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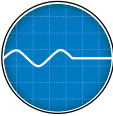
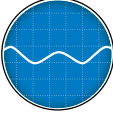
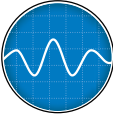
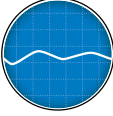
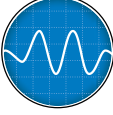

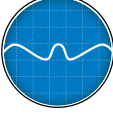


# ***9 Power Problems***

***Is your UPS up to the task?***

***IT & Facility Infrastructure Solutions***

# The nine power problems

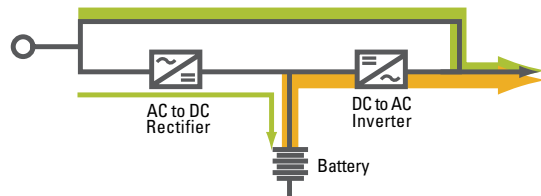
In an ideal world, your wall socket would provide an infinite stream of perfect power, at constant voltage and cycling exactly the same number of times per second. Don't count on it.

<b>Power Problem</b>	<b>Definition</b>
<b>1</b> Power Failure 	A total loss of utility power.
<b>2</b> Power Sag 	Short-term low voltage.
<b>3</b> Power Surge (Spike) 	Short-term high voltage more than 110 percent of normal.
<b>4</b> Under-voltage (Brownout) 	Reduced line voltage for an extended period of a few minutes to a few days. Often happens during the summer months when everyone is cranking up their air conditioners.
<b>5</b> Over-voltage 	Increased line voltage for an extended period of a few minutes to a few days.
<b>6</b> Electrical Line Noise 	A high power frequency power wave caused by radio frequency interference (RFI) or electromagnetic interference (EMI).
<b>7</b> Frequency Variation 	A loss of stability in the power supply's normal frequency of 50 or 60 Hz.
<b>8</b> Switching Transient 	Instantaneous under-voltage in the range of nanoseconds.
<b>9</b> Harmonic Distortion 	Distortion of the normal power wave, generally transmitted by unequal loads.

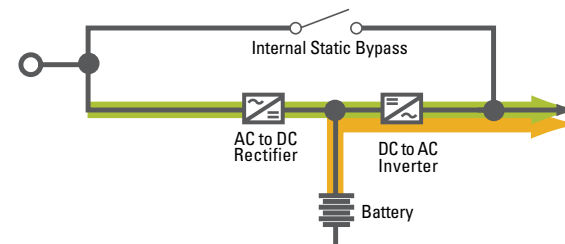
# UPS topologies

There are several different UPS topologies that provide varying degrees of protection. Selecting the best fit depends on several factors including the level of reliability and availability desired, the type of equipment being protected and the application or environment. While the UPS topologies outlined below meet the input voltage requirements for IT equipment, there are key differences in how the result is achieved, as well as the frequency and duration of demands on the battery.

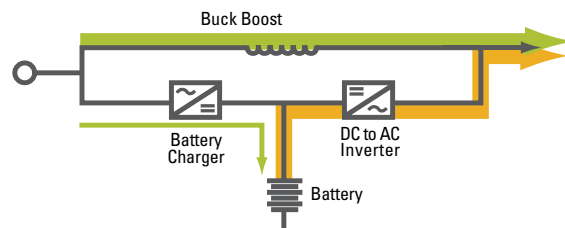
**Stand By UPSs** allow equipment to run off utility power until the UPS detects a problem, at which point it switches to battery power to protect against sags, surges, or outages. This topology is best suited for applications requiring simple back up such as small office, home office, and point-of-sale equipment.



