Uninterruptible Power Supply Systems

Power Protection Products, Inc.

Uninterruptible Power Supply Systems White Paper

by Dan Maxcy | 2016 Update

Power Protection Products, Inc.

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UNINTERRUPTIBLE POWER SUPPLY SYSTEMS

By Dan Maxcy

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An Uninterruptible Power Supply system is a device that provides power to your facilities equipment when the normal power provider cannot. The energy to operate this UPS system typically comes from batteries, however, some other sources of energy are flywheels, magnetism, fuel cells.

Quite often there is equipment in your facility that must have power supplied without interruption. The type of equipment determines the length of the interruption that can be withstood, for example… A light bulb can withstand a very long interruption and continue to operate when power resumes. The only problem is that we have no light when the power is off. When the power comes back on, the light bulb continues to operate without any intervention. In this case we do not need a very sophisticated UPS system if we want backup power for our light because the light can withstand a moment without any power while the UPS system activates.

In contrast to the above example of a light bulb there may be equipment in your facility that cannot continue to operate properly if power is lost for ANY amount of time. You may have a computer system that may shut down or malfunction if the power supply is lost for even a millisecond (one-millionth of a second), therefore, this computer system would require an UPS system that has a very small or no activation time. This leads us to the three basic types of Uninterruptible Power Supply systems available:

1. Stand By 2. Line Interactive 3. On Line

Stand By UPS

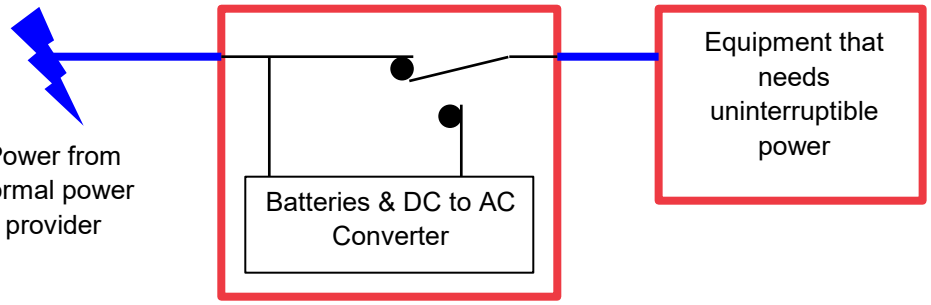
The stand by UPS system (sometimes called Off-line system) operates in the following manor: While the normal power provider is operational the equipment wired to the UPS system receives power from this normal power provider. When this normal power is lost (blackout) the UPS system activates (turns on) and supplies power to the equipment that needs uninterruptible power until the normal power returns. The way this UPS system creates power is by converting the DC power from batteries to AC via an inverter. The activation (turn on) time for the inverter and internal switch from normal power to inverter power is typically 8 to16 milliseconds.

The pros and cons of the Stand By system are:

Pros: Inexpensive, low operating costs (the majority of time your equipment is ran by the normal power provider), lightweight, compact.

Cons: Will pass spikes, noise, and harmonics from normal power provider, no voltage regulation in normal mode, slow activation time typically 8 to 16 milliseconds.

Example of Stand By UPS system:



Line Interactive UPS

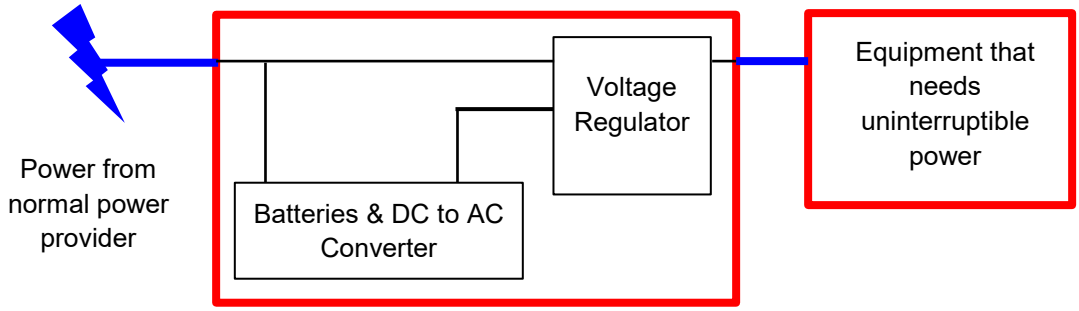
Line interactive UPS systems add extra features that give us, at a minimum, two advantages over the Stand By UPS system. One, they usually include some type of voltage regulator (for cleaner power) between the normal power provider and your equipment that needs uninterruptible power and two, they have activation times around 4 milliseconds.

