

UPS handbook

A guide to help you choose the UPS that works best for your needs.

What is an uninterruptible power supply?

An uninterruptible power supply, or UPS, offers guaranteed power protection for connected electronics. When power is interrupted or fluctuates outside safe levels, a UPS will instantly provide clean backup power and surge protection to plugged in sensitive equipment.

Why do you need a UPS in your home or business?

Home — The electronic devices you rely on every day for communication, security, and entertainment are at risk of damage and disconnect due to unexpected blackouts, voltage fluctuations, and other power disruptions. A UPS will provide backup power and protection for a variety of electronic devices, including:

- Wireless networking equipment (routers and modems)
- Computers
- Televisions
- Security systems
- Gaming consoles
- Mobile devices

Business — Downtime caused by power outages is frustrating for anyone, but can be financially crippling for a business or organization. Every year billions of dollars are lost due to the downtime caused by power disruptions that a proper UPS setup could have rectified.

- For the Fortune 1000, the average cost of unplanned application downtime per year is \$1.25 billion to \$2.5 billion.
- The average hourly cost of an infrastructure failure is \$100,000 per hour.
- The average cost of a critical application failure per hour is \$500,000 to \$1 million.

The cost associated with unanticipated downtime may not be as monetarily significant for small to medium businesses; but they are actually the most susceptible to outages because they show the least ability to generate revenue when experiencing downtime.

What size UPS do you need?

Electronics have both maximum watt ratings and maximum volt-ampere (VA) ratings; and neither the watt nor the VA rating of a UPS may be exceeded by the attached equipment. Watts measure the real power drawn by the equipment, while VAs are the product of the voltage applied to the equipment times the current drawn by the equipment.

What you really need to know is that for electronics such as computers and UPSs, watt and VA ratings can differ significantly; with the VA rating always being equal to or larger than the watt rating. The ratio of the watts to VA is called the “power factor” and is expressed either as a number (i.e., 0.8) or a percentage (i.e., 80%). This power factor is what really matters when sizing a UPS for your specific requirements. Typically, it is recommended that you choose a UPS with an Output Watt Capacity 20 – 25% higher than the total power drawn by the attached equipment.

For help sizing a UPS, please use our [UPS Selector](#).

If you need help choosing, please visit our [UPS Selector](#) for a customized solution.

[Learn more](#)



How much runtime do you need to support your attached equipment?

That depends on what you intend to backup with your UPS. Runtime refers to the amount of time a UPS will be able to power its attached equipment in the event of a power disruption. The more equipment you have plugged in to your UPS, the less runtime you will have, so it's important to make sure your UPS is only providing backup power to your most critical equipment.

What are some of the key features to understand when choosing a UPS system?

Green mode — Patent-pending operating mode that bypasses unused components in good power conditions to achieve very high operating efficiency without sacrificing protection.

Automatic voltage regulation — Gives high application availability by correcting low- and high-voltage conditions without using the battery.

Adjustable voltage transfer points — Maximizes useful battery life by widening the input voltage window or tightening the output voltage regulation.

Adjustable voltage sensitivity — Provides the ability to adapt the UPS for optimal performance in specific power environments or generator applications.

Temperature-compensated battery charging — Prolongs battery life by regulating the charge voltage according to battery temperature.

Intelligent battery management — Maximizes battery performance, life, and reliability through intelligent, precision charging.

Power conditioning — Protects connected loads from surges spikes, lightning, and other power disturbances.

Automatic self-test — Periodic battery self-test ensures early detection of a battery that needs to be replaced.

User-replaceable batteries — Increases availability by allowing a trained user to perform upgrades and replacements of the batteries.

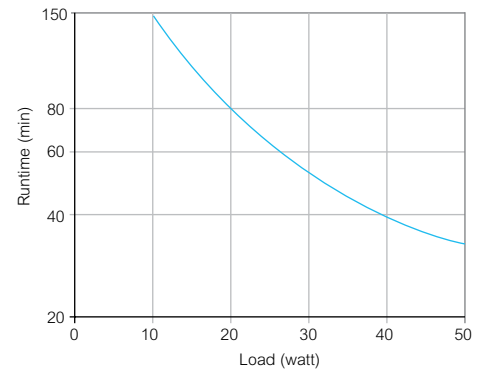
Hot-swappable batteries — Ensures clean, uninterrupted power to protected equipment while batteries are being replaced.

