

Eaton 9PX

700-3000 VA 2U Rack-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: [9PX700RT](#), [9PX1000RT](#), [9PX1000GRT](#), [9PX1500RT](#), [9PX1500RTN](#), [9PX1500GRT](#), [9PX2000RT](#), [9PX2000RTN](#), [9PX2200GRT](#), [9PX3000RT](#), [9PX3000RTN](#), [9PX3000GRT](#) and [9PX3000GLRT](#).

1.3 Standards

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

- IEC/EN 60950-1
- IEC/EN 62040-1 +A1 2013 (UPS Safety)
- IEC/EN 62040-2 (UPS EMC)
 - Emission Class B
 - Immunity levels C2
- IEC/EN 62040-3 (UPS Performance)
- IEC 61000-4-1 (Overview of IEC 61000-4 series)
- UL 1778 (UPS for USA)
- CSA C22.2 (UPS for Canada)
- RoHS EN 50581 2012

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. [9PX700RT](#)
 - 100/110/120/125V: 700VA / 630W
- b. [9PX1000RT](#)
 - 100/110/120/125V: 1000VA / 900W
- c. [9PX1000GRT](#)
 - 200/208: 1000VA / 900W
 - 220/230/240V: 1000VA / 1000W
- d. [9PX1500RT](#), [9PX1500RTN](#)
 - 120/125V: 1500VA / 1350W
 - 110V: 1350VA / 1215W
 - 100V: 1200VA / 1080W
- e. [9PX1500GRT](#)
 - 200/208: 1500VA / 1350W
 - 220/230/240V: 1500VA / 1500W
- f. [9PX2000RT](#), [9PX2000RTN](#)
 - 120/125V: 2000VA / 1800W
 - 110V: 1800VA / 1620W
 - 100V: 1600VA / 1440W
- g. [9PX2200GRT](#):
 - 220/230/240V: 2200VA / 2200W
 - 208/200V: 2200VA / 2000W
- h. [9PX3000RT](#), [9PX3000RTN](#)
 - 120/125V: 3000VA / 2700W
 - 110V: 2700VA / 2430W
 - 100V: 2400VA / 2160W
- i. [9PX3000GRT](#) & [9PX3000GLRT](#):
 - 220/230/240V: 3000VA / 3000W
 - 208/200V: 3000VA / 2700W

2. Nominal output voltage (user selectable):
 - a. 9PX2000RT, 9PX2000RTN, 9PX3000RTN
 - 120V default (100/110/120/125V)
 - b. 9PX2200GRT, 9PX3000GRT, 9PX3000GLRT
 - 208V default (200/208/220/230/240V)
3. Efficiency (full load, resistive load):
 - a. 9PX700RT: 89.9%
 - b. 9PX1000RT: 90.3%
 - c. 9PX1000GRT: 92.0
 - d. 9PX1500RT: 90.0%
 - e. 9PX1500GRT: 91.2%
 - f. 9PX2000RT, 9PX2000RTN, 9PX3000RTN: 91%
 - g. 9PX2200GRT, 9PX3000GRT, 9PX3000GLRT: 93%
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.
 - b. Bypass transfer thresholds in normal mode (percent is per nominal Watt/VA)
 - 102%~130%: 12 seconds
 - 130%~150%: 2 seconds
 - >150%: shutdown after 300 ms
 - c. Overload on battery
 - 102%~130%: 12 seconds
 - 130%~150%: 2 seconds
5. Waveform: Pure sinewave
6. Voltage regulation:
 - Normal mode: $\pm 1\%$ steady state
 - Battery mode: $\pm 2\%$ steady state
 - Frequency conversion mode: $\pm 4\%$ steady state
7. Output voltage distortion THDV% in normal mode:
 - a. Linear load: <2% linear load
 - b. Non-linear load: <5%
8. Dynamic voltage regulation:
 - a. 20% \rightarrow 100% \rightarrow 20% R load step: $\pm 6\%$
9. Recovery time (up to 90% voltage recovery):
 - a. 0% \rightarrow 100 \rightarrow 0% non-linear load step: 100ms @ full RCD load
10. Transient response:
 - a. IEC 62040-3 Classification 1 (test method defined by IEC62040-3 Edition 2 2011 for R load and non-linear load)

B. System input

1. Input voltage range

- a. at $\leq 40\%$ load: 100-276V
- b. $>40\%$ load: K-276V
 - $K = (176-100)/(\text{load}\%-40\%) V$
- 2. Input voltage hysteresis: Low +10V / High -10V
- 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.
- 3. UPS Runtimes:
 - i. 9PX700RT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
630	11.3	37.4	67	99	134
600	12.1	39.7	71	105	143
500	15.8	49.5	89	132	178
400	21.1	64	116	172	233
300	29.4	89	161	239	-
200	44.5	138	248	-	-

ii. 9PX1000RT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
900	6.3	24.1	43	64	86
800	7.7	27.8	50	74	99
700	9.5	32.8	59	87	118
600W	12.1	39.7	71	105	143
500W	15.8	49.5	89	132	178
400W	21.1	64	116	172	233
300W	29.4	89	161	239	-
200W	44.5	138	248	-	-

iii. 9PX1000GRT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
900	7.3	41.0	79	121	165
800	8.6	46.7	90	138	188
700	10.3	54	105	160	218
600	12.6	65	125	190	259
500	15.8	79	152	232	-
400	20.4	100	192	293	-
300	27.7	134	258	-	-
200	41.5	200	-	-	-

