



Decision and solution guide

November 2002



Selecting 110V-208V Uninterruptible Power Supply (UPS) options for IBM eServer xSeries Servers

Protecting data and systems with reliable, high-availability IBM power management solutions

NEW! Featured in this Guide is the IBM UPS3000X, an innovative new UPS solution designed by IBM to increase the availability and reliability of business-critical data. This high-density, cost-effective power management solution delivers advanced features, high performance and a low price per watt — all in a slim 2U form factor that converts easily from rack to tower configurations.

Server availability depends on reliable power management. No solution built from IBM eServer xSeries servers should be considered complete without a UPS solution. Today, UPS protection is more than a simple insurance policy; it is an integral component of any network.

IBM offers UPS products that have been tested and approved by IBM for compatibility with xSeries systems. The IBM family of offerings includes the new IBM-branded UPS3000X as well as select American Power Conversion (APC)-branded products that can complement most solutions.

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UPS products from IBM help protect your valuable investments in technology and data. The IBM lineup of tower and rack-ready UPS products are designed to provide:

- Battery backup to help ensure continuous operation or graceful system shutdown in the event of a power failure or power supply interruption
- Surge protection to help prevent damage to sensitive equipment from voltage increases
- Power conditioning to help prevent glitches and errors caused by irregularities in the power supply.

Why buy a UPS solution from IBM

There are compelling reasons for purchasing a UPS solution from IBM with every tower or rack-ready xSeries solution:

- All IBM UPS products have been tested by IBM under the IBM ServerProven® program and approved for operation with xSeries servers and options
- A preconfigured, all-IBM solution can help speed implementation with one-stop shopping and provide peace of mind that you have purchased the right degree of protection
- UPS products sold by IBM carry a three-year limited warranty**
- PowerChute Business Edition® software for advanced UPS power management and diagnostics provides easy integration with IBM Director server management software and with Tivoli® TME 10™ Network Management solutions for centralized control of UPS systems across monitored LANs
- UPS products sold by IBM are color matched (black) to xSeries servers and NetBAY rack products

IBM offers a comprehensive range of UPS products, including:

- **Low- and high-voltage UPS units in tower and rack-ready models**
- **PowerChute Business Edition management software and Director Plug In at no additional charge**
- **A full complement of UPS accessories available through select Vendor Logo Hardware programs**

**IBM-branded products come with an IBM three-year limited warranty. APC-branded products come with a three-year limited warranty from APC. See page 22 for additional information on limited warranties.^{1,2}

The need for power protection

Today, companies rely on computer systems to run almost every aspect of their business. In an ideal world, the electricity to power these systems would flow 24x7, without quality problems or interruption. However, no business is immune to power problems or occasional power outages.

Just how big a problem is power quality? Consider the following findings:

- "Power problems are the largest cause (45%) of data loss and server downtime." [source: Contingency Planning Research³]
- "Electrical interruptions will cost U.S. companies some \$80 billion this year (2000)." [source: Worldwatch Institute⁴]
- "Power disturbances account for about one third of all server failures." [source: IDC⁵]

The cost of downtime

What is the true cost of power problems—in other words, the cost of downtime? For many companies, your data is your business. Business-critical data can take the form of financial transactions, online purchases, customer demographics, correspondence, spreadsheets or any number of business applications.

When companies do not have reliable solutions for the continuing operation of their equipment, they lose money. If a Web server goes down due to blackout, for example, customers are apt to click over to a competitor's Web site—and not come back. Should mission-critical computers involved in manufacturing be damaged by a surge, inventory runs behind and schedules are missed. Data errors may occur when electronic noise penetrates a file server. In fact, network file servers that are constantly writing to disk are particularly susceptible to power-related problems.

How much is downtime worth to your business in lost revenue? Depending on the industry, the cost of downtime can vary dramatically, and could cost up to \$6.5 million per hour. Examples of downtime costs include:

Brokerage:	\$6.5M/hr
Energy:	\$2.8M/hr
Credit card operations:	\$2.6M/hr
Telecommunications:	\$2M/hr
Financial:	\$1.5M/hr
Retail:	\$1M/hr
Health care:	\$636K/hr

[sources: Network Computing, March 5, 2001⁶; Contingency Planning Research, a Division of Eagle Rock Alliance⁷]

The Internet has further emphasized that availability equals viability. According to the Yankee Group research firm, half of corporations surveyed rate their Internet downtime costs at more than \$1,000 per hour, and nine percent rate Internet downtime costs at more than \$50,000 per hour.⁸

Understanding power problems

While many businesses expect their electric power to always be available, in reality, power is far from perfect. Many events can impact power reliability, including:

- Generating station problems, including fuel shortages, human error, plant shutdowns and earthquakes
- Distribution network problems, including weather problems, trees, lightning, vehicular accidents, overloads and construction accidents
- Local building power problems, including overloads, equipment failures, construction accidents and poor wiring connections.

According to APC, each year a typical site averages 15 power outages that are sufficient to cause IT system malfunction. And of these outages, 90% are less than five minutes in duration.

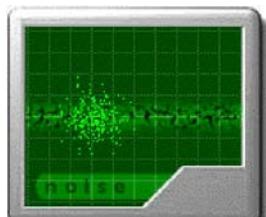
While power outages are the most apparent type of power problems, other irregularities in power supply can affect computer operations and data integrity.



Blackout

A blackout results in total loss of utility power.

- **Cause:** Blackouts are caused by excessive demand on the power grid, lightning storms, ice on power lines, car accidents, construction equipment, earthquakes and other catastrophes.
- **Effect:** Current work in RAM or cache is lost. The hard disk drive File Allocation Table (FAT) may also be lost, which results in total loss of data stored on drive.



Noise

More technically referred to as electro-magnetic interference (EMI) and radio frequency interference (RFI), electrical noise disrupts the smooth sine wave one expects from utility power.

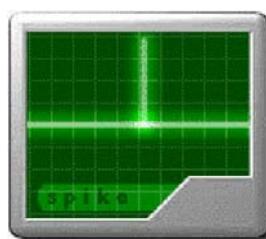
- **Cause:** Electrical noise is caused by many factors and phenomena, including lightning, load switching, generators, radio transmitters and industrial equipment. It may be intermittent or chronic.
- **Effect:** Noise introduces malfunctions and errors into executable programs and data files.



Sags

Also known as brownouts, sags are short term decreases in voltage levels. This is the most common power problem, accounting for 87% of all power disturbances according to a study by Bell Labs.

