3D-Printed Coax-to-Wire Connection Blocks

Leave PVC pipe odds and ends at the hardware store and 3D print your own lightweight, weatherproof antenna center blocks.

John Portune, W6NBC

I do a lot of antenna experimentation and building, which often entails connecting coax ends to separate wires. If I'm in a rush to try out a new antenna design, the juncture of the feeder coax and the antenna wires often becomes a kludge of electrical tape, heat-shrink tubing, and gooey wire sealant.

The next best thing would be the classic radio amateur solution of using PVC pipe odds and ends. While certainly workable, the design is heavier than necessary and, unfortunately, looks like what it is.

Fortunately, 3D printing provides a third option for making our own custom designs with a professional appearance, as shown in the lead photo. For my latest project, I wanted something smaller, lighter, and less expensive than the heavy commercially available dipole center blocks.

3D-Printed Connection Blocks

For my purposes, a simple, inexpensive, direct wire-to-coax connection would suffice. I decided on three sizes of easily 3D-printable terminations for connecting ordinary hook-up wire directly to three different diameters of common coax cable (see Figure 1).

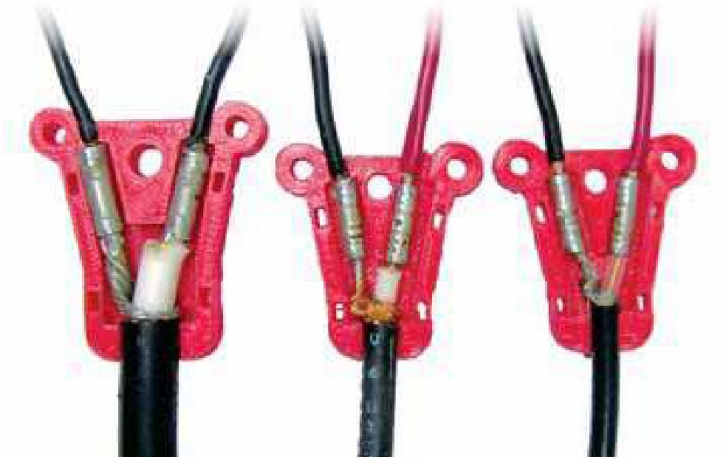

Figure 1 — Three shell designs accommodate coax cables with diameters from 0.2 inches to 0.4 inches.

The connection block is comprised of two identical halves that clamp together and are held tight by zip ties. There is a center hole at the top for vertical suspension and a pair of "Mickey Mouse" ears on either side to use as strain reliefs for dipole wires.

There are many different filament materials available for 3D printing. For this application, which will generally be used outdoors, a UV-stable material such as ASA (acrylonitrile styrene acrylate) is best. However, the more common PLA filament is usable if the connection block is protected by a coat of exterior paint. The design files are available from my website (**www.w6nbc.com/3dfiles**) or the *QST* in Depth web page (**arrl.org/qst-in-depth**).

Wiring

Strong and quick connections between the hook-up wire, coax braid, and center conductor are made with insulated crimp-type wire

3D Printing Availability

Don't be too concerned if you don't have a 3D printer. They are fast becoming less expensive and often there will be at least one person in a local Amateur Radio club who has one. There are also 3D printing services available on the internet, and even select UPS stores and public libraries have 3D printing available.

butt splices inside the connection block. Some may prefer to solder the connections, but I find properly crimped connections to be reliable and quick to make. The heat-shrink insulation on the crimp connector also provides an additional layer of weatherproofing for the connection.

I use common #14 AWG stranded vinyl-insulated primary hook-up wire for all three connectors. The #14 AWG wire is rated for 13 A rms, which is twice what's needed for 1,500 W PEP in 50 Ω line.

Use #16 – 14 AWG (blue) crimp butt splices for the two smaller connectors. Large diameter coax with its thicker shield bundle requires a #12 – 10 AWG (yellow) for the shield connection. For smaller hook-up wire or open-wire line, add one or two additional layers of heat-shrink tubing over the splice to create a tight fit in the connector. If you prefer, you can use the large connector for all sizes of coax, again by adding layers of heat-shrink tubing over the crimp splice.

