Eaton 9SX
700-3000VA Tower UPS
Guide Specification

1.1 Summary
This specification describes a continuous-duty, on-line, solid state uninterruptible power system, hereafter referred to as the UPS. The UPS shall operate in conjunction with the existing building electrical system to protect electronic equipment from power disturbances that may occur in utility power such as voltage fluctuations, brown-outs and blackouts, power surges and sags. The UPS shall provide high-quality AC power for sensitive electronic equipment loads.

1.2 Model Summary
This specification shall outline the performance characteristics of the following Eaton 9PX UPS models:

9SX700, 9SX1000, 9SX1000G, 9SX1500, 9SX1500G, 9SX2000, 9SX2000G, 9SX3000, 9SX3000G, 9SX3000GL

1.3 Standards
The UPS shall be designed in accordance with applicable sections of the current revision of the following documents:

- UL 1778 5th edition (UPS for USA)
- CSA C22.2 (UPS for Canada)
- RoHS EN 50581 2012
- IEC/EN 62040-1
- IEC/EN 62040-2
- IEC/EN 62040-3
- FCC part 15 Class B (120V, 3kVA models meet FCC part 15 Class A )
- CISPR22 Class B
- IEC 61000-3-2 Class 1
- IEC 61000-3-3 European limit
- IEC 61000-4-2 Criteria B (for 208V models)
- IEC61000-4-3 (Ed3.2) Criteria A
- IEC61000-4-4 Criteria B
- IEC61000-4-5 Criteria B
- IEC61000-4-6 Criteria A
- IEC61000-4-8 Criteria B
- IEC 61000-4-11 Criteria A
- ANSI C62.41 Category B3 (6kV ring and combination)
1.4 System Description
1.4.1 Modes of Operation

The UPS shall operate as an on-line double-conversion UPS with the following modes:

A. Normal mode: The rectifier shall derive power as needed from the commercial AC utility or generator source and supply filtered and regulated DC power to the on-line inverter. The inverter shall convert the DC power at its input to highly regulated and filtered AC power for the critical loads.

B. Hi efficiency mode: In the presence of favorable incoming utility conditions, the UPS shall optimize its operating state to maximize its efficiency (user selectable).

C. Battery mode: Upon complete failure of utility power, the UPS shall provide power to the critical loads through the inverter, from the internal or extended batteries. When utility power returns, the unit shall return to Normal operation.

D. By-Pass mode: The automatic bypass shall transfer the critical load to the commercial AC source, bypassing the UPS’s inverter/rectifier, in the case of an overload, load fault, or internal failure.

E. Standby mode: When initially attached to a utility or other power source, the UPS shall start in standby mode until the user initiates power to the critical load. In this mode, the UPS shall recharge the batteries, but power shall not be supplied to the critical load.

1.4.2 Design Requirements
A. Inverter Output

1. Maximum power ratings: (VA / W)
   a. 9SX700
      - 100/110/120/125V: 700VA / 630W
   b. 9SX1000
      - 100/110/120/125V: 1000VA / 900W
   c. 9SX1000G
      - 200/208/220/230/240V: 1000VA / 900W
   d. 9SX1500
      - 120/125V: 1500VA / 1350W
      - 110V: 1350VA / 1215W
      - 100V: 1200VA / 1080W
   e. 9SX1500G
      - 200/208: 1500VA / 1350W
      - 220/230/240V: 1500VA / 1500W
f. 9SX2000
   - 120/125V: 2000VA / 1800W
   - 110V: 1800VA / 1620W
   - 100V: 1600VA / 1440W

   g. 9SX2000G:
      - 208V: 2800VA / 1620W
      - 200V: 1600VA / 1440W

   h. 9SX3000, 9SX3000HW
      - 120/125V: 3000VA / 2700W
      - 110V: 2700VA / 2430W
      - 100V: 2400VA / 2160W

   i. 9SX3000G & 9SX3000GL:
      - 220/230/240V: 3000VA / 2700W
      - 208V: 2700VA / 2430W
      - 200V: 2400VA / 1440W

2. Nominal output voltage (user selectable):
   a. 9SX700, 9SX1000, 9SX1500, 9SX2000, 9SX3000, 9SX3000HW
      - 120V default (100/110/120/125V)
   b. 9SX1000G, 9SX1500G, 9SX2000G, 9SX3000G, 9SX3000GL
      - 208V default (200/208/220/230/240V)

