Here are plans for a home-made dual-band vertical antenna. Author Russ Rennaker shows how to build your own.

An Effective 40-75 Meter Vertical Antenna

BY RUSS RENNAKER*, W9CRC

There has been so much written about antennas recently that I hesitate to add my two cents worth. Yet I have had so many requests from stations I have worked asking for information that it may be of general interest to those amateurs like me, who find pleasure in experimenting with antennas and still like to make their own.

There is nothing radically different about this antenna except, perhaps, the method of making and resonating the coils. Two problems in making traps or loading coils for verticals (or dipoles for that matter) become apparent. One is how to make them waterproof and the other, and more difficult, is how to easily resonate the coils to frequency. This method presented here makes both problems easy.

I used 1½" (inside diameter) plastic water pipe, the rigid kind, for the coil forms. This is easily available from any plumbing source and consists of ¼" walls making the o.d. 2". 1½" aluminum tubing just slips easily inside the plastic pipe and, when sealed with epoxy, becomes absolutely waterproof. The coil forms (A in fig. 1a) are ten inches long. The aluminum tubing inserts (B in fig. 1a) I made ten inches long also but they may be any length long enough to provide rigidity to the antenna. They are inserted into the plastic pipe four inches, leaving two inches of space between ends in the center of the plastic pipe. This spacing is not critical however. The capacitor tubing (C in fig. 1a) is ¾" aluminum tubing ten inches long. The end supports (D in fig. 1a) in my case were turned out of some walnut stock I just happened to have but could be any insulating material that could be turned down. The idea is to be able to keep the inside tubing centered in the outside tubing. These insulating ends should be turned down so that they fit snugly but not so tightly so they may not be moved in or out when resonating the coil. The stub, however, that goes inside the inner tubing should fit tightly, preferbly held in place with epoxy to keep it from slipping out when the antenna is erect.

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I wound my coils with #12 bare copper wire with nylon cord separating the turns. I then brushed clear epoxy over the whole thing making a very rigid coil, impervious to moisture. I wrapped the entire assembly with plastic tape but I doubt if that was necessary. The 40 meter coil consists of 30 turns of #12 bare copper wire wound around the plastic pipe and fastened to metal self tapping screws (a and b in fig. 1b). These screws pass through the plastic pipe and fasten firmly into the aluminum tubing. Care must be taken here that these screws do not go through the aluminum tubing far enough into the air space between the two tubes that might cause r.f. flashovers. One screw however, (E in fig. 1a) must be left long enough to go through the outer tubing and penetrate the inner ¾" capacitor tubing, to form the connection between the inner and outer tubes. Obviously the opposite end of the inner tubing must *not* be connected to the outer tubing, thus forming a capacitance across the coil.

The coil may be easily resonated using a grid dip meter. The method is simple. Loosen metal screw E enough to be able to move the resonator in or out by inserting a wood dowel

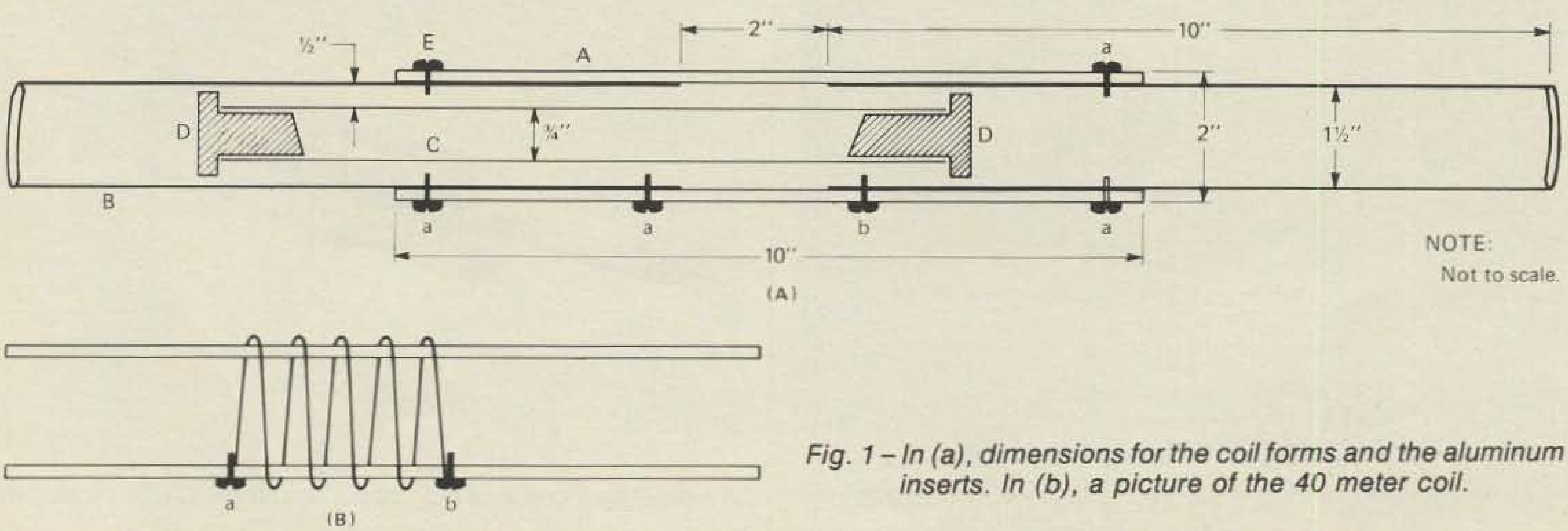


Fig. 1 – In (a), dimensions for the coil forms and the aluminum inserts. In (b), a picture of the 40 meter coil.

