

APC by Schneider Electric

Symmetra™ LX

Guide Specifications

4 kVA to 16 kVA, 208 V/240 V Solution

THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTERFORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS IN THE PROJECT MANUAL AND WITH THE DRAWINGS. WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", "INSTALL", "SUBMIT", ETC., UNLESS OTHERWISE INDICATED.

UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 SUMMARY

- A. **Scope:** This specification describes the operation and functionality of a continuous duty, single-phase, solid-state, static Uninterruptible Power Supply (UPS) hereafter referred to as the UPS.
- B. **Included Features of the UPS:**
1. The UPS utilizes modular power protection technology designed to allow internal redundancy, scalability of power and runtime, and fast mean time to repair (MTTR). The UPS is configured from five basic components
 - a. UPS frames
 - b. Extended run battery frames (XR frames)
 - c. Power modules
 - d. Battery modules
 - e. Intelligence modules.
 2. UPS and XR frames are capable of shipping with modules installed.
 3. XR frames are capable of communicating battery and runtime status to intelligence modules.
 4. Power, battery, and intelligence modules are hot-swappable and user-replaceable for fast MTTR.
 5. The system power train consists of hot-swappable, user-replaceable 3.2 kW/4 kVA and 10% Battery charger circuit power modules, which operate in parallel, and are configurable for N+1 redundant operation at rated load.
 6. The system includes
 - a. A field-replaceable internal automatic and manual bypass system module
 - b. Field-replaceable output power distribution panels
 - c. Removable input/output wiring tray
 - d. Standard redundant intelligent modules
 - e. Battery disconnects
 - f. An LCD interface display
 - g. Emergency Power Off (EPO)
 - h. An integrated UPS network management card with environmental monitoring (AP9631).
- C. **Performance, Design, and Configurations:** The UPS and associated equipment operate in conjunction with a primary power supply and an output distribution system to provide quality uninterrupted power for a mission-critical, electronic equipment load.
1. This specification describes the performance, functionality, and design of the UPS Service Bypass Panel, hereafter referred to as the SBP, the external Battery Systems, and connectivity solutions.
 2. All programming and miscellaneous components for a fully operational system as described in this guide specification are available as part of the UPS.

3. The UPS is available in the following configurations:

TYPE	MODEL	SKU
Tower	APC Symmetra LX 4 kVA scalable to 8 kVA N+1 Tower, 208/240 V	SYA4K8P
	APC Symmetra LX 8 kVA scalable to 16 kVA N+1 Tower, 208/240 V	SYA8K16P
	APC Symmetra LX 8 kVA scalable to 16 kVA N+1 Extended Run Tower, 208/240 V	SYA8K16PXR
	APC Symmetra LX 8 kVA scalable to 8 kVA N+1 Tower, 208/240 V	SYA8K8P
	APC Symmetra LX 12 kVA scalable to 16 kVA N+1 Tower, 208/240 V	SYA12K16P
	APC Symmetra LX 12 kVA scalable to 16 kVA N+1 Extended Run Tower, 208/240 V	SYA12K16PXR
	APC Symmetra LX 16 kVA scalable to 16 kVA N+1 Tower, 208/240 V	SYA16K16P
	APC Symmetra LX 16 kVA scalable to 16 kVA N+1 Ext. Run Tower, 208/240 V	SYA16K16PXR
Rack Mount	APC Symmetra LX 4 kVA scalable to 8 kVA N+1 Rack-mount, 208/240 V	SYA4K8RMP
	APC Symmetra LX 8 kVA scalable to 16 kVA N+1 Rack-mount, 208/240 V	SYA8K16RMP
	APC Symmetra LX 8 kVA scalable to 8 kVA N+1 Rack-mount, 208/240 V	SYA8K8RMP
	APC Symmetra LX 12 kVA scalable to 16 kVA N+1 Rack-mount, 208/240 V	SYA12K16RMP
	APC Symmetra LX 16 kVA scalable to 16 kVA N+1 Rack-mount, 208/240 V	SYA16K16RMP

