A47 - 1 of 3

THE HOT ROD ---

AN INEXPENSIVE, FERRITE BOOSTER ANTENNA

Gerry Thomas

As most of you know, I've been pretty impressed with Sony's ICF-6500W, especially in its modified (i.e., narrow IF passband) form. Most of you also know that the 6500's naked front end has been of some concern in that it does overload, especially at night, with anything longer than a 50' external antenna attached. One of the things I've recently built in an attempt to remedy the situation is an outboard, tuned booster antenna. These devices have been around for years and plans for their construction appeared frequently in the older radio magazines but I don't recall ever seeing the construction details in any BCB club publications. Because this thing (I call it the "Hot Rod") should work on virtually all portables with built-in loopsticks, I thought I'd take a few minutes to pass on the details for building one.

What it is

Actually the Hot Rod is nothing more than an oversized (16" x 3/4") ferrite rod assembly, tuned by a conventional 365 pF variable capacitor (VC), and inductively coupled to the built-in antenna of whatever portable radio is being used. It works on the same principle as Radio West's "Shotgun" and Edmund Scientific's "Select-A-Tenna" but costs signficantly less than the $35 these two commercially available units run. In fact, if it weren't for satisfying the minimum purchase requirements of the suppliers, the Hot Rod could be built for around $10.

What it does

Besides giving a significant boost to weak signals, the Hot Rod also resonates any external antenna attached to it. This reduces, but doesn't totally eliminate, the tendency to overload that some portables exhibit. For example, the SW feedthrough and image problems I experienced with the 6500 when a 150' dipole was attached are completely corrected, although I can still detect a weak birdie on 540 kHz (from WBSR-1450 kHz; the closest station to my QTH). Also, devices like the Hot Rod create a notch that can sometimes be useful in reducing interference on the low end of the band. In addition, the greater signal levels provided by the Hot Rod permit lower volume control settings, thereby resulting in lower battery consumption. Finally, I've also found that the insertion loss caused by the substitution of narrow IF filters is easily offset by the use of the Hot Rod. With the 6500, the narrow muRata plus the Hot Rod configuration provides much higher tuning meter readings than the 6500 in its stock (i.e., wide IF, no Hot Rod) mode. The boost is, in fact, so satisfactory that I've yet to encounter the need to attach an external antenna at night (I do use various external antennas for midday DX'ing though).

What you'll need

** 6 ferrite rods (8" x 3/8" each) from Etco Electronics, North Country Shopping Center, Rte. 9 N., Plattsburgh, NY 12901 (they didn't have a minimum order the last time I dealt with them). These cost $.29 a piece but the price drops to $.25 if you buy 10. I'd advise buying 10 because not all of them are perfectly straight and you will need six fairly straight rods. Alternatively, you can purchase two of Amidon's 7-1/2 x 3/5" rods but these have gone to over $10 each now. The address for Amidon is 12033 Otsego St., North Hollywood, CA 91607 (I'm unaware of their present minimum order requirements).

**16" length of 1" (outer diameter) PVC pipe. This can be purchased at just about any hardware store (most stores will cut it to length) and should run under a dollar.

** 1 365pF variable capacitor. I used the small 1" x 1" polyvaricon type that comes with a (coarsely) calibrated tuning knob. These are also available through Etco ($3.95) as well as from local electronics supply stores that handle Calectro products (about $3.50). The least expensive source of these VC's that I know of is Mouser Electronics, P.O Box C, Lakeside, CA 92040. They cost $2.37 each but Mouser has a $20 minimum order.

** 10' of high gauge wire. I used litz (obtained from Amidon) but 30-34 gauge magnet wire can be substituted (although Q and gain seems to suffer some). Don't go to a heavier gauge than recommended or the ferrite/coil assembly won't fit in the PVC tube.

** 1 small plastic box for housing the VC. These are really hard to find but a very neat 1-1/2" x 2" x 1" box and lid are available from Allied Electronics, 401 E. 8th St., Ft. Worth, TX 76102, for about $1.25. Allied's minimum order, unfortunately, is $30 though. If you have one of the old Radio Shack VC's that came with a little plastic dust cover for the VC plates, you're in luck. This can be used very adequately to mount the VC to the PVC tube and you won't have to worry about locating a box.

