

# The CCD Antenna Revisited

## — does it measure up on 40m?

The articles which appeared in *73 Magazine*<sup>1,2</sup> describing the concept of the CCD antenna really hit a high spot with me. After all these years of experimenting with and building dipoles and beams, the CCD antenna certainly presented a fresh and exciting project. W4ATE and W4FD deserve a pat on the back for exploring the applications of this concept for amateur use.

My objective in building this antenna was to see if the concept put forth by W4FD, W4ATE, and others who had built this antenna really measured up to the specifications. This antenna per-

forms better than any single wire antenna I have ever built in the past.

I decided on using center feed for this antenna simply because it suited my real-estate layout. The feedline was a good grade of 300-Ohm TV line. Prior to installing the feedline, I applied a heavy coating of floor wax over the entire length of the line. This paid off, especially during wet weather; the impedance of the antenna system remained quite stable. I also tried a 4:1 balun fed with 50-Ohm coaxial cable. At the resonant frequency of

the antenna, the swr was 1.6:1, and at the extreme high frequency end of 40 meters, the swr was 2.5:1.

I cannot quote specific figures of gain, radiation patterns, or angles of radiation for this antenna because I do not have the necessary test equipment nor an antenna range to perform such tasks. However, I can state that I am hearing more stations and have had many more solid QSOs than I've ever had with my inverted V antenna. One thing in particular that I have noticed is that this antenna is much quieter than any other antenna I have used. It's much easier to hear and work weak stations. Don't let the length of the 40-meter antenna deter you from trying it; the amazing thing is that you can zigzag this antenna in just about any plane, including through trees. Another thing that I've noticed is that when I contact another station that is using a CCD antenna, there seems to be much less QSB on the

signals. I have used this antenna on 15 and 20 meters with excellent results. I have no interest in 10 meters, but I'm certain that it will perform well on that band. The other night I had to get on 75 meters to meet a sked, and for the fun of it I tuned up using the antenna matching network. I was able to put out a respectable signal for local work.

It didn't take me long to gather up the parts for this antenna. I had to make the insulators, and for the wire I used the secondary of an old power transformer, which was number 22 wire. It was easy to handle and didn't cost a cent.

Basically, I wanted to build this antenna in such a manner that I could experiment with it and make changes if needed. This approach resulted in the following mechanical configuration. I used 140 feet of thin nylon cord with a tensile strength of 350 pounds. This cord was used as a messenger from which the an-

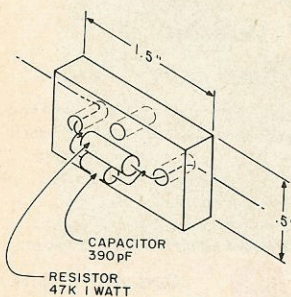


Fig. 1. Insulator with mounted resistor and capacitor.

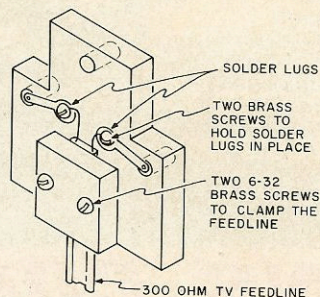


Fig. 2. Feedpoint insulator with feeder clamp in place.

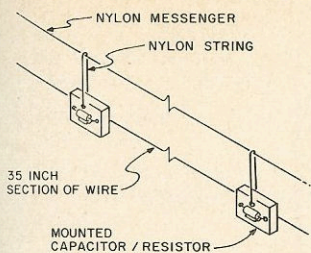


Fig. 3. Nylon messenger and 1 section of antenna.

tenna was suspended. Initially, I hung the messenger 3½ feet above the ground.

Next, I made a jig on a piece of wood which had two nails separated exactly 35 inches. Then I bent 48 pieces of wire around the nails, leaving a 2-inch tail at each end. The tails are used to tie in the resistor/condenser combination. When you've finished cutting and bending the 48 pieces of wire, put them aside in a neat arrangement so they won't snarl.