1.2 REFERENCES

- A. **General:** The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications is the latest date as of the date of the Contract Documents, unless otherwise specified.
- B. **Institute of Electrical and Electronics Engineers, Inc. (IEEE):**
- ANSI/IEEE 519, "Guide for Harmonic Control and Reactive Compensation of Static Power Converters" (copyrighted by IEEE, ANSI-approved).
- C. **International Organization for Standardization (ISO):**
- ISO 9001, "Quality Management Systems - Requirements."
 - ISO 14001, "Environmental Management Systems - Requirements with Guidance for Use."

1.3 STANDARDS

A. Regulatory Compliance:

1. All Symmetra LX models comply with the following regulatory standards::
 - a. CSA
 - b. FCC Part 15 Class A
 - c. UL 1778
2. The following Symmetra LX UPS models and the SYBT5 battery module are preapproved by the California Office of Statewide Health Planning and Development (OSHPD) and have been seismic-tested in an APC NetShelter™ VX Seismic 42 U Enclosure (AR2145BLK):
 - a. APC Symmetra LX 4 kVA scalable to 8 kVA N+1 Rack-mount, 208 V/240 V (SYA4K8RMP)
 - b. APC Symmetra LX 8 kVA scalable to 16 kVA N+1 Rack-mount, 208 V/240 V (SYA8K16RMP)
 - c. APC Symmetra LX 8 kVA scalable to 8 kVA N+1 Rack-mount, 208 V/240 V (SYA8K8RMP)
 - d. APC Symmetra LX 12 kVA scalable to 16 kVA N+1 Rack-mount, 208 V/240 V (SYA12K16RMP)
 - e. APC Symmetra LX 16 kVA scalable to 16 kVA N+1 Rack-mount, 208 V/240 V (SYA16K16RMP)

1.4 SYSTEM DESCRIPTION

A. Mechanical Design

1. The UPS weights and dimensions are:

SKU	UPS Cabinet	Weight, lb (kg)	Height, in (mm)	Width, in (mm)	Depth, in (mm)
SYA4K8P	4 kVA scalable to 8 kVA N+1 Tower	347 (157.8)	26.42 (671)	19.00 (483)	28.60 (726)
SYA4K8RMP	4 kVA scalable to 8 kVA N+1 Rack-mount	295 (134.1)	22.50 (572) (Rack Height 13 U)	18.60 (472)	27.10 (688)
SYA8K16P	8 kVA scalable to 16 kVA N+1, Tower	483 (219.6)	36.90 (937)	19.00 (483)	28.60 (726)
SYA8K16PXR	8 kVA scalable to 16 kVA N+1 Ext. Run Tower	1042 (473.6)	59.70 (1516)	19.00 (483)	28.60 (726)
SYA8K16RMP	8 kVA scalable to 16 kVA N+1 Rack-mount	437 (198.6)	32.90 (836) (Rack Height 19 U)	18.60 (472)	27.10 (688)
SYA8K8P	8 kVA scalable to 8 kVA N+1 Tower	444 (201.8)	26.42 (671)	19.00 (483)	28.60 (726)
SYA8K8RMP	8 kVA scalable to 8 kVA N+1 Rack-mount	392 (178.2)	22.50 (572) (Rack Height 13 U)	18.60 (472)	27.10 (688)
SYA12K16P	12 kVA scalable to 16 kVA N+1 Tower	580 (263.6)	36.90 (937)	19.00 (483)	28.60 (726)