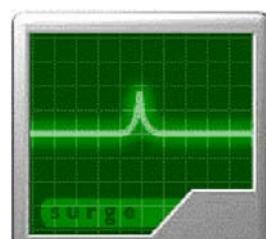
- **Cause:** Sags are usually caused by the startup power demands of many electrical devices (including motors, compressors, elevators and shop tools). Electric companies use sags to cope with extraordinary power demands. In a procedure known as rolling brownouts, the utility will systematically lower voltage levels in certain areas for hours or days at a time. Hot summer days, when air conditioning requirements are at their peak, will often prompt rolling brownouts.
- **Effect:** A sag can starve a computer of the power it needs to function, and cause frozen keyboards and unexpected system crashes which both result in lost or corrupted data. Sags also reduce the efficiency and life span of electrical equipment.



Spike

Also referred to as an impulse, a spike is an instantaneous, dramatic increase in voltage. A spike can enter electronic equipment through AC, network, serial or phone lines and damage or destroy components.

- **Cause:** Spikes are typically caused by a nearby lightning strike. Spikes can also occur when utility power comes back online after having been knocked out in a storm or as the result of a car accident.
- **Effect:** Catastrophic damage to hardware occurs. Data will be lost.



Surge

A surge is a short term increase in voltage, typically lasting at least 1/120 of a second.

- **Cause:** Surges result from presence of high-powered electrical motors, such as air conditioners and household appliances in the vicinity. When this equipment is switched off, the extra voltage is dissipated through the power line.
- **Effect:** Computers and similar sensitive electronic devices are designed to receive power within a certain voltage range. Anything outside of expected peak and RMS (considered the average voltage) levels will stress delicate components and cause premature failure.

Selection considerations

Points to consider	Factors influencing purchase decisions
How mission-critical is the data on the servers you want to protect?	Power protection almost always nets out as "cheap insurance" when you understand the short- and long-term costs associated with data loss and application outages.
How long a period of application downtime can your business tolerate?	Even though most power outages last only a few minutes, you should consider having enough battery power to sustain operations for longer term outages. For this reason, many customers often oversize their UPS requirements by a factor of two.
What is the value of your equipment purchase? How much are you willing to spend to protect that hardware investment?	You can provide maximum protection to your systems by investing in an adequately sized UPS. Typically, the cost will be a small fraction of the total cost of your servers and server options — and a good value in added piece of mind.
In addition to server(s) you plan to purchase, what other equipment needs protecting? Remember that UPS products provide surge protection and power conditioning as well as battery backup.	Look beyond the server to identify all equipment that merits power protection. This could range from switches and routers for a small office to multiple servers, network switches and storage devices for larger enterprises. It's easy to forget items like monitors, printers and other critical options when conducting an outlet count and a VA/Watt analysis.
What is the sum total power requirement of all the equipment you want to protect?	Proper sizing requires that you consider the power requirements for all devices that will be supported by a single UPS. See page 14 for information on the rack configurator.
How many outlets do you need to cover your current requirements?	In addition to total voltage/wattage, the UPS must be able to support the appropriate number of devices. It is easy to exceed the total allowable number of outlets or the VA/Watt rating of the original solution when taking into account all items.
Do you plan to add equipment to this UPS in the future? If so, what will the new outlet and load requirements be?	Consider both current and future requirements when selecting a UPS. Typically, it will be more cost-effective in the long run to purchase a unit that can accommodate growth rather than purchasing a smaller unit today and having to replace it at a later date.
In the event of a power failure, how much time do you need to save data, close applications and completely power down?	Be sure that the UPS you are considering will provide an adequate length of runtime for graceful shutdown of all equipment. At full load, most UPS products from IBM will provide five to seven minutes of battery-powered operation. This may not be adequate for some equipment. Even if you don't plan on adding more devices that will need power protection, buying a larger UPS can achieve longer battery operation and shutdown time in the event of a power failure.
What level of management do you require for your power protection?	All the IBM UPS offerings come with PowerChute Business Edition software, which makes it easy to manage and monitor your power at any point in time. The new IBM UPS3000X takes manageability one step further by offering a suite of network management opportunities via its built -n 10/100 Network Management Module and Network Shut Down software.
Have you deployed IBM Director?	The IBM suite of products easily integrates into IBM Director so customers can get the most out of their investment. Power management and power monitoring are all made easier with the IBM Director plug-ins available for IBM-offered UPS products.

Products and solutions

IBM UPS3000X overview

Available only from IBM, UPS3000X products are designed by IBM and manufactured to our demanding specifications by American Power Conversion (APC), a worldwide leader in power management and our longtime power management partner. This means you get IBM service, support, warranty protection and years of experience along with APC's knowledge of UPS manufacturing and management software.

Industry-leading advances in UPS design

- Hot-swappable electronics
 - User-friendly hot-swap modules allows for safe and easy module replacement while systems are up and running
- Extended-run capabilities
 - Scalable run time with the option of adding up to four external battery packs
- 2U form factor can be used in the rack or as a tower
- Multiple options for management connectivity: serial, USB and network (LAN-based)
- Exceptional efficiency: 3000VA and 2850W mean this UPS has a power factor of .95, at a lower price point than our previous 3000VA rack UPS products

Availability features

- QuickSwap™ batteries
 - User-friendly, hot-swappable battery system
 - Allows for safe and easy battery replacement while your system is up and running
- Automatic bypass
 - Automatic bypass to input line on fault or power module removal
- Automatic voltage regulation (AVR)
 - SmartBoost automatically corrects brownout conditions
 - SmartTrim automatically corrects overvoltage conditions
 - UPS will correct for voltage problems, within a certain range, without using the battery.
 - An internal transformer is used to step up and step down the voltage
- Intelligent battery management
 - CellGuard™ means longer battery life
 - Precision battery charging system and automatic true-load battery tests result in improved reliability
 - Redundant overcharge protection contributes to longer battery life
 - Battery replacement warning
 - Automatic self-test ensures customer will be alerted to degraded batteries before they wear out
 - Faster recharge time—typically 3 hours
 - Output is a pure sine-wave when on battery, providing assurance of compatibility with all loads

Management features

- PowerChute Business Edition and PowerChute Network Shutdown software, included with each unit, provide advanced UPS power management and diagnostics and an extensive set of user-configurable features, including:
 - Unattended system shutdown
 - Testing/status checking
 - UPS settings, such as transfer points, sensitivity and audible alarms
- Built-in Network Management Interface
 - An embedded Network Management module provides full management of the IBM UPS3000X via multiple open standards such as Telnet, HTTP, FTP and SNMP
 - The network port can also be used in conjunction with shutdown software to provide a graceful shutdown of the OS over the network
- Load, power and voltage meters
 - The load display LEDs let you know if you are nearing the UPS load capacity
 - The volt meter/battery charge LEDs report utility line voltage and battery capacity, allowing you to gauge how much time you have before batteries are low

