MORGAN SYSTEMS

Technical Bulletin

The Infamous Gas Tube

A gas tube is a glass or ceramic-bodied sealed chamber electronic device filled with inert gases. The quantity and mix of gases used determines the breakdown voltage rating of the device. The content is structured in such a way that when a voltage potential of a pre-determined nature is presented cross the chamber the gases inside ignite and burn, causing a very low state of resistance to occur (almost a dead short) until the voltage ignition source is removed.

Because of their small size and approximately 1-watt power rating gas tubes of the common resale variety were initially used in large numbers to protect telephone circuitry form over voltage damage, and they are still used widely in that application today. The application is appropriate, since telephone lines are made from tiny conductors and are rarely hit by large surge currents for any substantial length of time.

Other uses for the gas tube include circuit board protection and industrial control protection where fast action over voltage attack is required but burn time and current capacity are small.

Unfortunately these tiny parts have found their way to the telecommunications market and are being heralded by some lightning arrestor manufacturers as the "great savior of the world", capable of handling gargantuan amounts of current and pounding bolts of lightning into pitiful submission. How can this tiny part the size of a fingernail achieve such greatness? Well, it does not and it never did. While the tube can handle the conduction of as much as 50,000 amperes of current, it can only do so for a few billionths of a second. Actually, most 1/2 watt resistors and tiny wire scraps can do that, but unfortunately a bolt of lightning hangs around for a lot longer time - sometimes thousands of times as long. Here are a few notes to keep in mind about the limitations of gas tubes:

- These devices are intended for use with tiny wire conductors that have limited current delivery capacity. Using them with large, thick conductors found in radio transmission lines increases the current delivery capacity hundreds of times. Add a direct hit bolt of lightning and it's easy to see what will happen next.
- Each time a gas tube is ignited some of its gas is compromised. Determining the continuing current carrying capacity, attack speed, and

life expectancy is difficult to measure. Simply put, it's difficult to tell what the actual condition of the gas tube is.

- The duration of lightning strikes and the speed of their induced waveforms change as the surge travels down the transmission line, often slowing down by hundreds of times. This is referred to as the RL time constant of the line and it's not difficult to calculate. Unfortunately for the gas tube this effect pushes the tube into conduction for a much longer period of time than the actual length of the lighting event, frequently causing burnout or rupture of the tube. Often the tubes separate and fracture, leaving the equipment unprotected.
- In order to permit the transmission of radio signals gas tubes of very high voltage must be employed or the radio transmission's voltage will cause ignition. But when higher voltage tubes are used protection is reduced due to the larger voltages that must be reached by and induced lighting waveform before ignition occurs.

Visit us on the web at www.surgestop.com.