SKU	UPS Cabinet	Weight, lb (kg)	Height, in (mm)	Width, in (mm)	Depth, in (mm)
SYA12K16PXR	12 kVA Scalable to 16 kVA N+1 Ext. Run Tower	1075 (488.6)	59.70 (1516)	19.00 (483)	28.60 (726)
SYA12K16RMP	12 kVA Scalable to 16 kVA N+1 Rack- mount	534 (242.7)	32.90 (836) (Rack Height 19 U)	18.60 (472)	27.10 (688)
SYA16K16P	16 kVA Scalable to 16 kVA N+1 Tower	677 (307.7)	36.90 (937)	19.00 (483)	28.60 (726)
SYA16K16PXR	16 kVA Scalable to 16 kVA N+1 Ext. Run Tower	1108 (503.6)	59.70 (1516)	19.00 (483)	28.60 (726)
SYA16K16RMP	16 kVA Scalable to 16 kVA N+1 Rack- mount	631 (286.8)	32.90 (836) (Rack Height 19 U)	18.60 (472)	27.10 (688)

2. The UPS cabinet is capable of conversion between Tower and Rack-Mount configurations.

B. System Characteristics:


1. **System Capacity:** The system is rated for .8 Pf output in the following frame sizes:
 - a. 8 kVA/ 6.4 kW - Can be configured with up to (3) 3.2 kW power modules for N+1.
 - b. 16 kVA/12.8 kW - Can be configured with up to (5) 3.2 kW power modules for N+1.
2. **System AC-AC Efficiency:** >89.7% at 100% load.
3. **Input:**
 - a. **AC Input Nominal Voltage:**
 - 1) 208 Vac L-L (120 Vac L-N @120°)
 - 2) 240 Vac L-L (120 Vac L-N @180°)
 - b. **AC Input Voltage Window:**
 - 1) 208 nominal: 96 - 138 Vrms L-N, 166 - 244 Vrms L-L
 - 2) 240 nominal: 83 - 138 Vrms L-N, 166 - 276 Vrms L-L Balanced, Grounded Neutral
 - c. **Input Frequency Range:** 45-65 Hz
 - d. **Input Power Factor:**
 - 1) 0.90 at full load with 120/208 Vac source, 2PH + N + G
 - 2) 0.98 at full load with 120/240 Vac source, 2PH + N + G.
 - e. **Input Current Distortion with No Additional Filters:** < 5% at 100% load at 240 V.

4. **UPS Output:**

a. **AC Output Nominal Output:** 120/208 V or 120/240 V, Single Phase, 4 wire (2-Phase + N + G), 50 or 60 Hz.

b. **Output Connections:**

Output Connections 208 V/240 V UPS			
Maximum Load	Method	Circuit Breaker Rating (Recommended)	Connection
8 kVA	Hardwired (Standard on tower and rack-mount)	50 A	<ul style="list-style-type: none"> External circuit breaker #6 AWG (16mm²) Torque to 40 in-lb (4.5 N-m) 4-Wire (L1-L2-N-G)*
	Output receptacles (Standard on rack-mount)		<ul style="list-style-type: none"> 2 (L14-30R) 4 (L5-20R)
16 kVA	Hardwired (Standard on tower and rack-mount)	90 A	<ul style="list-style-type: none"> External circuit breaker #3 AWG (25mm²) Torque to 40 in-lb (4.5 N-m) 4-Wire (L1-L2-N-G)*
	Output receptacles (Standard on rack-mount)		<ul style="list-style-type: none"> 4 (L14-30R) 8 (L5-20R)

* Wire connection "G" represents protective earth ground. 

c. **Output Frequency:** (SYA16K16PXR, SYA16K16P, SYA8K8P, SYA16K16RMP, and SYA8K8RMP)

1) Online: 50 +/-3.0 Hz and 60 +/- 3.0 Hz auto-sense; 60 +/- 0.1 Hz; 50 +/- 0.1 Hz; 60 +/- 3.0 Hz; 50 +/- 3.0 Hz

2) On Battery: 50 or 60 Hz

3) In Bypass: 45 - 65 Hz (can be restricted to 47-53 or 57-63 Hz windows)

d. **AC Output Voltage Distortion:** Maximum 5% @ 100% Linear Load, phase to neutral loads.

e. **AC Static Output Voltage Regulation:** +/- 3% for 100% Linear or Nonlinear Load, phase to neutral loads.