- Audible alarms
 - Audible alarms alert you to changes in operating environment and battery conditions
 - Some alarms are software-configurable, and most can also be suppressed or delayed
- Switchable outlets
 - Three outlet groups can be independently commanded, allowing the UPS to selectively switch off banks of outlets powering nonessential systems or non-intelligent devices to increase run times for essential systems
- Serial, USB, and network communication ports

Reliability features

- Line-interactive design
 - Uses the DC-to-AC power inverter "in reverse," like a battery charger, during normal operation, providing greater performance and efficiency
- Network-grade line conditioning
 - Full time EMI/RFI filters help prevent line noise from causing data errors
- Auto self-test
 - Automatically initiates self-test at power-on, and every two weeks, helping ensure that users will be alerted to degraded batteries before they wear out
- Lightning/surge protection
- Site-wiring fault indicator (low voltage UPS only)
 - Alerts you to potential problems, such as a missing ground, reversed polarity between the hot and neutral lines, and an overloaded neutral

IBM also offers APC UPS products that have been tested and approved by IBM for compatibility with xSeries systems. APC is a leading provider of global, end-to-end AC- and DC-based power products and services.

APC Smart-UPS overview

Key features

- APC Smart-UPS products have been tested by IBM under the IBM ServerProven® program and approved for operation with xSeries servers
- Full-time multistage surge suppression, automatic voltage regulation and noise filtering
 - Provides Smart-UPS lightning and surge protection performance that is superior to virtually all separate surge suppressors
 - AVR Boost™ automatically steps up low voltage to help customers work through brownouts without unnecessary battery drain
 - AVR Trim™ automatically steps down high voltage to safe output levels
 - Network-grade line conditioning prevents line noise from causing data errors; APC Smart-UPS meets Novell and Microsoft approval for network protection without the need for additional external conditioners
- Graceful unattended shutdown: In the event of an extended power outage, APC Smart-UPS will interface with PowerChute Business Edition software via a serial or UPS port (depending on model) to perform automatic safe shutdown of the attached system(s). Safe shutdown options include:
 - Single-server support via serial or UPS cable
 - Multiple-server support for up to 15 servers via serial cable and 2-port or 8-port expander card(s)
 - Multiple-server support via network connection with Web/SNMP expander card
- Cell Guard intelligent battery management helps extend battery life
 - Precision microprocessor-controlled battery charging system
 - Prefailure diagnostics provide automatic self-testing and notification of battery wear
- QuickSwap hot-swappable battery replacement system allows fast, safe and easy replacement of batteries while systems are up and running
- Informative LED display with bar meters and status indicators provides at-a-glance information on load capacity, utility line voltage and battery status. Visible and audible alarms alert users to changes in operating environment and battery conditions.
- FAA-compliant battery disconnect feature meets or exceeds domestic and international safety requirements for shipment of battery-equipped devices by shipping all UPS products with the battery disconnected.

Technical specifications

Standard features available with APC Smart-UPS products sold by IBM

- Emergency Power Off (EPO) cable
- Longer communication cables (15')
- Longer shutdown cables (10')
- Three-year limited warranty** from APC (compared with the standard two-year warranty on non-IBM APC products)
- IBM versions of APC products are color matched (black) to xSeries servers and NetBAY rack products
- Specialized support for IBM customers through a dedicated toll-free telephone number, plus next-day delivery of replacement units

Product family at a glance

IBM P/N	Product	Description	Voltage
94G3134	APC Smart-UPS 700NET	700VA, 450W	110V
94G3135	APC Smart-UPS 1000NET	1000VA, 670W +USB	110V
94G3136	APC Smart-UPS 1500NET	1500VA, 980W +USB	110V
32P1020	APC Smart-UPS 1400RMB	2U Rack-mount 1400VA, 950W	110V
2130R30 (32P1681)	IBM UPS3000XLV	2U Rack-mount or tower 2400V-3000VA, 2400W-2850W	100V-127V
37L6861	APC Smart-UPS 5000RMB	5U Rack-mount 5000VA, 3750W	208V
94G4073	APC Smart-UPS 700iNET	700VA, 450W	220V-240V†
94G4074	APC Smart-UPS 1000iNET	1000VA, 670W +USB	220V-240V†
94G4075	APC Smart-UPS 1500iNET	1500VA, 980W +USB	220V-240V†
94G4076	APC Smart-UPS 2200iNET	2200VA, 1600W UPS	220V-240V†
32P1022	APC Smart-UPS 1400RMiB	2U Rack-mount 1400VA, 950W	220V-240V†
2130R31 (32P1691†)	IBM UPS3000XHV	2U Rack-mount or tower 3000VA, 2850W	200V-240V†
37L6862	APC Smart-UPS 5000RMiB	5U Rack-mount 5000VA, 3750W	220V-240V†

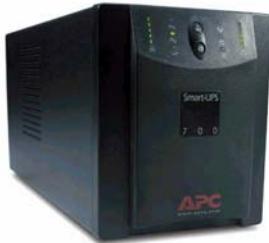
Options and parts for IBM UPS3000X

IBM P/N	Description
32P1692	UPS Extend Run Battery Pack

**See page 22 for additional information on limited warranty.^{1,2}

† For details on 220V-240V UPS units, consult the 220V-240V version of this guide. Part numbers vary, depending on country-specific line cord. Not all high-voltage models are available in all countries.

APC Smart-UPS 700NET



IBM part number	94G3134
Watts	450 (700VA)
Line input	NEMA 5-15
Input voltage	110V
Line output	NEMA 5-15
No. line outputs	4
Interface port	DB-9 RS-232
USB	No
No. SmartSlot™ bays	1
Style	Tower
Dimensions	15.7x13.7x35.8cm
Net weight	13.18kg (29 lb)
Shipping weight	14.55kg (32 lb)
Warranty**	3 years
Color	Black
General features	Hot-swap batteries, intelligent battery management, overload indicator, replace-battery indicator, site wiring fault indicator, SmartSlot, automatic voltage regulation (AVR), user-replaceable batteries
Includes	Smart-UPS signaling RS-232 cable, CD with software, user manual

Best use

- Protection for a single tower server, such as the x205, x200, x225 or x235
- Well-suited for high-volume installations, with a single 700NET purchased for each tower server installed

Points to consider	Reasons to buy up
The 700NET provides four outlets and can protect up to 700VA (450 watts). Is this sufficient for your present and near-future needs?	<ul style="list-style-type: none"> • A larger unit can support a higher total VA/wattage plus protect more devices. • The 1000NET provides four more line outputs, can cover up to 1000VA (670 watts). • The next step up, the 1500NET, also provides protection for up to eight units, plus can cover up to 1500VA (980 watts).
The 700NET does not provide a USB connection. Will this be a problem?	<ul style="list-style-type: none"> • Connecting the UPS to the server allows customers to take advantage of power management software. USB compatibility offers the flexibility of using either a serial port or a USB port for this connectivity.
In the event of a power failure, a loaded 700NET will give you about five minutes to power everything down. Is that enough?	<ul style="list-style-type: none"> • The 1000NET provides up to 140% longer backup time at the same wattage. • The 1500NET provides up to 300% longer backup time at the same wattage.

