Only One Antenna

All about multibands.

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The antenna dilemma for many hams is very real. Not everyone has the physical space or unlimited resources to install multiple HF antennas and towers. It is also safe to say that many hams live where at least some restrictions apply to antenna structures—and not every ham *wants* to put up towers and beams and separate antennas for each band. The reasons may vary from esthetics to finances.

All that a ham station really requires for communications is an efficient antenna for the chosen band(s) of operation and a rig to put a signal into the antenna(s). For most HF operators, this means an antenna capable of working all the bands, usually 80 through 10 meters. However, the antenna can include 160 meters if there is the physical space available.

The single-wire multiband antenna answer

There are several choices of single-wire antennas available that will operate on more than one band. The term single-wire means that only one wire is used in the antenna's construction (a dipole is a single-wire antenna). Each of the following antennas is a well-designed multiband antenna, constructed of a single-wire element antenna. Some examples can provide gain over a simple dipole on the higher bands.

Single-wire antennas are not obtrusive, are easily installed, and are as close to "sure-fire" as you can get. Cost covers the range from a few dollars for a home-brew wire antenna built with "junk-box" parts to a little over a hundred dollars for a factory-built trap antenna. The single drawback for using these antennas is the need for a tuner, particularly on the lower bands.

An adequate antenna tuner that is capable of handling the output power of any modern HF transceiver can be purchased new for under $100. For kilowatt power levels, the prices start at a little over $250. My personal favorite is the MFJ Differential-T tuner, which is capable of handling my linear amplifier and any antenna I have ever connected to it.

Many of the newer solid state HF transceivers have built-in antenna tuners that do the antenna matching automatically. Should you be fortunate enough to own such a rig, you only need to connect the feedline from a multiband antenna to work the world.

The Carolina Windoms

The original Windom antenna was designed by W8GZ in 1928 as a half-wave antenna, off-center fed with a single wire (this was BC: before coax). Today's Carolina Windom retains the half-wave off-center fed primary element; however, it is now fed with coax and incorporates a vertical radiating element (which is part of the feedline). They are well-constructed antennas designed to be installed and used for many years with no further attention.

The Carolina Windoms are available in three sizes (for various band combinations):

1. Carolina Windom 160 (160–10 meters), 252 feet long.
2. Carolina Windom 80 (80–10 meters), 133 feet long.
3. Carolina Windom /2 (40–10 meters), 66 feet long.

Installation can be either horizontal or as an inverted vee (see **Fig. 1**).

Due to the half-wavelength size of the horizontal element, the Carolina Windom antenna gives gain over a dipole on all bands above the primary

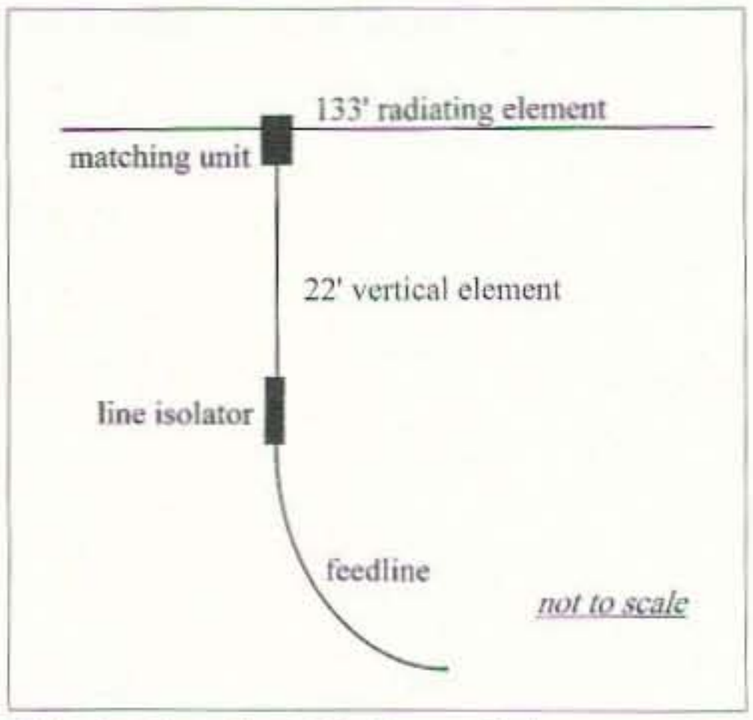

Fig. 1. *Carolina Windom. All figures not to scale.*

design band. The primary design band is the lowest operating band (40, 80, or 160 meters). The antenna should be mounted 30 or more feet above the ground.

An offshoot of the Carolina Windom is the Carolina beam, which is essentially a bent version of a Carolina Windom taking only 82 feet of horizontal space for installation. The Carolina beam is designed for improved performance in the DX bands, but performs well on the 80 and 40 meter bands (see **Fig. 2**).

Carolina series antennas are available from The Radio Works.

The G5RV antenna

The G5RV antenna is a small single-wire antenna, fed with coax line, and only 102 feet from end to end. It works on the 80–10 meter bands. The antenna is centerfed with a 31-foot section of 450-ohm ladderline, which is used as a matching section, and is terminated with a coax feedline. The feedline runs from the matching section to the transmitter (any length). The antenna must be mounted 35 or more feet above the ground, due to the ladderline matching section (see **Fig. 3**).

