

# Build the Broadband Bow Tie

*It's every ham's dream: An 80m antenna with a flat swr of 1.5:1 from 3.5 to 4.0 MHz. And it couldn't be simpler.*

Are you content with being stuck in one narrow segment of the 80-meter band? Do you enjoy tuning your transmatch so your solid-state rig will function properly? If you answered no to either of these questions, you may be interested in this antenna. It works well across the entire band. The swr is better than 1.5:1 from 3.5 to 4 MHz.

The Broadband Bow Tie was built as a Field-Day antenna for Ham Radio Explorer Post 373 (see Fig. 1). In the past we've tried normal dipoles, verticals, and even a double extended zepp. None of these were reliable or broad enough; we decided to try something new.

It had to be reliable. It had to be simple to erect and dismantle. It had to be cheap. And most important, it had to cover the entire band without the help of a transmatch.

Library books and old magazines produced two interesting antennas. One was a fan dipole. The other one was called a 10-meter Wonder Bar (Figs. 2 and 3). Both looked good, but neither was quite what I wanted. So I combined the best features of each, and the result is the 80-meter Broadband Bow Tie.

Begin building by finding the parts (see Parts List). Other than the toroid core, all parts can be found at

either Radio Shack or your local hardware store.

You will need to start with the two sections of  $\frac{3}{4}$ " thin-wall conduit. Flatten each end of the conduit for 2 inches or so and drill a  $\frac{3}{8}$ " hole 1 inch from each end. Make a loop in one end of each wire and solder it securely. Put a  $\frac{5}{16}$ " screw through the hole in the conduit, slide on the wire, put on the other hardware, and tighten (see Fig. 4). For permanent installations, each connection should be taped.

Connect the wires to the

center insulator as shown in Fig. 5. Each wire is 62' 4" long from the end of the conduit to the center insulator. Temporarily solder a SO-239 connector to the antenna and hook up some 50-Ohm coax. You're ready to set it up and do some preliminary testing.

Set up the Bow Tie at the location you plan to use it. Hook up your transmitter and swr bridge. On-the-air testing should be done in the morning or afternoon to avoid QRM.

Keeping keydown time to

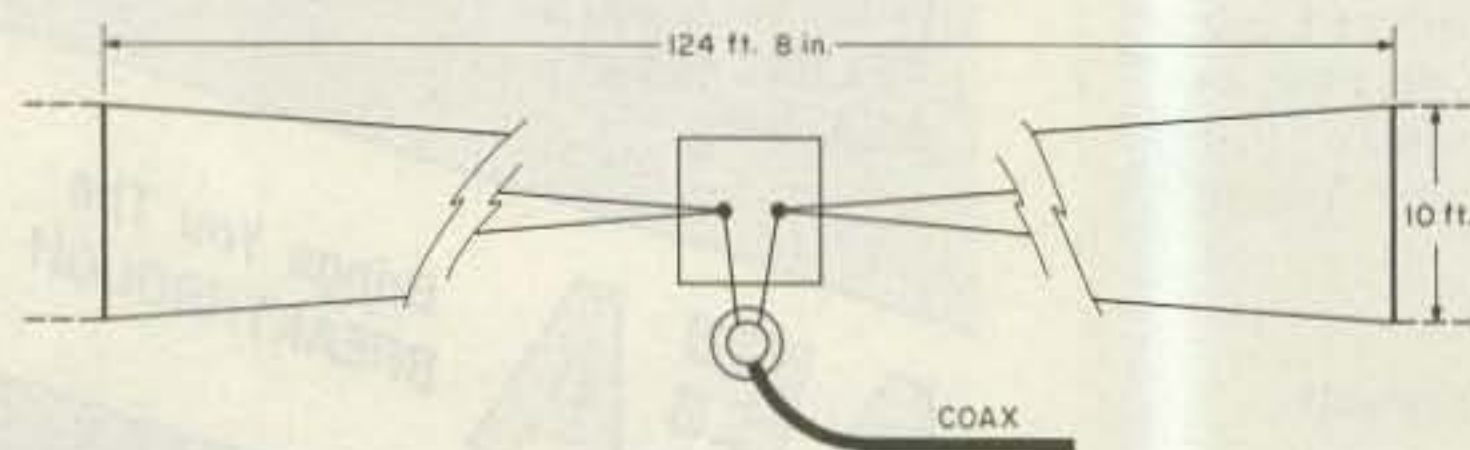


Fig. 1. 80-meter Bow Tie antenna. The 10-foot conduit spreaders can be mounted either vertically (as shown) or horizontally.

