About American Power Conversion

Founded in 1981, American Power Conversion (NASDAQ: APCC) is a leading provider of global, end-to-end availability enhancement solutions which include surge suppressors, uninterruptible power supplies (UPS), DC-based power systems, precision cooling equipment, cabling and connectivity solutions, power conditioning equipment, related software, professional and consulting services for Nonstop Networking™, as well as power purchasing solutions through energyOn.com, The World's Online Energy Store.

APC's comprehensive products, services and accessory offering, which is designed for both home and corporate environments, improves the availability, manageability and performance of sensitive electronic, network, communication and industrial equipment of all sizes. APC, which is headquartered in West Kingston, Rhode Island, reported sales of $1.337 billion for the year ended December 31, 1999 and is a Fortune 1000 and S&P 500 company. APC's global partners include: Hewlett Packard, IBM, Dell, Microsoft, Cisco, Intel, NEC, Fujitsu, Gateway, Sun, Tivoli, Computer Associates, Cabletron, Novell, Motorola, Siemens, and Micron.

Product lines include: Back-UPS®, Smart-UPS®, Matrix-UPS(TM), Symmetra Power Array, PowerShield(TM) UPS, Line-R(TM) power conditioners, SmartSlot(TM) UPS accessories, MasterSwitch(TM)PDUs, PowerChute® software, PowerNet(TM) SNMP adapters and software, SurgeArrest® surge suppressors, ProtectNet(TM) data-line surge suppressors, PowerManager(TM) PowerCenters and Silcon Delta Conversion UPS.

Recent Acquisitions :

1) February 1997, APC acquired Systems Enhancement Corporation. Systems Enhancement Corporation, based in St. Louis, MO, is developing and marketing power management software solutions to the Uninterruptible Power Supply (UPS) market.

2) April 1998, APC acquired Silcon, a Denmark based company, leading manufacturer of 3 ph uninteruptible power supplies upto 480 kVA. Several MW power can be generated by using such number of Systems connecting in Parallel. Silcon was among the ten largest UPS suppliers in the world and third largest in the European market. Silcon serves both the information systems and industrial UPS markets with its patented Delta Conversion Technology for highly efficient on-line UPS systems. The company has plants in Denmark, Switzerland, Ireland, China and Philippines.

3) April 17, 2000, APC acquired , Advance Power, a technological leader of DC-based power solutions used in telecommunications and Internet applications. Advance Power's family of DC rectifiers delivers technologically advanced efficiency, power density, and temperature range performance.
Advance Power is based in the U.K. with manufacturing facilities in the U.K. and Dallas and sales offices in the U.K., Dallas, France, Italy, Hungary and China.

4) May 2000, APC acquired ABL Electronics Corporation, a North American provider of computer and network cables, switches and other connectivity products. ABL's products range from universal serial bus-ready (USB) solutions for the small office/home office market to fiber optic, Category 5 and fibre channel cables commonly utilized in Internet, telecommunication, and storage area network (SAN) infrastructures to server management switches used to manage multiple servers from a single monitor

5) October 2000, APC acquired Airflow, a leading precision cooling equipment manufacturer. According to the industry, Airflow is the second largest provider in global precision cooling market. Airflow's product line includes floor and ceiling-mounted precision cooling systems as well as management systems used in a variety of applications including datacenters, co-location facilities and telecommunication stations.

Certificates & Approvals

1) Quality Assurance: ISO 9001
2) Environmental Management System : ISO 14001
3) CE Label
4) German standard TUV
5) American safety standards : UL1778
6) General & safety standards : EN50091-1
7) EMC requirements : EN50091-2, FCC Class A
8) EU Directive on Electomagnetic compatibility
   : 89/336/EEC, 73/23/EEC

