


<b>TECHNICAL GUIDE SPECIFICATIONS</b>	
<b>Valusine</b> <b>Single Phase, (500 to 2700 Watts)</b> <b>UL924 Central Lighting Inverter</b>	

## 1. GENERAL

### 1.1 SCOPE

This guide provides technical information and specifications for Perfect Power's Valusine Central Lighting Inverter System.

The Valusine equipment herein shall be referred to as UPS or Central Lighting Inverter.

The Valusine 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 (Insulated-Gate Bipolar Transistors) in its design. The Valusine will provide high quality regulated and conditioned AC power to all types of lighting loads all the time. It switches to battery power with virtually zero transfer time upon an input power loss or disruption.

The unit 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 unit 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 unit meets UL 924 requirements for recharging the battery while utilizing an industry distinctive small footprint. This allows equipment installation in limited spaces.

NOTE: This Guide Specification 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@perfectpower.com](mailto:sales@perfectpower.com).

## **1.2 STANDARD**

The Valusine complies with the following standards:

- Intertek certified per UL1778, UL 924 Life Safety for Emergency Backup Lighting latest edition
- 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 4th Editions - UL Standard for Safety Transient Voltage Surge Suppressors (Type 3, 4)

## **1.3 APPROVED MANUFACTURER**

The Inverter shall be an Emergency Central Lighting Inverter system and shall be manufactured by: Perfect Power, Inc.

Website: [www.perfectpower.com](http://www.perfectpower.com)

## **1.4 QUALIFICATION AND QUALITY ASSURANCE**

### **1.4.1 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 (Inverter) modules as specified in this document. The manufacturer shall hold a current ISO 9001 certificate and shall design and develop the units in accordance with internationally accepted standards.

### **1.4.2 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 incoming parts, modular assemblies and sheet metal shall undergo detailed receiving quality inspection.

### **1.4.3 Factory Testing**

Every unit shipped will have completed a documented functional test of the Inverter module. A copy of the test report shall be available at the customer's request.

## **1.5 PRODUCT FEATURES**

The System shall utilize high frequency pulse width modulation and digital signal processing for control and monitoring. The UPS's automatic overload and short circuit protection in normal and emergency operations shall have 150% momentary surge capability and withstand a 115% overload for 5 to 10 minutes, 125% for 30 seconds. The UPS's protection shall also include a low battery voltage disconnect to prevent damage to the battery bank. The UPS 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 UPS shall maintain output regulation of less than 5% under all operating conditions except overload and short circuit. The UPS 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 system shall include the following additional features:

- **An automatic, multi-rate, software-controlled charger**
- **Programmable automatic system testing capabilities (10 seconds monthly and 90 minutes yearly)**
- **A microprocessor controlled diagnostic panel capable of displaying alarm and status.**
- **Must provide power factor correction close to unity (1.0 pf)**
- **No break in transfer time (from Utility to Battery) mode**
- **Visual displays of all alarms**
- **A DC to AC converter (Inverter)**
- **A battery charger that meets the UL 924 standard**
- **DC Input Breaker**
- **A battery bank sized for the system's runtime requirements**
- **Full KW rating.**
- **Communication Interface Provisions:**
  - (RS232, RS485) for dedicated computer
  - Web Communication
  - Facility Interface (Dry Contacts)
- **Manual Test switch**
- **Optional integrated output distributions (N/ON, N/OFF with or without time delay.**

## 1.6 INVERTER DESIGN REQUIREMENTS

Output Load Capacity – The continuous output power rating of the Inverter shall be **[Select Unit Capacity]** kW

Input Voltage – **[Select Input Voltage.]** VAC,  $\pm 10\%$

Output Voltage – **[Select Output Voltage]** VAC

For Selectable items refer to catalog and use from drop down menu.