Benefit comparison for different size models

A comparison of the 700NET, the 1000NET and the 1500NET reveals:

	% Change		% Change	
	700NET to 1000NET	1000NET	700NET to 1500NET	1500NET
Cost	\$319		\$475	\$670
Backup time (minutes at 450W)	5	140%	12	300%
Max. load (VA)	700	43%	1000	114%
USB	0	—	1	—
Line outputs	4	100%	8	100%

**See page 22 for additional information on limited warranty.^{1,2}

APC Smart-UPS 1000NET



IBM part number	94G3135
Watts	670 (1000VA)
Line input	NEMA 5-15
Input voltage	110V
Line output	NEMA 5-15
No. line outputs	8
Interface port	DB-9 RS-232
USB	Yes
No. SmartSlot bays	1
Style	Tower
Dimensions	17.02x21.59x43.94cm
Net weight	18.86kg (41.5 lb)
Shipping weight	20.91kg (46 lb)
Warranty**	3 years
Color	Black
General features	Advanced battery monitoring, audible alarms, auto diagnostic testing, automatic voltage regulation (AVR), AVR Boost, AVR Trim, brownout correction, hot-swap batteries, Cell Guard intelligent battery management, lightning and surge protection, line-interactive design, load meter, network-grade line conditioning, overload indicator, pager notification, programmable power event response, QuickSwap, replace-battery indicator, sine-wave output, site wiring fault indicator, SmartSlot, status indicator LEDs, USB compatibility, user-replaceable batteries
Includes	USB cable, Smart-UPS signaling RS-232 cable, CD with software, user manual

Best use

- Can provide protection for up larger groups of x205, x225 or x235 tower servers
- Can also be used with tower servers that consume more power, such as the x240 and x255

Points to consider	Reasons to buy up
The 1000NET can protect up to 1000VA (670 watts). Is this sufficient for your present and near-future needs?	<ul style="list-style-type: none"> • A larger unit can support a higher total VA/wattage plus protect more devices. • The next step up, the 1500NET, also provides protection for up to eight units, plus can cover up to 1500VA (980 watts).
In the event of a power failure, a loaded 1000NET will give you about seven minutes to power everything down. Is that enough?	<ul style="list-style-type: none"> • The 1500NET provides up to 143% longer backup time at the same wattage.

Benefit comparison for different size models

A comparison of the 1000NET and the 1500NET reveals:

		% Change	
	1000NET	1000NET to 1500NET	1500NET
Cost	\$475		\$670
Backup time (minutes at 900VA)	7	143%	17
Max. load (VA)	1000	50%	1500
USB	1	—	1
Line outputs	8	—	8

** See page 22 for additional information on limited warranty.^{1,2}

**APC Smart-UPS
1500NET**



IBM part number	94G3136
Watts	980 (1500VA)
Line input	NEMA 5-15
Input voltage	110V
Line output	NEMA 5-15
No. line outputs	8
Interface port	DB-9 RS-232
USB	Yes
No. SmartSlot bays	1
Style	Tower
Dimensions	21.59x17.02x43.94cm
Net weight	24.9kg (52 lb)
Shipping weight	26.36kg (58 lb)
Warranty**	3 years
Color	Black
General features	Advanced battery monitoring, audible alarms, auto diagnostic testing, automatic voltage regulation (AVR), AVR Boost, AVR Trim, brownout correction, hot-swap batteries, Cell Guard intelligent battery management, lightning and surge protection, line-interactive design, load meter, network-grade line conditioning, overload indicator, pager notification, programmable power event response, QuickSwap, replace-battery indicator, sine-wave output, site wiring fault indicator, SmartSlot, status indicator LEDs, USB compatibility, user-replaceable batteries
Includes	USB cable, Smart-UPS signaling RS-232 cable, UCD with software, user manual

Best use

- Our highest power specific tower unit, the 1500NET can support small workgroups of tower servers. It has the power to support several xSeries towers, even when fully configured.
- It is also the great choice for the biggest power-consuming tower servers like the x240 and x255, providing the maximum battery backup available from IBM for tower servers.
- For a more powerful and feature rich option look to deploying the IBM UPS3000X in a tower format. Longer run times, better management options, greater outlet support.

	1500NET	IBM UPS3000X
Cost	\$670	\$1,799
Backup time (minutes at 1000VA)	11	26
Max. load (VA)	1500	3000
USB	1	1
Line outputs	8	6 plus 7 with NetBAY Rack PDU

**See page 22 for additional information on limited warranty.^{1,2}

**APC Smart-UPS
2U 1400RMB**



IBM part number	32P1020
Watts	950 (1400VA)
Line input	NEMA L5-15
Input voltage	110V
Line output	NEMA 5-15
No. line outputs	6
Interface port	DB-9 RS-232
No. SmartSlot bays	1
Style	Rack-mount
Form factor	2U
Dimensions	8.89x48.26x45.72cm
Net weight	28.64kg (63 lb)
Shipping weight	31.91kg (72.3 lb)
Warranty**	3 years
Color	Black
General features	Hot-swap batteries, Cell Guard intelligent battery management, overload indicator, rack mount, replace-battery indicator, site wiring fault indicator, SmartSlot, automatic voltage regulation (AVR), user-replaceable batteries
Includes	Emergency power off cable, Smart-UPS signaling RS-232 cable, two IEC rack jumper cords, rack-mounting support rails, CD with software, user manual

Best use

- The 1400RMB is best-suited for small groups of rackable servers, such as the x305, x335 and x345

Points to consider	Reasons to buy up
The 1400RMB provides six outlets and can protect up to 1400VA (950 watts). Is this sufficient for your present and near future needs?	<ul style="list-style-type: none"> A larger unit can support a higher total VA/wattage plus protect more outlets. The UPS3000XLV can cover up to 3000VA (2850 watts) in the same U size, with hot-swap electronics and optional run-time extension with up to four external battery packs. The UPS3000XLV can also protect up to 7 additional outlets by using one NetBAY PDU, for a total of 13 outlets The next step up, the 5000RMB, provides protection for eight outlets and can cover up to 5000VA (3750 watts) Plus, the 5000RMB can protect up to 14 additional outlets by using two NetBAY PDUs, for a total of 22 outlets.
In the event of a power failure, a loaded 1400RMB will give you about six minutes to power everything down. Is that enough?	<ul style="list-style-type: none"> The UPS3000XLV provides up to 200% longer backup time at the same wattage. The 5000RMB provides up to 683% longer backup time at the same wattage.

