

2 Meter Collinear Vertical Antenna

Build almost 6 dB of gain for almost \$10.

by Marty Gammel KAØNAN

Since my article about the 440 MHz PVC omnidirectional antenna was published in the November 1994 issue of *73 Amateur Radio Today* (page 22), I have had over 30 requests for the 2 meter version of that antenna. So, this article describes how to make my 2 meter version. Due to the wind load from the large sizes of PVC pipe needed to enclose the antenna, the 2 meter version can't be put inside PVC pipe—too cumbersome. You would need 4" inside diameter PVC pipe for the center section.

This collinear antenna is normally mounted vertically for FM voice and packet use. The antenna has almost 6 dB of gain and is fairly broadband. You should be able to obtain all the needed materials for under \$10, except for the coaxial feedline of your choice.

The idea for this antenna is an old one. I saw a sketchy plan in the 1974 *ARRL Handbook*, and I knew I could improve on it using modern materials and techniques. I changed the dimensions to make the SWR dip at the center of the 2 meter band. I also changed the feed point attachment and tuning design.

Cutting and Assembling the Antenna

Start by gathering all the materials and tools needed. Cut two pieces of 1/2" copper pipe to a 37-1/2" length, two pieces of 1/2" copper pipe to a 19-1/2" length, and one piece of 1/2" copper pipe to a 2" length. Using flux, assemble the 1/2" copper pipe pieces with the 1/2" copper elbows, and place a 1/2" copper cap on each vertical end. Now fire up your propane torch, and sweat solder all the joints. (The excess flux will be cleaned up later). *Hint:* I put a weight on the pieces to keep them in alignment as they are being soldered. Hang the joint that you are currently soldering out away from your work

table to avoid burning your house down.

Drill two holes in each of the vertical sections (see Figure 1), and attach the 1/4" x 1" x 6" piece of Plexiglas (I used 1/2" Plexiglas that I had in my junk box) to the antenna using 1/8" x 1" stainless steel bolts with nuts and washers. Install the PVC cap on the top of the 1" PVC mast. Lay the antenna with its Plexiglas standoff pieces on the PVC pipe, and drill two holes in each piece for attaching to the mast, using 1-1/2"-long stainless steel bolts with nuts and washers.

Making the Phasing Section

To complete this antenna, you also need to make a 52-ohm phasing section, one electrical half-wavelength long (see Figure 2). For mine, I used RG-8 that had a velocity factor of 0.80 times a half wave, equaling a needed

finished length of 30-1/2". If you use a 0.66 velocity factor, you will need a 25" finished length of 52-ohm coax. If you use a 0.78 velocity factor, you'll need a finished length of 29.64". Start with a piece of coax about 3" longer than your finished length to allow neat pigtailing of the ends. Twist all the shields together neatly, and then solder them together (see Figure 1 and the photos). Set this phasing section aside until you have finished constructing the antenna.

Cleaning and Finishing the Antenna

You should clean the entire surface of the completed antenna with solvent. Then spray two or three coats of a clear lacquer exterior finish to keep the antenna looking nice and to seal the surface from the weather. I attached the antenna to the PVC mast before spraying the finish. That way the finish coats the nuts and bolts to keep them looking nice, too.

Attaching the Phasing Section

The center conductor of your main feedline and one end of the phasing section connect to the upper feed point. Solder this neatly, as it will be clamped to the antenna when tuning. Tin the other end of the phasing section, and attach this to the lower feed point with a clamp. Tape the phasing section and the feedline together, and bring the completed coax phasing section over to the PVC mast *after* tuning the antenna.

Tuning the Completed Antenna

This antenna is very easy to tune. All you have to do is slide the phasing section-feedline assembly along the horizontal 1/2" copper tubing until you have found the lowest SWR point. For mid-band, this measurement should be about 12-1/2" from the vertical sections of 1/2" copper tubing. (See the figures and photos.)

