

IBM 11000VA LCD 5U Rack Uninterruptible Power Supply

IBM System x at-a-glance guide

The IBM® 11000VA LCD 5U Rack uninterruptible power supply (UPS) optimizes for both efficiency and performance, providing the right level of power protection for the moment. This online double-conversion UPS delivers 10,000 watts of clean conditioned power with an efficiency rating of up to 96% to protect your IBM System x® and BladeCenter® investment, improve availability, and reduce energy consumption. The power-dense 5U design conserves rack space, allowing for the protection of more equipment and leaving room for future IT expansion. Figure 1 shows the IBM 11000VA LCD 5U Rack UPS.



Figure 1. IBM 11000VA LCD 5U Rack UPS for IBM System x

Did You Know

Unlike other competing UPS topologies, the IBM 11000VA UPS features online double-conversion technology to fully protect connected equipment from all nine of the most common power problems: outages, sags, surges, spikes, brownouts, line noise, frequency variation, switching transients, and harmonic distortion. The UPS has a bright, easily customizable, graphical LCD display that lets you configure the device and displays important UPS status information in one of nine languages.

This UPS enhances system availability with Advanced Battery Management (ABM) technology, which significantly extends battery service life and optimizes recharge time, and by providing individual control of receptacle groups that can maximize run time for critical devices in the event of a prolonged power outage. It also provides a real-time clock that enables precise shutdown and powerup of systems in a preferred sequence, and records specific power-related occurrences for more accurate trending and data analyses. The IBM 11000VA UPS integrates with IBM Systems Director Active Energy Manager™ to help improve energy management.

About uninterruptible power supplies

A UPS is a device that acts as a defensive barrier between electronic equipment and incoming power problems. It conditions, regulates, and filters out power disturbances to ensure a clean power source for IT equipment. A UPS also provides battery backup in the event of a power failure.

In today's high-availability server environments, unplanned power outages or line quality irregularities can have a considerable financial impact on businesses of all sizes. The typical utility power is 99.9% available, but that means that there can be almost nine hours of downtime a year, not to mention brownouts and other power quality problems. Selecting the right IBM UPS can help protect against these potentially costly incidents.

The IBM 11000VA UPS is designed to prevent blackouts, brownouts, sags, and surges from reaching your servers and other valuable electronic equipment. The UPS filters small utility line fluctuations and isolates your equipment from large disturbances by internally disconnecting from the utility line. The UPS provides continuous power from its internal battery until the utility line returns to safe levels or the battery is fully discharged. The UPS has selectable high efficiency and double conversion modes of operation.

The IBM 11000VA UPS continuously conditions and controls AC output during normal operating conditions, regulating both voltage and frequency. Even when presented with severe power problems, UPS output remains within 2% of nominal voltage.

Part number information

Table 1 lists the orderable part numbers and feature codes for the IBM 11000VA UPS.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
IBM 11000VA LCD 5U Rack UPS (208V/230V)	5395-9KX	5395-RU5 (FC 6662)
IBM 11000VA UPS 3U Extended Battery Module (EBM)	69Y1986	5395-RU5 (FC 5735)
IBM LCD UPS Network Management Card (optional)	46M4110	6145
IBM LCD UPS Environmental Monitoring Probe (optional)	46M4113	6146

The UPS models include the following items:

- An accessory kit containing the following items:
 - Front bezel
 - Rack mount kit with rails and hardware, including 4-post rail kit
 - Serial cable (3.7 m, 12 ft)
 - USB cable
 - Remote emergency power-off (REPO) connector
- A documentation kit containing the following items:
 - Warranty flyer and Important Notices Manual
 - Documentation CD
 - Software CD, which contains IBM UPS Manager power management software

The UPS does not include an input line cord. The line cord is hardwired to a terminal block on the rear of the UPS. A licensed electrician will need to connect the units to a dedicated branch circuit. Circuit requirements are listed in the *IBM 110000 VA UPS and 11000 VA EBM Installation and Maintenance Guide*.

Operating modes

The UPS has selectable high efficiency, normal (double conversion), and converter modes of AC operation.

In high efficiency mode, the UPS monitors incoming power and stands ready to automatically transfer to normal (double-conversion) mode as needed. In this operation mode, the UPS can operate at up to 96% efficiency under normal conditions, and 93% or greater efficiency when poor power conditions require the UPS to work harder. As a result, the UPS uses less energy and dissipates less heat, which in turn reduces power and cooling costs. This mode protects against these power faults:

- Power failure
- Power sag
- Power surge
- Under voltage
- Over voltage

In normal (double conversion) mode, the UPS supplies filtered utility power, protecting the connected equipment from all nine of the most common power problems. Normal (double conversion) mode provides extra protection against four additional line quality irregularities:

- Harmonic distortion
- Line noise
- Switching transients
- Frequency variation

In converter mode, the UPS supplies the load from utility power while acting as a frequency converter, locking the UPS into a stable output frequency and transferring to battery mode as necessary. Use converter mode to lock the UPS output frequency at 50 Hz or 60 Hz to suit power-sensitive equipment, or to provide 50 Hz output when the available standard utility input is 60 Hz (or the reverse).