f. **Voltage Transient Response:** +/- 5% maximum for 100% load step

g. **Voltage Transient Recovery:** within <60 milliseconds

h. **Output Voltage Harmonic Distortion:**

1) <2% THD maximum and 1% single harmonic for a 100% linear load

2) <5% THD maximum for a 100% non-linear load

i. **Overload Rating:**

1) **Normal Operation (Online):**

a) >130% for 4 seconds

b) 105% continuous

c) <130% continuous at N+1

2) **Bypass Operation:** 50 A continuous, 8 kVA frame; 90 A continuous 16 kVA frame.

j. **Output Power Factor Rating:** 0.8

1.5 SUBMITTALS

- A. **Proposal Submittals:**
1. As bid system bill of materials.
 2. Product catalog sheets or equipment brochures.
 3. Product guide specifications.
 4. System single-line operation diagram.
 5. Installation information, including weights and dimensions.
 6. Information about terminal locations for power and control connections.
- B. **Delivery Submittals:**
1. Installation manual, which includes instructions for storage, handling, examination, preparation, installation, and start-up of UPS.
 2. User manual, which includes operating instructions.

1.6 PROJECT CONDITIONS

- A. **Environmental Requirements:** Do not install solid state UPS until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above ceilings is completed, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
1. The UPS is capable of withstanding any combination of the following environmental conditions in which it must operate without mechanical or electrical damage and without degradation of operating characteristics.
 - a. **Storage Ambient Temperature:** 5°F to 113°F (-15°C to 45°C).
 - b. **Operating Ambient Temperature:** 0°C to 40°C (32°F to 104°F). 25°C (77°F) is ideal for most battery types.
 - c. **Relative Humidity:** 0% to 95% non-condensing.
 - d. **Altitude:**
 - 1) **Storage Altitude:** 50,000 feet (15,000 meters) above sea level
 - 2) **Operating Altitude:** Maximum installation with no derating of the UPS output is 10,000 feet (3000 meters) above sea level.
 - e. **Audible Noise:** 62 dBA at 1 meter from the surface of the unit.

1.7 WARRANTY

- A. **Limited Warranty:** American Power Conversion (APC) warrants the UPS to be free from defects in materials and workmanship for a period of two years from the date of purchase,
1. **Warranty Limitations:**
 - a. The obligation of APC under this warranty is limited to repairing or replacing, at its own sole option, any defective product.
 - b. This warranty does not apply to equipment that has been damaged by accident, negligence, or misapplication or has been altered or modified in any way.
 - c. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.
 - d. EXCEPT AS PROVIDED HEREIN, AMERICAN POWER CONVERSION MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.
 - e. EXCEPT AS PROVIDED ABOVE, IN NO EVENT WILL APC BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Specifically, APC is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, costs of substitutes, claims by third parties, or otherwise.
 - f. This warranty gives you specific legal rights and you may have other rights that vary from state to state.

2. **Warranty Procedures:**

- a. To obtain service under warranty the purchaser must obtain a Returned Material Authorization (RMA) number from customer support.
- b. Products must be returned with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design:** Products specified are Symmetra LX Uninterruptible Power as manufactured by APC by Schneider Electric and as listed on page 2 of this specification. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect/Engineer will be the sole judge of the basis of what is equivalent.

