Quickstart – Antenna

Got to the website (WsprWithoutTears.com) for more information.

Parts List

Check the parts received against the parts listed below.

Part	Value
wire	42-0” ft 22 ga wire
coax	5 ft RG-174
toroid	FT37-43
P1	BNC connector
J1	BNC-BNC adapter
xxx	14” 30 Ga magnet wire
xxx	3” 24 Ga magnet wire
xxx	cable tie

Figure 1: Antenna Parts List

Note: The magnet wire gauges are unimportant – it's just what I happened to have around when I made my prototype.

What you'll need to complete the assembly

1. *Antenna kit*
2. Wire Stripper
3. *Soldering Iron and solder.* A small tip and adjustable temperature are good.
4. Small screw driver or pin
5. Matches or cigarette lighter
6. sandpaper

Stripping The Coax

I opted to use RG-174 coax for the antenna because it's, well light and relatively cheap. At least cheaper than the alternatives. That being said, RG-174 can be hard to prepare unless you know the secret. The secret is to pull the braid apart. Do this a little at a time and work your way along the braid, say 1/4” at a time.

Use regular wire strippers or a knife to remove the outer plastic sheathing for about 1-1/2” as shown in Figure 2: Unpacking Braid. Then push the braid back to spread it apart (also shown in Figure 3: Loosening Braid).

Use a small screwdriver (e.g. jeweler's screwdriver) or pin or any similar object and poke into the braid, just enough to get under it (Figure 3: Loosening Braid).

Figure 2: Unpacking Braid

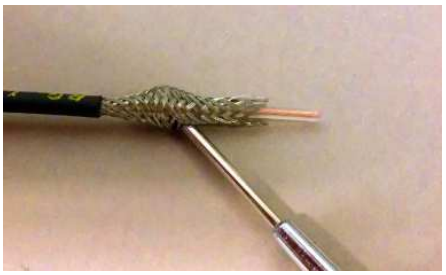

Figure 3: Loosening Braid

Pull a strand of the braid out (Figure 4: Unpacking Braid 2 and Figure 5: Unpacking Braid 3).

Figure 4: Unpacking Braid 2

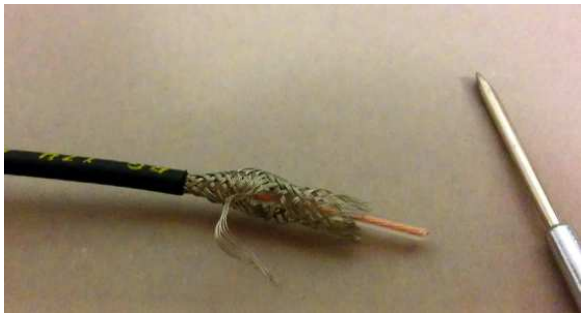

Figure 5: Unpacking Braid 3

Repeat until the braid is unwoven (Figure 6: Preparing Coax 1). Twist the braid and clip the end so that it's square (cut the stragglers off) and strip 3/8” insulation from the center conductor (Figure 7: Preparing Coax 2).

Figure 6: Preparing Coax 1

Figure 7: Preparing Coax 2

Winding The Toroid

Yeah, I know. Winding toroids is tedious. We're starting with two pieces of magnet wire and a toroid (Figure 8: Winding Toroid 1). Take the longer piece of magnet wire and pass it through the inside of the toroid (Figure 9: Winding Toroid 2). Leave about 3/4” sticking out past the toroid (Figure 10: Winding Toroid 3). I'm right-handed, so I hold the toroid with my left thumb and forefinger and feed the wire with my right hand.

Fold the wire over the top of the toroid and fish the end back through the middle of the toroid. Pull the wire snug (you don't have to kill it, just take the slack out). Repeat for 24 turns total. A turn is officially when the wire passes through the middle of the toroid.