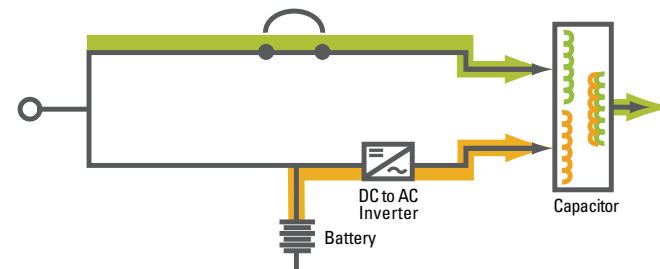
**Online UPSs** provide the highest level of protection by isolating equipment from raw utility - converting power from AC to DC and back to AC on the UPS output. Unlike other topologies, double conversion provides zero transfer time to battery for sensitive equipment. This topology is best applied to mission-critical equipment and locations where power generally is poor.



**Line-interactive UPSs** actively regulate voltage either by boosting or decreasing utility power as necessary before allowing it to pass to the protected equipment or by resorting to battery power. Line-interactive models are ideal for application where protection from power anomalies is required, but the utility power is relatively clean. MDF and IDF communication closets, non-centralized server and network rooms, and general IT enclosures are ideally suited for this topology.



**Ferroresonant UPSs** operate similarly to line-interactive models with the exception that a ferroresonant transformer is used to condition the output and hold energy long enough to cover the time between switching from line power to battery power which effectively means a no-break transfer. Many ferroresonant UPSs are 82-88 percent efficient and offer excellent isolation. Although no longer the dominant type of UPS, these robust units are still used in industrial settings such as the oil and gas, petrochemical, chemical, utility and heavy industry markets.



Normal Operation  
Battery Power

# UPS topologies

## The Push for High Efficiency UPS Technologies

The higher cost of power has seen an increased demand for development of innovative UPS technologies that allow the end user to realize cost savings, while also able to offer the necessary level of protection for their critical loads. This has led to development of a number of products from different manufacturers that offer multiple modes of operation:

- >Eco, or High Efficiency mode provides significant cost savings
- >True online double conversion mode

Eaton Industries has been a leader in the development of higher operating efficiency UPS products. Eaton's High Efficiency mode of operation in its BladeUPS product, and the Energy Saver System technology, or ESS, that is available in many of its larger 3 phase UPS systems allow for significantly higher levels of operating efficiency, independent of the level of load on the system.

The higher levels of operating efficiency within the Eaton products are essentially obtained by allowing the UPS to choose which mode of operation is sufficient for the input power conditions. In HE or ESS modes of operation the load is essentially powered through the static switch of the UPS, transferring to rectifier and inverter as alternate resources only when power conditions degrade to a certain point, or batteries need to be charged. This allows the Eaton UPS to power down the fans when in ESS or HE mode. This is a simplification of the process, but what is important to know is that in the event that a power anomaly is detected on the input of the UPS, the transfer to power through the inverter takes place in less than 2 ms, and can vary when compared to other manufacturer products. In the case of the Eaton products this is all made possible by the use of highly efficient IGBT Pulse Wave Modulated rectifiers, proprietary controls, software and design.

What does this all mean to the end user? Their UPS with a High Efficiency mode of operation can save them money in terms of operating costs, and the add-on costs of this functionality are not that expensive. The payback is a significantly faster cost of recovery on the capital expense of the UPS. The table shown here represents projected cost savings of over \$500k (direct energy cost savings + cooling cost savings) over a 15 year lifespan of a 550kVA Eaton 9395 UPS with ESS technology. This is based on comparison with a generic product, and a utility cost of \$0.10 per kWh.



\*These efficiencies are for guidance only. Actual unit and system efficiencies will vary based on site design/conditions and environmental parameters.



## ***Not all UPSs are created equal...***

As specialists in IT and facility infrastructure solutions we regularly assist our customers with their IT and facility power requirements. The UPS is a crucial part of this picture, providing protection against power related disturbances, as well as transitional power in the event of utility outages. At Potencia Technologies we understand the underlying UPS technology as well as its proper application and we are able to insure the right level of protection, and system availability for your connected loads. We partner with a number of world leading manufacturers and offer a wide range of single and three phase AC UPS products, as well as DC UPS solutions.



Contact one of our specialists today to discuss your UPS power protection requirements.