Three additional modes are available:

- Battery mode, where the UPS operates on battery (typically when utility power has failed)
- Bypass mode, where the battery is disabled (typically for the purposes of battery maintenance)
- Standby mode, where the UPS is turned off

Features

The IBM 11000VA LCD 5U Rack UPS has the following features and capabilities:

- Occupies 5U of vertical rack space.
- Up to 96% energy efficiency in high efficiency mode at 100% load or 93% or greater efficiency in normal (double conversion) mode
- Operates in one of three modes: Normal, high efficiency or converter mode, as described above
- Offers eight IEC 320 C19 receptacles
- Bundled intelligent IBM UPS Manager software enhances control and manageability.

- Supports IPv6 for future-proofing IP addressing and security.
- Includes a graphical LCD display that lets you configure the device and displays important UPS status information in one of nine languages:
 - English
 - French
 - German
 - Spanish
 - Russian
 - Korean
 - Japanese
 - Simplified Chinese
 - Traditional Chinese
- Includes a real-time clock that enables precise shutdown and powerup of systems in preferred sequence, and time stamping on event logs to track and record specific power-related occurrences.
- Integrates with IBM Systems Director Active Energy Manager for power and thermal trending analysis and management.
- Has load segments that allow for individual control of receptacle groups, maximizing run time for critical devices.
- Supports an optional network management card (part number 46M4140) for enhanced UPS monitoring and control.
- Allows dual channel communication through the USB port and an optional Network Management Card at the same time, which is an effective redundancy feature that maximizes communications flexibility.
- Supports an optional Extended Battery Module (EBM) for increased runtime requirements.
- Includes a Remote Emergency Power Off (REPO) port to remotely power off the UPS unit to prevent battery operation during a power failure.
- Requires the following input power:
 - 200 - 240 V ac, 50/60 Hz
 - Single-phase circuit with a 2-pole circuit breaker
 - 63A (Europe) or 80A (North America) circuit
- Includes hot swap batteries for maximum uptime, availability, and ease of maintenance.
- Supports an optional Environmental Monitoring Probe (part number 46M4113) for thermal management requirements (temperature and humidity), which requires that the Network Management Card be installed.
- Offers an Advanced Battery Management (ABM) three-stage charging technology, which significantly extends battery service life and optimizes recharge time. The three stages are:
 1. The battery is quickly charged to 90% to make sure the UPS is prepared for the next outage.
 2. ABM finishes charging the battery with a more moderate float charge.
 3. After the battery is charged, ABM turns the charger off, thereby preventing the batteries from being overcharged.

Specifications

Table 2 lists the specifications for the 11000VA UPS model.

Table 2. Specifications

Specification	IBM 11000VA LCD 5U Rack UPS (208V/230V)
IBM part number	5395-9KX
VA/Watts rating	11000 VA/1000 W
Nominal output voltage (Vac)	208 V/230 V auto sensing at first powerup, user configurable
Rated power output	11000 VA (normal and high efficiency modes) 5500 VA (double conversion mode)
Output power capacity in watts	10000 W (normal and high efficiency modes) 5000 W (double conversion mode)
Load segments	Two
Output connections	Eight IEC 320 C19
Circuit breakers	Four two-pole output breakers rated at 20 A (two breakers for each load segment)
Efficiency	Normal mode: 93% High efficiency mode: 96% Battery mode: 90%
Input	
Nominal input voltage	208 V/230 V (auto sensing at first powerup)
Maximum input current	69.96 A (line mode) 58.33 A (battery mode)
Input frequency (auto sensing)	50/60 Hz +/- 3 Hz
Input connection type	Hardwired to terminal block
Included line (input) cords	None
Input voltage range, mains operations	155-255 V for 208 V
Batteries	
Typical run times	See Table 3
Battery type	Valve Regulated Lead Acid (VRLA): maintenance-free, sealed, leak-proof
Optional External Battery Pack	Yes, 69Y1986
Typical recharge time	3 hours to 90% charge from a UPS/battery discharge of 50% rated load

Table 2. Specifications (continued)

Communications and management	
USB port	Yes
RS-232 serial port	Yes
Ethernet port	Optional using Network Management Card, 46M4110
Environmental Monitoring Probe	Optional Environmental Monitoring Probe, 46M4113
Surge protection and filtering	
Surge energy rating	1300 Joules
Filtering	ANSI/IEEE C62.41; 1991 CATEGORYB3 (SURGE)

Battery run times and recharge times

Table 3 lists the expected period during which the 11000VA UPS will operate solely on batteries.

Table 3. IBM 11000VA UPS runtime chart

Load			Run time on batteries	
Percent load	VA	Watts	Run time with standard internal battery only	Run time with internal battery plus External Battery Module (EBM)
50%	5500	5000	14 minutes	35 minutes
100%	11000	10000	5 minutes	14 minutes

Note: Battery backup times are approximate and can vary with equipment, configuration, battery age, and temperature.

