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Power Problems

When power problems are discussed, brownouts, blackouts and transients are usually mentioned but there are more power problems that we must address. Brownouts occur when the steady state voltage of the power company is reduced from 5% to 8%. This is very close to the limits of the capabilities of most sensitive equipment.

Transients are power line blips that dip the voltage below acceptable voltage levels for two to five cycles (one cycle equals 16.66 msec). The equipment may survive a brownout condition or a transient condition but the combination of both occurring simultaneously will cause sensitive equipment to malfunction causing errors in its output. Consider a piece of equipment that can tolerate a 15% power disturbance. If an 8% brownout condition and an 8% transient dip occur simultaneously, the total power dip will be 16% which is more than the equipment can tolerate. Combined effects are very common. The reason for the brownout condition is that the power company is under so much load stress that they had to reduce their voltage to meet load demands. In this stress condition, transients become more abundant on a weak power system, therefore brownouts and transient conditions often occur simultaneously.

One of the last power problems is power pollution, caused by Electromagnetic Interference (EMI). EMI occurs when high frequency signals are superimposed upon power lines. When these signals are fed into sensitive equipment, they can cause malfunctions in the low level logic sections of equipment. EMI on power lines is caused generally by the use of SCR rectifiers and welders used in many production processes.

SCR rectifiers cause harmonic distortion when the SCR's "gate on" and the SCR's are in a phase back condition. In this case, the line current suddenly goes from zero current to hundreds of amperes. In most cases, this sharp leading edge of current will propagate down the power line several miles from the actual origin of the EMI problem. These sharp current pulses excite the many resonant circuits that occur in

power lines and cause ringing. This ringing, when fed to the input of many pieces of sensitive equipment, will cause the internal logic to malfunction causing errors or burnout.

The last power problem is caused by nature and can be more disastrous than all the above **LIGHTNING**. Lightning is a major power problem causing transients, outages and EMI. Unlike other power problems, lightning itself can cause very high voltage transients and actually destroy the input stages of many pieces of sensitive equipment. This hardware damage may result in many hours of down time and high repair costs.