Benefit comparison for different size models

A comparison of the 1400RMB, the UPS3000XLV and the 5000RMB reveals:

	% Change		% Change		
	1400RMB to		1400RMB to		
	1400RMB	UPS3000XLV	UPS 3000XLV	5000RMB	5000RMB
Cost	\$855		\$1,799		\$3,299
Backup time (minutes at 900W)	6	200%	18	683%	47
Max. load (VA)	1400	114%	3000	257%	5000
Line outputs	6	116%	6 plus 1 PDU = 13	266%	8 plus 2 PDUs = 22

**See page 22 for additional information on limited warranty.^{1,2}

IBM UPS3000XLV



IBM part number	2130R30 (32P1681)
Watts	Up to 3000VA and 2850W
Line input	NEMA L5-30
Input voltage	110V-127V
Line output	IEC 320-C13 (6) NEMA L5-20R (1)
No. line outputs	6 plus up to 7 more with NetBAY Rack PDU
Interface port	DB-9 RS-232; USB; integrated Network Management Module (RJ45)
Style	Rack-mount, convertible to tower with included hardware
Form factor	2U
Dimensions	8.89x43.0x68.5cm
Net weight	46.7kg (103 lb)
Warranty**	3 years
Color	Black
General features	Emergency power off, hot-swap electronics, optional UPS Extend Run external battery packs (up to four), hot-swap batteries, controllable outlet groups, integrated network management, Cell Guard intelligent battery management, overload indicator, rack mount, replace-battery indicator, resettable circuit breaker, site wiring fault indicator, automatic voltage regulation (AVR), status indicator LEDs, user-replaceable batteries
Includes	Emergency power off cable, Smart-UPS signaling RS-232 cable, Ethernet-to-USB cable, four IEC rack jumper cords, rack-mounting support rails, CD with software, user manual

Best use

- Provides enough power to protect and back up medium-size workgroups of x305s, x335s or x345s
- Has the power capabilities to protect xSeries rackable servers that consume more power, such as the x360 and x440

Points to consider	Reasons to buy up
The UPS3000XLV provides six outlets plus the ability to protect up to seven additional outlets by using one NetBAY PDU, for a total of up to 13 outlets, and can protect up to 3000VA (2850 watts). Is this sufficient for your present and near-future needs?	<ul style="list-style-type: none"> • A larger unit can support a higher total VA/wattage plus protect more devices. • The next step up, the 5000RMB, provides protection for up to eight units and can cover up to 5000VA (3750 watts). • Plus, the 5000RMB can protect up to 14 additional outlets by using two NetBAY PDUs, for a total of up to 22 outlets.
In the event of a power failure, a loaded UPS3000XLV will give you about four minutes to power everything down. Is that enough?	<ul style="list-style-type: none"> • The 5000RMB provides up to 325% longer backup time at the same wattage. • Optionally, adding up to four Extend Run battery packs provides up to 1.7 hours of backup time at the same wattage.

Benefit comparison for different size models

A comparison of the UPS3000XLV and the 5000RMB reveals:

	% Change UPS3000XLV to 5000RMB	
	UPS3000XLV	5000RMB
Cost	\$1,799	\$3,299
Backup time (minutes at 2700W)	4	325%
Max. load (VA)	3000	67%
Line outputs	6 plus 1 PDU = 13	69%
		8 plus 2 PDUs = 22

**See page 22 for additional information on limited warranty.^{1,2}

**APC Smart-UPS
5000RMB**



IBM part number	37L6861
Watts	3750 (5000VA)
Line input	NEMA L6-30P
Input voltage	208V
Line output	IEC 320-C13 (8) IEC 320-C19 (2)
Interface port	DB-9 RS-232
No. SmartSlot bays	2
Style	Rack-mount
Form factor	5U
Dimensions	22.23x48.26x63.5cm
Net weight	102.7kg (225 lb)
Shipping weight	111.36kg (245 lb)
Warranty**	3 years
Color	Black
General features	Emergency power off, hot-swap batteries, Cell Guard intelligent battery management, overload indicator, rack mount, replace-battery indicator, resettable circuit breaker, site wiring fault indicator, SmartSlot, automatic voltage regulation (AVR), status indicator LEDs, user-replaceable batteries
Includes	Emergency power off cable, 2-port serial expander card (P/N AP9606), Smart-UPS signaling RS-232 cable, two IEC rack jumper cords, rack-mounting support rails, CD with software, user manual

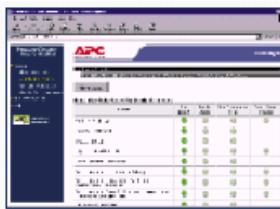
Best use

- Our highest power rackable UPS can support large workgroups consisting of midrange xSeries rackable servers, such as the x305, x335 or x345.
- The 5000RMB is the best choice for the rackable servers that consume the most power, such as the x360 and x440. This unit has the power to support several of these high-performance servers, even when fully configured.
- The 5000RMB provides the maximum battery backup available from IBM for rackable servers.
- The two C19 outlets on the 5000RMB allow the addition of up to 14 more outlets using two NetBAY PDUs, enabling the protection up to 22 outlets — a far greater number than any other IBM UPS.
- Another consideration: a pair of IBM UPS3000X provide greater wattage, more outlets, better management possibilities, in 4U. A single APC5000 or a pair of IBM3000 are close to the same price point!

5000RMB	
Cost	\$3,299
Backup time (minutes at 2700W)	17
Max. load (VA)	5000
Line outputs	8 plus 2 PDUs = 22 outlets

**See page 22 for additional information on limited warranty.^{1,2}

Power management software



PowerChute Business Edition

PowerChute Business Edition is perfect for IBM's customers who would like to manage multiple devices. The software's simple architecture includes agents that reside on each protected computer and communicate with connected Smart-UPS products, a PowerChute server that collects information from the agents, and a PowerChute Console that offers a central view of all collected information.

This new software is optimized to manage one or more UPS units over a network, building on the strengths of APC's award-winning PowerChute *plus* product. PowerChute Business Edition includes APC's PowerNet SNMP Agent (simple network management protocol) and provides seamless integration with IBM Director via a software plug-in available at no additional charge. PowerChute can manage both IBM-branded and APC-branded UPSs for the maximum level of control via a single console.