APC
Legendary Reliability™

Some Recent 3 Phase Wins in Singapore

- SingTel- 120 kVA
- M1-120 kVA
- Microsoft- 80 kVA
- Starhub- 240 kVA, 3nos
- Cisco Systems
- CitiBank- 80,120,160 kVA
- Singapore Power
- Overseas United Bank
- United Overseas Bank-2x120 kVA
- ST Microelectronics
- Chartered SemiConductor-160 kVA
- Ministry of Education-160 kVA
- DataOne 2x240 kVA
- GK Goh-160 kVA
- Bax Global
- 3M
- IDA
- ESSO
- ABN Amro bank -80,120,240 kVA
- Federal Express 240kVAx3
- i-STT (Singapore Telemedia)- 2x480 kVA
- LGA 240 kVA
- Ministry of Home Affairs-320 kVA
- Compaq Computers,120 kVA
- EasyCall- 2x80 kVA
- Mindef 80 kVA, 3 nos
- Federal Express-240 kVA,3 nos
- Comfort Cab-80 kVA
- Bank of America -80 kVA
- CSA 2x120 kVA
- Schlumberger SA
- Iaspire
- Little Green Apples

APC
Legendary Reliability™

Some Recent 3 Phase Wins in Asia

- Cisco, Australia- 2x320 ,160 kVA,
- ABN AMRO Bank,Japan- 2x120
- Fujikoshi Information system,Japan - 120 kVA
- China Communication System Co - 320 kVA, 160 kVA
- ACER,Taiwan 4x480 kVA,4 nos
- Telecom Shanghai- 2x480 kVA
- Hong Kong Bank,HK-2x240kVA
- HUTCHISON GLOBAL CROSSING, HK -240 kVA,8nos
- Dell, India - 2x240 kVA
- Infosys ,India - 240 kVA, 4 nos
- Cisco, Korea-320 kVA
- Dongbu Semiconductors, Korea- 320 kVA,12nos, 2x480 kVA
- LG Capital, Korea 2x240 kVA
- Samsung, Korea 240kVA,4 nos
- Thrunet, Korea 320 kVAX4
- Ogino, Philippines-2x480 kVA
- Veterans Hospital,Taiwan - 240 kVA
- Camera City Co., Ltd, Thailand - 320 kVA
- Fu Yuan Co.,Ltd., Thailand- 320 kVA
- Tisco Securities Company Limited,Thailand-2X240 kVA
- Dell, Australia - 80 kVA
- Hyundai Korea- 80,120 kVA
- National Bank,NZ 80 kVA,3 no
- Sony Semiconductor, Thailand

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Silcon DP300E

Performance ...

- √ Up to 97% efficiency
- √ Input power factor corrected to 1
- √ No harmonic feed back to power line
- √ Full-rated output power available in kW
- √ 200% overload capacity
- √ Compact and small footprint
- √ Expandable for more Power/ Redundancy

APC
Legendary Reliability™

Comparison between Double Conversion Legacy UPS system and Delta Conversion On-line UPS system.

Sr. No	Characteristics	Double Conversion	Delta Conversion
1	Input Harmonics	For 6-pulse rectifier 30-35% input harmonics are present	Input harmonics present are less than 5%
		For 12-pulse rectifier 10% harmonics are present but it reduces the efficiency of UPS	
		By addition of Input filters the harmonics can still be reduced in 6 as well as 12 pulse rectifier but it further reduces efficiency of UPS	
2	Input Power Factor	0.8 at nominal input voltage and is dependant on input voltage and percentage load	At 25% load 0.97 At 100% load minimum 0.99
		Power factor can be improved by using additional filter at loss of efficiency.	
3	Output power available	kW =0.8 times kVA. Not useful for Power Factor Corrected SMPS	kVA= kW. Power factor corrected UPS. Power factor is corrected on input as well as on output.
4	Module Efficiency	93%	97%
		Some double conversion UPS manufacturers claim efficiency as 96%. This is possible if UPS is kept in Economy mode. The UPS will run on Bypass and in case of failure of bypass Inverter will take care. This is more risky mode of operation as load is exposed to raw mains	On line mode efficiency is 97% Eco mode is in-built.
5	Diesel Generator	2.3 to 2.5 times. Some manufacturers claim 3 to 4 times rating of UPS. This is due to highly nonlinear nature of input harmonics.	1.3 times rating of UPS
6	Size of UPS	Big and Bulky due to output isolation transformer. If input is 12-pulse rectifier then size and weight increases further.	Small footprint due to new technology. Also weight is much less.
7	Paralleling of modules	Maximum of 6 modules	Maximum of 9 modules
		For more than 2 modules external static switch is required	Four modules can be paralleled without additional static switch.
			Five modules can be paralleled with one module redundant.
8	Overload	150% for maximum of 1 minute.	200% for 1 minute.