Physical specifications and operating environment

The physical specifications of the 5U uninterruptible power supply are as follows:

- Height: 212 mm (8.3 in.)
- Width: 483 mm (19 in.)
- Depth: 740 mm (29.1 in.)
- Weight: 99 kg (218 lb)

The physical specifications of the 3U Extended Battery Module are as follows:

- Height: 127 mm (5.0 in)
- Width: 483 mm (19 in.)
- Depth: 740 mm (29.1 in.)
- Weight: 79 kg (174 lb)

The IBM 11000VA LCD 5U Rack UPS is supported in the following operating environment:

- Temperature: 0 - 40.0° C (32 - 104° F) at 0 - 2,000 m (0 - 6,600 ft)
- Relative humidity: 5 - 95%
- Maximum altitude: 3,048 m (10,000 ft)

Warranty

The IBM 11000VA LCD 5U Rack UPS has a 3-year limited warranty.

Supported rack installation

The IBM 11000VA LCD 5U Rack UPS requires 5U of rack space in one of the following rack cabinets:

- IBM 42U 1200mm Deep Static Rack
- IBM 42U 1200mm Deep Dynamic Rack
- IBM 42U 1200mm Deep Dynamic Expansion Rack
- IBM 47U 1200mm Deep Static Rack
- IBM 42U Enterprise rack
- IBM S2 42U Dynamic rack
- IBM S2 42U rack
- IBM S2 25 U rack
- IBM 11U Office Enablement kit

Front panel controls

With a bright and easy-to-navigate panel that provides configurability and displays important status information, the IBM 11000VA UPS is easy to manage and an ideal solution for standardization across the global enterprise. Runtime, load, and other vital information and troubleshooting are also displayed.

Figure 2 shows the front panel of the UPS.

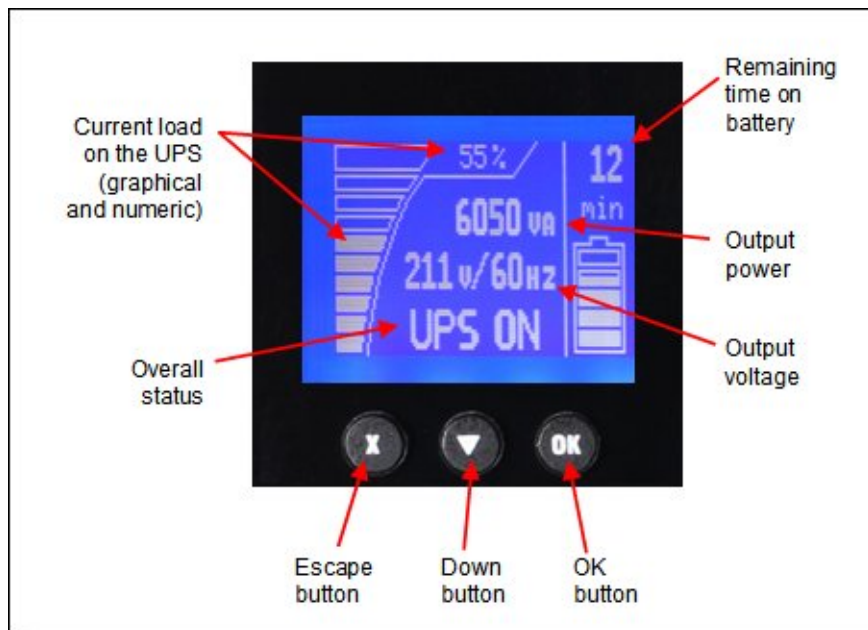


Figure 2. Front panel (showing system status)

The following functions are available on the control panel:

- System status: Displays the battery status, load percentage, output power, output voltage and frequency, mode, notice, or alarm status
- Alarm history: Displays the alarm history for the 50 most recent events
- Meters: Displays the output watts VA, current, power factor, voltage, frequency, input voltage, input frequency, battery voltage, and percentage charged
- Control screens: Displays the battery test, reset error state, configure load segments, and restore settings
- Model information: Displays the machine type, model, and serial number of the unit, as well as the firmware level of the UPS, including the optional Network Management Card's firmware level and IP address, if installed
- Configuration: Allows you to change up to 17 user settings with minimal navigation

The buttons have the following functions:

- Escape (X): Press this button to return to the previous menu without running a command or saving any changes.
- Down (▼): Press this button to scroll down to the next menu option.
- OK: Press this button to select the current menu or option.
- On/off: Press this button to turn on the UPS. Press and hold this button for 3 seconds to turn off the UPS.

On some screens, the OK button has an additional function if you press and hold the button longer than 1 second:

- On the User Setting screens, to save the displayed setting.
- On the Meter and Notice/Alarm screens, to lock the screen (prevent the screen from returning to its default after timeout). A locked screen displays a small key image near the status icon. To unlock the screen, press any button to perform its usual function.