**Efficiency** – Greater than 90% (Typical)

**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

**Battery Protection** – Battery CB (Circuit Breaker), for safe UPS battery operation and servicing

**Battery Type** –Valve Regulated Lead Acid (VRLA) n

## 2. SYSTEM DESCRIPTIONS

### 2.1 SPECIFICATIONS

#### 2.1.1 AC Input

- **Frequency** – 60 Hz  $\pm$ 4%
- **Input Current** – Sinusoidal, close to unity power factor under all line/load conditions (power factor correction)
- **Input Protection** – Optional input circuit breaker
- **Input Surge Protection** – **Optional** 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**, accepting #22 AWG to #6 AWG wire range, Three (3) Line, Neutral and Ground.

#### 2.1.2 AC Output

- **Frequency** – 60 Hz  $\pm$  0.5 Hz
- **Voltage Regulation** – Less than 5% (Typical)
- **Output Waveform** – Sinusoidal
- **Voltage Distortion** – < 5% THD; < 3% Single Harmonic
- **Inverter Overload Capability** – 115% for 5 to 10 minutes, 125% for 30 seconds
- **Bypass Overload Capability** – 150%
- **Protection** – Fault current limited
- **Non-Linear Load Capability** – 100%
- **Crest Factor** – 3 to 1
- **Output Power Connections** – Hard wired terminals accepting 14 AWG to 2/O AWG wire range, Two (2) wires plus ground for Single Voltage output, Three (3) Wires plus ground for Dual Voltage output
- **Output Distribution** – The UPS shall have an optional internal or external distribution: Main Output Breaker, Auxiliary Breaker: Normally ON, Normally OFF, Normally OFF with time delay
- **Communication Interface Optional** – The UPS shall have RS232, RS485 for dedicated computer, Web Communication provision, Facility interface (Dry Contact)

#### 2.1.3 Battery

Sealed, maintenance-free VRLA (Valve-Regulated Lead–Acid) 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 the same cabinet as the UPS 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. Optional 20 years battery life expectancy is available.

- **Standard Run Time** – 90 minutes at full load, based on UL924
- **Battery Type** – Sealed, Maintenance-free, Lead-Acid, VRLA (Standard) 10 years
- **Charger Ampacity** – Per UL 924
- **Float Voltage** – 2.25 V per cell
- **Protection** – Circuit breaker
- **Wiring** – Power cables from the UPS to the battery cabinet (if any) shall be provided by the customer in accordance with local code
- **Nominal DC Link Voltage** – 96VDC

## 2.1.4 Mechanical Design and Constructions

### A. Physical Specifications

Cabinet shall be Single door, floor mountable, fork liftable and painted black with a maximum depth of 30.5” to maximize front accessibility. Cabinet shall be no more than 23.5” width for best layout (bookshelf style). Cabinet height shall not exceed 35” to allow pass through standard door.

Unit Rating KW	Cabinet Dimensions W x H x D (Inches)
<b>.500 – 2.7 KW</b>	<b>23.5 x 34.25 x 17 without mounting brackets</b>
	<b>27.5 x 34.25 x 17 with mounting brackets</b>

### B. Enclosure

All system components shall be housed in a single floor mounted freestanding NEMA 1 enclosure. The cabinet should have front access only, allowing easy component access from the front. The enclosure shall have shelves for UPS and Battery 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 UL924 for accidental or unauthorized unit shutdown.

### C. 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 one electronic subassembly, (Inverter/UPS section is interchangeable.

### D. Earthquake Protection:

The cabinet shall be evaluated for earthquake zone 4 installation with the addition of optional earthquake brackets.

### **2.1.5 Environmental (Electronics)**

<b>Operating Temperature:</b>	<b>0° to 40°C (32 to 104°F)</b>
<b>Storage Temperature:</b>	<b>-20° to 70°C (-4° to 158°F)</b>
<b>Altitude:</b>	<b>1,829 meters (6,000 feet)</b>
<b>Relative humidity:</b>	<b>0% to 95% (non-condensing)</b>
<b>Audible Noise:</b>	<b>57 dBA, typical</b>

## **2.2 MODES OF OPERATION**

### **2.2.1 Normal**

During normal operation, utility (or generator) power is thoroughly conditioned and regulated by solid state electronics. The Solid-State Electronics in conjunction with the input filter, filters noise and transients from the incoming power.