After the lowest SWR has

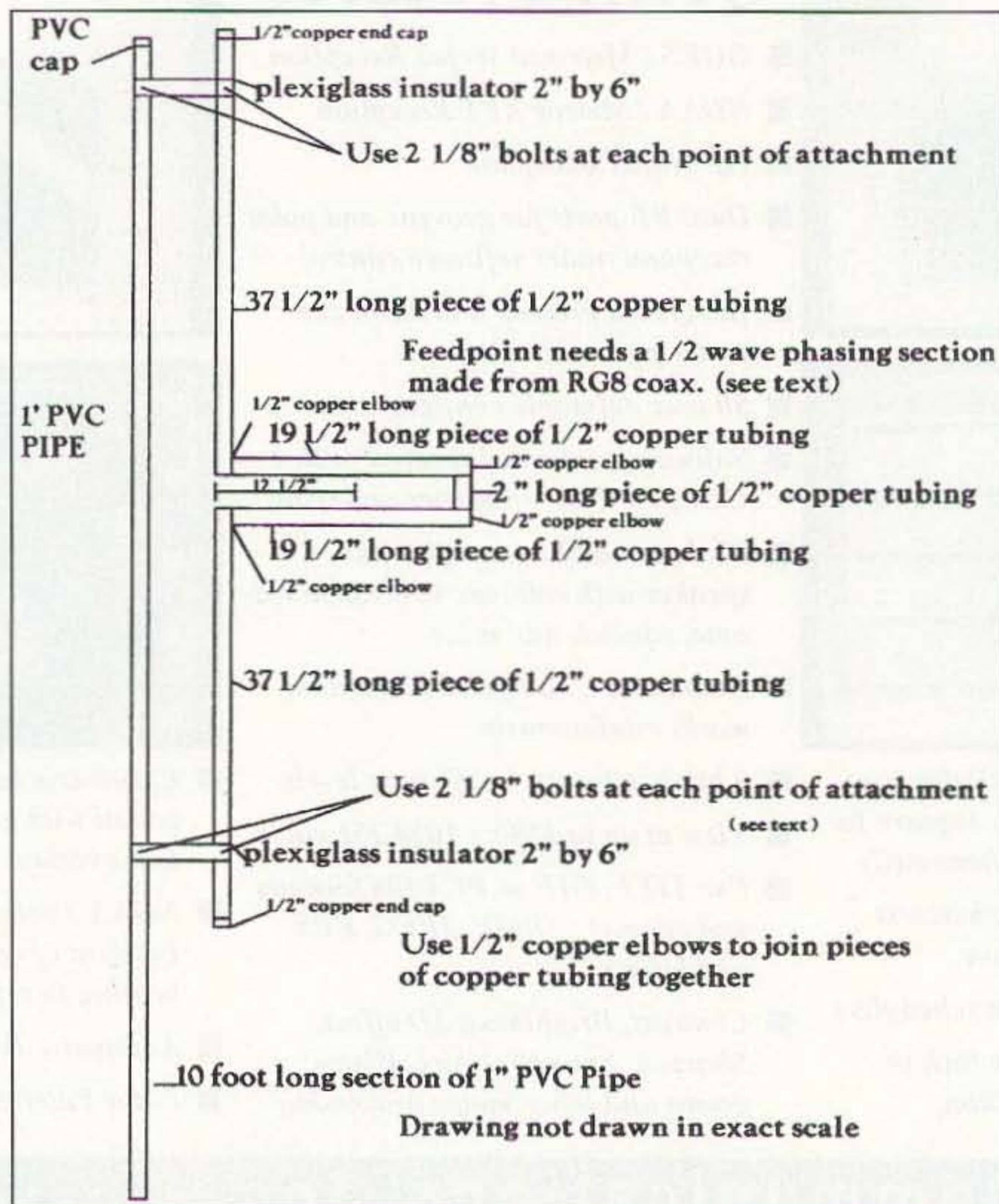


Figure 1. Construction details of the 2 meter collinear antenna.

