

POWER QUALITY: Problems and Solutions

Common power quality problems and solutions.

POWER PROBLEMS			SOLUTIONS		
Effect on Equipment	Disturbance	Contributing Factors	Low Cost	Moderate Cost	High Cost
Malfunction or permanent damage to electronic equipment	Surge: Caused by lightning, or arcing, when switching large loads on or off	<ul style="list-style-type: none"> Multiple grounds High resistance neutrals or grounds 	<ul style="list-style-type: none"> Unplug electronic equipment during storms Locate equipment on different circuits from large motors Improve grounds 	<ul style="list-style-type: none"> Surge protector with fail-safe feature to shut off power on failure Isolation transformer Maintain Contactors 	<ul style="list-style-type: none"> Power conditioner or uninterruptible power supply Surge arrestor at main panel and plug-in surge protector
	Temporary Overvoltage: Crossed wires due to weather conditions, trees and vehicle accidents	Multiple grounds, high resistance neutrals or grounds	<ul style="list-style-type: none"> Unplug electronic equipment during storms Improve grounds 	<ul style="list-style-type: none"> Surge protector with fail-safe feature to shut off power on failure Isolation transformer 	<ul style="list-style-type: none"> Power conditioner or uninterruptible power supply Surge arrestor at main panel and plug-in surge protector
	Static	Dry weather	Improve grounds	Humidifiers and static control	
<ul style="list-style-type: none"> "Hash" on monitors "Static" on radio 	Noise: Interference from small electrical motors, dimmers, photoelectric cells, adjustable speed drives and other devices	Poor grounding	<ul style="list-style-type: none"> Shut off or replace dimmers and appliances Improve grounds Move sensitive equipment to other circuits 	<ul style="list-style-type: none"> Noise filters (sometimes included in plug-in surge protectors) Isolation transformer Maintain devices causing noise 	Power conditioner or uninterruptible power supply
<ul style="list-style-type: none"> Lights dim or blink Equipment unexpectedly shuts down Monitor displays shrink Computers reset, lose data or programs 	Sags: Starting major appliances, short circuits on the power lines	<ul style="list-style-type: none"> Undersized or overloaded wiring Long and/or overloaded circuit runs 	<ul style="list-style-type: none"> Replace batteries in equipment Save data to disk frequently 	<ul style="list-style-type: none"> Constant voltage transformers Locate equipment on separate circuits 	Power conditioner or uninterruptible power supply
	"Momentaries" (outages up to 15 seconds): Short circuits due to storms, contractors digging up cables, vehicle accidents		Save data to disk frequently		Uninterruptible power supply
<ul style="list-style-type: none"> Equipment power supplies burn up Motors burn up/winding failures 1/3 to 1/2 of the lights shut down 	<ul style="list-style-type: none"> Single phase: Failure of one phase conductor to the building or equipment Temporary Undervoltage: Overloaded circuits and equipment failure 	<ul style="list-style-type: none"> Overloaded motors or power supplies Motor load and fuses/protective devices are not coordinated Circuits overloaded, high resistance neutrals or grounds 		Surge protectors with undervoltage protection	<ul style="list-style-type: none"> Power conditioner or uninterruptible power supply Install phase loss protection relays on motor contactors Undervoltage relays