2.2 MODES OF OPERATION

- A. **Normal:** The input converter and output inverter operate in an online manner to regulate power continuously to the critical load. The input and output converters are capable of full battery recharge while simultaneously providing regulated power to the load for all line and load conditions within the range of the UPS specifications.
- B. **Battery:** Upon failure of the AC input source, the critical load continues being supplied by the output inverter, which derives its power from the battery system. There is no interruption in power to the critical load during both transfers to battery operation and retransfers from battery to normal operation.
- C. **Recharge:** Upon restoration of the AC input source, the input converter and output inverter simultaneously recharge the battery and provide regulated power to the critical load.
- D. **Automatic Bypass:** The automatic bypass is used to provide transfer of critical load from the Inverter output to the bypass source. In the event of an emergency, this transfer is an automatic function.
- E. **Manual Bypass:** The system is equipped with an internal make-before-break two-pole switch to isolate the UPS electrically from the input and output during preventive maintenance, module upgrades, or limited frame service. The manual bypass is also considered a partial “wrap-around” bypass, configured to wrap around the power modules (rectifier, battery charger, inverter) and battery modules in the same manner as the automatic bypass while still supplying surge and EMI filtering and overcurrent protection. There is a positional sensor supplied to alert users that the UPS is in manual bypass.
- F. **External Service Bypass Panel (SBP):** The maintenance service bypass cabinet provides power to the critical load bus from the bypass source during times when maintenance or service of the UPS frame is required or when removal of the frame is desired. The SBP provides a mechanical means of complete isolation of the UPS from the electrical wiring of the installation. The SBP is constructed in a freestanding, rack-mounted or wall-mounted NEMA 1 enclosure unless otherwise stated in this specification. It is designed for either three-phase input or single phase input with a “no break” transfer between bypass and UPS power.
- G. **Charging:** Upon restoration of the AC input source, the UPS simultaneously recharges the battery and provides regulated power to the critical load.
1. The battery charging keeps the DC bus float voltage of $+137v, \pm 1\%$.
 2. The intelligent battery management system contains a temperature monitoring circuit that regulates the battery-charging current to optimize battery life.
 3. The battery-charging circuit remains active when in bypass and online states.

- H. **Bypass:** As part of the UPS, a system automatic bypass switch is provided. The system automatic bypass provides a break (<11 ms) transfer of the critical load from the Inverter output to the automatic bypass input source during times when maintenance is required or when the inverter cannot support the critical bus. Such times may be due to prolonged or severe overloads, or UPS failure. The additional manual bypass switch has a no-break transfer of critical loads from Inverter output to the manual bypass switch, which will correspondingly engage the automatic bypass switch, driving it into bypass position. The UPS will constantly monitor the output current, as well as the bypass source voltage, and inhibit potentially unsuccessful transfers to automatic bypass from taking place. The design of the automatic bypass switch power path consists of a heavy duty electromechanical bypass contactor with a continuous duty rating up to 100 A.
1. **Automatic Transfers:** An automatic transfer of load to bypass takes place whenever the load on the critical bus exceeds the overload rating of the UPS. Automatic transfers of the critical load from bypass back to normal operation take place when the overload condition is removed from the critical bus output of the system. Automatic transfers of load to bypass also take place if for any reason the UPS cannot support the critical bus.
 2. **Manual Transfers:** Manually initiated transfers to and from bypass are initiated through the UPS display interface or by engaging the manual bypass switch on the front of the unit.
 3. **Overloads:** The automatic bypass is rated for and capable of handling overloads equal to or less than 100 A continuously; actual current will be limited by the upstream circuit breaker protection. For instantaneous overloads caused by inrush current from magnetic devices or from short-circuit conditions, the automatic bypass is capable of sustaining overloads of 1000% of the continuous rating system capacity for sub-cycle fault clearing.
 4. **Modular:** The automatic bypass switch is of a modular design and easily field-replaceable by certified technicians.

2.3 INPUT POWER CONVERTER

- A. **General:** The input power converters of the system are housed within the parallel-connected, removable power modules. The converters constantly control the power imported from the mains input of the system to provide the necessary UPS power for precise regulation of the DC bus voltage, battery charging and Main Inverter-regulated output power.
- B. **Input Current Total Harmonic Distortion:** The input current THD_i will be held to 6% or less at full system load, while providing conditioned power to the critical load bus and charging the batteries under steady-state operating conditions. This is true while the UPS is supporting loads of both a linear or nonlinear type. This will be accomplished with no additional filters, magnetic devices, or other components.
- C. **Input Current Limit:**
1. The input converter controls and limits the input current draw from utility to 150% of the UPS output. During conditions where input current limit is active, the UPS is able to support 100% load, charge batteries at 10% of the UPS output rating, and provide voltage regulation with mains deviation of up to +/-20% of the nominal input voltage.
 2. In cases where the source voltage to the UPS is nominal and the applied UPS load is equal to or less than 100% of UPS capacity, input current will not exceed 130% of UPS output current, while providing full battery recharge power and importing necessary power for system losses.
- D. **Redundancy:** The UPS is configured with redundant input converters, each with semiconductor fusing, and logic-controlled contactors to remove a failed module from the input bus.
- E. **Charging:**
1. The battery charging will keep the DC bus float voltage of +/-137v, +/-1%.
 2. The battery-charging circuit contains a temperature monitoring circuit, which regulates the battery-charging current to optimize battery life.

