How to Test Gas Discharge Tube (GDT) based Radio Frequency (RF) Coaxial Surge Arrestors

(PolyPhaser, Pasternack, Fairview, L-com, ShowMeCables Brands)

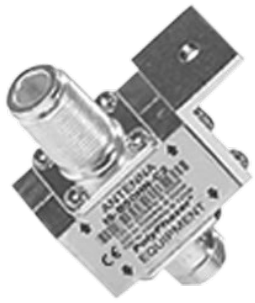
White Paper

The Infinite Electronics international DC block (PolyPhaser IS-B50 / IS-50) and other GDT based surge arrestors can be field tested to qualify whether they are working or not working.

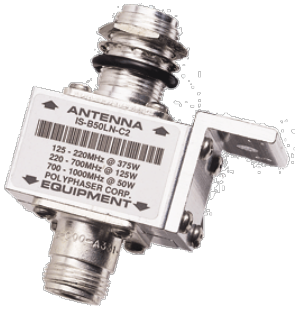
The following brands have their own brand labeled GDT based RF coaxial surge arrestor units: Pasternack, Fairview, L-com, ShowMeCables and PolyPhaser.

The images below show PolyPhaser IS-B50 Series DC block bulkhead mount, PolyPhaser IS-50 Series DC block flange mount, and bulkhead mount GDT only DC pass models. This white paper applies to all Infinite brand gas discharge tube DC block or DC pass radio frequency (RF) coaxial surge arrestors.

Technology internal to the IS-B50/IS-50 units include a DC blocking capacitor on the center-pin, blocking the DC element of a lightning strike, and a GDT in parallel between the center-pin and the body (see schematic below for reference) aligned near the antenna (surge labeled) connector. The DC pass GDT only unit is DC pass because there is not a DC blocking capacitor on the center-pin.



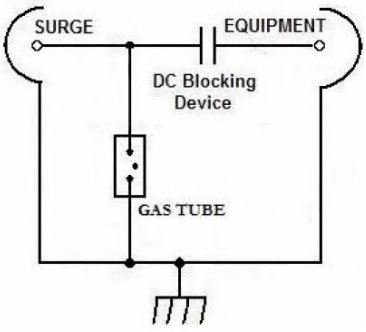
PolyPhaser IS-B50 Bulkhead Mount



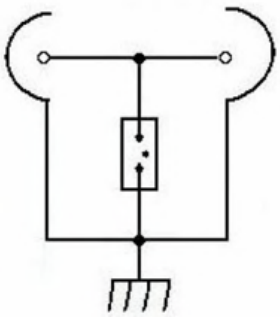
PolyPhaser IS-50 Flange Mount

Bulkhead GDT DC Pass Models

Here are schematics of the units:



PolyPhaser (DC Block) IS-B50 / IS-50



GDT Only (DC Pass) Models (All Brands)

GDT General Characteristics

GDTs are normally open devices when not shunting a surge event. GDTs are also degradable, wearing out after each surge event. Our GDT supplier(s) shares two specifications:

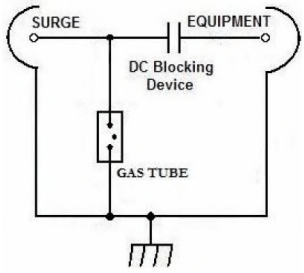
1) 20 Year Shelf Life
2) One-Time (Lifetime) 20kA Surge Capability which is Accumulative

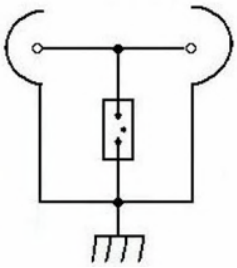
Most strikes are near or proximity strikes. GDT based RF coaxial surge arrestors will protect against numerous near strikes. However, direct strikes (30kA or much stronger in magnitude) can occur but are less typical. A direct strike will cause the surge arrestor to self-sacrifice. The surge arrestor still provides protection during a direct strike but is then rendered inoperable afterwards. If there is evidence of antenna damage after a lightning strike, such damage is confirmation of a direct strike. **Always replace a GDT based surge arrestor after a known direct strike.**

When conducting continuity tests, refer to the schematics on the previous page (and shared again below). For the DC block schematic, all continuity tests (Pin-to-Pin, and Pin-to-Shield) will measure OPEN. If a short is measured, the unit is defective or compromised and should be replaced (SHORTS are bad).

Both the capacitor and GDT components (DC block models) will measure open (referring to continuity testing). With the DC pass models, continuity testing from Pin-to-Pin should be a dead-short, but Pin-to-Shield (either connector) should measure OPEN. Continuity testing confirms expected opens or shorts and helps to reveal a problem short (DC block models).