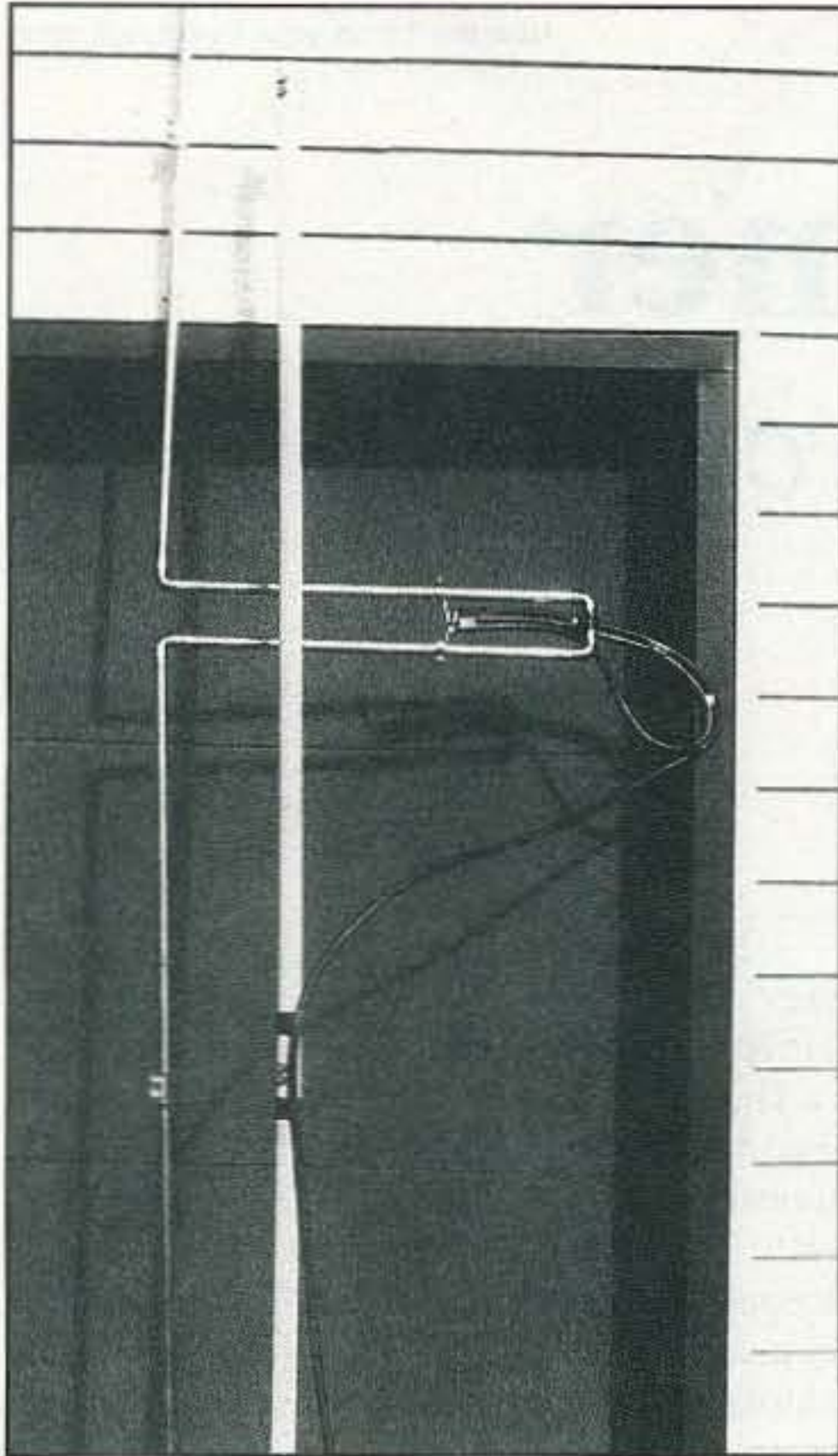


Photo A. The completed 2 meter collinear.

been found, use some plastic tie-wraps to secure the coax and phasing section to the mast and antenna.

Builder's Notes

I used a clean rag soaked with lacquer thinner to clean the antenna before applying the clear exterior finish.

Tape the phasing section and coax to the antenna for tuning. Add the plastic tie-wraps after the antenna is completed.

Trim excess length off the tie-wraps before putting the antenna on your roof or tower.

ABS type plastic pipe can be used instead of PVC pipe. I didn't use a wooden mast, avoiding the warping, shrinking, and swelling of wood.

Keep the antenna at least a half-wavelength away from metal to avoid any detuning from close masses of metal or wires.

I used the "solder the phasing section to the feedline" method of feeding the antenna to avoid any extra coax fittings adding their losses to the antenna system.

A convenient length of 52-ohm coax, 8 to 10 feet long, with a coax fitting on one end, may be attached to the phasing section to make installation easier. I had a 60-foot run of coax and didn't want any extra joints in the feedline run into my shack.

If you are going to mount this antenna in a roof tripod, you may want to slip a wooden dowel or closet rod inside the lower section of the mast to add strength to the mast.

