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Practical Tips on Contest Station Coax and Connectors

Tip No. 1: Coax Cable Center Conductor Migration

Coaxial cable used in Amateur Radio service has, for the most part, been made with one of three insulating dielectric materials between the center conductor and the shield. The common material types are: Solid polyethylene (PE); extended or "foamed" polyethylene (FPE), and solid Teflon (TFE). Teflon dielectric coax is usually trouble free and often used at VHF and UHF frequencies due to its low loss characteristics.

Foam polyethylene dielectric coax is used extensively on the HF bands. RG-8X and RG-11/U are examples found in many shacks. The *ARRL Antenna Book* includes a table of coax specifications, including a column listing dielectric type.

An unfortunate property of the foam used in foam dielectric coax is its lack of mechanical stability under some conditions. The center conductor in foam coax can migrate toward the shield causing an "impedance bump" or worse, a center conductor-to-shield short. Several user-created conditions can lead to foam coax developing a short circuit. A major culprit is bending or coiling foam coax with a tight radius. Where does this happen? Lots of places. Baluns are often made by wrapping several turns of coax into a tight bundle with a tight radius. Coaxial cable stubs also are sometimes wrapped into small-radius coils in order to keep them small overall and out of the way. Excess coax is sometimes coiled up too. These practices are all potential trouble.

An additive factor is the self-heating caused by the cable's loss — a direct function of the amount of power applied and the SWR on the cable. RG-8X is *not* rated for 1500 W, but a lot of amateurs use it successfully at that power level. RG-8X gets warm to the touch at 1500 W. Increasing internal temperature softens the foam, and this facilitates center-conductor migration. Tight-radius bends taken together with heating are a recipe for a short circuit down the road. Tightly coiled baluns used outdoors can receive solar heating in addition to self-heating and a tight radius. A balun made and used this way has a very high probability of shorting out over time — particularly when used at high power.

A typical PL-259 with a UG-175/U adapter for smaller-diameter coax. [Rick Lindquist, WW1ME, photo]

Avoiding center-conductor migration is easy: Don't put any sharp bends in the cable, particularly when it's used at high power. Instead, use solid dielectric coax to make tightly coiled coaxial baluns, and, if stubs must be coiled up, use solid dielectric coax for those too. Use up spare foam coax length by laying it flat on the floor and avoiding sharp-rad+ius turns or bends.

Tip No. 2: Coax Connectors — Not as Simple as They Appear

"You get what you pay for" is never more true than when it comes to common UHF connectors, including PL-259s, SO-239s, UG inserts, etc. Every hamfest seems to have at least one vendor selling "mystery" UHF connectors. Often these are found out in the flea market, but they are sometimes sold "inside" by reputable vendors. Mystery PL-259s cost as little as $1.

What are you buying when you spend a buck for a PL-259? Nobody knows. Even the seller in the flea market doesn't know — he just knows it's "great stuff." Without a doubt it's not!

PL-259s are simple enough, right? What could go wrong? PL-259s have four parts: The outer sleeve called the "knurled nut," the connector body, the insulator/dielectric, and the center pin. All four components can be compromised to the point of making a bargain connector useless.

Here are some frequently encountered problems:

• **Finish:** Bargain connectors sometimes have a finish you can't solder to! The non-solderable ones often have a chrome-like appearance, but some that look good are in fact nearly impossible to solder to.

• **Threading:** The internal threads at the head of the body are there to accept a UG-style insert to narrow the connector barrel to accept smaller-diameter coax such as RG-8X or RG-59. The threads may be metric! UG inserts also sometimes appear in the US market with metric threads. Some bargain PL-259s will not accept an English thread (the US standard) UG insert.

• **Dielectric:** Good connectors use quality phenolic or Teflon insulation between the center pin and the body. Bargain connectors might use anything, including materials like polystyrene, which will melt when the center pin is soldered.

• **Center pin diameter:** This is one of the most common and insidious problems in mystery PL-259s. The center pin ODs are almost always slightly smaller than they should be, and it's hard to notice. The center pin connection between a PL-259 and an SO-239 or barrel connector depends on correct diameter of the pin on the male plug and of the mating fingers on the female socket, which must be of the proper spring material.

In addition to mystery SO-239s in which the center-pin spring tension relaxes over time and/or temperature, the annulus flange that mates to a PL-259 may only have four indentations to match up with the nipples on the body of the male connector. If you look at a quality SO-239 or barrel connector, you'll see that the annulus has indentations all the way around. It is nearly impossible to mis-mate a quality PL-259 to a quality SO-239. With poor quality components, PL-259-to-SO-239 connections can become intermittent over time. They also become temperature sensitive when used outdoors.

As bad as mystery PL-259 and SO-239 connectors can be, there is something worse. The really bad actors are T and right-angle UHF adapters. Take a close look at what has to happen inside these adapters. The center conductor has to make a right angle turn inside the shell. In poor adapters the right angle connection is done with a spring contact, and these do not hold up. Quality T and right angle (elbow) adapters have internal conductors that are tapped and threaded, so the conductors are screwed together within the body at the right angle junction. Adapters

made this way are very reliable.

How can we tell the good connectors from the junk? Price, for one. If the price is too good to be true, it probably is. Finish is another tip-off. PL-259s with good silver plating have a dull appearance. Last but not least is the fact that mystery UHF connectors all have one thing in common: Mystery! Good connectors have a part number and manufacturers name stamped onto them. You can look up the connector's specifications if it's marked. Examples of this are connectors made by Amphenol, all of which have part numbers stamped on the connector body. Old timers are fond of saying, "Amphenol or not at all," although there are now competitors making quality connectors. For the difference of a dollar or two, "mystery" UHF connectors are a very poor investment.