Rear panel

Figure 3 shows the rear panel of the IBM 11000VA LCD 5U Rack UPS.

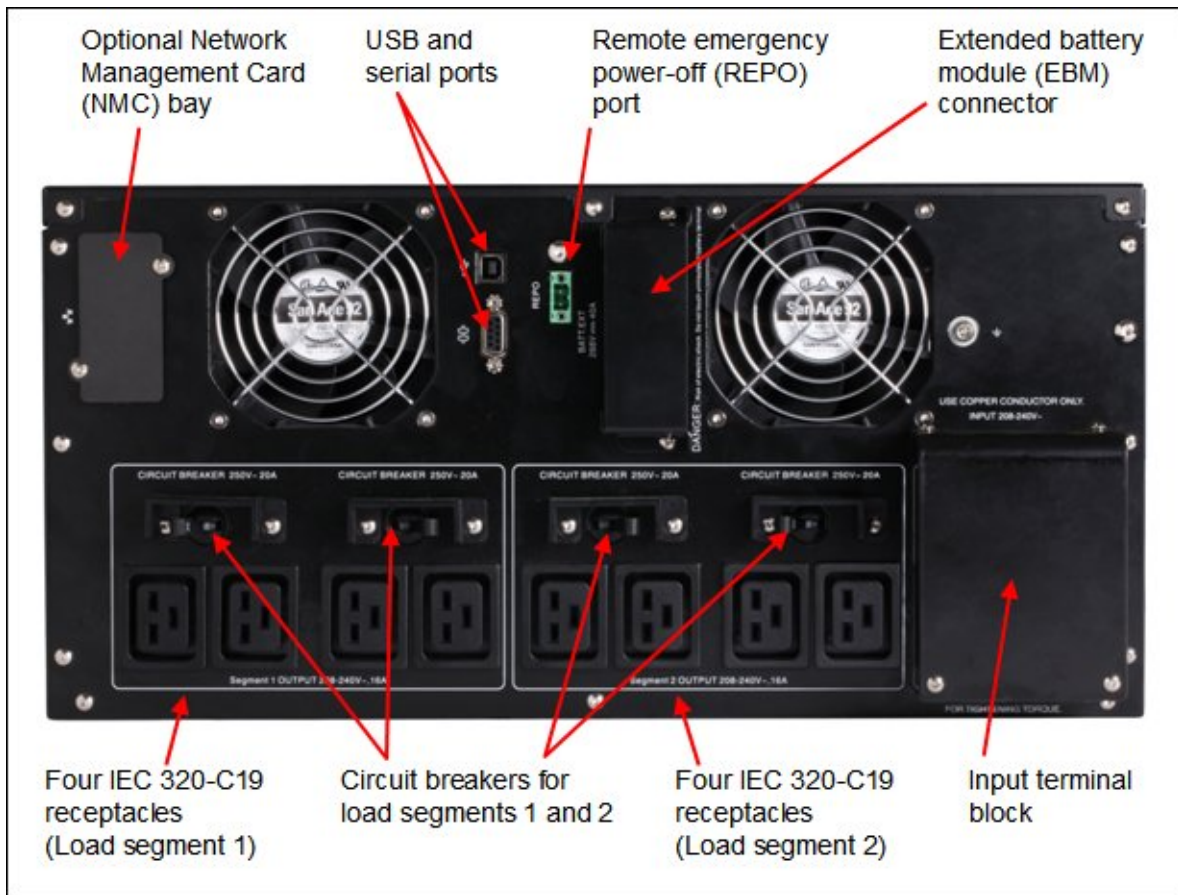


Figure 3. Rear panel of the IBM 11000VA LCD 5U Rack UPS

Figure 4 shows examples of how the IBM 11000VA LCD 5U Rack UPS can be configured to power the BladeCenter chassis. These examples are based on label ratings of the chassis.

