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The Basics of Selecting Uninterruptible Power Supplies (UPS)

As an integral component of a data center or remote site power chain, the uninterruptible power supply (UPS) essentially provides clean power when AC power is present and provides backup power in the event of a power outage.

UPS Installed

Typically, a UPS will help customers ride through a few minutes of outage, until a generator comes on or until equipment can be gracefully shutdown, which is when a computer is turned off by a software function and the operating system (OS) is allowed to perform its tasks of safely shutting down processes and closing connections, and is the opposite of a hard shutdown, when the computer is forcibly shut down by interruption of power.

In some select instances, the UPS can also provide power distribution for a limited amount of equipment.

Initial Checklist

Answer these four questions as you begin to research UPS options and solutions:

- What's the total power capacity (kW) to be supported?
  NOTE: With most modern day equipment being power factor corrected, it is much more important to compare kW ratings as against kVA ratings.
- What's the input voltage required – 120V or 208/240V?
- How long a runtime does your application require?
- How many outlets does your application require?

UPS Front View

UPS Rear View

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Which UPS Technology/Topology is Right for You?

Standby – in these instances, an AC blackout results in a total loss of utility power, there's been a "power sag," which is basically a short-term low voltage caused by starting inrush current or large equipment, utility switching, or a temporary overload, or there's been a voltage surge, where short-term high voltage goes above 110% of nominal for several cycles. Typically, standby UPS are:

- Least expensive
- They go to battery power more often
- Have a transfer time of up to 10ms
- Used on 700VA and lower UPS's
- Used for PC's, individual workstations, digital kiosks, Point of Sale (POS) systems
- Have no internal static bypass

Line Interactive – line interactive UPS function in all the same scenarios as a standby UPS, but they also include Automatic Voltage regulation (AVR) that minimizes use of battery during overvoltage and brownout conditions. These options typically include:

- Transfer time of up to 10ms
- Used on 700VA – 5,000VA UPS's
- Used for network racks, server cabinets, VoIP
- Have no internal static bypass

Double-Conversion Online – these include all the scenarios that standby and line-interactive UPS cover for, while also adding coverage for normal mode noise (when high frequency electrical waveforms between the line [L] and neutral [N] are caused by RFI or EMI interference), frequency variation, which means a frequency change occurs from nominal 60Hz or 50Hz, the switching transient, which occurs when there's a fast high voltage spike with a short duration time, or harmonic distortion, which occurs when distortion of the nominal waveform is triggered by nonlinear loads such as rectifiers, switch mode power supplies or variable frequency drives. These options typically include:

- Include no transfer time
- Provide coverage for most power problems
- Used for centralized datacenters, remote sites, server cabinets
- Have built-in internal static bypass

Which Battery Technology is Right for You?

UPS solutions are typically offered in two battery configuration types, depending on the application need, size and goals. These are:

Lead-Acid – provides reliable and cost-effective power protection for servers and network applications in the 800VA – 5000VA range.

Lithium Ion – provides more than twice the life, higher temperature tolerance, longer runtime, and faster recharge when compared to typical lead-acid battery solutions.

Additional Considerations

Runtime at Various Percentage Loads

- UPS runtimes vary between UPS sizes
- UPS runtimes vary at each load percentage
- Important to remember UPS runtime is not linear
- If you have 10 minutes of runtime at 100 Watts of load, it does not mean you will have 5 minutes of runtime at 200 Watts of load
- Check UPS runtime charts
- It is common to say that the UPS runtime at a half-load (50% load) and a full-load (100% load)
- For longer runtime requirements, choose extended battery packs

Recharge Time

- A battery's recharge time is the amount of time it takes for a battery to recharge after it has been discharged
- 10x runtime is an acceptable recharge time
- Faster recharge times are usually preferred
- Lithium-Ion batteries recharge faster than VRLA batteries

UPS Serviceability

- Ensure the UPS includes hot-swappable batteries
- When choosing line-interactive or double-conversion online, add a bypass distribution module that allows continual power to loads while UPS is being repaired or replaced

For more information on UPS selection and solutions, be sure to review these materials from Chatsworth Products.

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