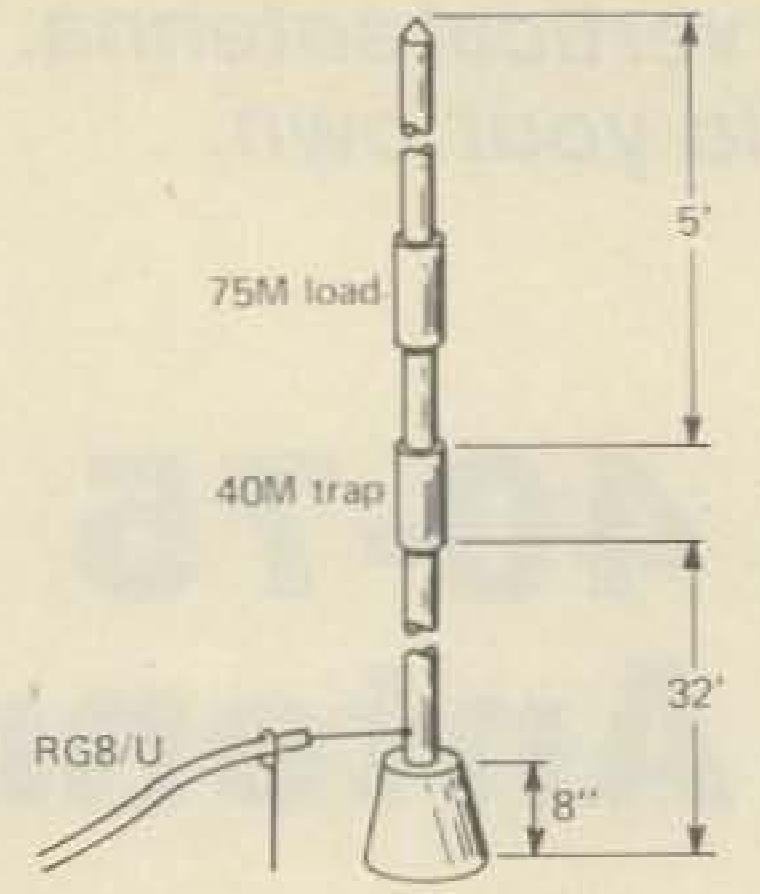
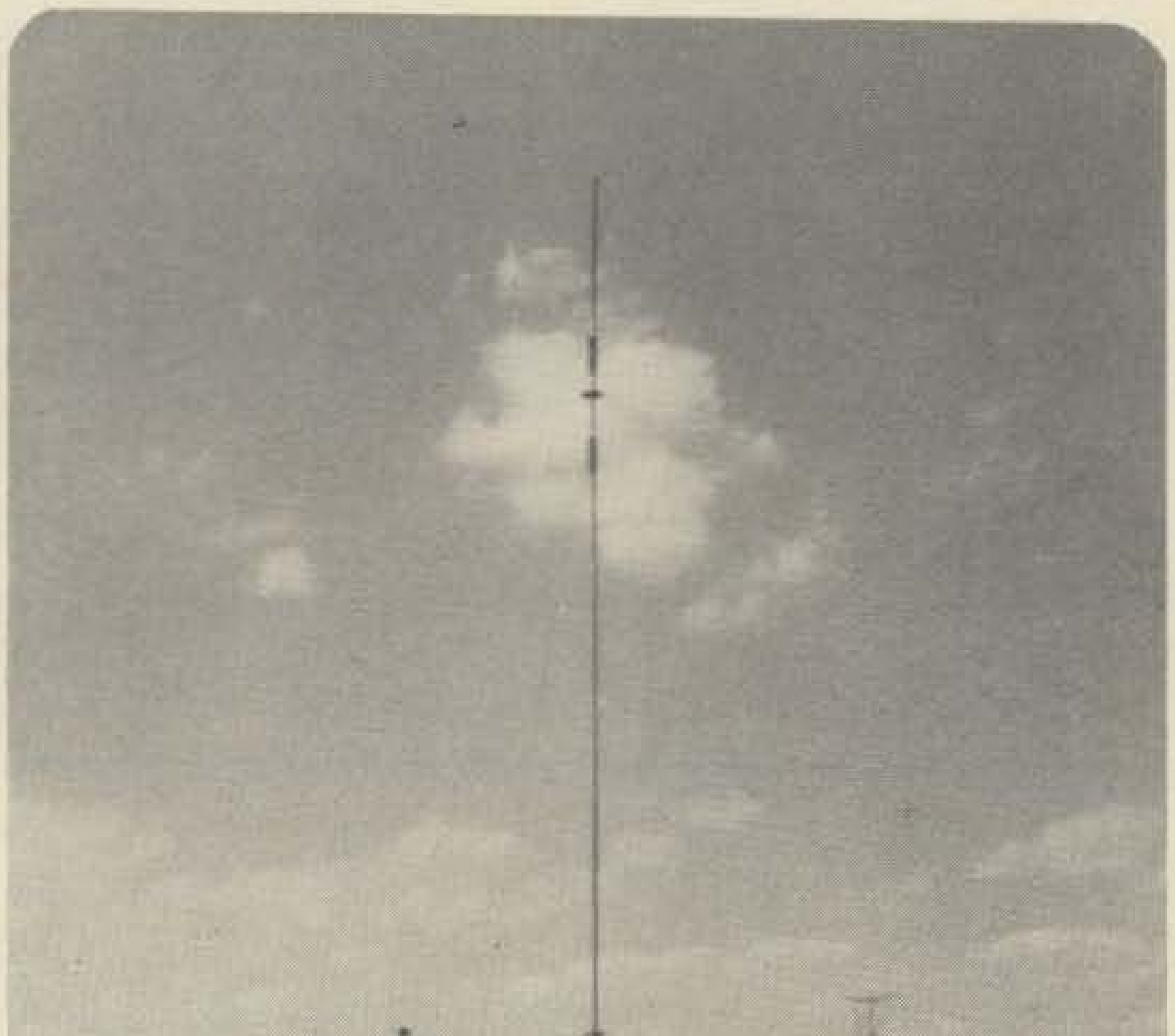


