

CARE AND HANDLING OF COAXIAL CONNECTORS THE QUICK, FOOLPROOF WAY



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MANY of the so-called UHF connectors were developed during World War II for use with medium size coaxial r.f. cables (such as RG-8/U and RG-11/U). Now generally supplanted by the newer Series N connectors in commercial equipment, these inexpensive and readily available UHF connectors are still widely used on amateur, CB, and SWL equipment. The most common members of this family are the male plugs (PL-259, PL-259A, and UG-295/U) and the female receptacles (SO-239, UG-296/U).

The male plug, a beguilingly simple affair, has a non-constant impedance, is a non-waterproof device and (to many exasperated amateurs and CB'ers) is an invention of the devil. A look at the PL-259 plug shows instantly how it *should* fit on the end of a piece of coax cable; the installation is self-evident! But, alas, getting the plug properly astride the cable end and soldered firmly in place is a frustrating and time-consuming task. In too many instances, the user simply gives up the battle, jams the connector on the end of the cable, and solders what he can, leaving whiskers of copper braid ready to short out the plug.

True, the plug manufacturers provide nifty little drawings showing how the plug should be placed on the cable; but

these pieces of advertising art merely make the frustrating experience seem more bitter, since sooner or later most amateurs come to the reluctant conclusion that the PL-259 plug was *never intended* to be placed on a coaxial cable by the hand of man!

I have battled the PL-259 plug problem for longer than I care to admit and I finally solved the dilemma by switching to the newer and better *type N* coaxial fittings, which were seemingly designed by a sane mind. However, time does not march on, and a large amount of gear in the W6SAI station is equipped with the PL-259's matching partner, the ubiquitous SO-239.

Finally, with the assistance of W6CYL, who had made his peace with the coaxial plug problem, it was decided to try a system approach that would solve the PL-259 question once and for all. Here is the solution.

Coaxial Connector Assembly. The mating cable must be properly prepared if the connector is expected to operate to its fullest capability. With a little care and some inexpensive tools, a well-engineered assembly may be made in a few minutes. In addition to a soldering iron or gun, you will need: a ruler, a sharp knife (the Stanley 99A Shop Knife is

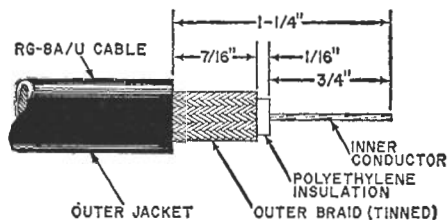
recommended), and a tubing cutter (the General Hardware #123 Midget Tubing Cutter is recommended). Oh yes, you'll need a pair of wire cutters to snip the cable to proper length, also.

Follow this procedure carefully:

Step 1. Slide the coupling ring of the PL-259 over the coaxial line. Next, take the shop knife and circumscribe a cut in the outer, black jacket of the cable about 1½" back from the end. Make the cut at right angles to the cable so that the end of the vinyl jacket will be square and ship-shape. Slit the free end of the jacket with the knife and peel it off.

Step 2. You now have part of the outer braided shield exposed. Using a hot soldering iron or gun, *quickly and smoothly* tin the braid, making the shield a solid entity. Do this quickly so as not to unduly overheat the inner polyethylene insulation of the cable. If you take too long, the inner insulation will melt and "squirt" out between the interstices of the braid. Don't worry; you'll obtain expertise in soldering the braid once you set your hand to it. Clean the left-over flux from the braid with paint thinner after the solder cools.

Step 3. Next, cut the soldered braid with the tubing cutter. You'll want to cut it so that ¼" is left exposed. Using a soft pencil, make a mark on the braid exactly ¼" out from the black jacket. Place the tubing cutter over the braid so that the cutter wheel falls on the pencil mark. Tighten the cutter a bit and slowly revolve it about the cable. Tighten the cutter wheel once or twice again and continue to revolve the cutter. Four or five revolutions, and the tubing cutter will neatly slice the solid braid. The unwanted braid end may be easily pulled off, using the wire cutters as snips.



By the time you have finished step 4, the end of your RG-8A/U cable should look like this.