** 1 external antenna terminal. You can use a binding post, Fahnestock clip, jack, or whatever is handy.

** Some kind of mounting system. Two 5" cable ties and two 1" x 1" self-adhesive mounting platforms work well (available from Mouser) but I ordered some "Kwik Klips" from Allied which can be permanently mounted to the radio and "lock" and "unlock" their grip on the Hot Rod to allow optimal gain/selectivity positioning as well as transfer to other radios similarly Kwik Klip-equipped. I should have them by the time this article sees print, so drop me a line.

** Spray paint. Krylon or similar (I used semi-gloss black and clear satin overcoat).

** Epoxy glue (for cementing the ferrite rods).

** 2 short length (i.e., 1/8"-1/4") screws for mounting the box to the tube (the tips of the screws should not extend into the interior of the PVC tube).

** Miscellaneous supplies including a screwdriver, soldering iron and solder, drill and suitable bits, several grades of sandpaper, a ruler, and electrical tape.

How to build it

1. Take the six straightest ferrite rods you have and try different end-to-end rod pairings until you have three pairs whose ends "kiss" well and whose overall lengths are relatively straight. Form a triangle (actually a 16" long "prism") with the three pairs, again trying different combinations and positions to attain the best matching of ends and sides. See Figure 1.

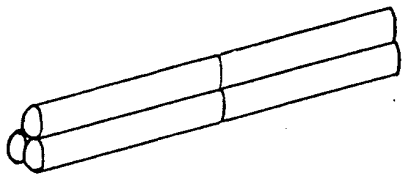

FIGURE 1

2. After you've determined the best pairings, mix the epoxy and cement the pairs end to end so that you now have three 16" rods. It is best to do this on a flat surface.

3. After the epoxy has completely hardened, arrange the three 16" rods in the prism shape illustrated in Figure 1 applying liberal amounts of epoxy to all surfaces which "kiss" to form the prism. You might want to then wrap a rubber band or twist tie around the assembly until the epoxy cures.

4. While the epoxy is hardening, drill two small holes along the center line of the bottom of whatever box you are using so that it can be mounted on the PVC tube. Drill two more small holes along the same center line so that the coil wires can pass from the PVC interior into the box and connect to the VC. Also drill a hole in the side of the box to mount an external antenna terminal and a hole in the lid of the box to mount the VC. Figure 2 illustrates the approximate locations of the holes.

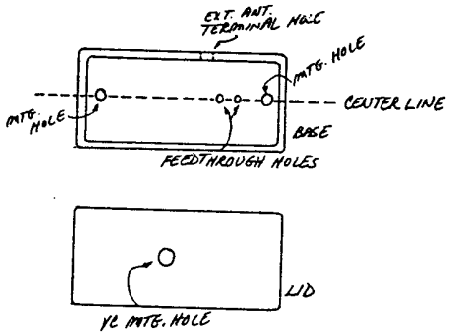

FIGURE 2

5. Position the box on the PVC tube so that it is about 3-4" from the end of the tube and stick a pin or other sharp, narrow object through each hole in the bottom of the box so that an impression is made on the PVC tube.

6. Drill holes in the PVC tube corresponding to the pin pricks.

7. Take the PVC tube and lightly sand the surface (heavily sand the ends).

8. Now apply several light coats of a good quality paint to the PVC tube, sanding very lightly between coats. Finish with a coat of protective clear coat, if you want.

9. After the epoxy has thoroughly hardened (an overnight wait is best), it's time to wind the coil. Take the 10' length of wire and scrape and tin the ends. If you're using litz, make sure you've adequately scraped the insulation from each individual wire; check for continuity with an ohmeter, if you have one.

10. I've found that best performance results if the coil covers about the central two-thirds of the ferrite bar (although I haven't tried all possible winding schemes), so start winding the coil about two inches from one end. Leave about a 6" tail of wire on the end where you start and secure the initial turns with a piece of tape. If you desire, you can make marks about every 1/4" so that the 48 turns are accommodated in the central 12" of the rod, but I now find that I can "eye ball" the proper spacing with little trouble.
    It's easiest for me to wind one of these coils if I sit down with the rod across my lap, my right hand holding and rotating the rod, while my left hand holds the wire tautly (and creates the spacing) as it is being taken up by the rotating rod. For some reason, I find rotating the rod toward me with the wire feeding over the top of the rod to be easiest.

11. After you've wound the central 12" of the rod, tape down the last few turns and trim (only if necessary!) the remaining wire so that a tail of about 12" remains.
    To prevent the coil from coming unwound, tape each end securely with a turn or so of electrical tape (if your initial taping of the ends was of a temporary nature). If you have some Q-dope around, coat the entire coil and set aside to dry.