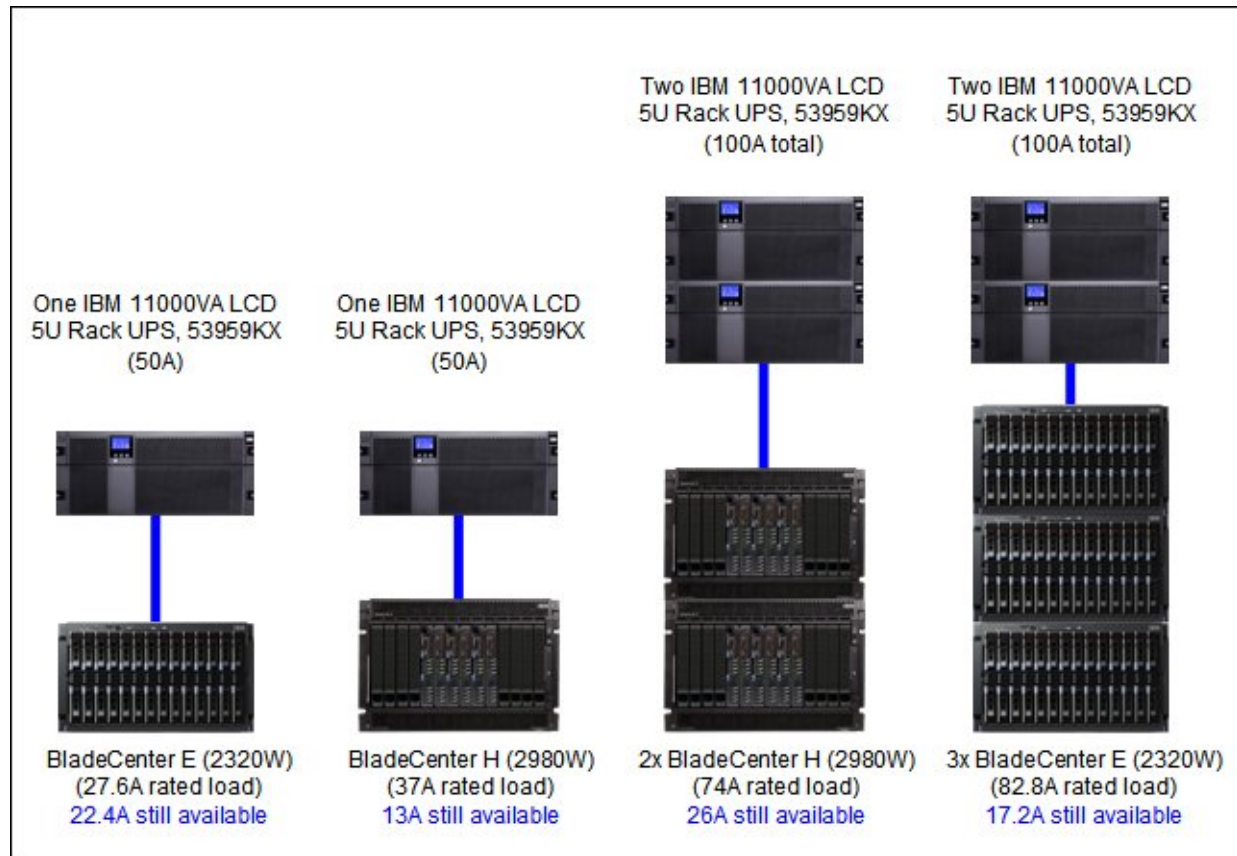


Figure 4. Examples uses of the IBM 11000VA LCD 5U Rack UPS

IBM UPS 3U Extended Battery Module

For applications requiring extended backup times, an external battery module can also be added to the 11000VA models to deliver hours of run time to critical systems during a prolonged power outage. The IBM 3U Extended Battery Module (EBM) is a 3U rack-mounted device that contains additional batteries. Table 3 shows the additional run times achieved with the EBM connected. Figure 5 shows the front of the 3U Extended Battery Module.



Figure 5. IBM 11000VA UPS 3U Extended Battery Module (EBM)

Network Management Card

The IBM 11000VA LCD 5U Rack UPS also comes equipped with a communication bay for the installation of an optional Network Management Card (46M4110). The Network Management Card provides convenient over-the-network UPS remote monitoring and management through a standard web browser. Figure 6 shows the IBM LCD UPS Network Management Card (NMC).



Figure 6. IBM LCD UPS Network Management Card (NMC)

The IBM LCD UPS Network Management Card:

- Allows simultaneous shutdown of protected servers
- Allows configuration of automatic email messages in response to UPS alarms and to transmit periodic reports (Figure 8)
- Allows control of UPS on/off switching with a web browser
- Allows adjustment and control of load segments through the HTML interface, including sequential starting of the installation and optimization of backup time by shutting down non-priority systems
- Allows protection by using an encrypted password
- Allows protection by using a secure SSL connection
- Allows log storage in the nonvolatile memory
- Allows card firmware updates through the network
- Allows fast Ethernet 10/100 Mbps compatibility with auto-negotiation on the RJ-45 connector
- Allows recording of events and measurements in the card log
- Has a humidity/temperature/dry contact sensor (optional EMP)
- Has support for IPv6
- Can be installed while the UPS is online, maintaining the highest system availability

Figure 7 shows the Network Management Card UPS properties window.

UPS Status	UPS Alarm	About your UPS
UPS Name :	IBM 2200VA/1920W Rack HV UPS	
UPS Custom Name :	UPS	
UPS Part Number :	53952KX	
UPS Serial Number :	00-000000-00000-000-0000-000	
UPS Technical Level :	unknown	
System Technical Level / Firmware Revision :	00.01.0008	
VA Rating :	2200	
Network Management Card		
Card Firmware revision :	00.01.0005	
Card Commercial Reference :	103006826	
Card Technical Level :	09	
Card Revision :	GA	
Card Serial Number :	BJ3K11003	
Card Ethernet Mac Address :	00:20:85:FD:42:10	
Card Ethernet Speed :	100 Mbit	

Figure 7. IBM LCD UPS Network Management Card (NMC) UPS properties window

IBM UPS Manager software

The UPS comes with the IBM UPS Manager software. The management software provides up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and notifies you of important UPS or power information. If there is a power outage and the UPS battery power becomes low, the software can automatically shut down the system to protect the data before the UPS shutdown occurs.