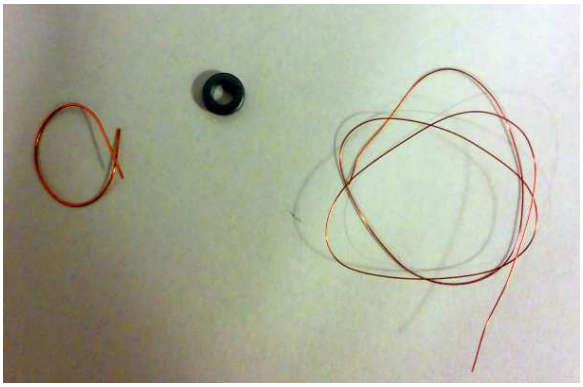

Figure 8: Winding Toroid 1

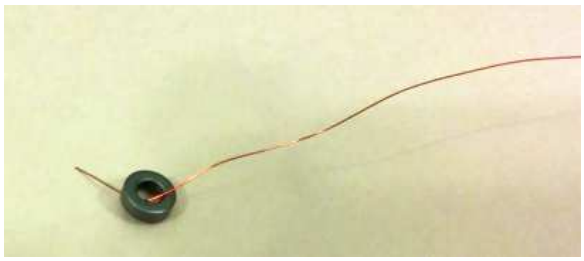

Figure 9: Winding Toroid 2

Now repeat the process with the other (thicker, shorter) piece of magnet wire and wind 3 turns. For convenience, I wind starting about a third of turn clockwise from where the first winding started (Figure 11: Winding Toroid 4). You'll have to scrunch up the turns periodically in order to fit them all on.

Trim the leads to about 3/4” (Illustration 12).

Remove the Enamel from the Magnet Wire

This part is also tedious. Supposedly, you can just burn the enamel off. I've never had any luck doing that. What I actually do is cook the end of the wire with a cigarette lighter or match for a few seconds. This makes the enamel easier to remove with sandpaper. I use a small piece of sandpaper folded in the middle and pull the end of the wire through the sandpaper. I pinch the sandpaper a little to help with enamel removal. A caution: don't pinch the sandpaper very hard with the thin magnet wire or the wire will break. The finished piece should look like Figure 12: Winding Toroid 5.

As a sanity check, verify that both windings have continuity using your DVM (this will tell you if you've done a good enough job removing the enamel).

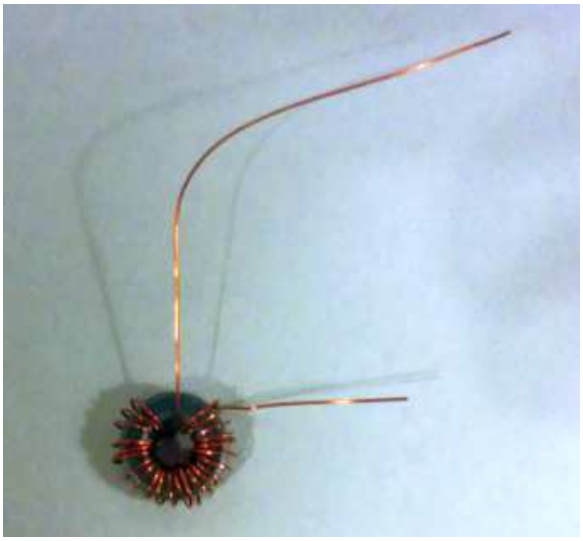

Figure 10: Winding Toroid 3

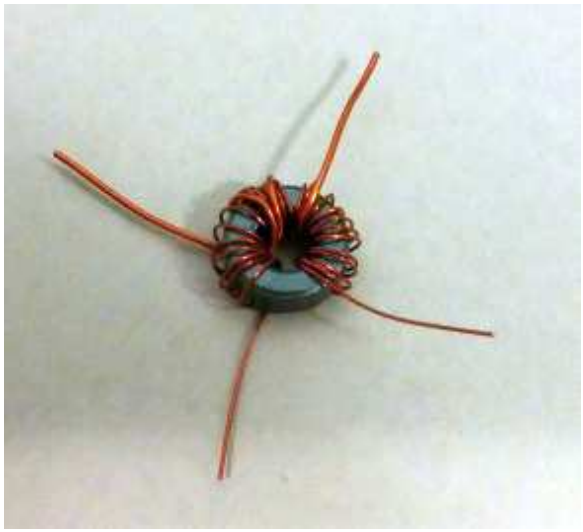

Figure 11: Winding Toroid 4

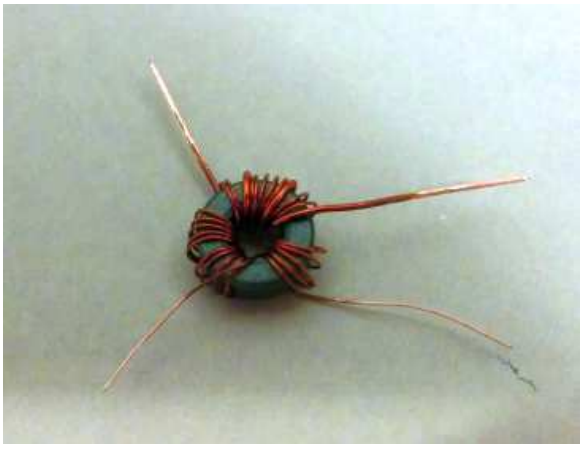

Figure 12: Winding Toroid 5

Assembling Everything

The schematic for the antenna is shown in Figure 13: End Fed Dipole Schematic.

