MORGAN SYSTEMS

Technical Bulletin

Modern Coaxial Lightning Arrestors
Polyphaser vs. Morgan Systems

This is a comparison report between coaxial cable lightning arrestor units manufactured by Polyphaser Corp. and Morgan Systems. Both companies manufacture a wide variety of such protective devices and are sold worldwide. The Morgan Systems design described in this report was originally patented by the U.S. Bureau of Patents and Trademarks in Washington, D.C.

Although there are some subtle variations in the product line, Polyphaser's basic coaxial line layout is basically a two component system. As shown in the schematic below, a high-voltage rated capacitor is used as a central blocking device to permit the unimpeded flow of RF currents through the arrestor while blocking DC voltages and low frequency AC voltages from passing through the arrestor while blocking DC voltages and low frequency AC voltages from passing through the device to reach station equipment. A gas discharge assembly having a breakdown voltage rating in the 400-1,000 volt range is used for transmitting services so that when a difference of potential between the conductors reaches this amount on the antenna side of the polarized unit the gas discharge unit ignites, shunting the voltage surge to ground.

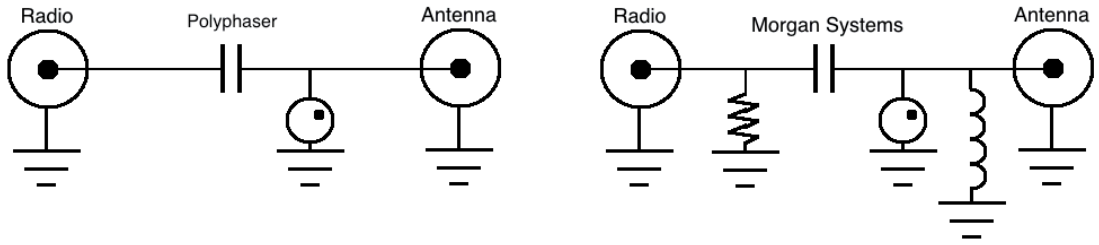
While this is certainly a workable arrangement and the Polyphaser units are well built, we concluded in our engineering studies that there were significant limitations to the design. Among them:

1. No constant drain mechanism is provided in the Polyphaser design. A coaxial line acts often like a large capacitor, storing electrical charge that can only leak off the line through antenna joint connections or through the dielectric, nearly always causing receiver "hash" noise during electrical activity.
2. The use of a gas discharge unit as a sole-source mechanism for neutralizing lightning currents delivered by heavy coaxial line conductors is controversial. Gas units have only a small dissipative power rating, seldom exceeding 1 watt. While the devices can handle large jolts of thousands of amperes of current, they can perform that service only if the entire impact event lasts only a few microseconds. Lightning currents, especially slowed down by time constants due to the inductance of

transmission lines are much slower to begin, endure, and end. The result is rupture and failure of gas discharge units, requiring frequent replacement and down time.

3. It is very difficult to determine the condition of a gas discharge unit, especially after it has taken a few "hits". They don't always go short circuit.

The Morgan Systems design, also shown below, took these characteristics into account during development and testing. We also use a central high voltage blocking capacitor, but with a large discharge inductor on the antenna side as a primary neutralizing agent. Any voltage development is quickly shunted to ground through the DC shorting nature of the inductor/RF choke. If large currents of a fast rising nature are presented to the arrestor in such a way that a back-EMF develops across the inductor then the companion paralleled gas discharge unit ignites, but its only workload is to collapse the magnetic field of the inductor. The result is an arrestor whose gas unit undertakes such a low workload that is will probably last forever. To date no replacement gas units have been sold by us. The added resistance on the equipment side of the arrestor was inserted to provide a similar drain function on the user side of the arrestor. Morgan Systems uses a four part system.



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