



Lightning Protectors for *ptf* GPS Receivers



ptf In-Line Lightning Protector

Introduction

Advances in technology have brought significant advantages to the capabilities offered in current instrumentation. The ptf range of GPS receivers are a prime example of this, bringing to market features and performance previously unattainable.

The instruments are designed to be rugged and reliable, however in using the advantages of the highly accurate GPS system it is necessary to externally mount an antenna to reliably receive the signals transmitted from the satellites.

In some cases the units are required to be used in locations where there is a possibility of adverse conditions, usually due to prevailing weather conditions in a particular area, giving the chance of incidents such as lightning strikes, and without adequate protection these instruments can be vulnerable to voltage surges and electrical transients.

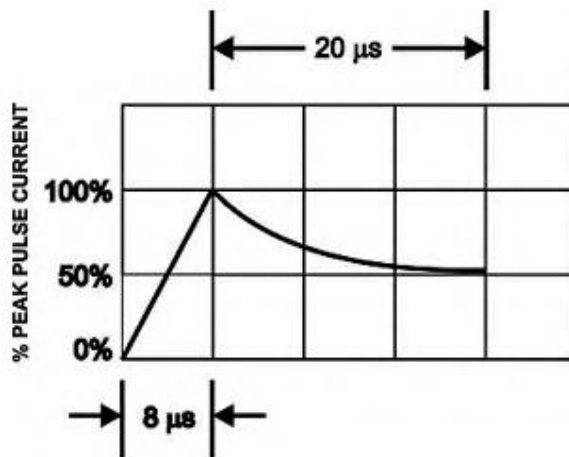
Although not a very common event, the consequences of electrical surges and transients may be severe and although the life span of these electrical phenomenon's is very short, the amount of energy that is carried can be extremely high. A typical transient event can last from a few nanoseconds to several milliseconds carrying several thousand volts and at least a few hundred amps of current, causing permanent damage to the sophisticated equipment to which the external antenna is connected.



Lightning Protection of ptf GPS Receivers, Transient Voltage Surge Suppressors (TVSS).

In order to protect the GPS receiver from incoming surges through the antenna coaxial cable, ptf provides an optional lightning protector (coaxial surge protector) comprising a purpose designed gas discharge tube, housed in an in-line connector.

The diagram below shows the waveform used to simulate real life lightning surges for testing purposes:



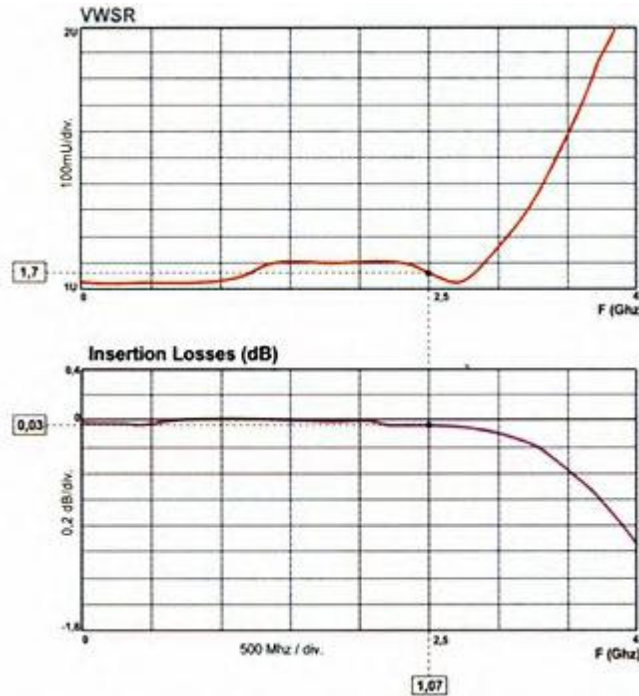
Lightning Surge Simulated Waveform

The Lightning Protector must be able to provide a low clamping voltage and be capable of diverting the lightning surge away from the GPS instrument without short-circuiting.

ptf GPS receivers operate on the satellite transmitted L1 frequency at 1575.42 MHz and the supplied lightning protector has a frequency range up to 4 GHz (4,000 MHz) with very low leakage currents and insertion losses.



The figure below illustrates the coaxial surge protector which has insertion losses so low (0.066 dB at 2.5 GHz, 0.2 dB at 4 GHz) that the protector is practically transparent on the antenna coaxial cable.



VSWR and Insertion loss of the coaxial surge protector

Once the surge voltage level reaches the surge protector's clamp voltage, the excess energy that may have damaged the GPS receiver is diverted to a common earth/ground point.

The in-line protector mounts directly in series with the coaxial cable and grounding is done through an external ground screw that is attached to the body of the surge protector.



Grounding

Critical to effective operation of the lightning protect is a proper ground connection.

Recommended grounds are the utility company ground, a ground rod, well casings, and cold water pipes that are of continuous metal.

Grounds that are unacceptable include sprinkler pipes, PVC pipe, conduit, buried wire and any ground that cannot be verified.

Bonding ensures the most effective ground. Bonding ties all of the grounds in a building together electrically. If there is a rise in ground potential and all of the grounds are bonded, no damage will occur since it is differential voltage that causes problems.

The following points should be noted:

- Make sure that the ground used for the AC power is the same as the ground used for the in-line antenna coaxial lightning protector
- Use a common ground reference must be achieved for all equipment
- Ground wires must be as short as possible
- Ground wires not be coiled nor looped
- Ground wires must be as straight as possible
- The larger the diameter, the better electrical conductivity
- The earth ground resistance on which the whole grounding system relies, must be less than 5 ohms