- PD010H2500T1			
	480 / 120, 208, 240, 277	SV- PD010H5800T1			
	277 / 480	SV- PD010R1100T1			
12.5	120 / 120	SV- PD012A0100N1	**192**	**3,681**	
	120 / 120, 208, 240, 277	SV- PD012A5800T1			
	208 / 208	SV- PD012B1300N1			
	208 / 120, 208, 240, 277	SV- PD012B5800T1			
	240 / 240	SV- PD012D0400N1			
	240 / 120, 208, 240, 277	SV- PD012D5800T1			
	277 / 277	SV- PD012R2500N1			
	277 / 120, 208, 240, 277	SV- PD012R5800T1			
	480 / 480	SV- PD012H1100T1			
	480 / 277	SV- PD012H2500T1			
	480 / 120, 208, 240, 277	SV- PD012H5800T1			
	277 / 480	SV- PD012R1100T1			
15.0	120 / 120	SV- PD015A0100N1	**240**	**3,852**	
	120 / 120, 208, 240, 277	SV- PD015A5800T1			
	208 / 208	SV- PD015B1300N1			
	208 / 120, 208, 240, 277	SV- PD015B5800T1			
	240 / 240	SV- PD015D0400N1			
	240 / 120, 208, 240, 277	SV- PD015D5800T1			
	277 / 277	SV- PD015R2500N1			
	277 / 120, 208, 240, 277	SV- PD015R5800T1			
	480 / 480	SV- PD015H1100T1			
	480 / 277	SV- PD015H2500T1			
	480 / 120, 208, 240, 277	SV- PD015H5800T1			
	277 / 480	SV- PD015R1100T1			
17.0	120 / 120	SV- PD017A0100N1	**240**	**4,512**	
	120 / 120, 208, 240, 277	SV- PD017A5800T1			
	208 / 208	SV- PD017B1300N1			
	208 / 120, 208, 240, 277	SV- PD017B5800T1			
	240 / 240	SV- PD017D0400N1			
	240 / 120, 208, 240, 277	SV- PD017D5800T1			
	277 / 277	SV- PD017R2500N1			
	277 / 120, 208, 240, 277	SV- PD017R5800T1			
	480 / 480	SV- PD017H1100T1			
	480 / 277	SV- PD017H2500T1			
	480 / 120, 208, 240, 277	SV- PD017H5800T1			
	277 / 480	SV- PD017R1100T1			