Additionally, the Solid-State Electronics regulates its output voltage to within specified limits. The rectifier section maintains the batteries in a fully charged state.

### **2.2.2 Emergency**

Upon loss of input power or when power exceeds the specified input limits, the control logic shall transfer to operation and disconnect the input line. The transfer to battery shall be an uninterrupted or "no break" power transfer. The inverter shall supply power from the batteries and through the Solid-State Electronics to the lighting system. The output shall be sinusoidal and within specified limits. If power is not restored before the batteries have been exhausted, the Inverter shall completely shutdown, protecting the batteries from possible damage.

### **2.2.3 Recharge**

Upon restoration of input power and before the batteries are completely exhausted, the Inverter 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. The battery charger shall recharge the batteries as set forth in UL924 Standard.

## **2.3 COMPONENT DESCRIPTIONS**

### **2.3.1 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.

### **2.3.2 Input Circuit Breaker**

A circuit breaker shall be provided and hard wired at the UPS input for protection from the utility line and associated wiring disturbances.

### **2.3.3 Input/Output Transformer (277V)**

An Input or Output transformer shall be used for 277V facility voltage to the inverter when it is required, it shall be factory installed and housed within the UPS cabinet.

### **2.3.4 Solid state electronics**

The Solid-State Electronics shall provide regulation and conditioning from incoming power aberrations. Power to the critical load shall be supplied by the Solid-State Electronics whether the Inverter is in normal mode or emergency mode. The output wave shape shall be sinusoidal for all modes of operation.

### **2.3.5 Battery Subsystem**

Sealed, maintenance-free batteries shall be provided. The batteries shall have an expected life of ten (10) years. The batteries shall be fully wired and contained within its own section. Battery run time (based on 100% full load) shall be no less than ninety (90) minutes. Optional Extended battery run times greater than ninety (90) minutes shall be available.

### **2.3.6 Inverter**

The Emergency Lighting Power System shall convert DC power supplied from the batteries into AC power.

### **2.3.7 Charger**

A battery charger shall be provided. The battery charger shall maintain the batteries at full charge. The battery charger shall be sized such that it recharges the batteries as set forth in UL Standard 924.

### **2.3.8 Power Connections**

The Emergency Lighting Power System input and output shall be hard wired. A main Input, Output and DC circuit breaker shall be provided. The main Input circuit breaker provides over-current protection and a means to easily disconnect power from the lighting system.

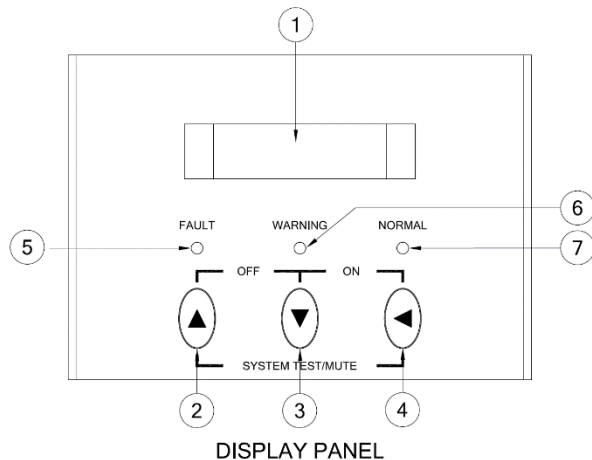
### **2.3.9 Transformer**

Unit shall utilize auto transformer for 277 Volt input & output only.

### **2.3.10 Internal Maintenance Bypass Switch, MBS Switch – Optional**

Internal Manual Maintenance Bypass Switch is a (3) position "AUTO", "MANUAL" and "MBS" rotary switch, when set to "MBS" provides power directly from UPS main input feed to the load which ensures continuous power to critical load without interruption.