General Information

Current version	PowerChute Business Edition v 6.0.1. (Patent Pending)
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Software Requirements

Console	Microsoft Windows NT v4.0
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	Microsoft Windows 2000
--	------------------------

Server	Microsoft Windows NT v4.0
--------	---------------------------

	Microsoft Windows 2000
--	------------------------

Agent	Microsoft Windows NT v4.0
-------	---------------------------

	Microsoft Windows 2000
--	------------------------

	Microsoft Windows XP
--	----------------------

	Red Hat Linux v7.1, 7.2, 7.3
--	------------------------------

	SuSE Linux v7.2, 7.3 (not available for UPS3000X)
--	---

	Novell NetWare v5.1, v5.6, 6.0
--	--------------------------------

Features and benefits

Graceful system shutdown	Prevents possible data corruption by performing graceful, unattended operating system shutdown in the event of an extended power outage
---------------------------------	---

Centralized management console	Allows network managers to quickly assess power status of their equipment
---------------------------------------	---

Mass configuration wizard	Ensures consistent configuration and decreases setup time by enabling configuration of UPS settings, shutdown and e-mail parameters for all UPS units simultaneously.
----------------------------------	---

Power event analysis	Quickly pinpoint power problems by tracking power data such as minimum/maximum utility line voltage, battery voltage, line frequency and load capacity. Also tracks ambient temperature and humidity (requires environmental monitoring accessory).
-----------------------------	---

Recommended actions	Reduces need for training and speeds troubleshooting by displaying the probable cause of power event and recommends corrective action.
----------------------------	--

Discovery	Discovers and manages multiple APC UPS units simultaneously over the network (25-node version can discover across network segments).
------------------	--

Auto-update capability	Receive automatic notification of software updates, providing immediate access to the latest product enhancements.
-------------------------------	--

E-mail/pager notification	PowerChute Business Edition sends event notifications via an e-mail or pager gateway so you can receive timely notification of power events.
----------------------------------	--

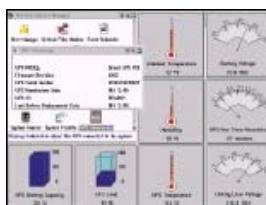
Higher level power events	Analyze power by pinpointing frequent or extended under and over voltages. Alerts users to unusual or chronic power situations that require attention. Individual events are still logged at a high level of detail.
----------------------------------	--

System event log integration	Writes events to NT/2000 OS log, allowing monitoring of UPS via standard tools such as NetIQ.
-------------------------------------	---

PowerChute Extension for IBM Director

With PowerChute Business Edition Extension for IBM Director, network administrators can manage up to 25 UPSs through a single IBM Director console. Users can quickly and easily determine UPS status through the System Monitor and configure UPS parameters. This integrated solution provides:

- A graphical "dashboard" display of diagnostic information, including UPS load, UPS runtime remaining, utility line voltage, UPS temperature, battery voltage, battery capacity, humidity and ambient temperature
- Full reporting of power events into the IBM Director events console
- Full unattended graceful server shutdown in the event of a power failure
- Auto discover of all UPS devices on the network for fast and easy setup.



UPS accessories

A comprehensive set of accessories can help extend the reliability, versatility and manageability of an APC Smart-UPS from IBM, including APC accessory cards that are designed to work with the SmartSlot in an APC Smart-UPS. Many of these accessories are available through the IBM Vendor Logo Hardware program. Check your region's or geography's availability. Many of these accessories will also work with the IBM UPS3000X, but the built-in functionality of this high-performance UPS makes many of them unnecessary.

2-port Interface Expander Card



Shut down up to three servers from one UPS

The 2-Port Interface Expander Card (AP9607) provides two additional ports to facilitate graceful system shutdown via serial connections and allows advanced UPS management. The unit is ideal for "server farms" or multiple operating system environments, since all three servers can be running different operating systems (OS).*

Share-UPS 8-Port interface expander



Shut down multiple servers from one UPS

Connect up to 8 completely OS-independent servers to a single UPS with Share-UPS (AP9207) 8-Port interface expander (15 servers with 2 Share-UPS). Share-UPS integrates with PowerChute plus software. Each server runs its own copy of PowerChute software, for monitoring and power management of the UPS.

Web/SNMP Management Card



Reboot hung servers via Web, SNMP or Telnet

APC's Web/SNMP Management Card (AP 9606) lets customers manage APC UPSs units in rack, computer room and data center environments using multiple open standards: Telnet, HTTP, SNMP and WAP (WML). Through Web-based management customers can:

- Monitor and configure APC UPSs to shut down/reboot computer systems
- Receive e-mail alerts
- View the event log
- Check the status of most APC's Smart-UPSs using a Web-enabled mobile phone.

Out-of-Band Management Card



Manage UPS remotely via modem

With APC's Out-of-Band Management Card (AP9608), customers can integrate "out-of-band" power management directly into a Smart-UPS to provide complete UPS management and control via a customer-supplied external modem. The Out-of-Band Management Card allows customers to determine UPS and power status, monitor environmental conditions (with optional SmartSlot Measure-UPS II), configure UPS settings, page users in response to critical UPS events and reboot devices even when network communications are not available. *

Relay I/O Card



Control and monitor power through a dry-contact interface

APC's Relay I/O Card (AP9610) allows customers to control and monitor power through a simple dry-contact interface, a communication format favored by manufacturers of PBXs, telecom management devices and alarm management systems. With the Relay I/O Card, customers can control the operation of a Smart-UPS and receive critical UPS alarms, a function normally available only through fileserver or modem communications. *

Environmental Monitoring Card



Monitor temperature and humidity

The Environmental Monitoring Card (AP9612TH) works with APC Smart-UPS to monitor ambient temperature, humidity and other environmental conditions. Smoke alarms and halon alarms can also be monitored through PowerChute Business Edition, PowerNet SNMP or the Out-of-band Management Card interface. A stand-alone unit utilizing zero U rack space is also available.*

Triple Expansion Chassis



Integrate multiple accessories

The Triple Expansion Chassis (AP9604) is an external, 1U, 19" rack-mountable device that allows integration of additional UPS slot accessories with a Smart-UPS. Triple Expansion Chassis can be used in a rack environment or as a stand-alone device that allows customers to add up to three slot cards to Smart-UPSs that have an existing slot already in use.

Remote Power-Off Device



Turn off equipment in an emergency

The APC Remote Power-Off device (AP9830) allows customers to turn off output from select Smart-UPS products with a remote switch. When used with an emergency power-off (EPO) system, this device can turn off equipment in an emergency. The Remote Power-Off device by itself is not an EPO system, but can be used as a part of an EPO system for complete protection.

*These products are not supported by or not necessary on the IBM UPS3000X.