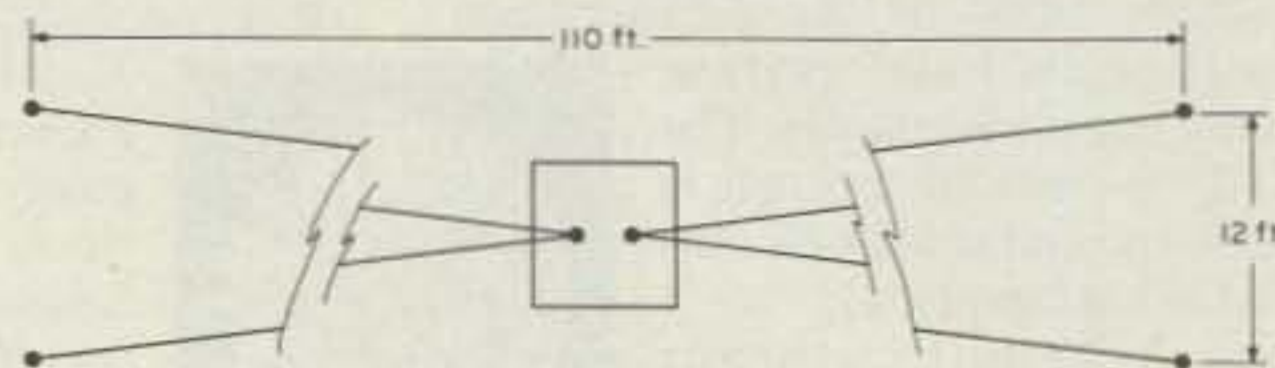


Fig. 2. 80-meter fan dipole.

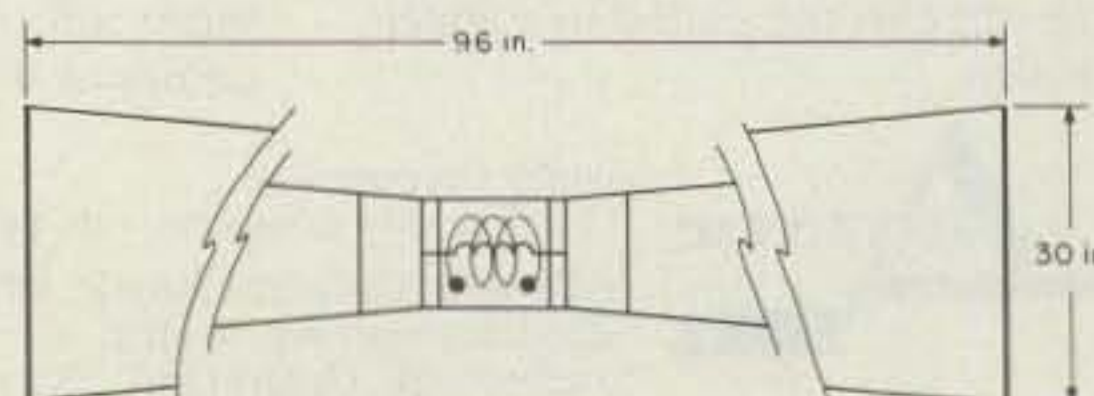


Fig. 3. 10-meter Wonder Bar.