Figure 8 shows normal operating using the IBM UPS Manager. The input voltage is 122 V, which is within the acceptable range, and is shown in the left pane. The output voltage of the UPS is 121 V and is also within the acceptable range. The battery is in *floating* mode, which is the second stage of the Eaton Advanced Battery Management (ABM) three-stage charging technology.

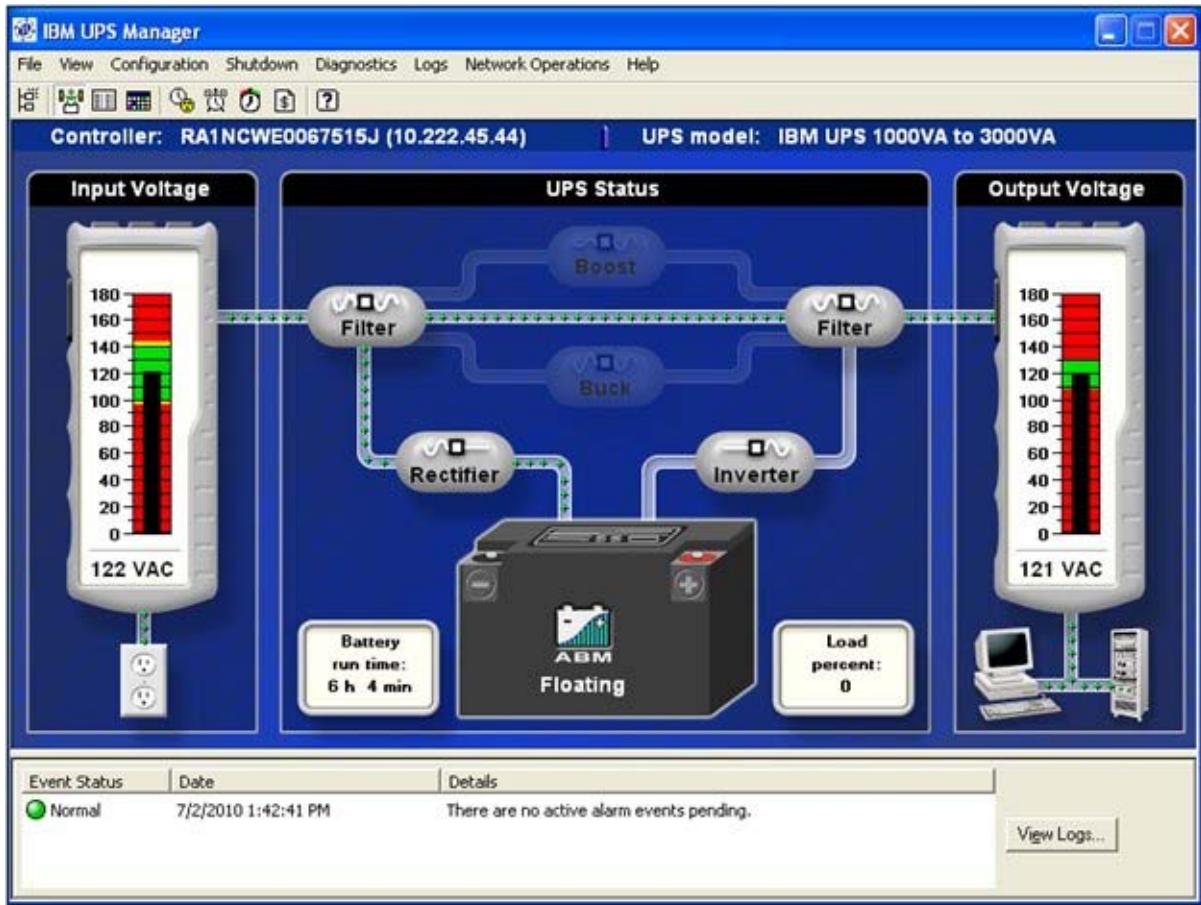


Figure 8. IBM UPS Manager normal status window

Figure 9 shows that the utility power supply has failed and that the UPS is now operating on battery. The UPS Manager software indicates that there is 10 minutes of battery time available based on the current load.

