A number of years ago, I built a J-Pole antenna from some scrap aluminum tubing and a 5-foot stick of TV mast. The antenna tuned easily, and operated well for a few years until nature did it in. After taking it down, I found a number of problems not contemplated in the original construction, such as dissimilar metals and other types of corrosion, and deterioration of parts of the coaxial feed line. These problems are identified and explained in the accompanying sidebar.

With the shortcomings of the original J-Pole in mind, I set about planning for another, similar antenna, using parts commonly available from a single source. If you spend much time in hardware stores and home improvement places, you get a feel for what’s available at a moment’s notice. In my case, rigid copper tubing, fittings, and assorted hardware, came to my attention as the material of choice. See Fig 1. The entire assembly can be soldered together when copper is used, thus ensuring electrical integrity, and making the whole antenna weatherproof in the bargain.

I’ll bet you could solder one of these together faster than using the nuts and bolts I did in my previous design. This antenna can be easily used for ARES/RACES groups that spot antennas around for emergency use, since it requires little, if any, maintenance during its lifetime.

The J-Pole will take about an hour or so out of your day to build and tune, making a great antenna for a VHF base station.

No special hardware or machined parts are used in this antenna, nor are insulating materials needed, since the antenna is always at dc ground. Best of all, even if the parts aren’t on sale, the antenna can be built for less than $15. If you only build one antenna, you’ll have enough tubing left over to make most of a second antenna, or perhaps to finish that small plumbing project the XYL has been hounding you about.

Materials
Copper and brass is used exclusively in this antenna. These metals get along together, so dissimilar metal corrosion is eliminated. Both metals solder well, too. Table 1 provides a detailed parts listing for the antenna.

Construction
Cut the copper tubing to the lengths indicated in Table 1. Item 9 is a 1 1/4-inch nipple cut from the 20 inch length of 1/2-inch tubing. This leaves 18 1/4 inches for the 1/4-matching stub. Item 10 is a 3 1/4-inch long nipple cut from the 60-inch length of 1/2-inch tubing. The 1/4-wave element should measure 56 1/4 inches long. Remove burrs from the ends of the tubing after cutting, and clean the mating surfaces with sandpaper, steel wool, or emery cloth.

After cleaning, apply a very thin coat of flux to the mating elements and assemble the tubing, elbow, tee, endcaps, and stubs.

Solder the assembled parts with a propane torch and rosin-core solder. Wipe off excess solder with a damp cloth, being careful not to burn yourself. The copper tubing will hold heat for a long time after you’ve finished soldering. After soldering, set the assembly aside to cool.

Flatten one each of the 1/8-inch and 3/8-inch pipe clamps. Drill a hole in the flattened clamp as shown in Fig 2. Assemble the clamps and cut off the excess metal from the flattened clamp using the unmodified clamp as a template. Disassemble the clamps.

Assemble the 1/2-inch clamp around the 1/4-wave element and secure with two of the screws, washers, and nuts as shown in Fig 2. Do the same with the 1/4-inch clamp around the 1/4-wave element. Set the clamps initially to a spot 4 inches or so above the bottom of the “J” on their respective elements. Tighten the clamps only finger tight, since you’ll have to move them when tuning.

Tuning
Tuning an antenna couldn’t be simpler. The toughest part might be determining what type feed line you are going to use. Anything from RG-58 to open-wire line is...
usable. The J-Pole can be fed directly from 50 Ω coax alone or with a \(\frac{1}{2}\)-wave balun, or twin lead, or whatever. Before tuning, mount the antenna vertically, about 5 to 10 feet from the ground. A short TV mast on a tripod works well for this purpose.

When tuning VHF antennas, keep in mind that they are extremely sensitive to nearby objects—such as your body. Attach the feed line to the clamps on the antenna, and make sure all the nuts and screws are at least finger tight. If using coax, it really doesn’t matter to which element \((\frac{1}{2}\)-wave element or stub) you attach the coaxial center lead. I’ve done it both ways with no variation in operational effectiveness. Tune as follows:

1. Apply RF at the frequency you want the antenna to perform best.
2. Check the SWR.
3. Turn off the RF.
4. Move the clamps equally up from the original position \(\frac{1}{2}\) inch.
5. Reapply RF.
6. Check the SWR again, and turn off the RF.
   a. If the SWR went higher, move the clamps 1 inch downward, equally.
   b. If the SWR went lower, move the clamps \(\frac{1}{2}\) inch upward, equally.
7. Reapply RF.
8. Check the SWR once more, then turn off the RF. By this time you will be approaching minimum SWR (You may never get a 1:1 SWR. Don’t sweat it, it’s not important enough to worry about.)
9. Adjust the clamps a small amount in the direction of minimum SWR.
10. Repeat Steps 7 through 9 until minimum SWR is achieved.

11. Remove RF.

A point to remember about tuning the antenna is this: It will tune with any type of feed line, but the clamps will not be in the same place for all types of line. In other words, 50-Ω coaxial cable will tune further down the antenna than 600-Ω open-wire line. You have to think of this feedpoint as being similar to a delta match, which it is, except the elements run parallel and not away from each other.

**Final Assembly**

The final assembly of the antenna will determine its long-term survivability. Perform the following steps with care:

1. After adjusting the clamps for minimum SWR, mark the clamp positions with a pencil.
2. Remove the feed line and clamps.
3. Apply a very thin coating of flux to the inside of the clamp and the corresponding surface of the antenna element where the clamp attaches.
4. Install the clamps and tighten the clamp.
screws. Don’t attach the feed line yet, and leave off the final washer and nut at the feedline attachment point.

5. Solder the clamps where they are attached to the antenna elements.

6. Apply a small amount of solder around the screw heads and nuts where they contact the clamps. Don’t get solder on the screw threads!

7. Clean away excess flux with a non-corrosive solvent.

After final assembly and erecting/mounting the antenna in the desired location, attach the feed line you tuned the antenna for, and secure with the remaining washer and nut. It would be a good idea to weather-seal this joint with RTV. Otherwise, you may find yourself repairing the feed line after a couple years.

On-Air Performance

Years ago, prior to building the first J-Pole antenna for this station, I used a standard ¼-wave ground plane vertical antenna. While there is no problem working the various repeaters around town with my ¼ wave antenna, simplex operation left a lot to be desired, so I felt something with a little more gain was necessary. Hence the switch to the J-Pole. In on-air comparisons with the Ringo Ranger 2B, a popular antenna everywhere, a small difference in bandwidth was noted. This J-Pole’s bandwidth, as built here, is slightly wider, probably from the greater element thickness, resulting in a lower Q. Actual performance differences between antennas of similar dimensions, such as those of the Ringo Ranger are negligible, although significantly better than the ¼-wave ground-plane vertical.

References


4. Silastic 732 RTV is made by the Dow Corning Company.