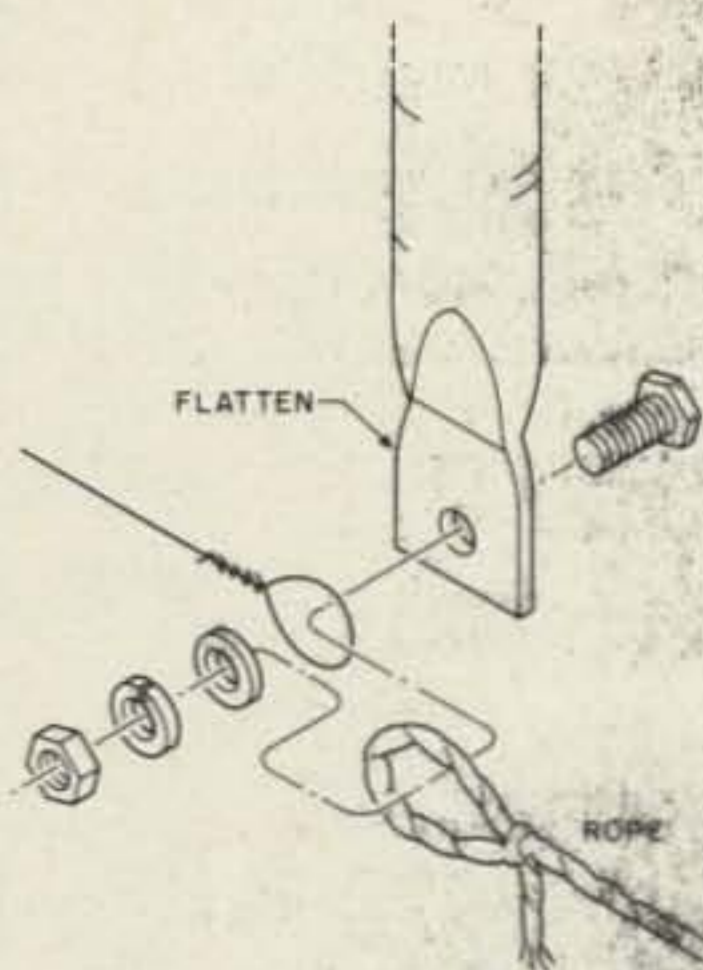


Fig. 4. Detail sketch of spreader, wire, hardware, and rope.

a minimum, check the swr across the band. I checked it every 50 kHz and graphed the results (see Fig. 6). I found that it was flat at 3:1 from 3.5-4 MHz. This could be due to its low height (20' at one end and 6' at the other). It could be that it was too long or it could be simply a characteristic of a large-diameter dipole. The important thing is that it does not change appreciably across the band.

The next step is to wind a transformer to match the 17 Ohms of my antenna to the standard 50-Ohm coax.

