UPS Systems – White Paper

Technology Installation Services

Providing a Fully Integrated Installation Service for the Computer / Telecommunications Industry

Large Enough to Cope
Small Enough to Care

What is a UPS?

UPS = Uninterruptable Power Supply

UPS – Is your protection again the many power problems that can occur.

Everyday your sensitive electronic equipment suffers from a wide range of voltage supply problems, some critically damaging and some life shortening.

Installing a UPS system will protect your computer system and other electronic devices connected to the local power source against spikes, electrical noise, sags, harmonics, surges, brownouts and blackouts.

Explained

1. Spikes
2. Electrical Noise
3. Sags
4. Harmonics
5. Surges
6. Brownouts
7. Blackouts

1. Spikes

Spikes are high surges of very short durations which can have devastating effects on your sensitive equipment. Spikes are caused by many daily occurrences, such as thermostats switching on or off and other equipment requiring high electrical currents or load switching by the power companies. However, the most serious and dramatic cause of spikes is local lightning strikes.

Spikes can damage both your hardware and software. Hardware damage can occur as fatal damage is done to sensitive electronic devices or as is normally the case, constant wear and tear causes spasmodic, unaccountable equipment malfunction.

Software damage can be less severe but more costly in the long run, as periodically read files become corrupted and routine system archives compound the error.

2. Electrical Noise

Electrical noise is the term used to describe both Common and Series Mode noise. Common Mode noise is a result of disturbances between the supply lines and earth. Series Mode noise is a results of disturbances between line and neutral.

This high-frequency voice can be caused by lightning strikes, load switches, cable faults, office equipment, radio frequency heaters and welding equipment. The list is endless.

Most modern electronic equipment uses the supply earth as reference for internal logic and supply filtering. High frequency energy entering this earth line can have catastrophic effects on sensitive circuits. Other connections to the unit e.g. through communications ports, provide a path for the noise current to pass on through the equipment.

Electrical noise can cause computers to ‘hang’ and corrupt data. Isolation transformers or spike suppressors fitted to electrical noise generators such as photocopiers can dramatically reduce the problems of noise.

3. Sags

Sags can last for several cycles and are drops in the mains supply. Their causes are similar to those for negative spikes but the difference lies in that sags have much longer duration.

Sags are very common occurrences which are most noticeable when offices and buildings change their level of use of electrical heaters or air conditioners. This can cause computers to hang or even reboot themselves, when the mains drops so low that the computer believes power to have been switched off.

4. Harmonics

Some voltage harmonics are caused by current harmonics and originate from non-linear loads (i.e. equipment which draws current in large gulps) such as computers, photocopiers, laser printers and variable-speed motors. Harmonics can adversely affect two types of equipments: motors of multi-kilowatt size where the harmonic voltage causes a disproportionate rise in current, resulting in increased temperatures; and audio or video equipment not protected through its power supply from supply interaction.

5. Surges

Surges are rises above the normal mains level, which last for more than 1 cycle. They are caused by the switching off or stopping of large 'voltage hungry' devices or by load switching as sub-stations.

Surges can have serious effects on computer systems because they can last for several cycles and place high voltage on a computer's Switch Mode Power Supply causing general component degradation or instant failure.

6. Brownouts

Brownouts are long duration sags in the mains supply, lasting anything up to several days. They are caused when the mains distribution system cannot cope with demand and the overall network voltage has to be dropped.

Brownouts damage computers in the same way as sags but last longer and so are more dangerous.

7. Blackouts

Blackouts are complete power losses, where no mains voltage is present. They can be caused by generating faults, drops on load switching, accidents, thunderstorms and other abnormal conditions.

Blackouts have an obvious effect, such as a system crash but continuing power breaks can damage critical components such as disk drives, Switch Mode Power Supplies and internal logic boards.

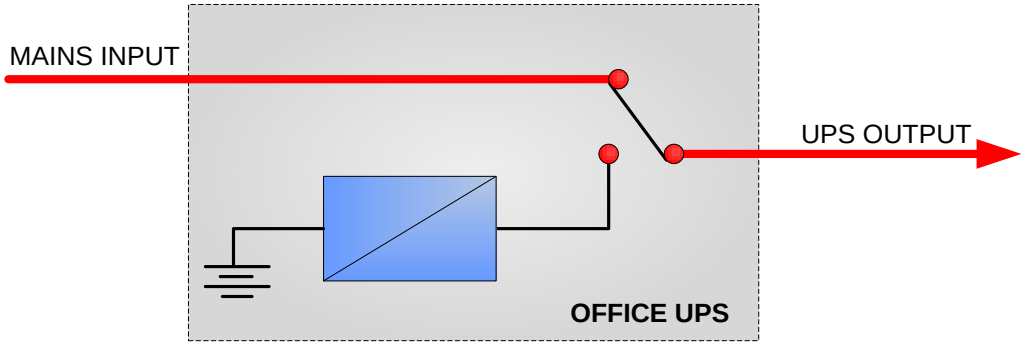
UPS Types

There are a variety of different types of UPS each with distinct performance characteristics. The most common are:

Offline UPS Systems

Advantages	Disadvantages
Cheap	Poor spike protection
Small	Voltage break of transfer
Efficient	Does not regulate voltage