SECTION
STATIC UNINTERRUPTIBLE POWER SUPPLY

1.0 General

1.1 Summary

This specification describes a three-phase,_____kVA, _____kW at unity power factor, 50Hz on-line, continuous operation, solid-state uninterruptible power supply (UPS) complete with sealed lead acid, maintenance free battery. The UPS shall operate as a active power control system, working in conjunction with the existing building electrical system to provide power conditioning, and on-line power protection for critical loads for at least _____ minutes.

1.2 The UPS system shall have provision for all necessary interface connections and ancillary items to provide a fully redundant system.

1.3 Operation and control of the UPS shall be provided through the use of microprocessor controlled logic.

Indications, measurements and alarms together with power history and battery autonomy shall be shown on a forty-character liquid crystal display.

Start up, shut down, manual transfer of load to reserve and retransfer back to inverter shall be by clear step by step routines shown on the display.

1.4 The UPS shall be designed in a modular way so as to enable the power of the UPS installed to be easily increased on the site by parallel more than one module to meet the new operating requirements and the desired reliability. In this connection, transformation of a unitary module into multi-module configuration shall be able to be carried out directly on site without returning the equipment to the factory for modification and with minimum installation down time.

1.5 Single module system shall have the rectifier/charger, inverter, static bypass switch and all the necessary monitoring and control functions contained in a single cabinet. Parallel operation shall consist of two or more single modules working together. It shall not require any additional 'bus-bar' module or interconnection module.

2.0 Modes of operation

The UPS shall operate as an on-line system in the modes listed below.

2.1 Normal: The inverter and the rectifier/charger shall operate in an on-line manner to continuously regulate the power to the critical load. The rectifier/charger also shall derive power from the AC input source and supply DC power to float charge the battery.

2.2 Overload: In the event that of an overload of an inverter, manual stop or failure the static switch will automatically transfer the critical load to the reserve supply, without interruption.

2.3 Emergency: Upon failure or reduction (-15%) of the AC input source, the critical load shall continue being supplied by the inverter without any switching. The inverter shall obtain its power from the battery. There shall be no interruption in power to the critical load upon the failure or restoration of the AC input source.

2.4 Recharge: Upon restoration of the AC input source, the rectifier and inverter shall simultaneously recharge the battery and regulate the power to the critical load.

2.5 External maintenance bypass: The external maintenance bypass switch shall be used for supplying the load directly from the mains supply, while the UPS is isolated for maintenance.

2.6 Downgrade: If the battery only is to be taken out of the service for maintenance, it shall be disconnected from the rectifier/battery charger and inverter by means of a switch. The UPS shall continue to function as specified herein, except for power outage protection. In cases where emergency generators are used, generator frequency fluctuation shall not interrupt the function of UPS.

2.7 Future expansion: The UPS shall be capable of field-up-grade to allow parallel operation with additional UPS modules for increased capacity or for redundant operation. The parallel systems shall be capable of operation on a common DC bus or with a separate DC bus for each system module and shall provide proportional load sharing between all available modules. To provide a true fault tolerant control system, any individual UPS module shall be capable of automatically assuming control of the entire system.

2.8 Operation with Diesel Generator: UPS shall be capable of operating with diesel generator of 1.3 times its capacity, whenever generator is connected at the input of rectifier.

3.0 Standards

3.1 Applicable Standards

The UPS shall be designed and manufactured in accordance with the following standards:

- IEC 146 Semiconductor Rectifier Equipment
- IEC 439-2 Low voltage switchgear and controlgear assemblies
- IEC 204-1 Electrical Equipment of industrial machines
- IEC 529 Protection Enclosure Degree
- IEC 76 Power Transformer
- IEC 950 Safety of Electrical Energized Office Machines, Data Processing Machines
- IEC 364 Building Electrical Installations
- IEC 38 Standard Voltages
- IEC 68-2-32 Free Fall Testing
- VDE 0510 Part 2 paragraph 6.5 Ripple Current for Battery Systems
- EN 50091-1 Uninterruptible Power Systems general and safety requirements.
- EN 50091-2 EMC requirements
- ISO9001 Quality Systems
- ISO14001 Environment Management System

3.2 Safety:

3.2.1 The UPS equipment shall be so constructed that the internal access to areas containing 'live' parts shall not be required for normal operation.