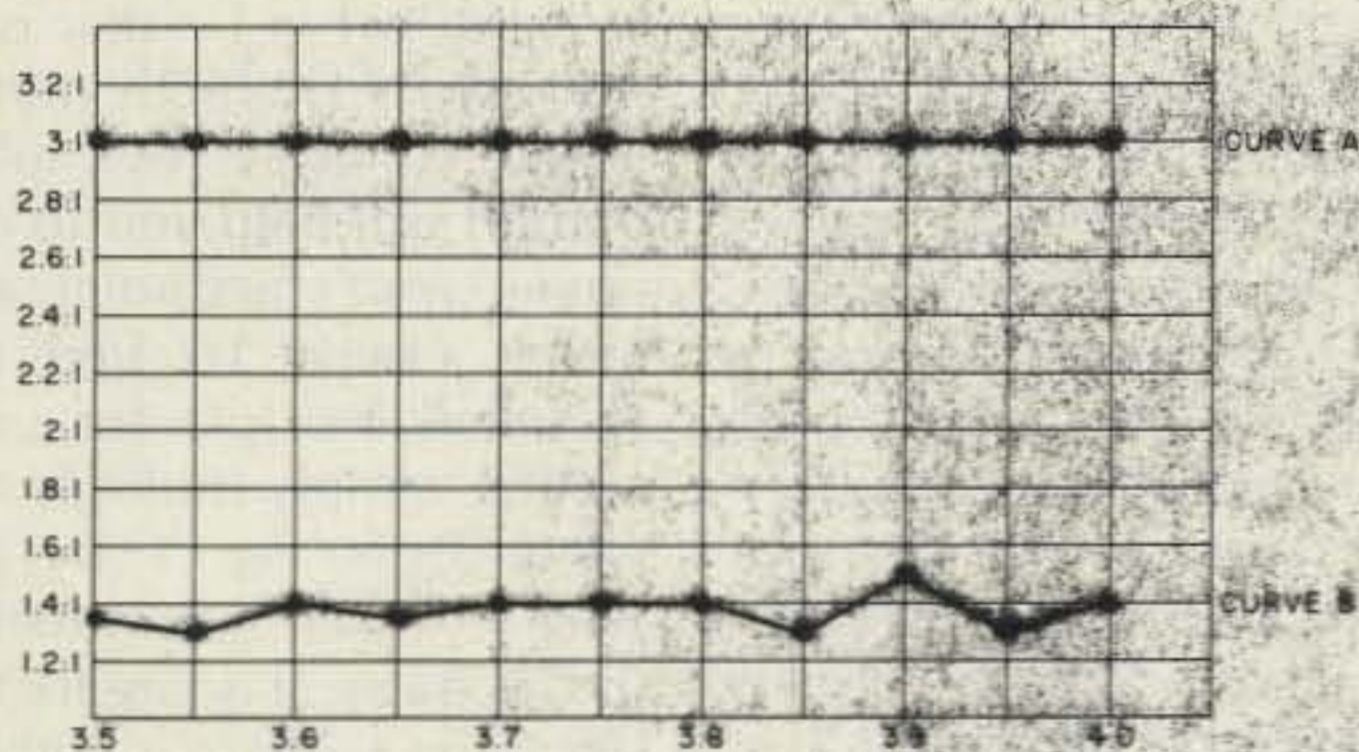


Fig. 6. Swr curves: Curve A is measured without un-un transformer. Curve B is with un-un tapped at 7 turns (1.7:1 turns ratio, 3:1 impedance ratio).

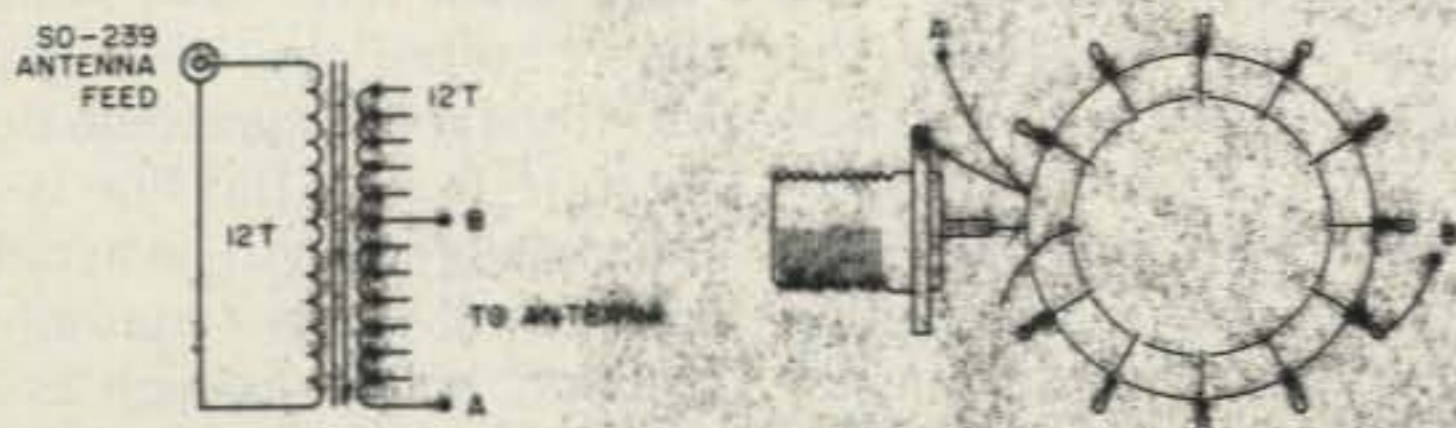


Fig. 7. Un-un matching transformer. Each side has 12 turns. Secondary is tapped every turn.