Continuity testing does not indicate the health of the GDT. PolyPhaser's white paper titled, Testing Rf Lightning Protectors Without Indicators specifically applies to all GDT based RF coaxial surge arrestors, sharing VSWR testing practices to measure GDT health.





The Testing RF Lightning Protector white paper recommends performing a Voltage Standing Wave Ratio (VSWR) test at initial installation, when the surge arrestor is new. If the coax cable and connectors, and antenna are in good condition, the VSWR reading should be: 1.1:1 ratio (100% forward RF power gets out when transmitting, and 0 (zero) reflected RF power is measured when transmitting).

As the GDT degrades over time, and after each surge event, the GDT degradation negatively impacts the capacitive impedance of the coax cable, which negatively affects the VSWR reading; VSWR test results will get worse over time, more and more reflected power will be evident when compared with the base line VSWR initial installation measurement.

At some point, a subjective decision is made by the field support technician on when too much reflected power is measured, to then replace the surge arrestor.

For sure, after a KNOWN direct lightning strike, replace the surge arrestor, even if it was just installed recently. The GDT will be fully depleted (is still an open device even when fully depleted) after a direct strike.

GDT based RF coaxial surge arrestors will react to numerous near strikes though, which is more typical (near strikes are more typical). As noted earlier, use VSWR testing to measure GDT degradation, then replace the surge arrestor when VSWR readings are too high (too much reflected power); assumes there are no other reasons for the high reflection as measured during VSWR testing.

Having a coaxial barrel pass-thru adapter handy for troubleshooting is strongly recommended. When measuring a bad VSWR test, further troubleshooting is needed before assuming the surge arrestor is the cause.

First, remove the surge arrestor and replace it with a barrel pass-thru adapter, then re-test. If the VSWR re-test result is good, then the surge arrestor is the reason for the bad VSWR reading. If the VSWR remains bad, then there is something else negatively impacting the bad VSWR reading, related to the coax cable (maybe including the surge arrestor) that will need to further investigation: water in the coax cable? Coax connectors are bad? The antenna is bad? Holes or kinks in the coax cable? These are all examples of things that also cause bad VSWR (cause high reflected power) besides a degrading GDT based surge arrestor.

The barrel pass-thru troubleshooting method gets to the heart of things very quickly (proves the surge arrestor is the problem, or that there is or are other problems besides just the surge arrestor).

PolyPhaser does not have barrel adapters, but our sister Infinite Electronics brands, L-com & Fairview do. Example image below shows an N Female to N Female barrel adapter (RF pass thru – no surge protection).

Customers can order barrel pass-thru adapters from:
L-com: 800-341-5266
Fairview Microwave: 972-590-8159

Here are L-com & Fairview Microwave part numbers and links to adapters for connector types:

UHF, TNC, 4.3-10, SMA, N, and 7/16 DIN; These are the most popular RF coax connector types used by PolyPhaser RF coaxial surge arrestors (and relabeled equivalents) across brands:

Brand Part Number	Product Description
L-com: AXA-NFNF	N Female to N Female Adapter
L-com: AXA-NMNM	N Male to N Male Adapter
Fairview: SM4013	N Male to N Female Adapter
L-com: AXA-DFDF	7/16 DIN Female to 7/16 DIN Female Adapter
L-com: AXA-DMDM	7/16 DIN Male to 7/16 DIN Male Adapter
Fairview: SM3393	7/16 DIN Male to 7/16 DIN Female Adapter
L-com: BA170	UHF Female (SO239) to UHF Female Adapter
L-com: BA280	UHF Male (PL259) to UHF Male (PL259) Adapter
L-com: BA404Z	UHF Male (PL259) to UHF Female (SO239) Right-Angle Adapter
L-com: BA2301	TNC Female to TNC Female Adapter
Fairview: SM5718	TNC Male to TNC Male Adapter
L-com: BA4000	TNC Male to TNC Female Adapter
L-com: BA23	SMA Female to SMA Female Adapter
L-com: AXA-SMSM	SMA Male to SMA Male Adapter
Fairview: SM4983	SMA Male to SMA Female Adapter
Fairview: FMAD1096	4.3-10 Female to 4.3-10 Female Adapter
Fairview: FMAD1166	4.3-10 Male to 4.3-10 Male Adapter
Fairview: FMAD1165	4.3-10 Male to 4.3-10 Female Adapter

For further information or questions, contact PolyPhaser's Technical Support Specialist at 208-635-6400, ext. 1046420, or via email: techsupportpro@infiniteelectronics.com.