

Electric Reliability Troubleshooting Guide

Device	Symptom	Electrical Disturbance	Aggravating Factors	Cause of Disturbance	Solutions
Adjustable speed drive (ASD)	Trips off line	Voltage sags Transients	Inadequate wiring Overloaded circuit Low or high voltage	Motor start, routine utility event (fault, capacitor switching)	Reprogram ASD, Retrofit with ride-through device Install line reactance* Install surge suppression
Computer	Computer lock-ups	Sags Transients Electrical noise	Inadequate wiring Bad data cable Mis-wired outlet	Motors starting lightning, photocopiers, printers, routine utility activities	Electrically separate disturbing loads from computer circuits Install surge protection Fix/improve wiring Use optical isolator for data lines
	Computer resets Reboots	Sags, Interruptions	Poor wiring Low voltage	Motors starting Routine utility events	Electrically separate disturbing loads from computer circuits Install power conditioner/UPS
	Data errors	Transients Electrical noise	Bad ground	Electrical lines, transformers, electrical equipment such as motors, lighting, and photocopiers, static discharge, lightning	Install surge protection Improve grounding, use optical isolator for data links
Computer monitor	Wavy screen	Radiated electrical noise (electric magnetic fields)	Unbalanced electrical circuit Faulty ground	High electrical current close to monitor – generally electrical cables, bus work, or a transformer physically very close (in the wall or next room)	Increase the distance from electrical current to monitor Shielding a possibility but generally very expensive
Control system Power Line Carrier (PLC)	Inoperative or inconsistent operation	Electrical interference		Electronic lighting	Try a different carrier frequency if possible Don't use PLC for control
Control system Discrete wiring	Inoperative or inconsistent operation	Radiated electrical interference	Signal and power wiring in close physical location Poor shielding	Electronic lighting Harmonic producing equipment Radio sources (cell phones)	Try separating wiring Install noise filter Improve shielding
Digital clocks	Lose memory, blinks	Sag, Interruption	Poor wiring , overloaded circuit	Motor starting, tripped circuit breaker, routine utility event	Replace/install battery back-up
	Runs fast	Transients Harmonics		Electronic air cleaners,	Install surge protector with "sine wave tracking" Discontinue using disturbing appliance Try a different clock
Hearing aid	Hum, buzz	Radiated noise		Electronic lighting	Modify or replace hearing aid

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Motor without ASD	Motor overheating/ burning out	Under voltage Voltage unbalance Harmonics	Inadequate wiring High harmonic loads	Overloaded circuit Unbalanced circuit Harmonic producing loads (computers, adjustable speed drives)	Reduce circuit loading and/or increase wiring/transformer size Install harmonic filter
Motor with ASD	Winding failures Bearing failures	Transients	Long cable lengths between ASD and motor ASD operating at high frequency (>10 kHz)	Interaction between rapid voltage pulses and inductance in cable High frequency switching capacitively couples voltage to shaft	Install filter on drive output Install shaft grounding device
Photocopier/ fax/ printer	Data errors, lost memory	Sags Transients	Poor wiring, grounding, overloaded circuit, low voltage	Motors starting and stopping, lightning, routine utility activities	Relocate device to different circuit Install surge protection
Power factor correction capacitors	Blown fuses or capacitor cases	Harmonics		Harmonic producing loads, resonant conditions	Install harmonic filters
Radio	Buzz or static	Electrical noise	Bad wiring or ground	Electronic lighting, arcing contacts (thermostat), appliances	Try moving radio to different location/circuit Install noise filter at radio
Security system	False trips or malfunction	Noise Transients	Low voltage, overloaded circuit Bad wiring, ground	Motors starting, light dimmers, photocopiers/printers, lightning, routine utility activities	Try relocating system to a different circuit Install surge protection with a noise filter Install a UPS
Telephone system	Damage	Transients	Poor grounding	Lightning, routine utility activities	Improve grounding system Install surge protection
	Static, buzz, hum	Noise Noise (radiated) Harmonics	Mis-wired outlet Poor ground	Electronic equipment (lighting, appliances)	Relocate equipment Install a noise filter at phone equipment Install harmonic filter
	Loses calls	Interruptions Sags	Low voltage, overloaded circuit	Motor starts, routine utility events	Install UPS at main telephone switch
Telephone answering machine	Loses memory	Sags Interruptions	Low voltage, overloaded circuit	Routine utility events Motor starts	Relocate machine to different circuit Install battery back-up