

Lightning & Induction (Induced Surges)

The occurrence of lightning induced surges is not difficult to understand if you are a technical person. However, the layman may not understand induction or its effect on electrical and electronic equipment. This article should help to provide a basic understanding of this phenomenon.

Induction is the principle that allows power companies to generate electricity for electric motors to run, telephones to work, etc. It is also the principle that allows lightning to enter power, data, coax and communication and telephone lines. The principle of how electric energy is induced is simple. **Induction is the act of causing the transference of energy.** Any energy form can be induced, i.e. heat, light, sound, electricity, etc. The wind blowing on a body of water induces wave action, a heat source will induce heat into a nearby object and lightning can be induced into conductors such as wire.

This principle of induction is the same as when a pot is placed above a hot burner on the stove. The heat source radiates out and induces heat into the pot even though it is not in direct contact with the burner. The induction of heat follows the same principle as the induction of electricity in a wire. In the case of the pot on the stove, the amount of energy induced is a combination of the pot's ability to absorb heat and the intensity of the heat energy.

The induction phenomenon occurs with wires that carry voltage. When electricity travels in a wire it creates a field around that wire. This field is "charged" and when another wire is close proximity, some of that energy is transferred to the wire without the charge.

Lightning travels the same way as energy does in a wire, only the voltage is much higher and the potential for induction is much greater. The amount of energy induced from lightning is dependent on the ability of the object to absorb the energy and the level of energy exposure. Lightning often contains millions of volts.

A copper wire is an excellent conductor of energy, consequently, it is common for lightning to induce many thousands of volts of energy even though the lightning may strike some distance from the wire.

Bell Labs determined through experimentation that a lightning strike almost a mile away from phone lines would induce 35+ volts per meter (39") of exposed wire. Lightning doesn't have to actually strike the wire since the energy is transferred into the wire by induction. A direct lightning strike on low voltage wires (communication, data, control, etc.) is rare and almost impossible to defend against. Lightning strikes on utility company lines are so common that utility companies have equipment in place that will almost always limit the customer's exposure. The exception would be when lightning strikes at or near the utility company's service entrance.

It is the responsibility of the user to protect systems and equipment from potential damage from direct lightning strikes or from those entering a facility as a result of induction.