3. Efficiency (full load, resistive load):
   a. 9SX700: 87%
   b. 9SX1000, 9SX1500, 9SX2000, 9SX1000G: 88%
   c. 9SX3000, 9SX3000HW: 89%
   d. 9SX2000G, 9SX3000G, 9SX3000GL: 92%

4. Current overload capability:
   a. The UPS shall attempt to clear overloads while remaining on inverter in normal operation (IT Mode) before transferring to bypass.
      - Transfer conditions:
        Transfer allowed by default if input voltage is within +15/-20% of nominal voltage and frequency is +/- 5Hz of nominal (50 or 60 Hz).
        Transfer can be disabled by user setting
      - Minimum time on bypass: 5s
      - On-line Transfer Time – Inverter to Bypass and Bypass to Inverter:
        o Synchronized: < 4 ms
        o Unsynchronized: >10ms (or set to >20ms)
   b. Overload capability online (percent is per nominal Watt/VA):
      - 100%-102%: overload warning
      - 102%-130%: transfer to bypass after 12s
      - 130%-150%: transfer to bypass after 2s
      - >150%: immediate transfer to bypass
c. Overload on battery
   - 100%-130%: 12 seconds
   - >130%: 2 seconds

d. Overload on bypass
   - 100%-110%: overload warning
   - 110%-130%: Shutdown after 5 min
   - 130%-150%: Shutdown after 15 sec
   - >150%: Shutdown after 300ms

5. Waveform: Pure sinewave

6. Voltage regulation, static, online:
   a. ±2% (steady state)

7. Battery mode voltage regulation: static:
   a. +/-3% RMS for entire battery voltage range and 0-100% load

8. Output voltage distortion THDV% in normal mode:
   a. Resistive load: <3% linear load (<4% at low battery)
   b. SMPS load: <3% linear load (<7% at low battery)

9. Dynamic voltage regulation (line mode with resistive load):
   a. 20% → 100% → 20% R load step: ±6%

10. Recovery time (up to 90% voltage recovery):
    a. 30ms with resistive load

11. Transient response:
    a. IEC 62040-3 Classification 1 (test method defined by IEC62040-3 Edition2 2011 for R load and non-linear load)

B. System input

1. Input voltage range

   a. 120V Models:
      i. 700-1.5KVA
         a. <77.8% load (pf=.7): 60 / 70 / 80Vac to 138 VAC
         b. <88.8% load (pf=.8): 90Vac to 138 VAC
         c. 100% load (pf=.9): 100Vac to 138 VAC
      ii. 2-3kVA
          a. <77.8% load (pf=.7): 70 / 80 / 90Vac to 138 VAC
          b. <88.8% load (pf=.8): 95Vac - 138 VAC
          c. 100% load (pf=.9): 100Vac – 138 VAC

   b. 208V Models:
      i. 700-1.5KVA
         a. <77.8% load (pf=.7): 120 / 140 / 160Vac to 276 VAC
         b. <88.8% load (pf=.8): 180Vac to 276 VAC
         c. 100% load (pf=.9): 190Vac to 276 VAC
      ii. for 2-3KVA:
          a. <77.8% load (pf=.7): 140 / 160 / 180Vac to 276 VAC
          b. <88.8% load (pf=.8): 190Vac to 276 VAC
c. 100% load (pf=.9): 200Vac to 276 VAC
2. Input voltage hysteresis: Low +10V / High -10V (default)
3. Frequency – 50/60Hz
   a. Auto sensing upon initial startup
   b. Selectable through front menu
4. Frequency range
   a. 50Hz: 40-60Hz
   b. 60Hz: 50-70Hz
5. Frequency hysteresis: Low +0.5Hz / High -0.5Hz
6. Input power factor: >0.99
7. Input current distortion, THDi%: <5% at nominal input voltage, full load and battery fully charged

C. Batteries and Charger
1. Battery type: Valve Regulated Lead Acid (VRLA), non-spillable, lead acid cells, maintenance free
2. Extended run time: The UPS shall have capability for addition of four external battery modules (EBMs) to increase total runtime. Refer to Tables 1.3.2.C.b.i and ii for runtimes. Battery times are approximate and vary depending on load configuration and battery charge.
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   - 9SX1000RT

