

SECTION 16611

UNINTERRUPTIBLE POWER SUPPLY BATTERY-INVERTER, AUTO-BYPASS

PART 1 GENERAL

1.1 SUMMARY

A. Description Of System

1. Provide a completely integrated static uninterruptible AC power system (UPS) of the static switching bypass type. System shall provide regulated and transient-free 120/208 volt, 3-phase, 4 wire, 60 hertz power to the Emergency Power Receptacle Panel from the unregulated AC power line under normal and abnormal conditions, including complete failure of the unregulated AC power line for a period of not less than 5 minutes, with automatic bypass of UPS equipment in the event of failure of the UPS equipment, all without objectionable disturbance or loss of AC service to the computer room. System shall consist of a static inverter, rectifier charger, static bypass switch and storage battery. Provide equipment having a KVA output rating not less than that indicated.
2. Operation. As follows for specified conditions.
 - a. Normal Unregulated AC Power Applied to UPS. Automatically supply the load through the inverter and rectifier charger directly, maintaining battery in fully charged "float" condition.
 - b. Abnormal Unregulated AC Power Applied to UPS. Automatically supply the load continuously with regulated power through the inverter combining the unregulated AC power source and the battery source.
 - c. Absence or Extreme Abnormality of Unregulated, AC Power Applied to UPS. Automatically supply the load from regulated power through the inverter from the battery source only for the limited period specified.
 - d. Return to Normal Unregulated AC Power Applied to UPS after Failure or Extreme Abnormality of Unregulated AC Power. Supply the load through the inverter and rectifier charger directly while recharging the battery.
 - e. Abnormal Output From or Loss of Rectifier Charger, Battery or Inverter. Automatically isolate and bypass the UPS equipment and supply the load from the unregulated AC power source by means of the static bypass switch.
 - f. Return to Normal Unregulated AC Power Applied to UPS After Restoration of UPS Equipment. Synchronize inverter output with unregulated AC power source and serve the load from the unregulated AC power source through the UPS equipment and isolate bypass circuit by means of the static bypass switch.
 - g. Overload or Short Circuit Beyond the Load Terminals of the UPS Equipment. Automatically isolate and bypass the UPS equipment and supply the load from the unregulated AC power source by means of the static bypass switch until the overload or short circuit is cleared at the Computer Room Power Panel. Return to normal operation as specified in paragraph above.
 - h. High efficiency power management software package for remote monitoring over a 10/100 network and Intranet and 2 dry contacts for event monitoring. Overall system shall be in conformance with UL924.

1.2 RELATED WORK SPECIFIED UNDER OTHER SECTIONS

1.3 QUALITY ASSURANCE

A. Reference Specifications And Standards

1. Furnish equipment meeting all applicable requirements of NEMA and IEEE Inverter Standards and the NEC.
 - a. ANSI C62.41 (IEEE 587)
 - b. FCC rules Part 15, Class A
 - c. National Electrical Code (NFPA 70)
 - d. OSHA
 - e. UL Standard 1778
2. The UPS shall be UL listed per UL Standard 1778.
3. The UPS shall be tested to ANSI 62.41 Categories A & B with no damage incurred.

B. Qualifications Of Manufacturers

1. Furnish essentially standard products of manufacturers regularly engaged in the production of such equipment.

C. Source Quality Control

1. Perform and record all normal factory tests on subassemblies and total assembly.
2. Manufacturer shall have a minimum of 5 year's experience in the design, manufacture, and testing of solid-state UPS systems and shall be ISO9001 certified.

1.4 SUBMITTALS

- A. Furnish submittals for items that are identified in this SECTION by a different typeface and a bracketed code (e.g., *Item [L]*). Refer to SECTION 01340 for definition of codes for types of submittals and the administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this SECTION are specified herein under this Article.
- B. Submit complete manufacturers drawings of the proposed UPS equipment showing assembly of units, outline dimensions and weights, shipping lengths, location of conduits and ground lugs, interconnection diagram for external cabling and internal wiring diagrams of equipment.