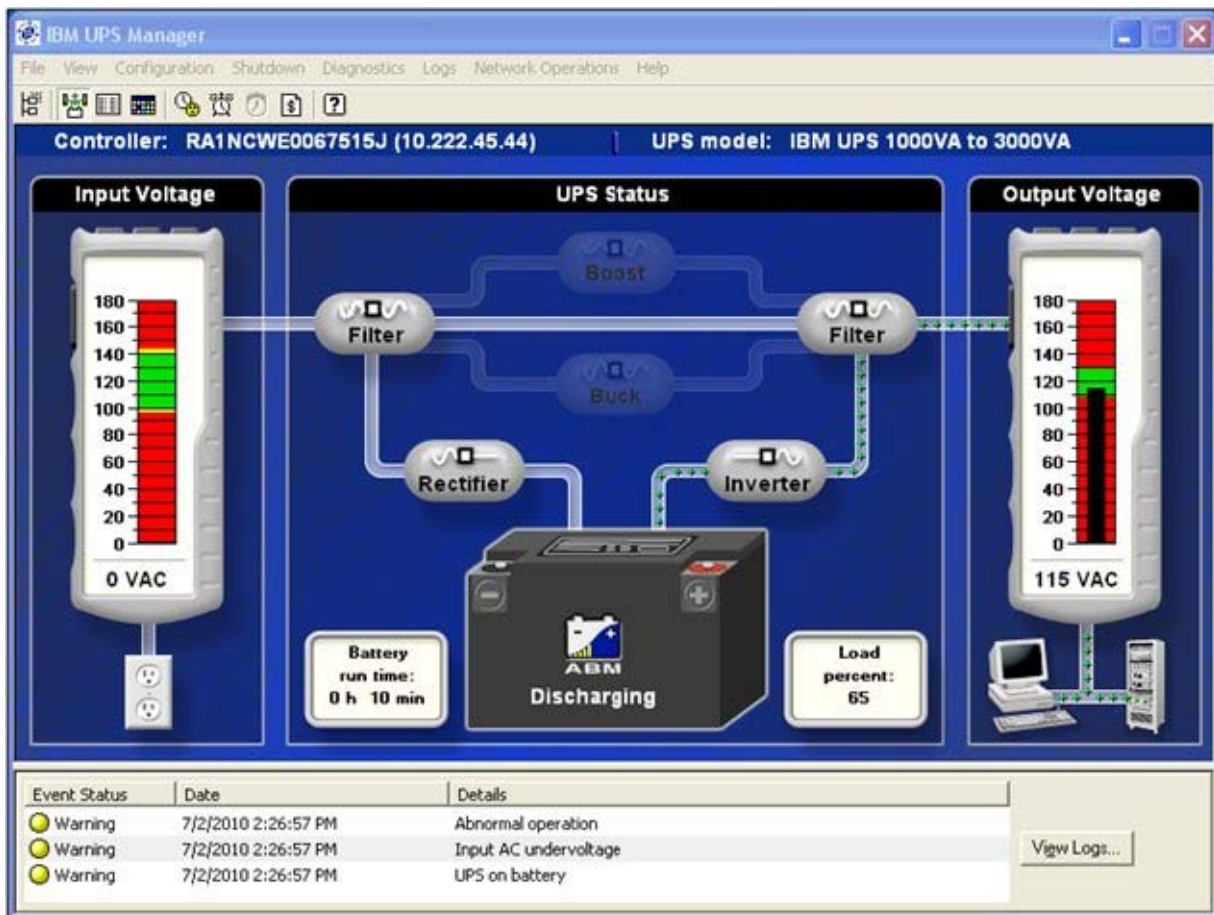


Figure 9. IBM UPS Manager warning status window

Figure 10 shows the event notification window, where you can configure how you (and other users) want to be notified when certain events occur.