## 2.4 SYSTEM MONITORING PANEL



### ■ (1) LCD Display

This Indicates the UPS operation information, including UPS status, input/output voltage, input/output frequency, battery voltage, battery capacity left, output load, inside temperature, and the times of history events. Besides, UPS output voltage and output frequency can be set from the LCD panel.

### ■ (2) Key select up

It is pressed to select upward the UPS status on LCD Display. When this key is pressed with the LCD Select Down-key simultaneously for 3 seconds, the UPS will be switched off.

### ■ (3) Key select down

It is pressed to select downward the UPS status on LCD Display.

### ■ (4) Key on-off control

(Only available during maintenance and or repair): When this key is pressed with the LCD Select Down-Key simultaneously for 3 seconds, the UPS will be switched on. Besides, in the mode of battery back-up, press both of this key and LCD Select UP-key at the same time to disable the beeps.

### ■ (5) Fault LED

This red LED indicates the UPS is in fault condition because of inverter abnormal or over-temperature or DC\_BUS fault.

### ■ (6) Warning LED

This yellow LED indicates the UPS is the status of overload, bypass or battery back-up.

### ■ (7) Normal LED

This green LED indicates the UPS is operating normally.



## **2.5 OPTIONS**

### **2.5.1 Normally On / Normally Off (with or without time delay) Output Auxiliary Circuit Breakers**

Unit shall provide up to 12 optional 1 pole 20amp din-rail output circuit breakers.

### **2.5.2 Seismic Mounting Brackets:**

Left and right seismic floor mounting brackets are available.

### **2.5.3 Internal Maintenance Bypass Switch (MBS)**

### **2.5.4 Communication Interface**

Unit shall have RS232 and USB communication port Option.

### **2.5.5 SNMP/Web Card (Simple Network Management Protocol)**

SNMP shall allow direct monitoring in SNMP based networks for monitoring of the Unit through web browser.

### **2.5.6 Auxiliary TVSS**

Input Transient voltage suppressor shall comply with UL1449 third edition.

### **2.5.7 Remote status panel**

AS400C W/ Relay card & remote monitor for remote monitor (available in hard wire connection).

### **2.5.8 Battery Exerciser and Event Logger**

Unit shall provide battery testing to comply with UL924.

### **2.5.9 Thermal Runaway Control**

Unit shall provide a "BATT OVER TEMP" alarm.

## **3. WARRANTY**

### **3.1 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 12-month period beginning with the factory startup, 13<sup>th</sup> through 24<sup>th</sup> months only valid with factory performed preventive maintenance, (extended warranty contract).

### **3.2 BATTERY**

The battery manufacturer's standard warranty shall be transferred and assigned to the end user. It will have a minimum period of ten years (1 year full) (9 years pro rata) when operated in specified environment not to exceed 25°C (77°F).

## **4. FACTORY STARTUP, MAINTENANCE, & EXTENDED WARRANTY**

### **4.1 FACTORY STARTUP**

Offer factory trained service personnel to perform the initial startup of the Central Lighting Inverter System.

### **4.2 SYSTEM OPERATION**

The system shall allow connection of either "normally on" or "normally off" (Dedicated Emergency Lighting) 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 with zero transfer time.

### **4.3 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.

### **4.4 CONNECTED LOADS**

The Central Lighting Inverter system shall be designed to maintain the normal operation and performance integrity of all connected loads including voltage and frequency sensitive equipment by providing true "no break", continually conditioned sinusoidal output. Refer to plans for type and location of loads served by the system.

### **4.5 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.

### **4.6 MAINTENANCE TRAINING**

In addition to the basic operator training conducted as a part of the system start-up, optional 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 System 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.

#### **4.7 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.

#### **4.8 LOAD BANK TESTING AT SITE**

The manufacturer's field service personnel shall provide optional load bank testing at site if requested. The testing shall consist of a complete test of the UPS system and the associated options supplied by the manufacturer. The test results shall be documented, signed, and dated for future reference.