I used 46 one-Watt resistors, with a value of 47k, and 46 Mallory SXM 339 capacitors, 390 pF, at 160 volts dc. Prior to installing these capacitors, I found that 2 were defective, and 1 was not within tolerance. The testing of the capacitors prior to installation can save you a lot of problems and work later on.

The next job was to make 48 insulators and the feedpoint insulator. I used some 1/8-inch Lucite that I had in the junk box. Figs. 1 and 2 give the details. The next step involved mounting and soldering a capacitor and resistor to each section of wire. Remember, you have 48 sections of wire and only 46 capacitor/resistor combinations. Start at the feedpoint insulator and connect the first section of wire (the end without the insulator) to the feedpoint insulator solder lug and solder it.

The other end of the wire will have the capacitor/resistor mounted on an insulator. Refer to Fig. 1 and note the hole at the top middle of the insulator. I used a 7-inch piece of nylon string

and suspended the insulator about 3 inches below the messenger. I continued this process until all the sections were installed and soldered. Using this method of suspending the wire sections allows the antenna to ride free, with no mechanical strain on it whatsoever. So far the antenna has withstood 45-mph winds, rain, and hot sun without any problems. Fig. 3 shows a section of the completed antenna.

The mechanical work is now completed, and we're ready to begin the preliminary antenna tests. I used the authors' design criteria<sup>1</sup> for a 40-meter antenna with a low frequency cutoff of 7050 kHz. I connected a 3-turn loop at the feedpoint insulator and, using a grid-dip meter, resonance occurred at 7002 kHz. Next, the 300-Ohm TV feedline was connected to the feedpoint. About 80 feet of line was needed to reach the shack. I prefer the use of an antenna tuner rather than a 4:1 step-up transformer, because a tuner permits you to tune out any residual reactance in the overall antenna system. Next, I tuned up the transceiver on 7200 kHz and adjusted the antenna tuner for minimum swr between the exciter and the input of the antenna tuner. Using a Bird wattmeter, I set the output of the exciter to 1 Watt. Any swr meter will serve the same purpose; the main consideration here is that only a minimum of power is required to excite the antenna. The rf indicator which I used to check each section of the antenna consisted of a 50  $\mu$ A meter, using a couple of 1N34s as rectifiers. A 6-inch piece of wire was used as the rf probe. Next, I walked the entire length of the antenna, holding the rf probe at a uniform distance from the antenna, and checked each section. At the ends of each section, I recorded 12  $\mu$ A, and near the middle of each section, the

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rf probe indicated 29  $\mu$ A. These same approximate readings occurred at each section, right down to each end. In other words, I had a uniform radiating surface over the entire length of the antenna. Remember, this antenna is only 3½ feet above ground. It didn't take me long to get back into the shack and fire up on 40 meters.

The first thing that I noticed was that the receiver was very quiet. Signals were right up there in strength. I made three contacts (about 200 miles) and my reports were Q5 and S9 plus. This was with 100 W dc input. I left the antenna at 3½ feet for about a month and did a lot of listening and QSOing. The results have been more than gratifying.

My next task was to raise the antenna to 50 feet. This was a snap with the nylon messenger. All I had to do was coil the antenna up, take it to the mast, stretch it

out, attach the feedpoint insulator to the halyard, and pull it up. Next the ends of each messenger were snaked through and among the trees and secured wherever convenient. I find it difficult to describe the physical configuration of the antenna, but the feedpoint is up about 50 feet and the rest of the antenna is hidden among the trees. I have 86 trees on the property and an XYL who loves trees; 'nuff said.

All in all, I'm very happy with the results of this antenna and I'm thankful to W4FD and W4ATE for providing me with a very interesting and rewarding project. ■

#### References

1. Harry A. Mills, Gene Brizen-dine, "Antenna Design: Something New," *73 Magazine*, October, 1978.
2. Harry A. Mills, Gene Brizen-dine, "The CCD Antenna—Another Look," *73 Magazine*, July 1981.