All common varieties of coax are accommodated. The large connector is for coax with a 0.4-inch diameter outer jacket, such as RG-8, RG-213/214, or LMR-400. Coax with a 0.2-inch jacket, such as RG-58, uses the small connector. Mini-8 and RG-59, with a 0.25-inch jacket, use the medium connector. All connectors accept 300 Ω and 450 Ω open-wire line, again by adding layers of heat-shrink tubing to fatten the open-line wires.

Assembly

First remove 1½ inches of the coax outer jacket, taking care not to nick the braid. Unweave the individual coax braid wires into separate strands down to the plastic jacket, then twist the strands into a single conductor. Trim the ends as shown in Figure 2. Next, expose ¼ inch of the center conductor, which should leave ⅜ inch of dielectric exposed.

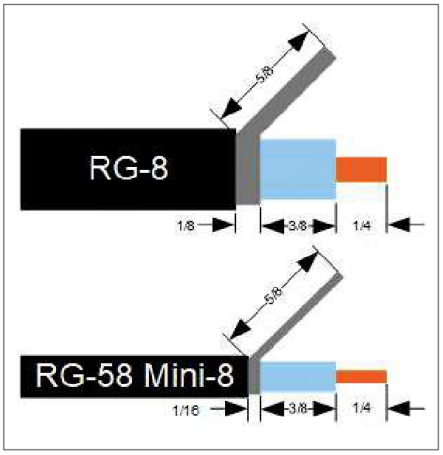

Figure 2 — Coax cable end preparation for butt-splice crimp connectors.

After preparing the coax ends, make the connections to the antenna wires with appropriately sized butt-type crimp connectors (a proper ratcheting crimping tool pays off here). Before crimping, dry fit the assembly into the plastic shell to make sure that the coax jacket and hook-up wire insulation will be securely clamped by the connector. For a permanent installation, fill the inside of the connector with a suitable RF sealant before tightening the zip ties. I recommend clear RTV silicone adhesive, available at most hardware stores. Other common sealants may have poor RF properties. Silicone grease and commercial coax sealant are also suitable.

Conclusion

Say goodbye to tape kludges with these lightweight, 3D-printed blocks, which are exceptionally handy while experimenting with a new antenna design during the initial tune-up and matching phase before adding a permanent connector. For permanent use, they make excellent dipole center blocks and are ideal for portable and backpacking antennas.

Photos by the author.

John Portune, W6NBC, is an ARRL member and frequent contributor to *QST*. He has been licensed for 53 years and has held an Amateur Extra-class license since 1972. John has a BS in physics and also holds FCC Commercial General Radiotelephone Operator and FCC Radiotelegraph licenses. He retired as a broadcast television engineer and technical instructor at KNBC in Burbank and then from Sony Electronics in San Jose, California. You can reach John at **jportune@aol.com** or through his website at **www.w6nbc.com**.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

New Products

The S-BOX and S-BOX-USB by N6TV

The Serial Box (S-BOX) is a reconfigurable passive serial port splitter and amplifier interface designed to simplify simultaneous connections of a logging computer and peripheral devices to a transceiver's serial port, using only standard cables with molded connectors. The S-BOX-USB includes one internal FTDI USB-to-serial adapter, whereas the S-BOX-USB-2 includes two independent adapters. Supported peripheral devices include ACOM, SPE, and Elecraft HF automatic amplifiers, SteppIR controllers, serial port band decoders, serial port automatic antenna switches, the Kessler/Palstar AT-Auto Tuner, and more.

All models include four independent open-collector keying circuits that can provide computer-generated CW, FSK RTTY, and PTT keying to any supported transceiver, plus remote power-on ability for an Elecraft K3 via *RemoteHams* software. The S-BOX retails for $149, the S-BOX-USB for $169, and the S-BOX-USB-2 for $189. Prices include custom configuration and labeling. See **www.bit.ly/S-BOX** for more details.