3. The battery-charging circuit remains active when in automatic bypass and in normal operation.
- F. **Back-feed Protection:** The logic controlled contactor also provides the back-feed protection required by UL1778.

2.4 OUTPUT INVERTER

- A. **General:** The UPS output inverter constantly recreates the UPS output voltage waveform by converting the DC bus voltage to AC voltage through a set of IGBT-driven bidirectional power converters. In both normal operation and battery operation, the output inverters create an output voltage independent of the mains input voltage. Input voltage anomalies such as brown-outs, spikes, surges, sags, and outages will not affect the amplitude or sinusoidal nature of the recreated output voltage sine wave of the output inverters.
- B. **Overload Capability:** The output power converters are capable of 200% for short-circuit clearing. Steady-state overload conditions of up to 130% of system capacity (N+1) will be sustained by the inverter continuously in normal and battery operation. If overloads persist past the outlined limitation, the critical load will be switched to the automatic bypass output of the UPS, which is based upon the rating of 100 A.
- C. **Output Contactor:** The output power stage (inverter) is equipped with an output mechanical contactor to provide physical isolation of the inverter from the critical bus. With this feature a failed inverter will be removed from the critical bus.
- D. **Battery Protection:** The inverter is provided with monitoring and control circuits to limit the level of discharge on the battery system.
- E. **Redundancy:** The UPS is configured with redundant output inverters, each with semiconductor fusing, and logic-controlled relays to remove a failed component from the critical bus.

2.5 DISPLAY AND CONTROLS

- A. **Control Logic:** The UPS is controlled by two fully redundant, user-replaceable, hot-swappable intelligence modules. These modules have separate, optically-isolated, communication paths to the power modules and the automatic bypass contactor. Logic power for the control modules is derived from internal regulated power supplies, each having a separate AC and DC input and output. The communication of the control modules is of Inter IC Communication (IIC).
- B. **Display Unit:** A microprocessor-controlled display unit is located on a hinged door in the front of the system. The display unit consists of an alphanumeric display with backlight, an alarm LED, and a keypad consisting of pushbutton switches.
- C. **Metered Data:** The following metered data is available on the alphanumeric display:
1. Year, month, day, hour, minute, and second of occurring events
 2. Source Input Voltage
 3. Output AC voltage
 4. Output AC current
 5. Input Frequency
 6. Battery voltage
 7. Internal temperature
- D. **Event log:** The display unit allows the user to display a time- and date-stamped log of the 64 most recent status and alarm events.