## 5. SPECIFICATIONS

Watts	Model Numbers	Input/Output	BTU/HR*	Weight Inverter & Battery
500	VS.50A0100N1	120/120	478	275 LBs
	VS.50R0100T1	277/120	550	"
	VS.50A2500T1	120/277	550	"
	VS.50R2500T1	277/277	550	"
750	VS.75A0100N1	120/120	492	370 LBs
	VS.75R0100T1	277/120	575	"
	VS.75A2500T1	120/277	575	"
	VS.75R2500T1	277/277	575	"
1000	VS1.0A0100N1	120/120	615	370 LBs
	VS1.0R0100T1	277/120	675	"
	VS1.0A2500T1	120/277	675	"
	VS1.0R2500T1	277/277	675	"
1250	VS1.2A0100N1	120/120	780	460 LBs
	VS1.2R0100T1	277/120	890	"
	VS1.2A2500T1	120/277	890	"
	VS1.2R2500T1	277/277	890	"
1500	VS1.5A0100N1	120/120	925	510 LBs
	VS1.5R0100T1	277/120	1100	"
	VS1.5A2500T1	120/277	1100	"
	VS1.5R2500T1	277/277	1100	"
2100	VS2.1A0100N1	120/120	1175	570 LBs
	VS2.1R0100T1	277/120	1525	"
	VS2.1A2500T1	120/277	1525	"
	VS2.1R2500T1	277/277	1525	"
2500	VS2.5A0100N1	120/120	1351	720 LBs
	VS2.5R0100T1	277/120	1813	"
	VS2.5A2500T1	120/277	1813	"
	VS2.5R2500T1	277/277	1813	"
2700	VS2.7A0100N1	120/120	1392	730 LBs
	VS2.7R0100T1	277/120	2103	"
	VS2.7A2500T1	120/277	2103	"
	VS2.7R2500T1	277/277	2103	"

Specifications for 120VVAC /277VAC									
Capacity (W)	Description	500	750	1000	1250	1500	2100	2500	2700
Input	Voltage	Single Phase 120Vac or 277Vac							
	Voltage Range	120Vac ±10% or 277Vac							
	Frequency	60Hz +/- 4Hz							
Output	Voltage (on battery)	Single Phase 120Vac or 277Vac							
	Voltage Range	120Vac ±2% or 277Vac							
	Frequency (on battery)	60 Hz +/-0.5%							
	Transfer Time	0 ms							
	Overload Recovery	Auto transfer to Inverter							
	High-Efficiency mode (AC to AC)	> 95 %							
	SYSTEM Design Technology	On-Line / Fully digitized microprocessor-controlled							
	Output Wave Form	Sine wave							
	Harmonic distortion	< 3% of T.H.D. at linear load							
Protection and Filtering	Overload Protection	125% for 1 minute and 150% for 10 seconds							
	Short Circuit Protection	Circuit breaker							
System/Display/Warning	Visual Display (LED model)	SYSTEM on(green), line-mode(green), battery mode(yellow), bypass(yellow), fault(red)							
	Visual Display (LCD model)	Input/output voltage, input/output frequency, on-line mode, backup mode, battery capacity,							
	Audible Alarm	Beep every 5 sec							
	UPS Fault	Continuous beeping sound and LCD screen							
	Communication	RS-232 Serial Port and USB							
Battery	90 min. UL924 (Eight Sealed, maintenance-free lead acid Battery)								
Dimensions	(Inches) Width x Height x Depth	23.5 X 34.25 X 18.25							
Environmental	Operating Temperature	0 - 40°C / 32 ~ 104°F							
	Storage Temperature	-20 ~ 50°C / -4 ~ 122°F							
	Audible Noise (1 meter from surface)	< 40 dBA							
	Relative Humidity	0 ~ 95% humidity, non-condensing							

Note: Due to continuous improvement, specifications are subject to change without prior notice.