Anyone wanting more information may write to me directly (1703 Hewitt Ave. W., St. Paul, MN 55104-1128), sending an SASE (a #10 business size works best). I will answer all requests sent this way. Good luck on your antenna project, and happy hamming—73. 73

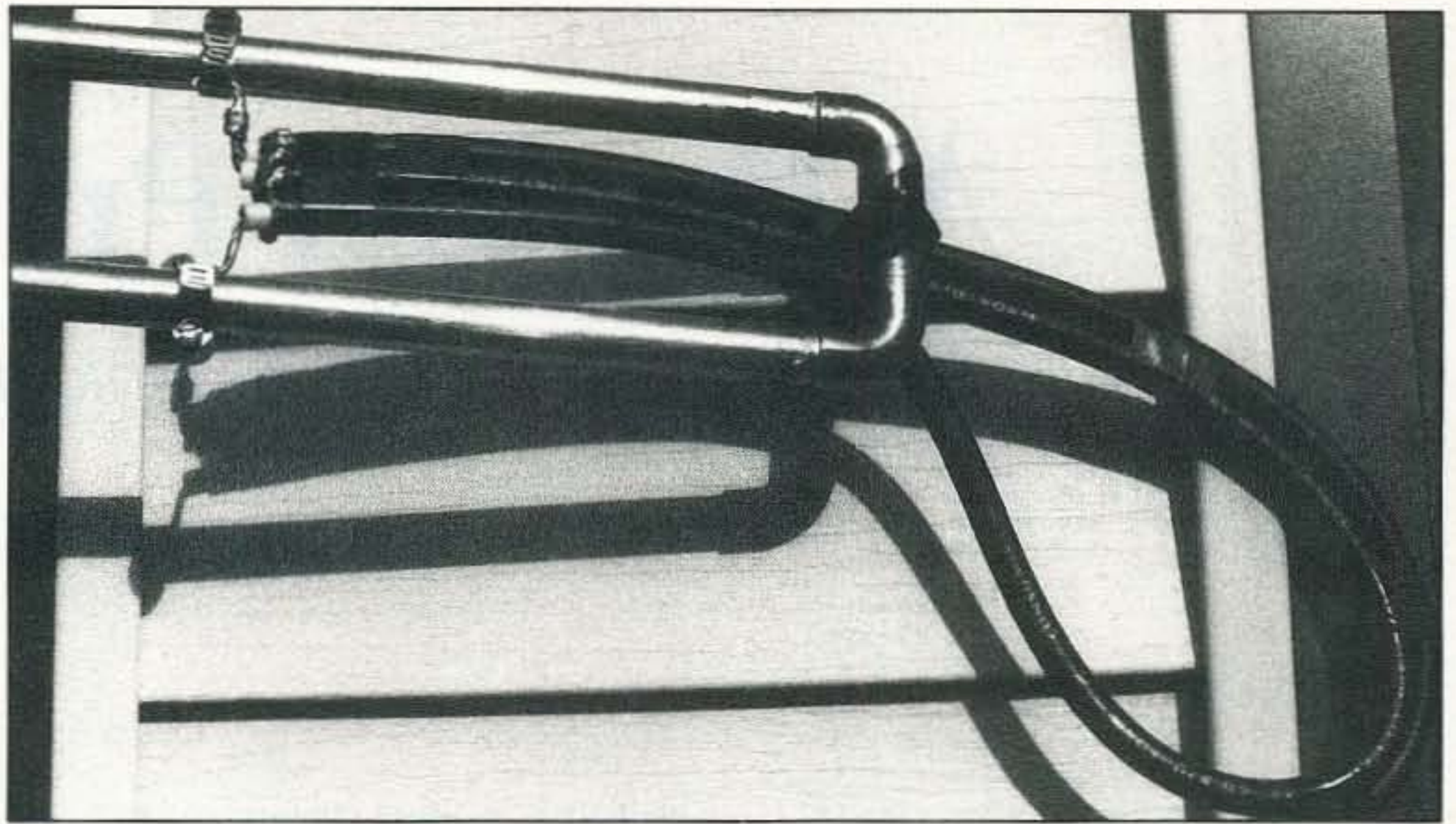


Photo B. Detail of the half-wavelength phasing section.