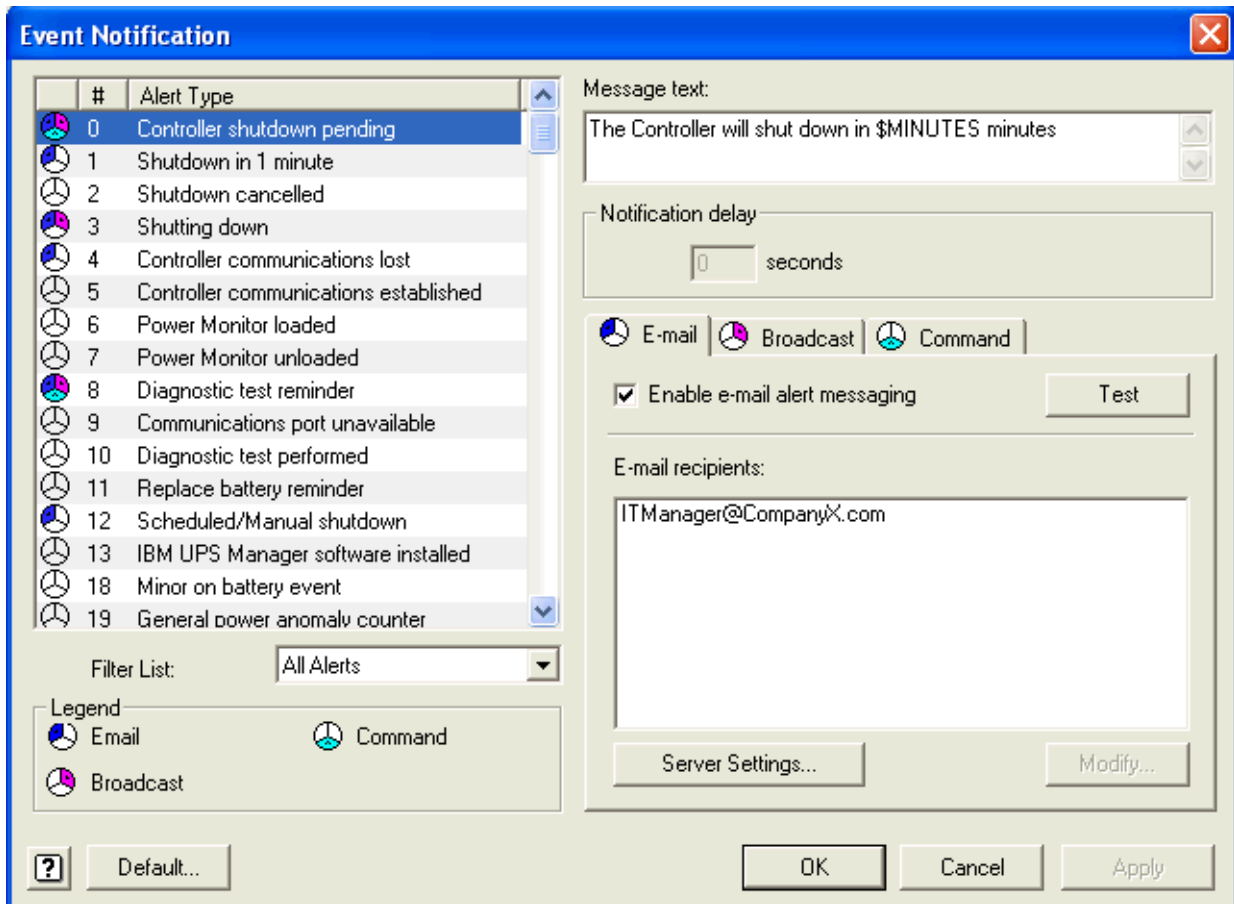


Figure 10. Event Notification window

IBM Environmental Monitoring Probe

The Environmental Monitoring Probe (EMP) (part number 46M4113) is used to report local temperature and humidity values and make that information available to management tools such as IBM Systems Director Active Energy Manager (AEM). The EMP connects to the UPS via the Network Management Card. Figure 11 shows the EMP.



Figure 11. IBM EMP

The Environmental Monitoring Probe has the following characteristics:

- It connects to the Network Management Card (NMC) settings/sensor connection.
- Its temperature and humidity thresholds are easily set to trigger alarm notifications or shut down the protected system.
- Its status can be monitored from the IBM Systems Director AEM or from the Network Management Card web interface.
- It measures temperatures between 0 and 80°C (32 and 176°F) with an accuracy of $\pm 1^\circ$ C.
- It measures relative humidity between 10 and 90% with an accuracy of $\pm 5\%$.
- It can be located away from the UPS with a CAT5 network cable (up to 20 m (65.6 ft)).
- Its user-selectable alarm thresholds enable you to define acceptable temperature or humidity limits.
- It allows email notification through SMTP.

Figure 12 shows information retrieved from an EMP using the NMC web interface.



Figure 12. Environmental Monitoring Probe data as viewed from the Network Management Card web interface

IBM Systems Director Active Energy Manager

IBM Systems Director Active Energy Manager (AEM) provides an array of new features that allow power and thermal trending analysis for improved power management. AEM collects power information for each device attached to an IBM UPS, presenting a more complete view of energy usage within the data center.

The IBM Systems Director AEM helps:

- Collect power information from each device attached to an IBM UPS, thus presenting a more complete view of energy usage.
- With server consolidation plans, because of the increased server and rack power densities that have driven the requirement for advanced power management solutions.
- In combination with the optional Environmental Monitoring Probe, AEM enables cross-platform power and thermal trending analysis for improved power management. This configuration allows IT and facility managers to manage data centers for optimal energy efficiency, migrate workloads to eliminate hot spots, and transfer work from underutilized systems to conserve energy.

Related publications

For more information, see the following documents:

- IBM US Product Announcement
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS1111-002>
- IBM System x UPS product page
<http://www.ibm.com/systems/x/hardware/options/upsrack.html>
- *IBM 11000VA LCD 5U Rack Uninterruptible Power Supply Installation and Maintenance Guide*
<http://ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5086831>
- *Network Management Card User Guide*
<http://ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5085199>
- *IBM System x Configuration and Options Guide*
<http://ibm.com/support/entry/portal/docdisplay?Indocid=SCOD-3ZVQ5W>
- *IBM System x Uninterruptible Power Supply (UPS) Guide*
<http://ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP101655>

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