Fig. 2 – The overall dimensions of the antenna and the method used to feed it.

(do not use metal for this) into one end or the other pushing it farther in or out of the coil form until you have it resonated as required. Each time you make a measurement with the grid dip meter be sure you have tightened screw E down against the inner tube. Note also that the hole for screw E in the outer tubing should *not* be a clearance hole, in other words screw E must fit tightly into both the outer and the inner tubes to form a good connection.

When you have adjusted the coil to the resonance frequency (in the case of 40 meters it should resonate at about 7.1 MHz for the phone band) take screw E out and drill a hole into the inner tube so that the screw will now permanently connect with the inner tube. Of course at this point care must be taken not to move the inner tubing while drilling the hole or you may find your coil off resonance when you tighten the screw down again. In my case I used another screw on the opposite side (a) to hold the tubing in place while I drilled the hole for E. This screw can be left in contact with the inner tube or you may want to repeat what you just did with E and screw "a" into the inner tube just as you did screw "E." As a matter of fact I used four screws at each end of the plastic pipe to hold the aluminum tubing more firmly into the plastic pipe—of course at only one end did the screws penetrate into the inner tube.



The 40-75 meter vertical antenna. Note the 40 meter trap and the 80 meter loading coil near the top.

The length of the antenna proper, of course, will decide the resonance frequency of the antenna. I used a 12 foot section of 2" tubing for the lower section and a second 12 foot section of 1½" which telescoped into the 2" nicely. This is the place to adjust the length of the 40 meter antenna. The 40 meter section should be adjusted correctly to the frequency in the band at which you wish to operate *before* the top section is adjusted for 75 meters, since any adjustment of the lower section will also affect the 75 meter section—but not so in reverse. The 75 meter loading coil was constructed like the 40 meter trap except it consisted of 20 turns of #12 bare copper wire and was resonated at 4.1 MHz (because it is a loading coil and not a trap it must be resonated above the 75 meter band). The top section above the loading coil was then cut to the proper length to bring the 75 meter antenna into resonance wherever you wish in the band. The top section could consist of telescoping pieces to make this adjustment easier, but I cut mine to formula and it was just right the first time.

The antenna is fed at the base with RG8/U, the shielding grounded and the inner conductor connected to the aluminum tubing near the base insulator. The bottom of the antenna should be about eight inches from the ground but this dimension is not critical. In my case I buried 120 radials out from the base of the antenna and connected the whole thing with a #6 copper wire to the plumbing in the basement. The better your ground system the more effective your antenna will be. I have 1.1:1 s.w.r. across the 40 meter band and about 1.5:1 at the center of the 75 meter phone band. I supported the antenna with an insulator at the apex of my house roof at about the 12' point and attached nylon guys just above the 75 meter load coil. Also be sure you seal the top of the antenna tubing so water will not run down inside your antenna. I simply turned a piece of wood to just fit into the end of the tubing and used epoxy to hold it in place and to make it waterproof.

While this particular antenna is designed for only 40 and 75 meters I have made all-band verticals the same way. In that case, however, the 10, 15 and 20 sections all operate at ¾ wave while the 40 and 75 operate at ¼ wave as they do in this one. One advantage of this antenna is that no matching arrangement need be used and random length non-resonant coax may be used. With a good ground system the impedence of the antenna at the base approximates the impedence of the RG8/U closely enough.

A typical trap coil and the "capacitor" tube that fits inside the coil section.