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   - 9SX1000GRT
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<td>73</td>
<td>99</td>
</tr>
<tr>
<td>2100W</td>
<td>6.6</td>
<td>31.2</td>
<td>57.1</td>
<td>86</td>
<td>116</td>
</tr>
<tr>
<td>1800W</td>
<td>8.3</td>
<td>37.2</td>
<td>68</td>
<td>102</td>
<td>138</td>
</tr>
<tr>
<td>1500W</td>
<td>10.8</td>
<td>45.7</td>
<td>84</td>
<td>125</td>
<td>170</td>
</tr>
<tr>
<td>1200W</td>
<td>14.9</td>
<td>59.0</td>
<td>108</td>
<td>162</td>
<td>219</td>
</tr>
</tbody>
</table>
4. Battery replacement – When not on battery, the UPS shall have batteries that are capable of being hot-swappable by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.

5. Advanced Battery Management – The UPS will provide Advanced Battery Management that uses sophisticated sensing circuitry and a three-stage charging technique that extends the used service life of the UPS batteries while optimizing the battery recharge time. Additionally, the UPS should be able to provide up to 60 days’ notice of the end of useful battery service life to aid in scheduling of battery replacement.

6. Auto Battery Test – If customer does not use Advanced Battery Management and uses a constant charging mode, the UPS will perform an auto battery test with a factory default set at once per week to determine the overall health of the battery. This interval should be settable to select either no test, every day, every week, or every month.

D. Form Factor
1. The UPS shall be a pure tower form factor

E. Weights and Dimensions:
1. The UPS shall have the following weights and dimensions:

<table>
<thead>
<tr>
<th>Catalog number</th>
<th>Dimensions (HxWxD, in.)</th>
<th>Weight (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>120V output, 50/60 Hz bundles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9SX700</td>
<td>9.9 x 6.3 x 13.9</td>
<td>26.5</td>
</tr>
<tr>
<td>9SX1000</td>
<td>9.9 x 6.3 x 15.1</td>
<td>30.9</td>
</tr>
<tr>
<td>9SX1500</td>
<td>9.9 x 6.3 x 17.1</td>
<td>41.9</td>
</tr>
<tr>
<td>9SX2000</td>
<td>13.6 x 8.4 x 16.2</td>
<td>77.2</td>
</tr>
<tr>
<td>9SX3000</td>
<td>13.6 x 8.4 x 16.2</td>
<td>77.2</td>
</tr>
<tr>
<td>9SX3000HW</td>
<td>13.6 x 8.4 x 16.2</td>
<td>77.2</td>
</tr>
<tr>
<td><strong>208V output, 50/60 Hz bundles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9SX1000G</td>
<td>9.9 x 6.3 x 15.1</td>
<td>30.9</td>
</tr>
<tr>
<td>9SX1500G</td>
<td>9.9 x 6.3 x 17.1</td>
<td>41.9</td>
</tr>
<tr>
<td>9SX2000G</td>
<td>13.6 x 8.4 x 16.2</td>
<td>77.2</td>
</tr>
<tr>
<td>9SX3000G</td>
<td>13.6 x 8.4 x 16.2</td>
<td>77.2</td>
</tr>
<tr>
<td>9SX3000GL</td>
<td>13.6 x 8.4 x 16.2</td>
<td>77.2</td>
</tr>
<tr>
<td><strong>External Battery Modules (EBMs)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9SXEBM36T</td>
<td>9.9 x 6.3 x 13.9</td>
<td>41.8</td>
</tr>
<tr>
<td>9SXEBM48T</td>
<td>9.9 x 6.3 x 17.0</td>
<td>52.9</td>
</tr>
<tr>
<td>9SXEBM96T</td>
<td>13.6 x 8.4 x 16.2</td>
<td>110.2</td>
</tr>
</tbody>
</table>

F. Input connection
1.  9SX700, 9SX1000, 9SX1500: 5-15P
2.  9SX2000: 5-20P
3.  9SX3000: L5-30P
4.  9SX3000HW: Input terminal block
5.  9SX1000G, 9SX1500G: C14
6.  9SX2000G: C14 (C13-L6-20P 6-ft jumper provided)
7.  9SX3000G, 9SX3000GL: C20 (C19-L6-20P 8-ft jumper provided)