1.5 MAINTENANCE DATA AND OPERATING INSTRUCTIONS

- A. Furnish, per SECTION 01730, operating and maintenance manuals covering installation, operation and servicing procedures for the equipments furnished, and complete illustrated parts breakdown with manufacturer's name, nomenclature, and part number for each component part and assembly. Include a list of recommended spare parts.

1.6 ENGINEERING FIELD SERVICE

- A. Require the manufacturer of the UPS equipment to provide a qualified engineer to check the complete equipments after all equipment is installed and wired. Furnish to the OWNER the manufacturer's written certification assuring that each item of equipment is complete, in good condition, free from damage, and properly installed, connected and adjusted. Require the

manufacturer's engineer to make any adjustments or replacements which may be necessary to insure the proper functioning of the equipment furnished and to instruct the OWNER'S personnel in operation and maintenance of the equipment.

PART 2 PRODUCTS

2.1 FABRICATION AND MANUFACTURE

A. Manufacturers

1. Cyberex Inc.
2. Emergency Power Engineering
3. Emerson Electric
4. Liebert Corp.

B. Equipment

1. *UPS Equipment [D,P]*: Furnish equipment providing the operation as described under Article "DESCRIPTION OF SYSTEM" and having the following electrical characteristics when used with an unregulated AC power source rated 120/208 volts, 3 phase, 4 wire, 60 hertz.
 - a. Output Power Rating. Rated for full power output when installed in an ambient temperature range of 0 degC to 40 degC, and capable of operation in a 50 degC ambient at not less than 80% of rated power output.
 - b. Output Voltage Stability. Output voltage stable within plus or minus 1% for any one of the following listed conditions, and within plus or minus 2% for any combination of the following listed conditions.
 - 1) Increasing load from no-load to full load at 1.0 to 0.7 PF.
 - 2) Varying AC input voltage within plus or minus 10% of rated voltage and varying input frequency within plus or minus 5% of rated frequency.
 - 3) Operating above a 40 degC ambient.
 - 4) Varying battery voltage from fully discharged value to maximum recharge value.
 - c. Output Voltage Adjustment. Adjustable within plus or minus 5% of rated voltage.
 - d. Transient Response of Output Voltage After 100% Load Application and Removal. Plus or minus 5% within 8 milliseconds with maximum deviation of 10%.
 - e. Output Voltage Unbalance with 100% Load Unbalance. 4% maximum line to neutral.
 - f. Output frequency stable within plus or minus 0.5% of rated value in any ambient temperature between 0 degC and 50 degC when not synchronized to the AC line.
 - g. Output frequency adjustable within plus or minus 2 hertz of rated frequency.
 - h. Output Phase Separation. Within plus or minus 5% with 20% load unbalance.
 - i. Output Harmonic Distortion. Not exceeding plus or minus 3% for any single harmonic and not exceeding plus or minus 5% total at the fundamental frequency of 60 hertz +/- 2-1/2% at rated nominal output voltage plus or minus 10%; from 10% to full load at 0.7 to 1.0 PF and over battery voltage range.
 - j. Minimum Output Capacity. (a) 150% of unity PF rating for 30 seconds minimum at essentially full voltage and (b) 800% of unity PF rating for 0.01 second minimum at essentially full voltage.

