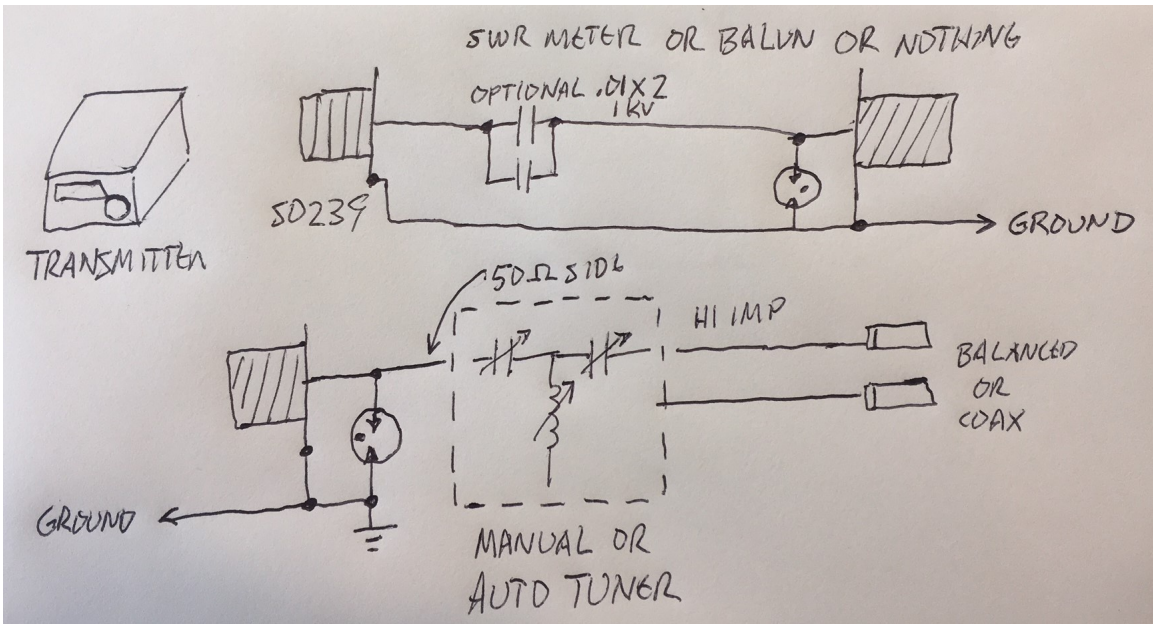
“LabNLunch” Lightning/EMP Arrestor

Note: *Nothing can protect totally against a direct lightning strike* – it vaporizes wires! However, this inexpensive system provides significant hardening against nearby strikes with induced voltages and also hardens against EMP – a part of Level II DHS EMP hardening. Ref: http://qsl.net/nf4rc/2018/DHSEMPRec.pdf Grounding is not required for EMP hardening but is strongly suggested for lightning hardening --- by the shortest, straightest, largest conductor possible.

LabNLunch is a voluntary, no-cost (other than materials) educational opportunity provided by Alachua County ARES for any and all amateurs, or amateurs-to-be --- no membership or club commitment is required. The goal is to increase the base knowledge level and radio equipment assets of local amateurs, to improve community resilience and readiness for emergencies.



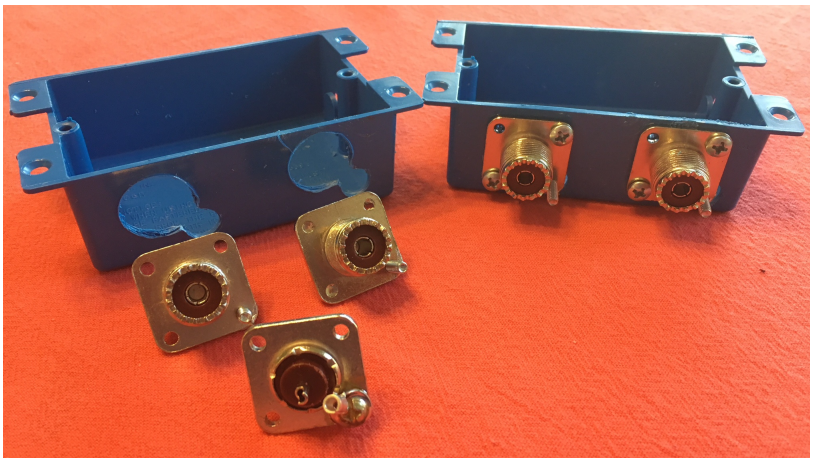
Gas Discharge Tubes begin to conduct at an approximate voltage. Their accuracy is typically +/-10% For a brief moment they can conduct thousands of amperes, but are damaged by repetitive conductions. They are widely used to protect expensive circuitry against over voltage. Although the rise time of conduction is several nanoseconds or more, they are useful in protecting against EMP if the feedline and antenna system has somewhat limited bandwidth, which slows down the extremely fast risetime of an EMP E1 pulse.