UPS configuration and sizing

Tower UPS models

	APC Smart-UPS 700NET	APC Smart-UPS 1000NET	APC Smart-UPS 1500NET
UPS attributes			
Part number	94G3134	94G3135	94G3136
Warranty**	3-year	3-year	3-year
Color	Black	Black	Black
Line input	1 NEMA L5-15P	1 NEMA L5-15P	1 NEMA L6-30P
Output receptacles	4 NEMA 5-15R	8 NEMA 5-15R	8 NEMA 5-15R

Rackable UPS models

	APC Smart-UPS 1400RMB	IBM UPS3000XHV	APC Smart-UPS 5000RMB
UPS attributes			
Part number	32P1020	2130R30 (32P1681)	37L6861
Unit height	2U	2U	5U
Warranty**	3-year	3-year	3-year
Color	Black	Black	Black
Emergency power off cable	Yes	Yes	Yes
Rail kit	Yes	Yes	Yes
UPS expander card AP9607	No	Integrated Network Management Module for managing multiple servers	Yes
Line input	1 NEMA L5-15P	1 NEMA L5-30P	1 NEMA L6-30P
Output receptacles	6 NEMA 5-15R	6 IEC 320-C13 (16amp) 1 NEMA L5-20R (20amp)	8 IEC 320-C13 (10amp) 2 IEC320-C19 (16amp)
Outlet expandability via NetBAY PDU	No	Yes	Yes
Support for external battery packs?	No	Yes	No

xSeries Rack Configurator software

The variety of sizes, access, component cabling and power supply requirements of servers, accessories and storage components make configuring a complex networked system a challenge. The IBM @server xSeries Rack Configurator provides an easy-to-use tool that helps design the optimum layout. The configurator helps customers check, correct and report the following:

- Components by product number and position
- Infrastructure specifications, including weight, power, volt-amps (VA), heat (BTU/hr), bays, EIA, outlets and console ports
- Width and depth; front, rear and side clearances; total weight and top clearance
- Cables and connectors by component position
- Download the configurator software from ibm.com/pc/us/eserver/xseries/library/configtools

** See page 22 for additional information on limited warranty.^{1,2}

Sizing guide for IBM UPS solutions

Step 1:

Identify the devices contained in the rack configuration

Step 2:

Sum the total load (watts) of all devices in the configuration, using either Maximum Load for minimum runtime or Typical Load for typical runtime.

Servers	# Power Cords	Std/Max Watts Load Max/Typical
xSeries 200	1/1	350/245
xSeries 205	1/1	485/340
xSeries 220	1/1	350/245
xSeries 232 (one 385W power supply)	1/1	400/280
xSeries 232 (two 250W power supplies)	2/3	450/315
xSeries 235	1/2	800/560
xSeries 240	2/3	450/315
xSeries 250	2/4	475/350
xSeries 255	2/4	1000/530
xSeries 300	1/1	200/140
xSeries 305	1/1	200/140
xSeries 330	1/1	200/140
xSeries 335	1/1	340/245
xSeries 342	1/2	390/270
xSeries 345	1/2	500/350
xSeries 350	1/3	525/365
xSeries 360	2/3	740/520
xSeries 370	3/3	1450/1015
xSeries 380	2/2	2000/1400
xSeries 440	2/2	950/950
Other Devices		
RXE-100 (8684-1RX)	2/2	370/260
EXP300 Storage Expansion Unit (3531)	2/2	360/285
FASST200 Storage Server (35421RU)	2/2	390/275
FASST200 HA Storage Server (35422RU)	2/2	390/275
FASST500 Storage Server (35521RU)	2/2	200/140
FASST700 Storage Server (17421RU)	2/2	390/275
FASST EXP500 Storage Expansion Unit (35601RU)	2/2	350/245
FASST EXP700 Storage Expansion Unit (17401RU)	2/2	350/245
SAN Fibre Channel Switch, 8-port (2109S08)	1/2	200/n/a
SAN Fibre Channel Switch, 16-port (2109S16, 2109F16)	1/2	200/n/a
TotalStorage SAN Switch F08, 8-port (3534F08)	1/1	50/n/a
SAN Data Gateway Router UltraSCSI LVD Port (2108R3L)	1/1	90/n/a
DLT Tape Autoloader and Library (3502)	1/1	135/n/a
Magstar® MP 3570 Tape Subsystem (C2x)	1/1	200/140
NetMEDIA Storage Expansion Unit EL (3551)	2/2	185/130
3600 Series Tape Autoloader and Library (3600xxx)	1/1	700/500

Step 3:

Find the Total Configuration Load In the table to the right

Step 4:

Select the most appropriate UPS model to achieve the desired runtime. If the Total Configuration Load is greater than the entries in the table, split the load across two or more UPS units.

Model	APC Smart-UPS 700NET	APC Smart-UPS 1000NET	APC Smart-UPS 1500NET	APC Smart-UPS 1400RMB	IBM UPS3000XLV	APC Smart-UPS 5000RMB
Part Number	94G3134	94G3135	94G3136	32P1020	2130R30 (32P1681)	37L6861
Total Load (Watts)	Runtime Minutes⁹	Runtime Minutes	Runtime Minutes	Runtime Minutes	Runtime Minutes	Runtime Minutes
200	22	38	62	45	144	240
250	17	28	43	34	84	200
300	12	22	34	25	84	166
350	9	18	29	22	58	145
400	7	14	23	18	52	125
450	5	12	20	15	45	110
500	-	11	18	13	38	97
550	-	9	16	11	38	87
600	-	8	13	10	31	76
650	-	7	12	9	29	68
700	-	6	11	8	26	63
750	-	-	10	8	25	59
800	-	-	9	7	22	55
850	-	-	8	7	20	51
900	-	-	7	6	18	47
950	-	-	6	5	18	43
1000	-	-	-	-	16	39
1100	-	-	-	-	14	34
1200	-	-	-	-	12	31
1300	-	-	-	-	12	28
1400	-	-	-	-	9	25
1500	-	-	-	-	9	22
1600	-	-	-	-	8	20
1700	-	-	-	-	7	18
1800	-	-	-	-	7	17
1900	-	-	-	-	7	14
2000	-	-	-	-	6	12
2100	-	-	-	-	6	11
2200	-	-	-	-	5	11
2300	-	-	-	-	5	10
2400	-	-	-	-	4	10
2500	-	-	-	-	4	9
2600	-	-	-	-	4	9
2700	-	-	-	-	4	8
2800	-	-	-	-	4	8

Additional resources

Glossary

AC (alternating current)

Used to indicate that voltage or current in a circuit is alternating in polarity at some frequency, as in "230 Volts AC."

Alarms

Audible alarms alert you of changes in operating environment and battery conditions. Most can be suppressed or delayed to eliminate unwanted noise.

Automatic voltage regulation (AVR)

AVR automatically steps up or steps down voltage to safe output levels, allowing you to work through brownouts without unnecessary battery drain.

AVR Boost

AVR Boost automatically corrects brownout conditions. This feature automatically steps up voltage to safe output levels, allowing you to work through brownouts without unnecessary battery drain.