- k. Overall Efficiency. 75% minimum at full load when operating from the unregulated AC power line.
 - l. Automatic Synchronization. Hold phase of inverter voltage within plus or minus 5% of unregulated AC power source; however, if the unregulated AC power source frequency deviates beyond plus 0.6 to minus 0.5 hertz of nominal, revert to inverter internal reference frequency, automatically, and when the unregulated AC power source returns to nominal frequency, resynchronize inverter to the unregulated AC power source nominal frequency. Maximum rate of change of inverter frequency. 1 hertz per second.
 - m. AC Output Current Limiting. Automatically protect the inverter against damage due to excess overloads, or short circuit current in excess of 150% of unity PF rated current by bypass operation and automatically return to normal operation on removal of abnormal load.
 - n. Discontinuity of Power Upon Loss of Inverter Output or Restoration of Normal Operation. Maximum disturbance less than 1/4 cycle.
 - o. Battery Recharge Time After Loss of Unregulated AC Power Source for the Rated Protection Period. 24 times protection period maximum.
 - p. Load Switching. Capable of switching any loads within overload rating or starting into any load without improper operation.
2. Storage Battery. Lead acid calcium stationary type complete with open type steel rack, intercell connectors, necessary maintenance accessories, and electrolyte.
 3. Adjustments. Provide means of adjusting the following parameters:
 - a. Frequency.
 - b. AC current limit.
 - c. AC output voltage.
 - d. Static switch transfer levels for transient and steady state undervoltage. Factory set steady state overvoltage level.
 - e. Static switch return to normal level.
 - f. DC float voltage.
 - g. DC equalize voltage.
 - h. DC current limit.
 4. Testing Provisions. Provide means for testing the inverter control equipment independent of the power equipment without disconnecting or removing the equipment from the inverter. Provide test points as required for proper adjustment and servicing of the control. Provide means for testing the system, including static switch, under dummy load while the load is bypassed to the unregulated AC power source.
 5. Overcurrent Protection. Provide integral overcurrent protection to prevent damage to UPS equipment including the following:
 - a. Circuit breaker or fuses on AC input to charger and to static switch, on DC output of charger, and on DC input and AC output of inverter.
 - b. Current-limiting fuses on all power SCR units.
 - c. Fuses on input capacitors in parallel banks.
 6. Operator Controls. Provide the following controls readily accessible on the front of the unit, as a minimum.
 - a. Charger "On-Off".
 - b. Inverter "On-Charge-Off".
 - c. Static switch "Transfer Test" switch.
 - d. Static switch "Manual Return to Inverter" switch.

- e. “Manual Bypass to Unregulated AC Power Source” with isolation of system including synchronization signal (no break transfer).
7. Instrumentation. Provide the following controls and meters (2% accuracy as a minimum).
 - a. AC voltmeter on unregulated AC power input with selector switch.
 - b. AC voltmeter on inverter output with selector switch.
 - c. AC ammeter on inverter output with selector switch.
 - d. Frequency meter on inverter output.
 - e. DC voltmeter on battery input to UPS equipment.
 - f. DC ammeter on charger output.
8. Indicating and Alarm Lights and Provisions for Remote Alarm. Provide the following indication, and alarm contacts rated 2 amperes, 120 volts AC.
 - a. “Synchronization Monitor” light.
 - b. “Low Battery Voltage” alarm light and alarm contacts.
 - c. Alarm and indicating lights as required for “Static Switch Position” and alarm contacts.
 - d. “Battery Operation” light and alarm contacts.
9. Enclosures. House all UPS equipment in one or more free standing panels constructed of smooth sheet steel welded together with structural members to provide a rigid self-supporting panel or section. Round all corners, and equip the front of each panel with a hinge door or doors for access to all equipment and wiring. Equip door with a latch and cylinder lock. Prime and finish paint all exterior and interior surfaces with manufacturer’s standard baked enamel finish. Bolt adjacent panels together in suitable shipping lengths to fit through a 3 foot by 6 foot hatch. Provide a grounding lug in the assembly. Provide NEMA 1 enclosure with gaskets and permanent type filters over all ventilation openings. Where cooling fans are required for proper operation, provide redundant systems, individually protected.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install the equipment at locations indicated and anchor securely to the concrete pads. Provide all power control and grounding connections.

END OF SECTION

Revision History	
Date	Rev. No.
A	0
B	0
D	0
E	0
F	0
02-19-09	0

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