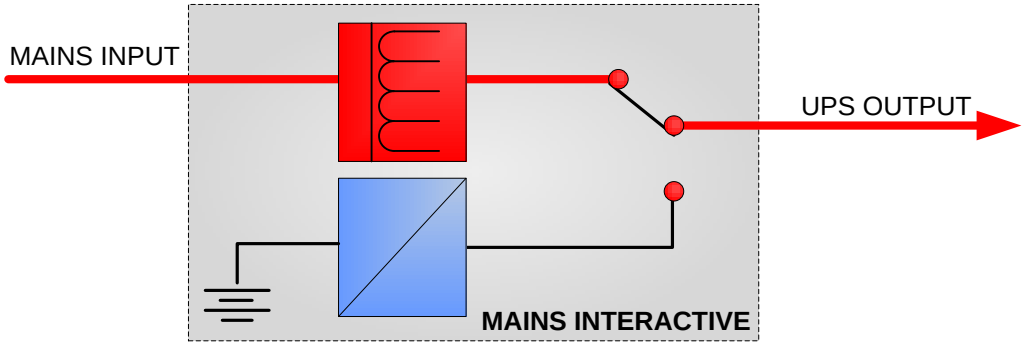
Suitable for single DC in non-critical applications



Line Interactive UPS Systems

Advantages	Disadvantages
Cheap	Poor spike protection
Small	Voltage break of transfer
Efficient	Does not regulate frequency
Boosts a low mains voltage	

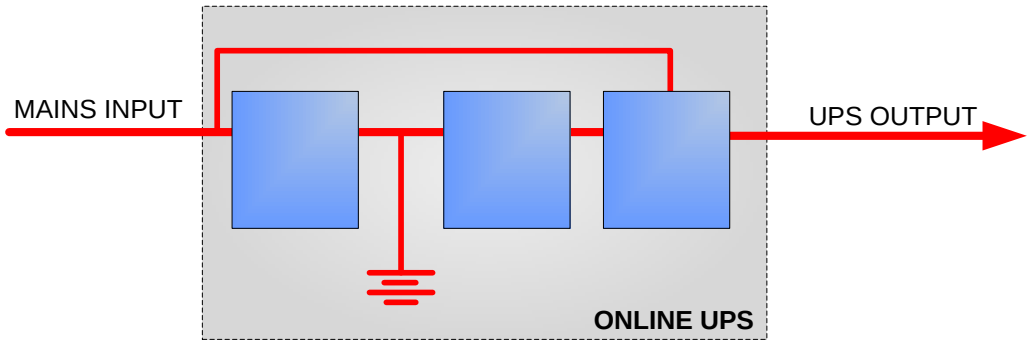
Suitable for single PCs or groups of PCs in locations where serious mains spikes are not normally a problem.



On-Line UPS Systems Double Conversion

Advantages	Disadvantages
Excellent spike and transient protection	Expensive
No break AC output at all times	
Regulates the output voltage accurately	

Suitable for all critical computer and communications applications



Batteries

Most UPS systems have battery systems that will support the system of 10-15 minutes. However, if the UPS system is, for example only 10-15% loaded the effective support time could be extended to 1.5 hours or more. Batteries can be purchased with a 5, 10 or 15 year life expectancy.

Maintenance

We recommend a yearly maintenance contract is taken out with the system manufacturer, to ensure continued use.

Installation

We recommend stand-alone UPS systems have a wrap around maintenance bypass switch installed.

The bypass switch allows the UPS load to be switched to raw mains supply without losing connection to protected devices. The UPS can then be removed and replace in fault conditions.

Sizing a UPS

Sizing a power centre to meet present and future needs is a fundamental requirement.

Present Requirements

Estimating the present system size in kilovolt amperes (KVA) is done in a number of ways. Typical sources include computer site planning manuals, equipment name plate data and electrical servicing data. KVA requirements are estimated using any of the following formulas:

V = Volts
A = Amps
KVA = Kilovolt Amperes
KW = Kilowatts
PF = Power Factor
X = Multiplied by
BTU/hr = British Thermal Units per hour (heat output)
KCAL/hr= Kilocalories per hour (heat output)

1. Power Profile of Equipment

This is the most reliable base from which to estimate present KVA loading

For 3-phase systems:

$$KVA = \frac{V \times A \times (1.73)}{1000}$$

$$A = \frac{KVA \times 1000}{V \times (1.73)}$$

For single-phase systems:

$$KVA = \frac{V \times A}{1000}$$

$$A = \frac{KVA \times 1000}{V}$$

2. Kilowatts (KW) and Power Factor (PF)

$$KVA = \frac{KW}{PF}$$

(If PF is not given, assume 0.8)

3. Ampere specifications for electrical service feeding the site (for 3-phase systems)

$$KVA = \frac{V \times A \times (1.73)}{1000}$$

4. BTU/hr of KCAL/hr Specifications

$$KW = \frac{BTU/hr}{3413} = \frac{KCAL/hr}{860}$$

$$KVA = \frac{KW}{PF}$$

(If PF is not known, assume 0.8)

Note: *After the present KVA requirement has been determined, the anticipated growth and special characteristics of the load must be considered.*

Growth Requirements

The power centre should be sized to anticipate growth. Growth rates associated with data processing centres double power requirements in a short time, therefore it is reasonable to size the system for twice the present KVA load.

Even in a minimal growth environment, the power centre should be sized for 125% of the estimated KVA load.

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