iv. 9PX1500RT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
1350	5.8	26.7	49.5	74	100
1200	7.1	30.9	57	86	116
1050	8.8	36.5	67	101	137
900	11.2	44.2	81	122	165
750	14.4	55.3	102	153	206
600	19.2	72.0	133	199	268
450	26.8	100.3	185	276	-
300	41.9	157.3	289	-	-

v. 9PX1500GRT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
1500	5.0	25.1	46.4	69	94
1350	5.8	28.2	52.0	78	105
1200	6.9	32.2	60	89	120
1050	8.5	37.7	70	104	140
900	10.7	45.2	83	124	168
750	13.9	55.6	102	153	207
600	18.5	71	131	195	264
450	25.8	95.7	176	263	-
300	38.8	143	263	-	-

vi. 9PX2000RT, 9PX2000RTN

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
1800	7.7	33.1	61	91	123
1620	9.1	37.6	70	104	140
1440	10.9	43	80	120	162
1260	13.2	51	94	141	190
1080	16.2	61	113	169	227
900	20.2	76	139	208	281

720	26.0	98	180	269	-
540	35.8	136	250	-	-
360	56.1	209	-	-	-

vii. 9PX3000RT, 9PX3000RTN

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
2700	4.8	23.0	43	64	86
2430	5.6	26.2	49	73	98
2160	6.8	30	56	84	113
1890	8.4	36	66	99	133
1620	10.7	43	78	118	159
1350	13.9	53	97	145	196
1080	18.3	68	126	188	254
810	24.6	95	176	262	-
540	42.9	147	-	-	-

viii. 9PX2200GRT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
2000	6.0	28.8	53	79	107
1800	7.0	32.9	60	90	121
1600	8.4	38	69	104	140
1400	10.3	44	81	121	163
1200	12.9	52	96	144	194
1000	16.6	64	118	176	238
800	21.9	82	151	225	304
600	30.1	112	206	-	-
400	46.0	170	-	-	-

ix. 9PX3000GRT, 9PX3000GLRT

Load (watts)	Internal	1 EBM	2 EBMs	3 EBMs	4 EBMs
3000	3.8	20.0	37.0	54.9	74
2700	4.5	23.0	42.2	63	85
2400	5.4	26.7	48.7	73	99
2100	6.6	31.2	57.1	86	116
1800	8.3	37.2	68	102	138
1500	10.8	45.7	84	125	170
1200	14.9	59.0	108	162	219
900	21.8	82	151	225	304
600	34.0	125	231	345	466

4. Battery replacement – Hot swappable internal 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 able to be used in both rack and tower applications.
2. The front LCD menu shall be able to rotate 90 degrees so that the front menu displays vertically in both a rack and tower form factor.
3. Rack mounting: The UPS and EBM accessories shall ship with a 4-post rail kit included for mounting in a 4-post, 19-inch enclosure.
4. The UPS shall ship with pedestal feet to stabilize the UPS in the tower form factor.

E. Dimensions:

1. The UPS shall have the following dimensions:
 - a. 700-1500VA UPS: 3.4" (2U) x 17.3" x 17.7" (H x W x D)
 - b. 700-1500VA EBM: 3.4" (2U) x 17.3" x 17.7" (H x W x D)
 - c. 2000-3000VA UPS: 3.4" (2U) x 17.3" x 23.8" (H x W x D)
 - d. 2000-3000VA EBM: 3.4" (2U) x 17.3" x 23.8" (H x W x D)

F. Input connection

1. 9PX700RT, 9PX1000RT, 9PX1500RT, 9PX1500RTN: 5-15P
2. 9PX1000GRT, 9PX1500GRT: C14 inlet
3. 9PX2000RT, 9PX2000RTN: 5-20P
4. 9PX3000RT, 9PX3000RTN: L5-30P
5. 9PX2200GRT, 9PX3000GRT, 9PX3000GLRT: C20 inlet with C19 to L6-20P detachable input cord

G. Output receptacles

1. 9PX700RT, 9PX1000RT, 9PX1500RT, 9PX1500RTN: (8) 5-15R
2. 9PX1000GRT, 9PX1500GRT: (8) C13
3. 9PX2000RT: (6) 5-20R, (1) L5-20R
4. 9PX3000RT: (6) 5-20R, (1) L5-30R
5. 9PX2200GRT, 9PX3000GRT: (8) C13, (2) C19
6. 9PX3000GLRT: (2) L6-20R, (2) L6-30R

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 EBMs 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
 - On/Off Button

1.4.4 Optional Accessories

- A. Battery integration system: The UPS shall have an available mounting kit for stacking multiple modules without the use of an IT rack. The system shall come equipped with (2) wheels and (2) casters as well as (4) leveling feet. The system shall allow for stacking of up to (8) 3U modules.
- B. Optional 2-post rail kit: There shall be an optional accessory to mount the UPS and EBM in a 2-post rack.

1.4.5 Communications Option

- A. Network Card
 1. UPS shall include one communications slot that will allow the operator to field install a network communications card [[Eaton Network Card-MS](#) or equivalent] which is supplied with the UPS. Minimum features are described below.
 - a. The network communications card must be hot-installable.
 - b. Communicates with SNMPv3 and IPv6
 - c. Supports IETF UPS MIB
 - d. Supports redundant UPS configurations
 - e. Allows control of UPS managed load segments
 - f. Manual and scheduled on/off controls of UPS

- g. Capable of mass firmware upgrades
- h. 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 / ROO (Remote Power Off / Remote On/Off)
 1. The UPS will provide both Remote Power Off and Remote On/Off capability.
 - a. 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. 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.

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 3 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 B2
- F. Audible noise
 - 700-1500VA models: ≤40 dB at 1m
 - 2000-3000VA models: ≤45 dB at 1m