- E. **Alarms:** The display unit allows the user to display a log of all active alarms. The following minimum set of alarm conditions is available:
1. Input Frequency outside configured range
 2. AC adequate for UPS but not for Bypass
 3. Low/No AC input, startup on battery
 4. Intelligence Module inserted
 5. Intelligence Module removed
 6. Redundant Intelligence Module inserted
 7. Redundant Intelligence Module removed
 8. Number of Batteries changed since last ON
 9. Number of Power Modules changed since last ON
 10. Number of Batteries increased
 11. Number of Batteries decreased
 12. Number of Power Modules increased
 13. Number of Power Modules decreased
 14. Redundancy Restored
 15. Need Battery Replacement
 16. The Redundant Intelligence Module is in control
 17. UPS Fault
 18. On Battery
 19. Shutdown or unable to transfer to battery due to overload
 20. Load Shutdown from Bypass. Input Frequency Volts outside limits
 21. Fault, Internal Temp exceeded system normal limits
 22. Input Circuit Breaker Open
 23. System level fan failed
 24. Bad Battery Module
 25. Bad Power Module
 26. Intelligence Module is installed and failed
 27. Redundant Intelligence Module is installed and failed
 28. Redundancy has been lost
 29. Redundancy is below alarm threshold
 30. Runtime is below alarm threshold
 31. Load is above alarm threshold
 32. Load is no longer above alarm threshold
 33. Minimum runtime restored
 34. Bypass is not in range (either frequency or voltage)
 35. Bypass contactor stuck in OFF position
 36. Bypass contactor stuck in ON position
 37. UPS in Bypass due to Internal Fault
 38. UPS in Bypass due to overload
 39. Low Battery Shutdown
 40. Low Battery Warning
- F. **Controls:** The following controls or programming functions are accomplished by use of the display unit. Pushbutton membrane switches facilitate these operations.
1. Silence audible Alarm
 2. Display or set the date and time
 3. Enable or disable the automatic restart feature
 4. Transfer critical load to and from bypass
 5. Test battery condition on demand
 6. Set intervals for automatic battery tests
 7. Adjust set points for different alarms
 8. Program the parameters for remote shutdown.
- G. **Potential Free (Dry) Contacts:** The following potential free contacts are available on an optional relay interface board:
1. Normal Operation
 2. Battery Operation
 3. Bypass Operation
 4. Common Fault
 5. Low Battery
 6. UPS Off

- H. **Communication Interface Board:** A communication interface board provides the following communication ports, which can be used simultaneously:
 1. RS232 Serial Port #1
 2. RJ-45 Interface port for a Remote Display
 3. Extended runtime external battery communication port

2.6 BATTERY

- A. The UPS battery is of modular construction consisting of user-replaceable, hot-swappable, fused battery modules. Each battery module is monitored for voltage and temperature for use by the UPS battery diagnostic and battery charger circuitry.
- B. The batteries are of the valve-regulated lead acid (VRLA) type.
- C. The UPS incorporates a battery management system to continuously monitor the health of each removable battery module as well as external battery modules installed in extended run battery cabinets. This system notifies the user if a failed or weak battery module is found.
- D. Additional battery modules may be added to increase runtime by utilizing up to seven extended run battery cabinets. These cabinets will be hot-pluggable, allowing for easy and quick installation without the need for electrical wiring, electrician, or powering down of the UPS. The battery modules are monitored by each individual frame and this information passed upstream to the main intelligence modules.
- E. Battery modules have an embedded EEPROM that supplies the serial number as well as some diagnostic information to the user to help in the local, network, or out-of-band management of these modules.
- F. Each UPS Battery Module has a built in DC disconnect switch for transportation and to disconnect the battery module completely from the internal bus while installed in the UPS system.

PART 3 – ACCESSORIES

3.1 SERVICE BYPASS PANEL (SBP)

- A. The service bypass panel provides power to the critical load from the bypass source, during times where maintenance or service of the UPS is required. The SBP provides a mechanical means of complete isolation of the UPS from the electrical wiring of the installation. The SBP is constructed in a free-standing, rack-mounted or wall-mounted NEMA 1 enclosure unless otherwise stated in this specification.

3.2 REMOVABLE INPUT/OUTPUT ELECTRICAL TERMINAL

- A. The input and output terminal connections are a removable tray for easy electrical connection.

3.3 SOFTWARE AND CONNECTIVITY

- A. **Network Management Card:** The Network Management Card 2 with Environmental Monitoring (AP9631) allows one or more network management systems (NMSs) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) is provided in DOS and UNIX "tar" formats. The Network Management Card is connected to the UPS via the RS232 serial port on the standard communication interface board.
- B. **Unattended Shutdown:** The UPS, in conjunction with the Network Management Card, is capable of gracefully shutting down one or more operating systems during the time when the UPS is on battery mode. The UPS is also capable of using an RS232 port to

communicate with the host computer by means of serial communications to gracefully shut down one or more operating systems during an on-battery situation.