AVR Trim

AVR Trim automatically corrects over-voltage conditions. This feature automatically steps down high voltage to safe output levels and allows you to work through over-voltages without unnecessary battery drain.

Battery

A battery is an energy storage system that is used in a UPS. The battery used in a UPS is rechargeable. The UPS converts the DC power from the battery to AC power for use by the load.

Battery management

A term used by many UPS manufacturers to describe a suite of functions related to charging, testing and maximizing the life of a UPS battery. Battery management may include imminent battery failure diagnosis and indication, scheduled battery testing, hot-swappable user-replaceable batteries, high-speed battery charging, output regulation to reduce unnecessary battery usage and/or special battery charging techniques.

Cell Guard

This feature provides intelligent battery management that helps extend battery life.

Distortion

When used in relation to AC power distribution, this refers to deviations between the actual AC voltage waveform delivered to the user and the ideal sine wave of voltage.

Efficiency

A ratio of output to input power expressed in percent. UPS efficiency of less than 100% causes increased energy use.

EMI (electro-magnetic interference)

EMI usually refers to unwanted electrical noise present on a power line.

Environmental monitoring capabilities

Delivers temperature and humidity monitoring for enhanced peace of mind.

Intelligent battery management

Intelligent battery management delivers longer battery life, faster recharge and warning of battery wear.

Joule

The Joule is a measure of the amount of energy delivered by one watt of power in one second or one million watts of power in one microsecond. The Joule rating of a surge protection device is the amount of energy that it can absorb before it becomes damaged.

Multiple server support

A single UPS and software should accommodate multiple servers and multiple operating systems. With multiple server support, a unit will be compatible even if the network configuration changes.

Network grade line conditioning

Full-time EMI/RFI filters prevent line noise from causing data errors.

Network Management Module

Built-in network capabilities available on the IBM UPS3000X, this feature takes the place of optional smart cards used on other UPS models. The module allows remote management and monitoring of the UPS itself plus attached servers.

QuickSwap™

QuickSwap is defined as a user-friendly, hot-swappable battery replacement system. It saves the time and expense of returning the UPS to the factory for battery service and allows safe and easy replacement of batteries while attached devices are up and running. Replacement battery kits ship in a reusable box for convenient return of exhausted batteries to a recycling center or to APC.

Reboot

A reset of a computer that is manually initiated or occurs due to a software crash or due to a power sag or surge. A reboot causes all the current work that was in process to be lost.

Redundant

An intentional repetition of a given function—usually intended to improve reliability.

Redundant switch

The redundant switch continuously monitors two AC circuits and automatically switches from the primary to the redundant power source, increasing overall system availability.

RFI (radio frequency interference)

This is electrical noise which is present in communications or computing equipment which results from some parts of the equipment or attached wiring acting as a radio antenna.

Site wiring fault indicator

Alerts users to potential problems, such as a missing ground and reversed polarity, two common wiring mistakes that usually require an electrician to diagnose.

SNMP (Simple Network Management Protocol)

Simple Network Management Protocol is a protocol that allows the management of networks that today is mainly used for managing TCP/IP networks.

Surge suppressor

A surge suppressor is a device used to protect equipment from transient over-voltages present on AC power, data or telephone circuits. The suppressor may operate by absorbing the surge, by blocking the surge from flowing or by a combination of the two.

Transient

A transient is a momentary variation that ultimately disappears. Most power problems are transient.

VA (Volt-Amps)

Volt-Amps is a form of power measurement. A VA rating is the Volts rating multiplied by the Amps (current) rating. The VA rating can be used to indicate the output capacity of a UPS or other power source or it can be used to indicate the input power requirement of a computer or other AC load.

Watts

This is a form of power measurement. For AC power systems, the Watts rating is the Volts rating multiplied by the Amps rating multiplied by the Power Factor. Watts represent actual delivered energy.

PowerChute software configurable features:

UPS ID

Users may assign any eight character settings to assist in UPS identification.

Low transfer

Low transfer voltage may be moved downward to extend brownout range or upward to protect sensitive equipment.

High transfer

High transfer voltage may be moved lower to protect sensitive equipment, or higher to conserve battery during extended high line voltage conditions.

Sensitivity

Sensitivity to line noise may be adjusted for fuel-powered AC generator applications.

Self-test

The APC Smart-UPS automatically performs a self-test every two weeks, ensuring proactive detection of a weakening battery. Users can opt for weekly testing, testing at startup only or no automatic self-test.

Alarm

The audible alarm may be suppressed or delayed to eliminate nuisance alarms.

Shutdown delay

The delay between when the "shutdown signal" is sent from the CPU to UPS and when the UPS "shuts down" can be adjusted for special applications.

Turn-on delay

Allows multiple APC Smart-UPS on the same power grid or circuit to stagger or sequence their return from shutdown once the utility line returns.

Low battery capacity

The low battery warning may be moved from two minutes up to ten minutes before battery exhaustion. This allows plenty of time for safe shutdown of complex applications.

Minimum battery capacity

When the utility line returns after a shutdown, Smart-UPS can ensure that the batteries first recharge to allow for subsequent safe shutdown of file servers and CPUs.

**For more
information**

IBM @server xSeries Racks and rack options

ibm.com/pc/ww/eserver/xseries/rack

IBM @server xSeries Options

ibm.com/pc/us/eserver/xseries/storage

IBM @server xSeries Rack Configurator

ibm.com/pc/us/eserver/xseries/library/configtools

IBM @server xSeries Configuration and Options Guide

ibm.com/pc/us/eserver/xseries/library

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APC software downloads

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1) For terms and conditions or copies of the IBM limited warranty, call 1 800 772-2227 in the U.S. and in Canada call 1 800-426-2255. Limited warranty includes International Warranty Service in those countries where this product is offered. Registration is required. Telephone support may be subject to additional charges. For warranties including on site service, IBM sends a technician after attempting to resolve the problem remotely.

- 2) APC offers a three-year limited warranty when the APC UPS is purchased through IBM.
 - 3) Visit <http://www.contingencyplanningresearch.com> and <http://www.apcc.com> for more information on the findings.
 - 4) Visit <http://www.worldwatch.org> for more information on the findings.
 - 5) Visit <http://www.idc.com> for more information on the findings.
 - 6) Visit <http://www.networkcomputing.com> for more information on the findings.
 - 7) Visit <http://www.contingencyplanningresearch.com> and <http://www.eaglerockalliance.com> for more information on the findings.
 - 8) Visit <http://www.yankeeegroup.com> for more information on the findings.
- 9) Battery run times are estimates based on IBM testing, actual times will vary depending on many factors including battery age, temperature, maintenance, etc.

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