

Note: The following article was initially submitted for publication in *Terrestrial VHF+*, July 1992, pages 2-3. It was then republished in *Cheese Bits Magazine*, December 1992, pages 9-10; *The 26th Eastern VHF/UHF Conference*, August 25, 2000; and the *ARRL 2000 Proceedings*.

PLUMBING PARTS AS 7/8 INCH HARDLINE CONNECTORS

By KEVIN KAUFHOLD, WB9GKA

Recently, I scrounged up some 7/8 inch Andrews Hardline, enough for two very nice runs up my tower. A call to a electronics supply store specializing in connectors produced quite a shock - the commercial, retail price for 7/8 inch connectors terminating into N type females or males was well over \$100 per connector. And I would need 4 of them!!

Further telephone calls produced scary results, as well - surplus connectors (i.e., really scrounged) were running anywhere from \$40 to \$75 for each connector, if you could locate them.

Not happy about the price of connectors, I let the hardline sit in the basement while I put up several runs of equally scrounged 1/2 inch CATV line. I used UG-21 D/U N type connectors, and modified these connectors as suggested in an earlier KOIFL newsletter. These fat, little D/U's worked great on 1/2 inch line.

Not content at letting very good Andrews hardline just rot in my basement, I returned to the connector problem for the Heliac. I went to the Hardware store, and fooled around in the electrical department for a while, with no results. I then wandered into the plumbing area, and noticed that the threads on some of the plumbing parts looked very similar to the threads of UHF type connectors. A closer inspection proved to be a bonanza - a UHF type barrel connector fit very nicely into a 1/8 inch plumbing reducer!

After fiddling around several more hours at home, I had some very nice looking terminations from the Heliac that would fit either N type or UHF type fittings. And all using plumbing and hardware parts, and all for a price of \$10 to \$15 per termination - even cheaper if brass fittings were not used.

Use of plumbing parts proved to be cheap and easy. Further, while I was working on 7/8 inch hardline, plumbing reducers are available that would fit almost any size Hardline. And, if the right type of plumbing reducers are used, most of the parts could be interchanged for either N type or UHF type connections.

I have not checked the resistance value of this Plumber's special. I would hazard to guess that the impedance value is anything but 50 ohms. If you want perfect impedance, break down and buy commercial grade connections.

FOR UHF TYPE CONNECTIONS:

Obtain a reducing union that goes from 3/4 inch inside thread to 1/2 inch inside thread (a reducer down to 3/8 inch could also be used, but then it would have to be completely changed if the termination would someday change to a N type connection).

Place an 1/2 inch (outside thread) to 3/8 inch (inside thread), and insert into the 1/2 inch side of the union. Use an anti-oxidizing compound if dissimilar metals are being used.

Cut off some of the plastic jacket of the Heliac. Screw the 3/4 inch side of the union onto the end of the Heliac. Use an anti-oxidizing compound for dissimilar metals. The 3/4 inch union may have to be coaxed on the Heliac with some small amount of force. It is going to be a tight fit, but the union can be screwed onto the end of the Heliac.

Take a piece of 5/16 inch all-thread (it normally comes in 3 foot lengths), and cut it to around 3 inches (the exact dimension is not critical). Gradually taper the last one inch of the all thread - down to 3/16", This can be easily accomplished with just an old fashioned file. File down the end of the all thread so that the last 1/4 inch or so of the rod is 3/16" in diameter. The all-thread piece is going to be the center conductor of the coax, so it would be a good idea

to make sure a UHF type barrel connector fits its center connection onto the filed-down end of the all-thread.

Gently screw the thread end of the all-thread piece into the copper tubing of the Heliac. The all-thread makes a perfect fit into the center tubing of the Hardline, and gently pushing the all-thread into the tubing in a rotating manner will produce some furrows in the copper tubing that will grab the all-thread and keep it in place. A 5/16 inch rod can be used instead of all-thread, but then it must be soldered into place somehow.

