Document Title: Description, AN, Lightening Surge Protection		Part # and Rev. 14516 -01	
		Release Date: 1-31-11	
Rev.	Description	Revision By	Date

Production Filename: 14516-01 AN, Lightening Surge Protection

Path to Working Files: DecaDoc\Application Notes\Master

Dimensions: 8.5 inch wide, 11 inch tall

Material: Paper, 92 Bright White or better, 75g/m² or heavier

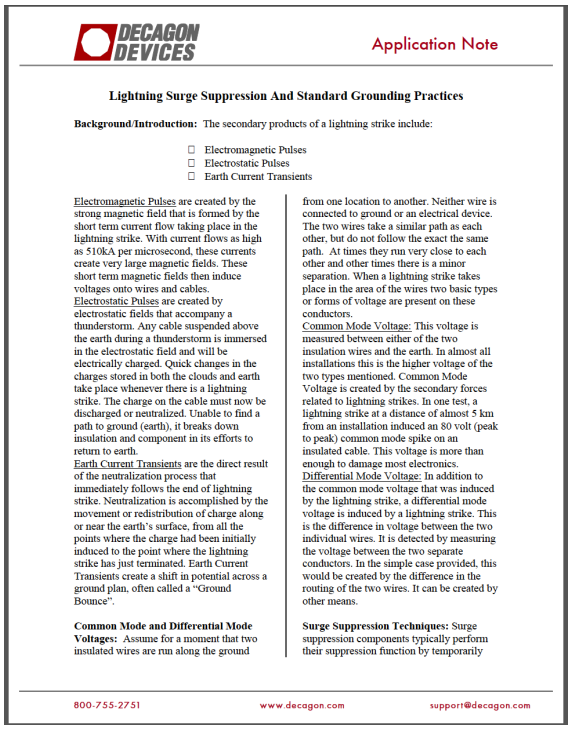
Colors: Color Print on White

Printer: HP Color LaserJet 5550

Finish: None

Adhesive: None

Special Notes: Illustrations are Ref Only ** Not to Scale ** (Page 1 of 2)



DECAGON DEVICES

Application Note

Lightning Surge Suppression And Standard Grounding Practices

Background/Introduction: The secondary products of a lightning strike include:

- Electromagnetic Pulses
- Electrostatic Pulses
- Earth Current Transients

Electromagnetic Pulses are created by the strong magnetic field that is formed by the short term current flow taking place in the lightning strike. With current flows as high as 510kA per microsecond, these currents create very large magnetic fields. These short term magnetic fields then induce voltages onto wires and cables.
Electrostatic Pulses are created by electrostatic fields that accompany a thunderstorm. Any cable suspended above the earth during a thunderstorm is immersed in the electrostatic field and will be electrically charged. Quick changes in the charges stored in both the clouds and earth take place whenever there is a lightning strike. The charge on the cable must now be discharged or neutralized. Unable to find a path to ground (earth), it breaks down insulation and component in its efforts to return to earth.
Earth Current Transients are the direct result of the neutralization process that immediately follows the end of lightning strike. Neutralization is accomplished by the movement or redistribution of charge along or near the earth's surface, from all the points where the charge had been initially induced to the point where the lightning strike has just terminated. Earth Current Transients create a shift in potential across a ground plan, often called a "Ground Bounce".

Common Mode and Differential Mode Voltages: Assume for a moment that two insulated wires are run along the ground from one location to another. Neither wire is connected to ground or an electrical device. The two wires take a similar path as each other, but do not follow the exact the same path. At times they run very close to each other and other times there is a minor separation. When a lightning strike takes place in the area of the wires two basic types or forms of voltage are present on these conductors.
Common Mode Voltage: This voltage is measured between either of the two insulation wires and the earth. In almost all installations this is the higher voltage of the two types mentioned. Common Mode Voltage is created by the secondary forces related to lightning strikes. In one test, a lightning strike at a distance of almost 5 km from an installation induced an 80 volt (peak to peak) common mode spike on an insulated cable. This voltage is more than enough to damage most electronics.
Differential Mode Voltage: In addition to the common mode voltage that was induced by the lightning strike, a differential mode voltage is induced by a lightning strike. This is the difference in voltage between the two individual wires. It is detected by measuring the voltage between the two separate conductors. In the simple case provided, this would be created by the difference in the routing of the two wires. It can be created by other means.

Surge Suppression Techniques: Surge suppression components typically perform their suppression function by temporarily

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