12. Loading the coil into the PVC pipe comes next. First, take two piece of light gauge scrap wire, each about 16"-18" long, and thread them down into the interior of the tube through the two feedthrough holes you drilled earlier. Continue feeding them into the holes until they exit the end of the tube closer the holes.

13. Lightly solder one scrap wire to one end of the coil and the other scrap wire to the other end of the coil.

14. Now gently insert the ferrite rod assembly into the PVC tube, taking up the wire slack as you go. Continue until the rod is completely inserted into the tube and the entire length of each scrap wire has been pulled back through the feedthrough holes. See Figure 3.

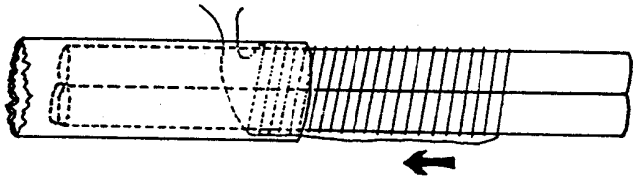

FIGURE 3

15. Desolder the scrap wires from the coil. You should now have the rod/coil assembly inside the tube with only the two ends of the coil wire protruding through the feedthrcugh holes of the tube.

16. Thread the two coil ends through the holes in the bottom of the box and mount the box to the PVC tube with the two screws. You can add a bead of adhesive to the box/tube interface if you choose.

17. Now solder one end of the coil to one tab of the VC, and the other end to the other tab. Also, solder a short length of wire to either one of the tabs or to the washer tab on the shaft of the VC (if yours came with one). See Figure 4.

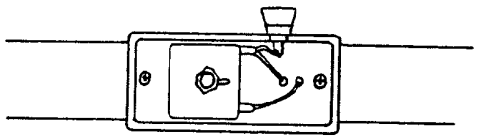

FIGURE 4

18. Mount whatever kind of external antenna terminal you've chosen on the box and solder the loose wire end to it.

19. Place the lid on the box and mount the VC and knob.

20. Confirm that everything is working properly by positioning the Hot Rod near (1-2") the back or top (wherever the internal loopstick is located) of your radio so that the length of the Hot Rod is parallel to the loopstick. Tune the radio to a weak station and rotate

A47 - 3 of 3

the Hot Rod's knob while listening for a peak or sharp drop in signal strength. If you hear either, move on to Step #21. If you can't detect anything happening as you tune the Hot Rod, try positioning it differently (i.e., move it closer or farther from the radio; slide it lengthwise; etc.) If you still don't hear any action, try a different weak station in the middle of the band. If still nothing occurs, recheck your wiring and solder connections.

21. After you've confirmed that the Hot Rod is working, check its range by tuning and peaking stations near 540 kHz and 1600 kHz. If all is well, go to Step #22; if not, try re-positioning the Hot Rod. (There's an optimal gain/selectivity/coverage point of coupling between the Hot Rod and your radio.) If the Hot Rod doesn't tune the high end, remove wire from the coil; if it doesn't tune to 540 kHz, add wire. This shouldn't be a problem, however, if you are using components comparable to those recommended.

22. Lightly glue the lid to the box and, if the rod assembly doesn't fit snugly in the tube, put a dab of glue at each end.

23. Mount the Hot Rod on your radio using whatever method you've chosen (Kwik Klips, mounting platforms and cable ties, etc.). If you don't want to permanently attach the Hot Rod to your radio, you might want to mount it on a small piece of Plexiglas and simply place it near the radio. I suspect, though, that the Kwik Klips will be the mounting method of choice.

24. Go DX.

I think you'll find that the Hot Rod is a worthwhile accessory for portable radio DX'ing, especially if you sometimes use an external antenna. Incidentally, when using an external antenna, the gain of the Hot Rod can be controlled to some extent by sliding the Hot Rod toward one end of the radio or the other. This is really only practical, though, if you use the Kwik Klip system.

In closing, I'd like to mention that since I had to observe the minimum purchase requirements of several suppliers, I now find myself loaded down with far more components than I need. If you are interested in the Hot Rod, I'll be happy to supply you with a kit of all the required parts (you'd still need epoxy to glue the rods, a soldering iron and solder, and some electrical tape) for $13. Or, if you are really mechanically disinclined, I'll (I know I'm going to regret this offer, hi) put one together for you for $19. PLEASE include an additional $2-$3 to help cover packaging and UPS charges. Thanks in advance.

If you have any questions about the construction or operation of the Hot Rod, don't hesitate to drop me a line at:

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