Keep screwing the all thread into the tubing until it is flush with the end of the 1/2 inch to 3/8 inch insert.

Screw in a UHF type barrel connector into the 3/8 inch opening. It should fit very tightly, and resistance should be felt as the connector starts to grab the filed down end of the all-thread. Gently tighten until a good connection is established. As always, be sure to use some type of compound that keeps down oxidation, rust and corrosion in the metal connections.

Use an Ohm meter to make sure the center and outside connections are electrically solid.

FOR N TYPE CONNECTIONS:

Obtain a reducing union to go from 3/4 inch inside thread to 1/2 inch inside thread. Also obtain a 1/2 inch threaded nipple (1 to 2 inch long should work).

Screw the nipple into the 1/2 inch side of the reducing union. 3/4 inch reducer to 1/2 inch copper pipe fitting could be used instead of the union and the nipple, as suggested above, but then it could not be interchanged if you need to go from N type to UHF Type.

Cut off some of the Heliac's plastic jacket. Screw the 3/4 inch side of the union onto the Heliac. It will be a tight fit, so don't push it too hard. I would suggest to slowly rotate the union around the Heliac as small amounts of pressure is being applied to the union - The union should then thread itself onto the outside copper conductor of the Heliac.

The 1/2 inch nipple then fits into a UG-21 DIU N type connector, as modified and described in the earlier KOIFL newsletter. Instead of the D/U connector fitting onto a 1/2 inch hardline, it is connecting into a 1/2 inch nipple that is fitted onto the reducing union as noted above.

Use 5/16 inch all-thread for the center conductor of the Heliac. Again, a solid rod could be used, but then it may slip without some type of soldering onto the copper tubing of the Heliac.

Some experimenting will have to be done to make the end of the all-thread fit onto an N type center pin. Many center pins have small inside diameters, something on the order of 2/16 inch or less. Some center pins designed for 9913 will have larger openings that will accept a bigger center conductor. If you have the 9913 type of center pin, you may be successful in just filing the end of the all-thread until it fits into the center pin. If you have a small diameter N type pin, however, I would suggest that you throw it away and obtain some 9913 pins.

The all-thread is then threaded into the copper tubing far enough to allow the center pin to stick past the end of the 1/2 inch nipple. The D/U connector is then attached onto the nipple, the center pin fits into the hole provided (the N Type center hole may have to be drilled out a bit, as suggested in the earlier article on 1/2 inch hardline).

TO INTERCHANGE BETWEEN N TYPE and UHF TYPE:

Many times, equipment manufacturers will have N type terminations for some antennas and radios, and also will have UHF type connections for other equipment. Other manufacturers will also have different connections, as well. I wish everything would be N Type for 6 meters and above. But unless you are ready and able to change fittings on the radios and antennas, you probably will be faced someday with a coax termination that does not fit the radio or antenna.

Instead of using an adapter to go from N to UHF, thereby producing some line loss inefficiency in the adapter, you can easily change the above referenced plumbing connections on the Heliac. Keep the 3/4 inch to 1/2 inch-reducing union, and then change from a 1/2 inch nipple to a 3/8 inch union, if you are going from N to UHF (or visa versa for UHF to N type). The tapered piece of the all-thread may make a direct fit from N type fittings converted to a UHF termination, at least if you have used a large diameter 9913 center pin on the N connector. The UG-21 D/U would then be replaced by a UHF barrel connector.

Presto! The Heliac termination has been quickly changed from N type to UHF type (or visa versa). You will end up with different sexes, though - instead of an N type Male, you will have a N type female.

FINAL COMMENTS:

This article should be used as a guideline. It is meant to be improved upon, and experimented with. It at least shows that simple, cheap and easily available plumbing parts can be made to work as terminations for Heliac, and other large diameter hardlines. If brass and copper fittings are used, the end product will be pleasing to the eye, as well as functional.