Installing Coax Crimp Connectors

Dino Papas, KLØS

Parts List

- LMR-400 or LMR-240 coaxial cable — LMR®-style coax has lower RF energy loss than RG-213 and RG-8X. LMR-400 is thicker, and best for permanent installations where the cable doesn't have to move; LMR-240 has a smaller diameter and is useful where more flexibility is required, such as routing through a wall or around an antenna rotator.
- Crimp-style type N connectors (vendors will specify the type appropriate for your coax)
- Scrap lengths of solid 18- or 20-gauge wire
- Heat-shrink tubing
- Heat gun
- Labels to mark the coax
- Small diagonal cutter
- Sharp dentist-style pick
- Multimeter

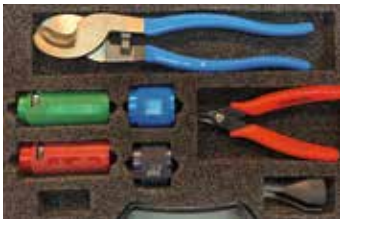
Coaxial cable and connectors provide the attachment between your radio and your antenna. Crimp-style coax connectors can be attached to coax cable without soldering. Crimping is poised to overtake soldering as the method of choice for attaching connectors to coaxial cable. It's is stronger, more reliable, and less potentially messy. Even NASA crimps! With the right tools and some practice, you can crimp like a pro.

Tools

Installing crimp connectors requires a ratcheting crimping tool. The ratcheting action applies the correct force, which compresses a cylindrical ferrule over the exposed cable braid, securely clamping it around the rear of the connector body. This provides a strong mechanical and electrical connection. The connector pin can be crimped or soldered to the cable's center conductor.

I use the Andy-Crimp Pro set sold by Quicksilver Radio (below left). It comes with a selection of die sets for each cable and connector type. The set also includes cable cutters and rotary axial-style coax stripping tools that can prepare coax for both crimp- and solder-style connectors.

Although not required, I also use DX Engineering's Coaxial Cable Prep Tool Kit that, while intended for preparing coax for solder connectors, also makes easy work of preparing it for crimp-on types (below right). DX Engineering also sells ratcheting crimp tool sets.



At the top: LMR-400 (left) and LMR-240 (right) coaxial cable, with the braid pulled back to expose the cable's dielectric.

In the center: Type N crimp connectors, sized appropriately for each cable.

At the bottom: Scrap wire, shown after it's been bent to make your measuring tools for this project.

Step 1: Square the cable end.

Cut a small piece from the end of the cable with a large, sharp cable cutter to create a straight flush cut. A cutter that is dull or too small will deform the end of the cable. Slip the ferrule and a 2- to 3-inch piece of heat-shrink tubing onto the cable before continuing (1).

Step 2: Expose the braid.

Use a radial axial coax prep tool (available separately, or in the Andy Crimp Kit) or DXEngineering's prep kit. For LMR-240 cable, I use their green tool's "1st CUT" opening to expose 5/8" of braid and aluminum shield. For the larger LMR-400 cable, I use the red tool's "2nd CUT" opening to expose ¾" of braid and shield. Both tools remove the outer cable jacket as you turn them (2).

TIP **A rubber jar-opening pad helps grip the coax cable as you're turning the prep tool with your other hand.**

Step 3: Prepare the braid.

Slide the ferrule up to the end of the coax jacket where the braid material is first exposed. Holding the ferrule temporarily in place with your thumb, pull the braid back over the ferrule, so you can verify that neither the dielectric nor the center conductor was damaged. Then use a pick or small screwdriver to fold the braid perpendicular to the cable, around its entire circumference. With a sharp set of diagonal cutters, carefully trim the exposed circular braid by roughly half its length (3). Before crimping, push the ferrule forward to ensure it covers the braid completely over the rear of the connector body without any braid protruding from the point where the ferrule will be forced up to the rear of the connector body. This takes practice. With LMR-240 cable, I carefully slice the loose foil shield lengthwise along the dielectric on the opposite side of where the foil is split. I peel the cuts down to create two strips of foil, and trim them to match the length of the trimmed braid. They will lie with the braid and be covered by the ferrule. With the thicker LMR-400 cable, I simply leave the foil in place around the dielectric.