"When You Buy, Say 73"

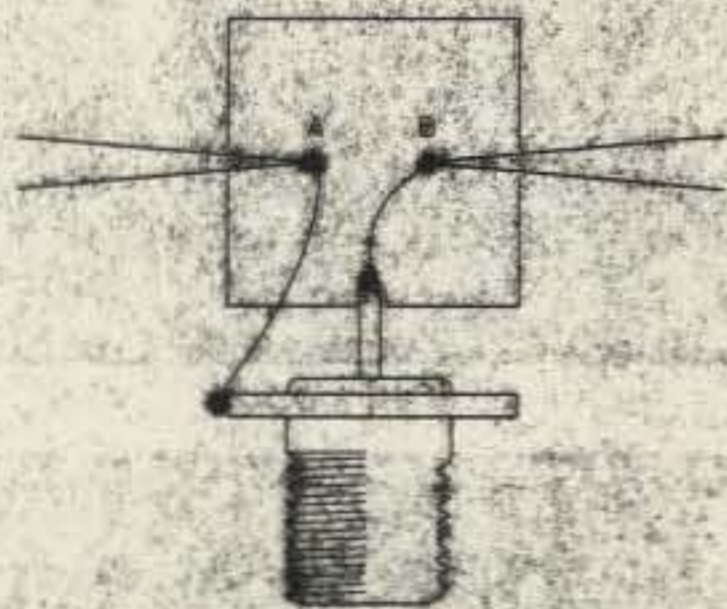



Fig. 5. Detail of center insulator before un-un is attached. SO-239 is removed and put on un-un.

My transformer was wound on a junk-box toroid of unknown origin (Fig. 7). Any toroid core that can handle a kW at 80 meters should work. There are 12 turns of #14 enamel wire on the feedline side. There are also 12 turns on the antenna winding, but with a tap at each turn. The correct turns ratio is equal to the square root of the swr, so in my case  $\sqrt{3} = 1.73:1$  or 7 turns on the antenna side. A tapped secondary is used because height above ground may greatly affect the impedance.

Once the un-un (unbalanced-to-unbalanced transformer) is wound, take down the antenna and remove the SO-239. Solder in the un-un



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and raise the antenna. You should be ready to operate on 80 and 75 meters.

This antenna was built and erected temporarily in the early afternoon. There was not a lot of activity on 80 or 75 meters at the time. We were able to work any station that we could hear with a barefoot TS-520S. Signal reports varied from S7 to 10 over S9 both ways. Performance seems to be about the same as you get from a dipole. The difference is in the bandwidth. I have never

seen a dipole that can cover the entire band the way the Broadband Bow Tie can. I'm pleased with this antenna, and if you try it I think you will be too.

I would like to thank KA9DHM, KC9ON, KA9MBR, and the others in Explorer Post 373 for their help and encouragement.

#### Afterword

This antenna was taken to Field Day. It was used on CW and SSB. Stations were worked from coast to coast. It was set up 20 feet high between two trees. The swr was even better than Fig. 6 curve B. I sincerely believe that it was worth the effort. ■

#### References

1. Stu Leland W1JEC, "The Old Timers' Notebook: Remember the Wonder Bar Antenna—A 10-Meter Bow Tie?" *QST*, April, 1980, pp. 59-60.
2. William I. Orr W6SA1, "A Broadband Dipole System," *Radio Handbook*, 19th Edition, 1972, pp. 25.9, 25.10, 25.11.

#### Parts List

- 4 rolls antenna wire, 85 ft. each, Radio Shack #278-1320
- 1 center insulator, Radio Shack #270-1518
- 2 pcs. 3/4" thinwall conduit, (EMT), 10 ft. each
- 4 screws 3/16-18 x 1.5 inches long
- 4 3/16" flat washers
- 4 3/16" lock washers
- 4 3/16-18 hex nuts
- 1 SO-239 coax connector
- 1 toroid core, 2-inch or larger