UHF CONNECTORS

For RG-8A/U and RG-58/U Cable

Plugs: PL-259, PL-259A, UG-295/U

Adapters for RG-58/U: UG-175/U, UG-410/U

Right-angle adapter: UG-297/U, UG-646/U, M-359

Adapter, straight (female-female): PL-258, UG-360/U, UG-299/U

Receptacle: SO-239, UG-296/U

Adapter, straight (male-male): Dow-Key F-2

Hybrid adapters:

UHF (female) to BNC (male): UG-255/U

UHF (male) to BNC (female): UG-273/U

UHF (female) to N (male): UG-146A/U

UHF (male) to N (female): UG-83B/U

UHF (female) to male phono connector:

Dow-Key A-210

UHF (male) to male phono connector:

Dow-Key A-211

UHF plug (solderless): Amphenol 83-851

(for RG-8A/U)

Step 4. Trim the inner polyethylene insulation of the cable. It should be cut cleanly (using the utility knife) so that a collar about ¼" wide is left at the end of the outer braid which was just trimmed. Go slowly, so that you do not nick the inner conductor. Once the slug of insulation is free, it may be removed from the cable by grasping it with your fingers and slowly but firmly pulling and rotating it at the same time. When the slug is off, tin the inner conductor.

Step 5. You have now come to the moment of truth. The cable is ready for the PL-259 shell. It should be pushed on the cable end and rotated with the fingers so that the internal threads of the shell are screwed onto the outer vinyl jacket of the cable. As the plug is screwed onto the cable, you should see the tinned outer jacket appear through the four solder holes of the plug. Continue twisting the plug onto the cable until the braid is completely visible through all holes.

Step 6. The last step is to solder the braid through the solder holes of the plug and solder the center conductor to the center terminal of the plug. Use an iron or gun with a small point and make neat connections to the braid, taking care that the solder does not run over the outer threads of the plug. With a little care, you'll have a work of art. When the joints cool, examine your masterpiece and then slide the coupling ring down over the plug.

Sealing for Outdoor Use. The PL-259 is not waterproof and must be protected against moisture by an additional covering. If water does get into the plug, it can be very quickly sucked down the coaxial cable by capillary action. Soon the entire outer braid becomes corroded and line loss rises rapidly.

To seal the plug and line properly, the mating surface between the plug and the matching SO-239 receptacle should be packed with silicone grease. The connectors are then mated and the excess grease is forced out of the joint and wiped off. The next step is to wrap the coaxial joint thoroughly with pressure sensitive vinyl electrical tape. Several layers of tape should be used; and the wrappings should extend beyond each connector a minimum of four inches, making the total wrap about ten inches long. The tape should be put on under tension, with one layer overlapping the one beneath. As a final precaution, the cable run should be dressed so that water cannot run to a joint and stand there.

Use With Small Cables. The popular PL-259 UHF plug may be used with small-diameter coaxial cables (such as RG-58/U and RG-59/U) by adding a reduction adapter. For example, RG-58/U (52-ohm cable) requires a UG-175/U adapter and RG-59/U (72-ohm cable) requires a UG-176/U adapter. Follow much the same procedure detailed above with the exceptions noted below.

Step 1. Insert the cable end through the coupling ring and the adapter. Note that the knurled end of the ring and the narrow end of the adapter face the open end of the cable. Cut the end off $\frac{3}{4}$ " of the cable jacket with the utility knife.

Step 2. Fan the braid out slightly and fold it back over the outer jacket.

Step 3. Push the adapter forward under the braid and trim the braid with small, sharp scissors to a length of $\frac{3}{8}$ ". Next, using the utility knife, remove $\frac{5}{8}$ " of the insulation from the center conductor. Be careful not to nick the conductor. Tin the exposed conductor quickly with a small soldering iron.

Step 4. Carefully screw the plug assembly onto the adapter. The center conductor will pass through the center pin and the braid should appear through the side holes of the plug assembly. Using an iron

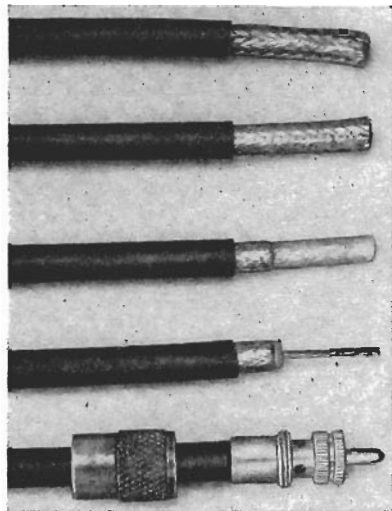


Photo shows, from top to bottom, the results of steps in preparing the cable.

with a small soldering tip, solder the braid through the plug assembly holes. Use just enough heat to bond the braid to the shell. After these have cooled, solder the center connector to the tip of the plug. Finally, screw the coupling ring on the assembly.

Waterproofing and sealing are even more important when using either the RG-58/U or RG-59/U cable. -30-