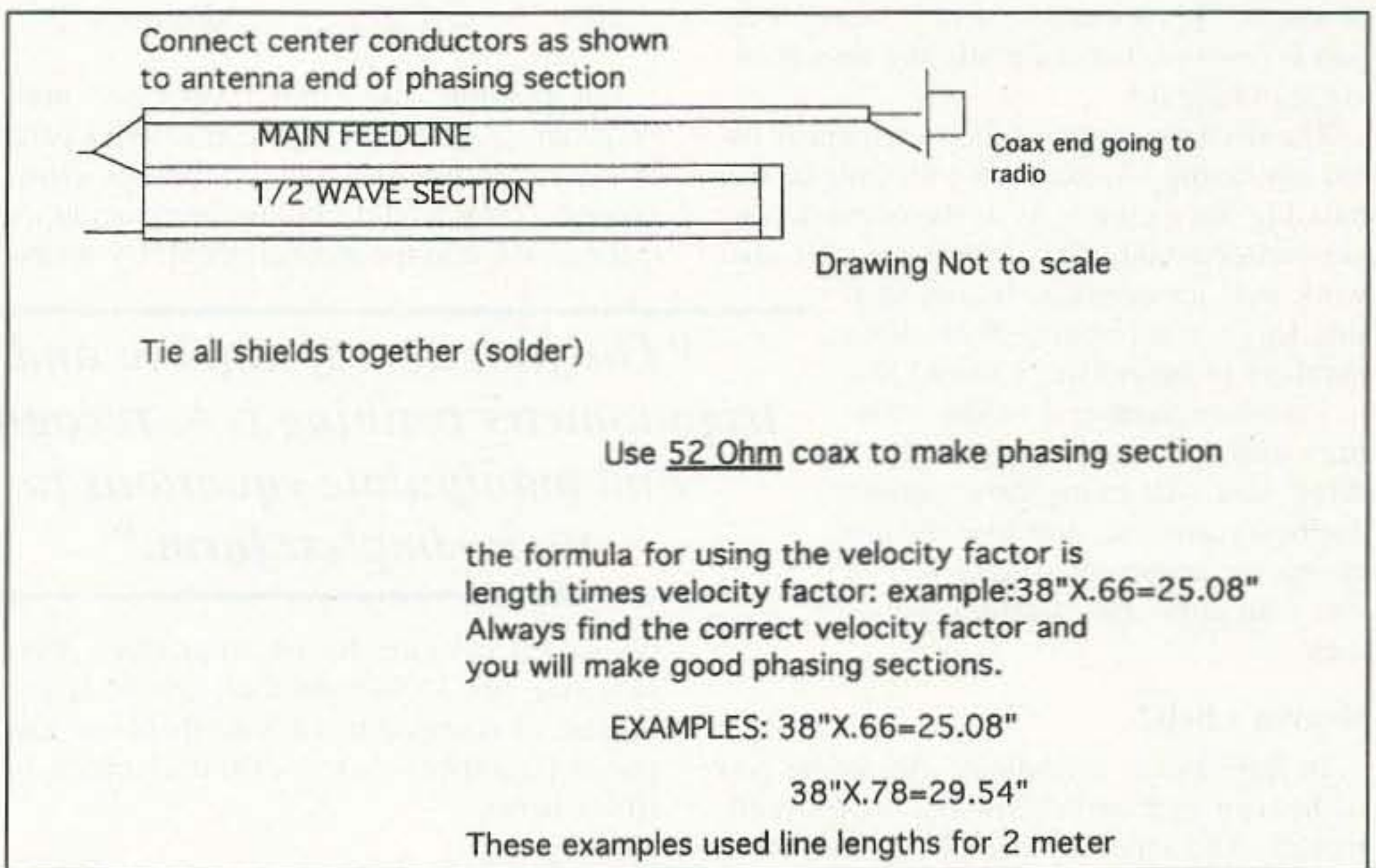


Figure 2. Main feedline half-wave section.

Parts List

- 1/2" Schedule M copper tubing:
- 2 pieces 37-1/2" long 1/2" copper tubing (for vertical sections)
 - 2 pieces 19-1/2" long 1/2" copper tubing (for horizontal sections)
 - 1 piece 2" long 1/2" copper tubing (for center stub)
 - 4 pieces 1/2" copper elbows (for attaching tubing together); see drawing/photo
 - 2 pieces 1/2" copper end caps (for top and bottom of vertical sections)
- PVC plastic pipe and fittings:
- 1 piece 1" PVC pipe 10 feet long (for mast)
 - 1 piece 1" PVC cap (for the top of the mast pipe section); see drawing/photo
- Plexiglas or other non-conductive material:
- 2 pieces 1/4" thick by 1" wide by 6" long (for attaching antenna to mast)
- Miscellaneous items:
- 4 1/8" by 1-1/8" stainless steel bolts with nuts (for attaching antenna)
 - 4 1/8" by 1-3/4" stainless steel bolts with nuts (for attaching antenna)
 - 2 3/8" wide by 7/8" diameter stainless steel hose clamps (for feed point)
- Some plastic tie-wraps (for securing coax and phasing section)
- Silicone or other sealing compound (to weatherproof coax connections)
- Tools needed:
- Plumber's-type tubing cutter
 - Propane torch
 - Tape measure
 - Wrenches
 - Electrical tape
 - Solder and flux