1. Twist together and solder one end of the thin magnet wire, one end of the thick magnet wire, and the braid from the coax (Figure 14: Soldering Toroid).
2. Connect and solder the center wire of the coax to the other end of the thick wire.
3. Connect and solder the the antenna (42 ft long hookup wire) to the other end of the thin wire.

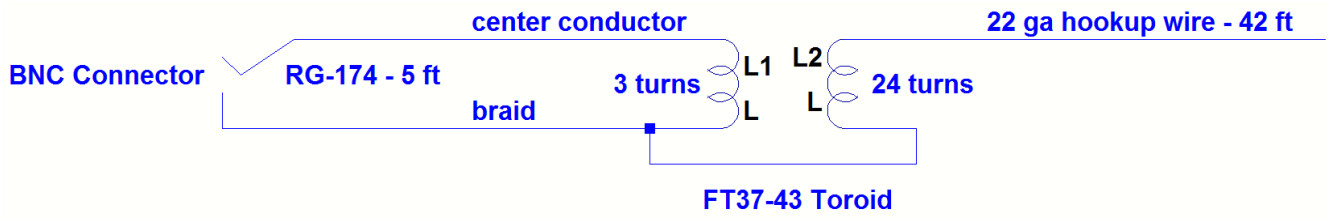

Figure 13: End Fed Dipole Schematic

Your antenna should look like Figure 14: Soldering Toroid.

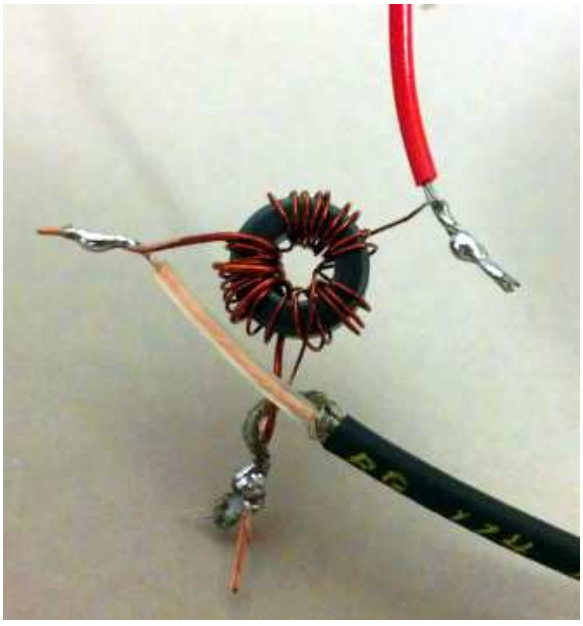

Figure 14: Soldering Toroid

Figure 15: Strain Relief

Wrap the cable tie around the coax and hookup wire as shown in Figure 15: Strain Relief to provide strain relief.

Solder the other end of the coax to the BNC connector as shown in Figure 16: Antenna BNC 1 and Figure 17: Antenna BNC 2. It helps to have helping hands (soldering tool with alligator clips) or someone else with an extra set of hands/vice to hold the BNC connector, but it's not necessary. I find that it's easier to tin the coax center lead and fill the BNC center connector with solder (melt solder in it) before trying to solder the coax to the BNC center connector (Figure 16: Antenna BNC 1).

Figure 16: Antenna BNC 1

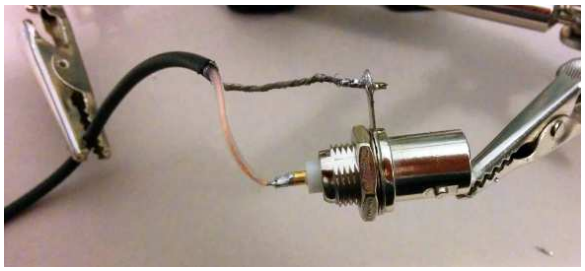

Figure 17: Antenna BNC 2

Warning:

The antenna has been designed to be used with a low-power WSPR transmitter. The toroid is the weak link in the chain. It limits how much power the antenna can safely handle. The magnetic flux in the toroid reaches its maximum allowable value with 0.25 watts of input power. Don’t try running 25 watts (or even 1 watt) into it or you’ll let the smoke out.