










9 Power Problems and Their UPS Solutions

Power Problem	Definition*	Cause*	Solution
1 Power Failure	 <p>A total loss of utility power</p>	<p>Can be caused by a number of events: lightning strikes, downed power lines, grid overdemands, accidents and natural disasters.</p>	Series 3 UPS
2 Power Sag	 <p>Short-term low voltage</p>	<p>Triggered by the startup of large loads, utility switching, utility equipment failure, lightning and power service that's too small for the demand. In addition to crashes, sags can damage hardware.</p>	
3 Power Surge (Spike)	 <p>Short-term high voltage above 110% of nominal</p>	<p>Can be caused by a lightning strike and can send line voltages to levels in excess of 6,000 volts. A spike almost always results in data loss or hardware damage.</p>	
4 Undervoltage (Brownout)	 <p>Reduced line voltage for extended periods of a few minutes to a few days</p>	<p>Can be caused by an intentional utility voltage reduction to conserve power during peak demand periods or other heavy loads that exceed supply capacity.</p>	Series 5 UPS
5 Overvoltage	 <p>Increased line voltage for extended periods few minutes to a few days</p>	<p>Overvoltage can be triggered by a rapid reduction in power of a loads, heavy equipment being turned off, or by utility switching. The results can potentially damage hardware.</p>	
6 Electrical Line Noise	 <p>High frequency waveform caused by or EMI interference</p>	<p>Can be caused by either RFI or EMI interference generated by transmitters, welding devices, SCR driven printers, lightning, etc.</p>	Series 9 UPS
7 Frequency Variation	 <p>A change in frequency stability</p>	<p>Resulting from generator or small co-generation sites being loaded and unloaded. Frequency variation can cause erratic operation, data loss, system crashes and equipment damage.</p>	
8 Switching Transient	 <p>Instantaneous undervoltage (notch) in the range of nanoseconds</p>	<p>Normal duration is shorter than a spike and generally falls in the range of nanoseconds.</p>	
9 Harmonic Distortion	 <p>Distortion of the normal line waveform, generally transmitted by nonlinear loads</p>	<p>Switch mode power supplies, variable speed motors and drives, copiers and fax machines are examples of non-linear loads. Can cause communication errors, over heating and hardware damage.</p>	

*Reference IEEE E-050R & old FIPS PUB 94