Predictive failure notifications — Provides early-warning fault analysis ensuring proactive component replacement.

Battery failure notifications — Provides early-warning fault analysis on batteries enabling timely preventive maintenance.

Pure sine-wave output on battery — Simulates utility power to provide the highest degree of compatibility for active power-factor-corrected servers and sensitive electronics.

Transformer-block spaced outlets — Protect equipment with input transformer blocks without blocking access to other receptacles.



Surge only outlets — Protect secondary electronics from surges and spikes without reducing battery power used to run primary electronics during an outage.

Rack/tower convertible — Protects the initial investment in the UPS when migrating from tower to rack-mount environments.

Scalable runtime — Allows additional runtime to be quickly added as needed via external battery packs.

SmartSlot™ — Customize UPS capabilities with network management cards.

Plug-and-play external batteries — Ensures clean, uninterrupted power to the loads when adding extra runtime to the UPS.

Building wiring fault indicator — This LED informs users of potentially dangerous wiring problems in the wall circuit.

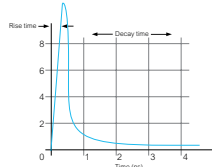
What power conditions will a UPS protect against?

Many power problems originate in the commercial power grid, which, with its thousands of miles of transmission lines, is subject to weather conditions such as hurricanes, lightning storms, snow, ice, and flooding along with equipment failure, and traffic accidents.

The types of power disturbances a UPS will protect your equipment against are:

Transient

Potentially the most damaging type of power disturbance; transients are momentary variations in current, voltage, or frequency.



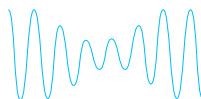
Interruption

An interruption is defined as the complete loss of supply voltage or load current.



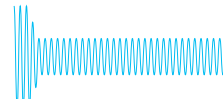
Sag

A sag is a reduction of AC voltage at a given frequency. Sags are usually caused by system faults or switching on loads with heavy startup currents.



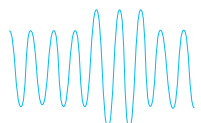
Undervoltage

Undervoltages are the result of long-term problems that create sags. The term "brownout" has been commonly used to describe this problem.



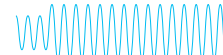
Swell

A swell is the reverse of a sag, having an increase in AC voltage. High-impedance neutral connections and sudden load reductions are common sources.



Overvoltage

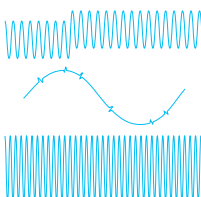
An overvoltage can be thought of as an extended swell. This is common in seasonal regions where communities reduce power usage during off-season.



Waveform distortion

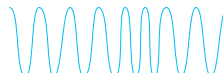
There are five types of waveform distortions:

1. DC offset
2. Harmonics
3. Interharmonics
4. Notching
5. Noise



Frequency variation

Frequency variations are common in sites that have dedicated standby generators or poor power infrastructure, especially if the generator is heavily loaded.



Voltage fluctuation

A voltage fluctuation is a systematic variation of the voltage waveform or a series of random voltage changes of small dimensions and generally below 25 Hz.



Did you know?

Weather-related power outages in the U.S. have doubled since 2003.
- ClimateCentral.org

For more information on the different types of power problems, please refer to White Paper 18, [The Seven Types of Power Problems](#).

Still need help choosing a UPS?

Please visit our [UPS Selector](#) to receive a customized UPS recommendation for your home or business.

Explore our solutions

Computer and peripheral

Battery backup and surge protection for computers, home networking, external storage, gaming, home servers, and other.



Network and server

Power availability and management for entry-level to high performance servers, storage, and business networking systems.



Data center and facility 3-phase

Three-phase power protection with fully integrated solutions for enterprisewide networks, data centers, mission-critical systems, and industrial/manufacturing processes.



Special applications

Secure power systems for special single-phase applications including industrial controls, renewable energy, marine, telecommunications, and other configurations.



UPS management

Software, network management cards, and peripherals for UPS management and safe system shutdown.



Special applications

Power availability and management for entry-level to high performance servers, storage, and business networking systems.



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