



## *Lightning Damage*

*Lightning* is the transient passage of electrical current between a cloud and either the surface of the earth, or another cloud, etc.

Part of the lightning current can be carried inside a building by electric power, telephone, analog or digital data lines (e.g., closed circuit television cameras, sensors in an industrial plant, etc.). This direct injection of lightning current inside a building can cause immense damage to electrical – and especially electronic – circuits and equipment.

*It is the responsibility of the user to install lightning protection, electrical surge-protective devices, and power conditioning equipment to mitigate the effects of disturbances in the electrical voltage waveform.*

It is well recognized that the trend toward integrated circuits with more transistors per unit area, and faster switching speeds, makes these circuits more vulnerable to both upset and damage.

Electronic equipment is typically designed to operate in a well-controlled electrical environment

*Damage* is a permanent alteration in the physical properties of one or more components, that requires repair or replacement before the equipment can resume normal operation. Examples of lightning damage to electrical equipment include flashover of insulation inside motors or transformers, so that the equipment is no longer functional. Examples of lightning damage to electronic equipment includes vaporized traces on printed circuit boards, vaporized transistors and integrated circuits, blown fuses, etc.

Aside from surge currents that are conducted on wires or cables, there can also be damage from magnetic fields associated with lightning currents. For example, lightning current that travels to earth along reinforcing steel inside a concrete wall or column can produce a rapidly changing magnetic field that can erase floppy disks or computer tapes inside a storage cabinet. Further, this rapidly changing magnetic field can induce a surge current in loops of wire or cable that are common in computer systems, and such surge currents can cause damage or upset in the same way as direct injection of lightning current into wires and cables.

It is well known even to laymen that lightning tends to strike elevated objects, such as tall trees, tall buildings, water towers, transmitting antennae for radio or television stations, overhead power lines, etc. As a result of this knowledge, many people have the misconception that burying a cable somehow protects it from lightning. The truth is that

when lightning current reaches the surface of the earth, the current does not magically disappear, but prefers to travel through highly conducting metal pipes (e.g., buried gas and water pipes, etc.) and buried cables (e.g., electric power, telephone lines, cable television, etc.) instead of dry soil or dry rock. In this way, buried pipes and cables can act like an attractor for lightning current, in the same way as a tall tower or building.

Lightning current can travel for long distances on overhead power lines, or in underground pipes and cables, so that a user who experiences upset or damage may not recognize that it coincided with a lightning strike some distance from the user.

It is in our experience with Computers and Lightning damage, that the computers that have sustained electrical damage usually have a decrease in life expectancy. Most of them return with electrical problems further in time.

*Protection against lightning can be much less expensive than repair or replacement of damaged equipment, as well as consequential damages from loss of use of damaged equipment. However, merely connecting some surge suppressors inside the building may result in an improved ability to withstand mild surges, but is generally inadequate protection and can create significant new problems.*

### **Protection Against Lightning:**

You should unplug your phone line when not online, or risk expensive damage to you modem and even your computer. Telephone lines are usually not protected from lightning surges.

Thunder storms can be your computer's worst enemy. Many people will take the time during a thunderstorm to turn off their PC to save it from damage, apparently trusting in their surge protector to save them.

The unfortunate truth is that simply turning a computer off will offer no protection from a power surge, and surge protectors and power strips often give a very false sense of security. Most do not offer any protection from a power surge on your phone line.

Whenever a storm enters the area you should unplug your computer and any electronic equipment -- completely. Be sure to unplug the power cords from the wall REGARDLESS of whether or not you have a surge suppressor. Surge suppressors serve their purpose, but they are NO MATCH for awesome power of lightning. In addition, you should unplug your telephone line from the modem or from the wall to ensure that a power surge does not damage your modem. Of all the pieces of equipment in your computer, the modem is the most sensitive thing that connects directly to the outside world. Do not underestimate the damage that can be caused to your modem by a power surge, especially when lightning is involved.

ALWAYS REMEMBER that storms are very dangerous to your modem and that faulty modems, wet phone lines, even faulty surge protectors and telephone equipment on the line can cause poor connect rates.

**If a computer must be left on or plugged in during a storm, a battery backup unit with a warranty against lightning protection is highly recommended.**