The feedline voltage in an antenna system is dependent on the power employed and the impedance as well --- higher impedances will have much higher voltages for any given power. For this reason, the gas discharge tube should be positioned at a 50-ohm portion of the system.

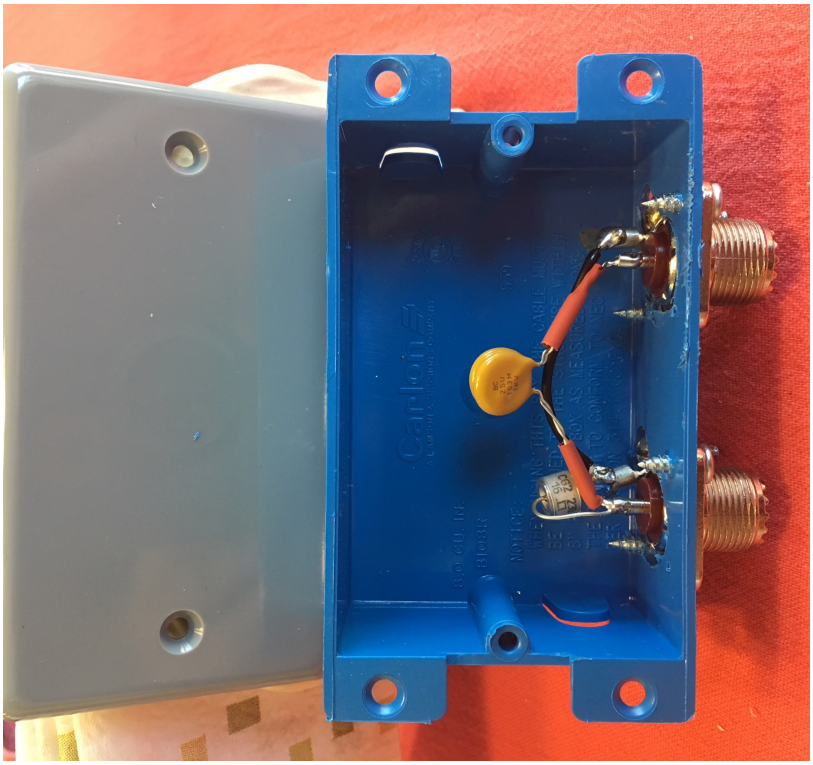
Possible Sites of the Gas Discharge Tube
On the antenna side of a 1:1 current balun or SWR meter
On the antenna side of a blocking capacitor
On the transmitter side of a manual or automated tuner

It is suggested that the voltage of the Gas Discharge Tube be chosen based on this table:

Power / SWR extremes	Gas Discharge Voltage
<=100 watts, 2:1 or better SWR	230 V
<=100 watts, 3:1 or better SWR	350 V
500 watts or more	two 350V in series



A DC blocking capacitor is optional. It may provide additional protection against lightning or EMP. In ordinary amateur radio usage, it appears as a very slight reactance and needs less than 50V rating – however, a much higher rating is used to provide sufficient current carrying capacity and to reduce the chance that it will be destroyed by even slight nearby lightning strikes.



LabNLunch Topics
Lightning Arresters
The Bitx40 $59 40meter SSB/CW transceiver (easy addition of 80 meters)
SWR Meters
Antenna tuner construction: MFJ941EK ($129) and/or ZM-2 (QRP) $65
HF Off Center Fed Antenna/Balun Construction (based on the proven Buckmaster design)
VHF Antennas
Operating HF Modes
Operating High Power Amplifiers
Operating glow-in-the-dark Transceivers
Building simple power supplies