3.2.2 All exposed terminals must be covered with proper protective material to prevent accidental shorting of the terminal.

3.2.3 Conformity to local Codes of Practice

The contract is to ensure that all design and installation is conformed to local codes of Practice.

3.3 Reliability

The UPS equipment shall have a MTBF of 120,000 hrs

4.0 System Description

4.1 System Operation

4.1.1 Each UPS shall consist of superior rectifier/charger, inverter, a static bypass transfer switch and an external maintenance bypass switch as specified herein.

4.1.2 It shall ensure continuity in supply of regulated and transient free power to the load within the specified tolerance as described in Item 5 without interruption on failure of the normal input source for a maximum protection time determined by the capacity of the backup batteries installed.

4.1.3 Normal Condition

The UPS shall provide regulated and transient free power to the load in compliance to Item 5

4.1.4 Fault Condition

(a) In the event of any malfunction in the inverter, the UPS system shall automatically transfer its load to the Bypass power source and retransfer its load to the inverter output when the inverter normalize. Such transfer operation shall not cause any interruption or variation of the voltage supplied to the load.

(b) While the commercial power fails, the battery shall maintain DC power to the Inverter. The inverter shall continue to supply the load without interruption or variation for the voltage supply for the specified duration of AT LEAST _____ minutes under full load condition and power factor 1. When the battery voltage drops to the minimum permissible voltage required for the Inverter input, the UPS shall shut down automatically in sequence.

(c) On restoration of the Commercial power, the Battery shall be recharged automatically.

4.2 System Facilities

4.2.1 Normally the inverter frequency should be synchronized with input frequency for the selected frequency window. UPS shall have capability to synchronize with a frequency fluctuation upto +/-6%. A static transfer switch of make-before-break contacts shall be made available for transferring the load to a bypass power source without any interruption and vice-versa.

4.2.2 An external Manual Maintenance Bypass Switch shall be installed to allow the load to be fed from a Bypass Supply to provide complete isolation of the UPS system and the Static Transfer Switch without interruption. The transferring of the load to the maintenance bypass supply not cause any interruption to the load.

4.2.3 The UPS unit must have a switch that enables disconnection of the battery while UPS is supplying 100% load .

5.0 Electrical Specifications

5.1 Type

5.1.1	Rating	:	_____kVA
5.1.2	Cooling	:	Forced air cooling with fully redundant air blowers
5.1.3	Colour	:	Supplier to indicate

5.2 Input

5.2.1	Phase	:	3 phase 4 wire + ground for Rectifier
5.2.2	Voltage	:	380/400/415V AC ±15%
5.2.3	Frequency	:	50Hz ± 0.5% to 8%(programmable)
5.2.4	Power Factor	:	0.99 for 100% load 0.97 for 25% load

5.2.5 The maximum input current THD injected on the mains shall be less than 5% over a full load range without any filter used.

5.2.6 Magnetizing inrush current to UPS: NONE

5.3 Output

5.3.1	Phase	:	3 phase 4 wire + ground 120 degrees +/- 1 degree for balanced load 120 degrees +/- 1 degree for 50% unbalanced load 120 degrees +/- 3 degrees for 100% unbalanced load
5.3.2	Voltage	:	380/400/415V ± 1% ±1% steady state for a static 100% balanced load ±3% steady state for a static 100% unbalanced load ±5% for a 0 to 100% load step
5.3.3	Frequency	:	50Hz ± 0.1% free running

5.3.4 Harmonics Distortion

Total harmonic distortion on the voltage shall be less than 5% rms over 100% load without addition of passive (LC) filters. Only active harmonics filters can be used.

5.3.5 Transient Response

Peak voltage shall not exceed ±5% with a load step of 100% of UPS system rating

5.3.6 Transient Recovery

Less than 50 milliseconds to return to nominal output.

