



## **Uninterruptible Power Supply Systems**

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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, and natural or LP gas.

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

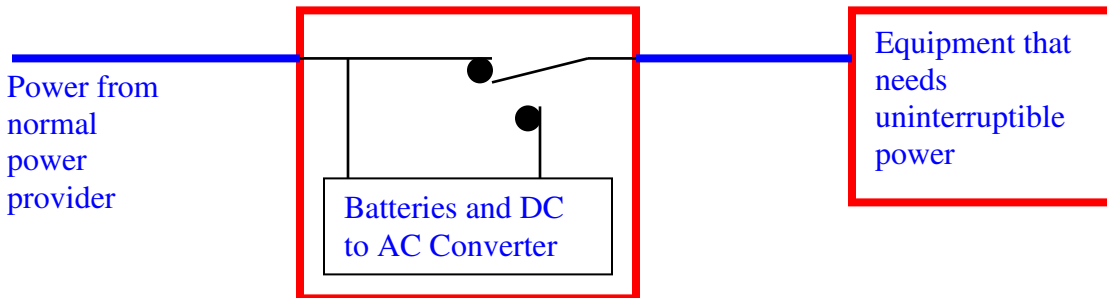
### **Stand By UPS**

The stand by UPS system (sometimes called Off-line system) operates in the following manner: 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 4 milliseconds.



If your equipment, that needs uninterruptible power, can withstand this 4-millisecond lapse the Stand By UPS might be a good choice.

Example of Stand By UPS system:



Stand By UPS System

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.

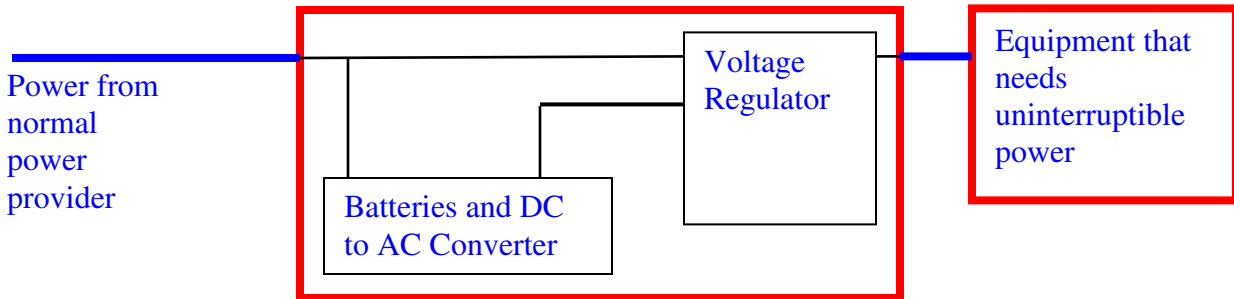
Cons: Will pass spikes, noise, and harmonics from normal power provider, no voltage regulation in normal mode, slow activation time typically 4 milliseconds.

### 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 2 milliseconds.



Example of Line Interactive UPS system:



Line Interactive UPS System

The pros and cons of the Line Interactive system are:

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

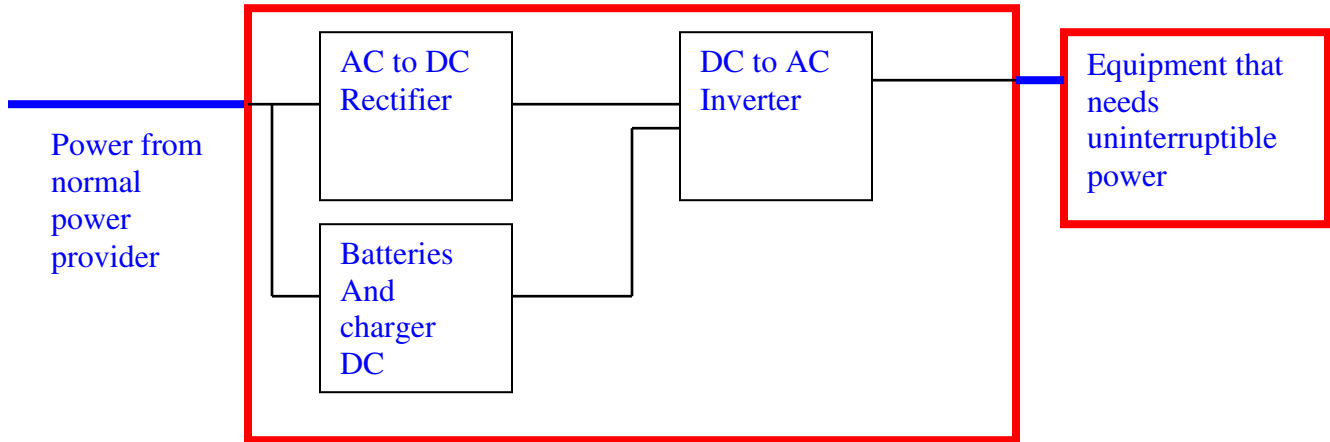
Cons: Will still pass spikes, noise, and harmonics from normal power provider. Slow activation time compared to the next system.

### 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.



Example of On Line UPS system:



On Line UPS system

The pros and cons of the On Line system are:

Pros: Excellent voltage regulation and power conditioning, brownout protection, no lapse in power output, isolation from normal power provider.

Cons: the addition of all the above comes with a cost, however, it is the best solution if the uninterrupted operation of your equipment is critical.

### 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, Transient Voltage Surge Suppression, and custom wiring. Careful consideration must be used to determine which option or combination of options best suits your needs.