THE NO5H
ALL-BAND DIPOLE

Easy to build, easy to move antenna

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My line of work requires that I move to a new location every four or five years. This means I'm continually taking down or putting up antennas. As a result of this, I am always looking for a wire-type antenna that's easy to construct and get working.

I enjoy working all the HF bands from 160 through 10 meters and do most of my operating on 160 and 40 meters. My goal was to design a coax-fed dipole antenna that was simple to build and fit into a 198-foot space.

Description

My antenna design is neither new nor unique. But I've never seen it written up in any of the Amateur publications.

I built a 3/2-wavelength dipole cut for the center of the 40-meter band and fed with 75-ohm CATV coax through *a half-wave matching section of 300-ohm or open-wire line.* Why a 3/2 antenna cut for 40 meters? I wanted an antenna that would operate on 160 meters as a dipole, and in an inverted "V" configuration. I didn't want to resort to traps or to tying the feeder wires together, as you would when using a short dipole as a "T"-type antenna. I wanted the advantage of a dipole, in a length shorter than full dipole size.

If the antenna I've described sounds like a G5RV-based design, it should. The G5RV is also a 3/2-type dipole, except that Louis Varney, G5RV[1] designed his dipole to a 3/2 wavelength at a frequency of 20 meters. Like the G5RV, my antenna is an all-band 160 through 10 design, but it has certain advantages because of the longer length of the dipole. This longer length allows full-dipole and/or long-wire performance on all bands from 160 through 10 meters; you don't need to tie the feeders together for 160-meter operation.

Operation

The NO5H antenna operates in the following configurations on the accompanying bands:

- shortened half-wave dipole on 160 meters
- two half waves in phase on 75 meters
- a 3/2-wavelength dipole on 40 meters
- two full waves in phase on 30 meters
- two long wires each 3/2 wavelengths long on 20 meters
- two long wires each 2 full wavelengths long on 15 meters
- two long wires each 5/2 wavelengths long on 12 meters
- two long wires each 3 full wavelengths long on 10 meters

All-band coverage (including the two usable WARC bands) is achieved easily with this simple antenna configuration.

Construction

The flat-top portion of the antenna is 203′ long; each half of the flat top is 101′6″ in length. The formula I used is:[2]

$$L = \frac{1451.4}{f\ (MHz)} \qquad (1)$$

The matching section is made from 53′6″ of 300-ohm twin lead with a velocity factor of 82 percent (in my case). When the formula is used this way it becomes.[3]

$$L = \frac{468}{f\ (MHz)} \times .82 \qquad (2)$$

I used a run of 75-ohm CATV RG-6 coax to the antenna tuner in the station.

This antenna design has some unique features that set it apart from similar antennas. I use CATV RG-6 coax with 100-percent aluminum shield,* along with a long shank F-type cable connector at both ends of the coax. The F-type connector requires the use of a compound jaw crimping tool. The antenna is as simple to build as any other dipole, and using F-type connectors on the coax makes the assembly process even easier.

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*Radio Shack, RG-6 CATV coax p/n 278-1324.

Once the 203′ flat top is laid out and the center insulator installed, attach the 53′6″ matching section by soldering it in place at the center insulator. I installed an SO-239 chassis connector at the other end of the matching section. One wire of the matching section is soldered to the center pin and the other to a solder lug bolted to one of the corner mounting holes. The connection needs to be sealed from the weather by whatever means you generally use. I installed a long shank F-type connector** on the end of the RG-6 coax and coiled the coax into a 6″ diameter 11-turn choke coil. Then I attached a female F to PL-259 adaptor*** to the F connector on the RG-6 coax. This lets you run the coax to the station antenna tuner after the antenna is raised to its operating position. When you connect the coax at the station end it's good to allow a little extra; you may have to shorten the coax run a bit if you encounter a hard-to-load condition on one band. **Figure 1** gives dimensional details for the antenna.

Some of you many wonder why I used CATV-type RG-6 coax and F connectors for an Amateur antenna project. The better quality RG-6 has the same loss per hundred feet as RG-213 coax and lower loss than RG-8X coax at a cheaper price per foot than the others. RG-6 cable is also 100 percent shielded. The coax has an aluminum shield which is not intended to be soldered, and that's why I used the F connector. Using this connector at the 200-watt level hasn't presented a problem. In fact, using the crimp on the long shank F connector makes trimming the lead-in much easier if a loading problem occurs on one of the bands in use.

I think we all need to be more innovative when it comes to antennas and feed systems. Those who operate at VHF and UHF learned long ago to use CATV hardlines and cables because of the lower loss. Fifty ohms doesn't have to be the magic number for most applications. Many stations now use antenna tuners or rigs with built-in tuners to control the SWR that their solid-state rigs feed into. So don't be afraid to give other cables or connectors a try; you may find that they do make antenna projects easier and more fun.

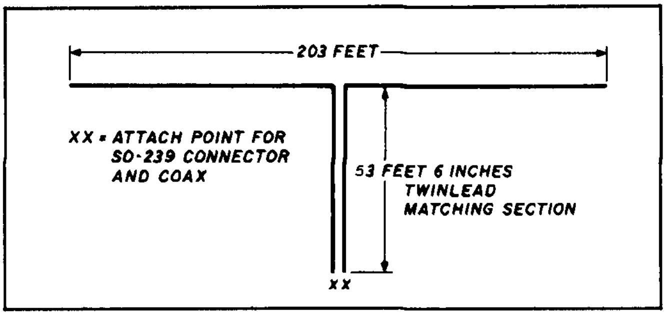
Conclusion

The antenna can be mounted either as a horizontal dipole or an inverted V. In my case, the antenna is in the inverted Vee configuration with the apex at about 50 feet and the ends of the antenna about 10 feet off the ground.

Does it work? Comparisons with my regular G5RV show improvements on all bands. The greatest are seen on 30 through 10 meters. On 40 and 80 meters I find that the improvement depends on the distance and propagation of the signal being received.

One thing I can't stress enough is that both this design and the G5RV require the use of an antenna tuner. Take time to read Louis Varney's comments on the G5RV design in the *ARRL Antenna Compendium, Volume One.*[4] Even at the 3/2 design frequency with the half-wave matching section, the feedpoint impedance is still a little over 100 ohms. On the other bands the feedpoint impedance varies because of the complex loads presented by the antenna, resulting in the need for an antenna tuner. My design and the G5RV are efficient all-band antennas that can be coax fed.

FIGURE 1



Dimensional details of the NO5H all-band antenna.

REFERENCES

1. Louis Varney, G5RV, "The G5RV Multiband Antenna...Up to Date," *The ARRL Antenna Compendium, Volume 1*, 1985, page 86-90.
2. Bill Orr, W6SAI, "Ham Radio Techniques: The G5RV Explained," *Ham Radio*, February 1985, page 59.
3. Louis Varney, G5RV, ibid., page 89.
4. Louis Varney, G5RV, ibid., pages 86-90.

**Radio Shack, gold-plated CF-56 type F connectors p/n 278-225.
***Radio Shack, PL-259 plug to female F connector p/n 278-258.