The pros and cons of the Line Interactive system are:

Pros: Moderate pricing, voltage regulation that gives brownout protection, efficient, compact, quicker activation (4 milliseconds).

Cons: Will still pass spikes, noise, and harmonics from normal power provider. Slow activation time compared to the next system.

Example of Line Interactive UPS system:



On Line UPS

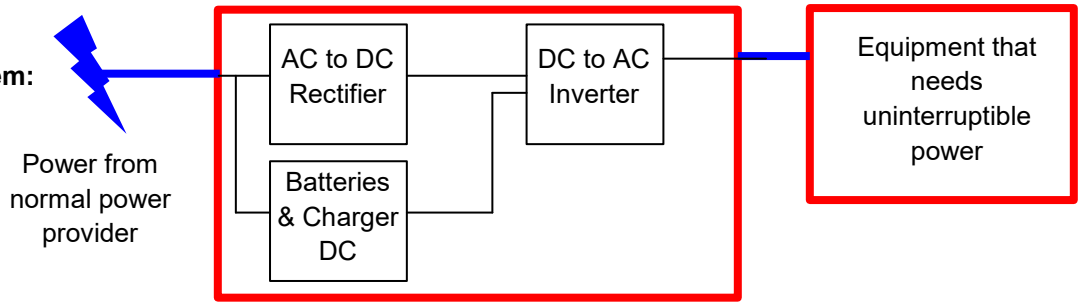
The On Line UPS is the best option when your equipment cannot lose power for even a split second. With an On Line system power is constant and there is no activation time. The On Line system uses batteries and a DC to AC inverter just like to other two units mentioned above, however, it also uses something called a rectifier. The addition of the rectifier along with the batteries and inverter enable the On Line UPS to give constant power to your equipment that needs uninterruptible power. The inverter that supplies power to your equipment is always on. The inverter gets its power from either the normal power provider (via the rectifier) or the batteries. With power to your equipment being supplied constantly from the inverter you receive clean regulated power at all times. In many cases this On Line technology is the only answer to your sensitive equipment power needs.

The pros and cons of the Line Interactive system are:

Pros: Moderate pricing, voltage regulation that gives some brownout protection, compact, quicker activation (2-4 milliseconds).

Cons: Will still pass spikes, noise, and harmonics from normal power provider. Slow activation time compared to the next system.

Example of On Line UPS system:



In Summary

Most applications where it is determined that a UPS is necessary involve not only a UPS system but also may include generators, transfer switches or transfer switchgear, Surge Protection devices, and custom wiring. Careful consideration must be used to determine which option or combination of options best suits your needs.

An Introduction to P3 & PQU

Power Protection Products, Inc. (P3)

P3 is the industry's trusted and respected advisor for critical power, cooling and energy solutions.

P3 represents some of the leading industry brands and strives to provide the top performing products. We stay on top of industry advances and have designed and built a variety of data center infrastructures, IT expansion projects, and industrial power upgrades.

We believe in providing a stable and secure electrical environment to meet customers' needs. For more information about our power, cooling, and data center related products & services give us a call or visit our website.

Power Quality University

Providing an educational environment for hands-on training, testing, & evaluation of today's power quality solutions & equipment.

POWER QUALITY PQU UNIVERSITY

P3 is "showing you how" with our Power Quality University (PQU) free seminar series. PQU brings real world knowledge into the classrooms. The instructors who teach at PQU are highly qualified professionals and are all experts in the field. Upon completion of a PQU program, students can obtain Continuing Education Credits (CEU's). PQU is just one more way that Power Protection Products, Inc. is supporting the electrical and data center communities in a positive way.

Learn more at PQU! www.powerqualityuniversity.com

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