5.3.7 Overload

200% for 60 seconds in normal operation.
125% for 10 minutes in normal operation.
150% for 30 seconds in battery operation.
125% continuously in bypass operation.
1000% for 500 milliseconds in bypass operation.

5.3.8 Power Factor

Output power factor range: 0.9 leading to 0.8 lagging at rated kVA. The unit's kVA capacity shall not require derating for a 1.0 load power factor.

5.3.9 System AC to AC efficiency: Shall be >= 94.8% at 100% load, at nominal input voltage, with batteries fully charged.

5.3.10 Acoustical noise: ____dB(A) of noise, typical, measured at 1 meter from the operator surface.

5.3.11 Short Circuit withstand: The UPS must withstand a bolted-fault short circuit on the output without damage to the UPS module.

6.0 Inverter/Battery charger

6.1 The combined rectifier/battery charger and inverter shall provide the UPS system with superior operating efficiency and low input current distortion without compromising on line critical load protection.

6.2 The rectifier and inverter shall be a high-speed insulated-gate bi-polar transistor switch module type (IGBT) and shall be controlled by a pulse-width modulation technique to precisely regulate system output voltage and battery charge current.

6.3 Output current limit: The inverter shall be capable of supplying overload current of 150% of the system rating for 30 seconds.

6.4 Temperature protection: The inverters shall be temperature protected. In case of inverter over temperature, the unit shall activate an alarm and automatically transfer to static bypass operation.

6.5 Charging operation modes:

a. Float charge: Under nominal operating conditions, the rectifier shall provide a precisely regulated nominal DC bus voltage (programmable).

b. Boost charge: The rectifier shall provide a boost charge of 2.27 to 2.40 volts per cell (programmable) for a period of 1 to 24 hours (programmable).

6.6 Battery charging temperature compensation: For protection of the batteries, the unit shall monitor the temperature of the batteries. To extend battery life, charge voltage must be compensated for changes in battery temperature.

6.7 Battery charge current limit: The battery charging current limit must be limited to 10% of nominal DC discharge current .

7.0 Static switch

7.1 The static switch shall be solid state, rated for continuous duty and be provided with it's own dedicated, redundant power supply.

7.2 The static bypass switch shall automatically transfer the critical load to mains supply without interruption after the logic senses one of the following conditions:
a. Inverter overload beyond rating.
b. Battery runtime expired and bypass available.
c. Inverter failure.
d. Battery circuit breaker open.
e. Fatal error in control system.

7.3 The static bypass switch shall automatically retransfer from bypass to the inverter , when one of the following conditions occurs:
a. After an instantaneous overload-induced transfer has occurred and the load current has returned to less than 100% of the system rating.
b. The UPS inverter are active (on).

8.0 Storage Battery Bank

8.1 The battery bank shall be able to provide AT LEAST ____ minutes backup time at power factor=1 for the proposed UPS system.

8.2 The Battery cells shall be the Maintenance Free Sealed type and shock resistant plastic container and shall have a life span of at least 10 years operating at temperature of 25° C.

8.3 Moulded plastic terminal covers shall be provided for the battery terminals

8.4 A free-standing cabinet or racks that complements the appearance of the UPS and is designed to allow for ease of maintenance. The battery cabinet or racks assembly shall include battery disconnects to provide a positive means of isolating the battery from the rest of the system. The disconnects shall be capable of EPO operation. The battery cubicle or racks shall be made of anti-corrosive type of metal. Proper insulation must be provided to insulate the battery cells which are in-contact with any metal parts of the battery cubicle or racks.

8.5 To prevent total discharge or damage to the battery, the UPS shall transfer to standby operation when the battery voltage reaches a set minimum voltage level (programmable). If the AC input source has not returned within 10 minutes after low battery shutdown, the UPS shall electronically disconnect DC power from the battery to avoid deep discharge.

8.6 A battery monitor function shall be capable of monitoring and defining battery capacity. It shall be possible to program the unit to perform an automatic battery test every 90 days to test the condition of the battery.

8.7 Each battery cell shall be clearly identified as to cell type, voltage, and capacity. All cells in the battery have to be tested to verify 100% system capacity.

9.0 UPS Control, Display & Monitoring and Interface

9.1 A microprocessor-controlled display unit shall be located at the front of the UPS cabinet. The display unit shall consist of an alphanumeric display with backlight, an alarm LED, and a touch keypad.