Step 4: Prepare the exposed dielectric.

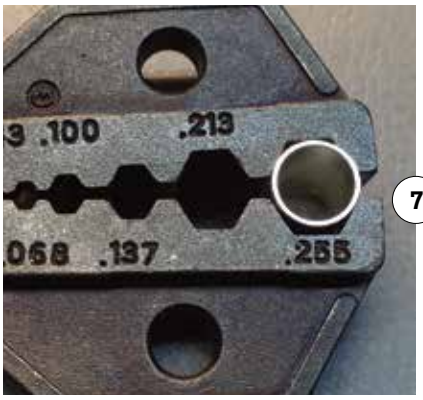
Once the center insulating dielectric has been exposed, you can create a measuring gauge to mark how much dielectric to remove in order to expose the center conductor. Insert a piece of stripped scrap wire into the end of the connector body until it stops. Then, bend the wire over the edge of the connector into an L shape. The bottom leg of the L represents the combined length of the exposed center conductor and the center pin required to place the top of the pin in the correct position. Mark the wire length on the dielectric (4). Use a conventional rotary axial-style coax stripping tool (at right) or a sharp blade to carefully cut and remove the dielectric that extends past the mark. Make sure the end of the dielectric is also a clean square cut.

Step 5: Prepare the center pin.

Use your L-shaped wire measuring tool to get a good approximation of where to trim the end of the center conductor. You'll determine this by trial and error, dry-fitting the center pin to the inner conductor without soldering, and then inserting the cable into the body of the connector. If the length is too long or too short, you may have to start again (5). Test fit the connection to ensure the center pin comes up flush with the end of the connector. Inside the body of the connector, the end of the cable dielectric should be flush with the connector's dielectric. To test the correct combined length of center conductor and pin, drag your fingertip across the top of the connector, and you should just feel the tip's sharp point; it should not extend past the end of the connector body. If the pin remains in the body when you pull out the coax, gently push the head of the pin with a small wooden dowel to remove it. Once you're satisfied with the fit, remove the cable and crimp or solder the pin to the center conductor.

Step 6: Prepare the connector.

Use a multimeter to ensure there's no short circuit between the braid/aluminum shield to the center conductor pin, then firmly push the connector onto the coax (6). Confirm the center pin is correctly seated. Next, slide the ferrule over the braid and shield until it's flush with the connector body. Trim off any braid that protrudes from this junction.



Step 7: Crimp the connector.

Select the proper crimping die set and place it over the ferrule. When everything is properly aligned, squeeze the crimp tool handles until they automatically release. (7) shows an unmounted die positioned properly on a ferrule for an LMR-240 connector.

Step 8: Finishing.

Slide the heat-shrink tubing over the ferrule, flush with the connector body, and set it with a heat gun to help waterproof the connection. Finally, add an ID label (8).

Once you've installed connectors on both ends of the cable, use your multimeter to confirm that (1) there is continuity from connector outer shell to outer shell and center conductor to center conductor and (2) there is no short circuit between the outer shell and center conductor.

Conclusion

Learning to crimp coax cable connectors takes practice. You can use scrap pieces of coax to practice preparing the ends for a crimp connector. As long as you don't solder or crimp the center conductor pin or crimp the ferrule, you can use the components over and over again until you get the hang of it. Alan Wolke, W2AEW, has an excellent how-to video at youtube.com/watch?v=ktQVwfo-s9w.

Dino Papas, KLØS, has been an amateur radio operator for almost 50 years. He holds a BSEE degree from the University of California at Davis and a Masters of Engineering Management from George Washington University. Dino retired as an infantry colonel after 26 years of active duty in the US Army. You can contact Dino at kl0s@arrl.net.

A No-Fuss Solution

Though knowing how to install crimp connectors onto coax is a good skill to have, it's a lot of work — and it's work that you can leave to the pros. It's possible — and perfectly acceptable — to buy coax that has the connectors already attached. Knowing how to attach connectors on your own is handy for when you need a coax of a particular custom length, but for the most part, feel free to buy coax with the connectors attached.