"The Dirty Half Dozen"

A list of the most commonly encountered power disturbances

"Dirty Half Dozen"	Symptoms	Probable Causes	Typical Solutions
Voltage Sags	Computers * System lock-up * System crash * Data loss and errors Process Control * Loss of control * System shutdown Motors * Overheating * Contact damage Nuisance tripping ASDs Lighting * Lower output * HID extinguish	Fault Clearing (either side of the meter) * Weather * Fires * Trees * Animals * People * Equipment Large motor start-up Undersized distribution system	Power Conditioner * Constant Voltage Transformers (CVT) * Motor Generator Uninterruptible Power Supply (UPS) * On-line * Line-interactive * Off-line Stagger motor starts Size infrastructure properly
Transient Overvoltages	Computers * System lock-up * Data loss and error * Component damage Process Control * Loss of control Motors * Insulation damage * Nuisance tripping ASDs	Lightning strikes Capacitor switching Arcing faults Load switching	Transient Voltage Surge Suppression (TVSS) * Power Conditioner with TVSS * Uninterruptible Power Supply (UPS) with (TVSS) Inductors
Interruptions	All electrical equipment shuts down	Equipment failure Loose or broken power line fittings Safety device tripping	Uninterruptible Power Supply (UPS) * On-line * Line-interactive * Off-line Back-up generators
Harmonics	Overheated distribution neutrals and transformers Voltage distortion can cause timing errors Nuisance tripping GFRs	Non-linear loads Single phase computers Electronic power supplies ASDs	Oversized and dedicated neutrals "K" rated transformers Filters
EMI/RFI/EMF "electrical noise"	Data errors Monitor noise or wavy screen Process control errors	Motors/welders Improper grounding Electronic devices	Separate loads Isolation transformer Proper grounding-shielding Some power conditioners Some UPSs, some TVSSs
Wiring and Grounding Problems	Computers * System lock-up * Data loss and errors * Component damage Safety devices * Nuisance tripping GFRs * Circuit breaker tripping * Failure to operate due to poor grounding Misoperation of equipment	Piecemeal work Rapid expansion Out of date electrical drawings Lack of maintenance Aluminum wiring Large percentage of harmonic loads Manufacturers' grounding specifications	Perform wire and grounding survey Keep single-line diagram up to date Follow IEEE guidelines Specify lower harmonic equipment Perform regular maintenance Review entire system