9.2 The UPS shall be equipped with digital fan monitoring circuitry to monitor degraded performance, failure of cooling/ventilation fans and shall display the message on the front mimic in case of degraded performance or failure of the cooling/ventilation fans.

9.3 The display unit shall display the following UPS status messages:

1. Normal operation: load power xxx%.
2. Battery operation: time xxx minutes.
3. Bypass operation.
4. Standby.
5. System off

9.4 Metered parameters: The display unit shall allow the user to display the following metered parameters:

1. Year, Month, Day, Hour, Minute, Second
2. Mains Input AC voltage (line-to-line, three-phase simultaneous).
3. Mains Input AC current (line-to-neutral, three-phase simultaneous).
4. Output AC voltage (line-to-line, three-phase simultaneous).
5. Output AC current (line-to-neutral, three-phase simultaneous).
6. Output frequency.
7. Battery voltage.
8. Battery current (charge/discharge).
9. Battery temperature.
10. Output peak current.

9.5 Alarms: The display unit shall allow the user to display a log of all active alarms. A minimum of 50 alarm conditions shall be monitored.

9.6 Events log: The display unit shall allow the user to display a time- and date-stamped log of the 250 most recent UPS status and alarm events.

9.7 Controls: The following control or programming functions shall be accomplished with the display unit:

1. Silence an audible alarm.
2. Set the alphanumeric display language to English.
3. Display or program the time and date.
4. Enable or disable the automatic restart feature.
5. Transfer to or from static bypass operation.
6. Program the unit for economy operation.
7. Program the battery charger.
8. Calculate battery back-up time.
9. Test battery condition on demand.
10. Program the unit to periodically test battery condition.
11. Program voltage and frequency windows.
12. Calibrate metered parameters.
13. Enable or disable adaptive slew rate. Set maximum slew rate.
14. Adjust set points for different alarms.
15. Program the remote shutdown contact (enable/disable remote shutdown, polarity, delay).
16. Set the delay for the common fault contact.
17. Program the unit for soft start for use with a generator.

9.8 Potential free contacts:

The UPS shall be equipped with two potential free contacts:

1. Common fault alarm.
2. Battery operation.

Other potential free contacts shall be available as option.

9.9 A communication interface board shall provide the following communication ports, and it shall be possible to use two or more ports simultaneously.

1. RS232 serial port #1.
2. RS232 serial port #2.
3. COM-PORT with the following normally open or normally closed potential free contacts:
   a. UPS on.
   b. Static bypass operation.
   c. Battery operation.
   d. Battery low.

9.10 The external maintenance bypass shall supply the load from the bypass source while the UPS is isolated for maintenance. A UPS input, output, and bypass switch shall be housed in the same cabinet. Each switch must be monitored by the UPS via auxiliary contacts. The maintenance bypass must be housed in a wall mounted or freestanding enclosure that complements the appearance of the UPS.

9.11 Remote UPS monitoring shall be possible via either RS-232 or contact closure of the UPS and an existing computer system. The UPS manufacturer shall have available interface kits to support remote monitoring for the following systems:
systems:
a. Microsoft Windows 3.1, 3.11
b. Microsoft Windows 95
c. Microsoft Windows NT
d. OS/2
e. Netware 3.12, 4.1, 4.11
f. Apple
d. DEC VMS
g. DG-UX
h. Silicon Graphics
i. DEC OSF/1
j. SCO UNIX
k. SCO XENIX
l. SVR4
m. Interactive
n. Unix Ware
o. SUN Solaris
p. SUN OS
q. IBM AIX
r. HP-UX

9.12 SNMP adapter: The Ethernet/Token Ring SNMP adapter shall allow one or more network management systems (NMS) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in DOS and UNIX tar formats. The SNMP interface adapter shall be connected to the UPS via the RS232 serial port on the standard communication interface board.