G. Output receptacles
1.  9SX700, 9SX1000, 9SX1500: (6) 5-15R
2.  9SX2000: (1) L5-20R, (6) 5-20R
3.  9PX3000: (1) L5-30R, (6) 5-20R
4.  9PX3000HW: Output terminal block
5.  9SX1000G, 9SX1500G: (6) C13
6.  9SX2000G: (8) C13
7.  9PX3000G: (1) C19, (8) C13
8.  9PX3000GL: (1) L6-30R, (2) L6-20R, (2) 6-20R

1.4.3 Display and Controls

A. Local display:
1. The UPS shall be provided with a full graphical LCD display that provides the information and access to all settings and control features of the UPS.
2. The main status screen shall include all the following information at a single view:
   a. UPS mode status
   b. Load information:
      - Load Wattage
      - Load VA
      - Load Percentage
      - Graphical representation of load %
   c. Battery Condition
      - Battery Charge Percentage
      - Estimated Runtime
      - Number of EBM’s connected
      - Graphical representation of battery %
   d. Alert / Alarm conditions
   e. Efficiency

B. User menu:
1. Controls will consist of a 5 button configuration including:
   - ESC – Exit menu item / cancel changes
   - UP – Go to previous screen or menu/value selection
   - DOWN – Go to next screen of menu/value selection
   - ENTER – Enter menu or select value
1.4.4 Communications Option

A. Network Card
   1. UPS shall include one communications slot that will allow the operator to field install an
      network communications card [Eaton Gigabit Network Card-M2 or equivalent]. The
      network card must be hot-installable, must be UL2900-2-2 listed and provide the
      minimum features described below:

         a. The network communications card must be hot-installable.
         b. Communicates with SNMPv3 and IPv6
         c. Communicate natively with 1GB networks
         d. Supports IETF UPS MIB
         e. Supports redundant UPS configurations
         f. Allows control of UPS managed load segments
         g. Manual and scheduled on/off controls of UPS
         h. Capable of mass firmware upgrades
         i. Capable for mass configuration

B. RS232 serial Communication
   1. The UPS will provide a RS232 serial connection. Cable provided to provide DB-9
      interface.

C. USB
   1. The UPS will provide a USB connection that is HID compliant for network connection

D. RPO port / programmable signal inputs
   1. The UPS will provide a Remote Power Off (RPO) port that can be programmed for the
      functions listed below through the front menu. Programming will be native and will not
      require specialized firmware:

      a. RPO (Remote Power Off) – Allow a remote contact to be used to disconnect power
         to the UPS and all devices attached. Restarting the UPS requires manual
         intervention.
      b. ROO (Remote On/Off) – Allows remote contact to be used to turn the UPS On and
         Off. Resetting the contact to the normal position will automatically return the UPS
         back to normal state without manual intervention through the front menu.
      c. Forced bypass – If feeding the load, the unit shall go to bypass operation and stays
         there regardless of the bypass state until the input is inactivated.
      d. Building alarm – Active input generates an alarm, “building alarm”
      e. On generator – Active input disables synchronization and transfers to bypass
      f. Remote shutdown – Active input turns the UPS output (or outlet groups) off after a
         user defined shutdown delay, but keep charging batteries according to selected
         charging scheme. Inactive input does not abort shutdown countdown.
1.5 Management Software

The UPS will be compatible with power management software [Eaton Intelligent Power Software Suite (IPSS) or equivalent]. This software will perform the following actions:

- Monitors power consumption at the load segment level
- Support redundant UPS configuration
- Lightweight software, not running in JRE
- Mass update of network card firmware
- Plugs into dashboard of major Virtualization players. Allows for monitor of power equipment through the same dashboard that the Virtualized data center uses.
- Triggers movement of virtual machines to avoid shutdown of server facing imminent power disruption

1.6 Warranty

The UPS will have a warranty that covers both the UPS electronics and the internal batteries for 2 years with product registration in the U.S. and Canada.

1.7 Environmental conditions

A. Operating temperature: 0 to 40°C (32°F to 104°F)
B. Storage temperature: 0 to 35°C (32°F to 95°F)
C. Storage temp less battery: -25 to 55°C (-13°F to 131°F)
D. Relative humidity: 0 to 96%
E. Surge suppression: IEEE ANSI C62.41 Cat B3 (6 KV Ring and Combination)
F. Audible noise: < 50 dBA at 1 meter typical