3.4 REMOTE UPS MONITORING

- A. The following three methods of remote UPS monitoring are available:
 - 1. **Web Monitoring:** Remote monitoring is available via a web browser such as Internet Explorer.
 - 2. **RS232 Monitoring:** Remote UPS monitoring is available via either RS232 or contact closure signals from the UPS.
 - 3. **Simple Network Management Protocol (SNMP):** Remote UPS Monitoring can be accomplished through a standard MIB II compliant platform.

3.5 SOFTWARE COMPATIBILITY

- A. **PowerChute Network Shutdown:** This software is provided with the pre-installed Network Management Card 2 with Environmental Monitoring (AP9631). It is compatible with the following operating systems.
 - 1. IBM® AIX
 - 2. HP/UX
 - 3. Linux
 - 4. Mac OS X
 - 5. Novell NetWare
 - 6. Solaris
 - 7. Windows® 2003
 - 8. Windows® 2008
 - 9. Windows® 7
 - 10. Windows® Vista
 - 11. Windows® XP
- B. **StruxureWare™ management software:** All Symmetra LX Rack-Mount models are also certified for use with StruxureWare management software. Any of the following products can be purchased as an option:
 - 1. StruxureWare Central Basic (AP9465)
 - 2. StruxureWare Central Standard (AP9470)
 - 3. StruxureWare Central Enterprise (AP9475)
 - 4. StruxureWare Central Standard Management Pack (AP9480)
 - 5. StruxureWare Central Basic Management Pack (AP9482)
 - 6. StruxureWare Central Enterprise Management Pack (AP9485)

PART 4 – EXECUTION

4.1 FACTORY-ASSISTED STARTUP

If a factory-assisted UPS start-up is requested, factory-trained service personnel will perform the following inspections, test procedures, and on-site training.

- A. **Visual Inspection:**
 - 1. Inspect equipment for signs of damage.
 - 2. Verify installation per manufacturer s instructions.
 - 3. Inspect cabinets for foreign objects.
 - 4. Inspect battery modules.
 - 5. Inspect power modules
- B. **Mechanical Inspection:**
 - 1. Check all UPS and external service bypass panel internal power wiring connections.
 - 2. Check all UPS and external service bypass panel terminal screws, nuts, and/or spade lugs for tightness.
- C. **Electrical Inspection:**
 - 1. Verify correct input and bypass voltage.
 - 2. Verify correct UPS control wiring and terminations.

3. Verify voltage of all battery modules.
4. Verify that neutral and ground conductors are properly landed.
5. Inspect external service bypass panel for proper terminations.

D. **Site Testing:**

1. Ensure proper system start-up.
2. Verify proper firmware control functions.
3. Verify proper firmware bypass operation.
4. Verify proper 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.
9. Document, sign, and date all test results.

- E. **On-Site Operational Training:** During the factory assisted start-up, operational training for site personnel includes key pad operation, LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation, and alarm information.

4.2 FIELD QUALITY CONTROL

A. **Manufacturer Field Service:**

1. **Worldwide Service:** The UPS manufacturer has a worldwide service organization available, consisting of factory-trained field service personnel to perform startup, preventive maintenance, and service of the UPS system and power equipment. The service organization offers 24 hours a day, 7 days a week, 365 days a year service support.
2. **Replacement Parts:** Parts are available through the worldwide service organization 24 hours a day, 7 days a week, 365 days a year. The worldwide service organization is capable of shipping parts within four working hours or on the next available flight, so that the parts may be delivered to the customer site within 24 hours.

4.3 MAINTENANCE

- A. A complete offering of preventive and full service maintenance contracts for the UPS system and the battery system are available from APC by Schneider Electric. Contract work is performed by Schneider Electric factory-trained service personnel.

END OF GUIDE SPECIFICATION

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