9.13 WEB/SNMP adapter

The Ethernet WEB/SNMP adapter has to allow one or more network management systems (NMS) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) must be provided in DOS and UNIX tar formats. The SNMP interface adapter has to be connected to the UPS via the RS232 serial port on the optional communication interface board. The WEB/SNMP adapter has to provide remote monitoring and control functions via HTTP and TELNET protocols. This is to allow network administrator to monitor the UPS status via network by using easily-available browser and telnet software. The WEB/SNMP adapter has to be integrated with CiscoWorks 2000 for monitoring purpose. The WEB/SNMP adapter must be capable to send out internet e-mail to inform network administrator about UPS alerts via SMTP mail server.

9.14 Server shutdown software

Server shutdown must be possible via network wiring. The UPS and its accessory should hold a list of server IP addresses. In the event of extended power outages, The UPS and its accessory should send signals to a list of servers via TCP/IP network to perform shutdown. The server shutdown software should allow individual servers to run certain scripts to safely shutdown application services prior to OS shutdown. The server shutdown software should be able to support the following systems:

- Microsoft Windows NT
- Microsoft Windows 2000
- Netware 5.0
- Sun Solaris
- HP-UX
- IBM AIX
- Linux

10.0 Mechanical Design

10.1 The UPS shall be housed in a freestanding enclosure with IP30 protection level. The enclosure shall be designed to blend into a computer room environment. The cabinet shall be equipped for fork truck lifting. The UPS cabinet shall be painted with the manufacturers standard color.

10.2 The UPS shall be cooled by forced air and shall be equipped with fan monitoring circuits. External battery systems shall be cooled by free-air ventilation and convection.

11.0 Other Requirement

11.1 Components

All active electronic devices shall be solid state. All relays shall be provided with dust covers.

11.2 Materials

All material and parts comprising of the UPS shall be new of current manufactured and shall not have been in prior service except used for factory testing.

12.0 Site Acceptance Test

If UPS start-up is requested, factory trained service personnel shall perform the following inspections, test procedures, and on-site training:

12.1 Visual Inspection:

1. Inspect equipment for signs of damage.
2. Verify installation per manufacturer s instructions.
3. Inspect cabinets for foreign objects.
4. Verify correct electrolyte level of flooded cells (if applicable).
5. Inspect battery cases.
6. Inspect batteries for proper polarity.
7. Verify all printed circuit boards are properly configured.

12.2 Mechanical Inspection:

1. Check all UPS, external maintenance bypass cabinet, and DC disconnect switch internal control wiring connections.
2. Check all UPS, external maintenance bypass cabinet, and DC disconnect switch internal power wiring connections.
3. Check all UPS, external maintenance bypass cabinet, and DC disconnect switch terminal screws, nuts, and/or spade lugs for tightness.

12.3 Electrical Inspection:

1. Check all UPS fuses for continuity.
2. Verify correct input and bypass voltage.
3. Verify correct phase rotation.
4. Verify correct UPS control wiring and terminations.
5. Verify correct termination and voltage of battery strings.
6. Verify neutral and ground conductors are properly configured.
7. Inspect external maintenance bypass switch for proper terminations and phasing.

12.4 Site Testing:

1. Ensure proper system start-up.
2. Verify proper firmware control functions.
3. Verify proper firmware bypass operation.
4. Verify proper maintenance bypass switch operation.
5. Verify system set points.
6. Verify proper inverter operation and regulation circuits.
7. Simulate utility power failure.
8. Verify proper charger operation.
10. Verify battery runtime through load test
11. Document, sign, and date all test results.

13.0 On-Site Operational Training

During the factory assisted start-up, operational training for site personnel shall include key pad operation, LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation, and alarm information.

14.0 Defect Liability Period

14.1 Worldwide service

The UPS manufacturer shall have a worldwide service organization available consisting of factory trained field service personnel to perform start-up, preventative maintenance, and service of the UPS system and power equipment. The service organization shall offer a 24 hours a day, 7 days a week, 365 days a year service support.

14.2 Replacement parts

Parts shall be available through the worldwide service organization 24 hours a day, 7 days a week, 365 days a year.

The worldwide service organization shall be capable of shipping parts within 4 working hours or on the next available flight, so that the parts may be delivered to the customer site within 24 hours.

14.3 Maintenance Contract

A complete offering of preventative and full service maintenance contracts for the UPS system and the battery system shall be available. Contract work shall be performed by factory trained service personnel.