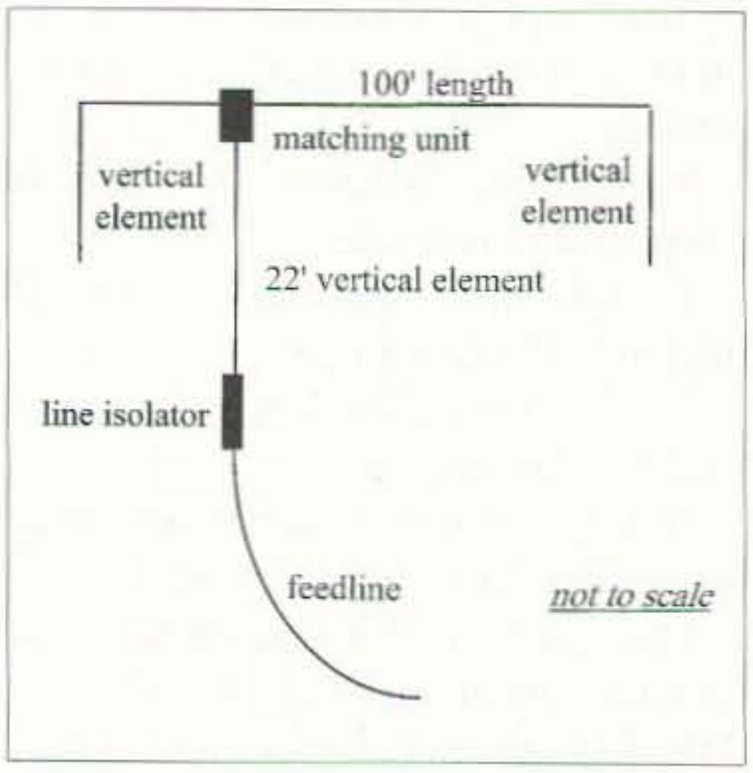

Fig. 2. *Carolina beam.*

The G5RV antenna provides gain over a dipole on all bands above 80 meters and functions well with the auto tuners found on many of the newer HF rigs. It can be installed as a horizontal or inverted vee antenna.

Constructed G5RV antennas by Van Gorden Engineering are available through many amateur radio equipment outlets. The Radio Works also produces a G5RV antenna. As a homebrew project, the G5RV is a popular antenna, with parts readily available from ham stores and the suppliers listed at the end of this article.

Trap antennas

Trap multiband antennas have been around for many years. Due to the weight of the traps used, they tend to be somewhat heavier than the wire-only antennas previously mentioned. Trap-based antennas function as dipoles for each band and provide no gain as the operating frequency increases.

The theory of a trap antenna is the simple isolation of the used portion of the radiating element, based upon frequency, from the overall antenna. In other words, each band's traps isolate part of the antenna into a simple dipole for a single band (see **Fig. 4**).

Some trap antennas use a single pair of traps for all-band coverage, while others use several traps. All trap antennas are physically shorter than a full-size antenna for a comparable single band. It is normal to need a tuner on the lower bands for full frequency coverage. Trap antennas can be installed as horizontal or inverted vee antennas.

Manufactured trap antennas are available from SPI-RO Manufacturing, Inc. Individual sets of traps are available from many ham radio stores for those wanting to build their own trap antennas.

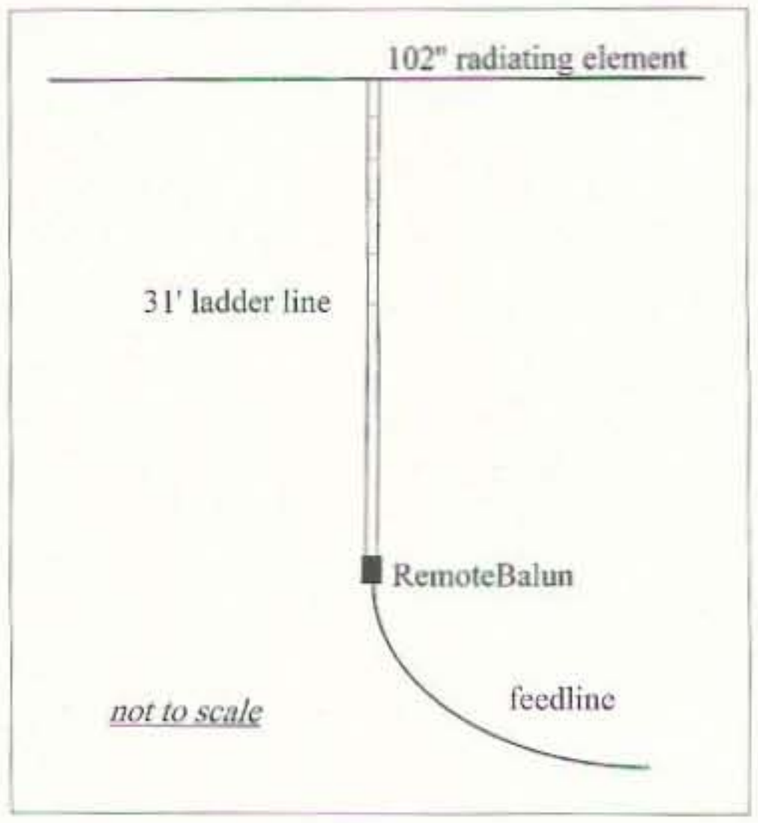

Fig. 3. *G5RV.*

Multiband center feed

A very easy antenna to install, this one provides gain on bands above 80 meters and is perfect for the homebrewer. It's a simple half-wave dipole (cut for the lowest frequency of planned use) fed at the center point with 450-ohm ladderline. Generally, the antenna is about 135 feet in overall length (see **Fig. 5**). The antenna can be designed for 40 meters and up by using an overall length of 67 feet.

Many hams are scared away by the ladderline. However, there is a very simple solution to the "ladderline problem"—use a RemoteBalun™ from The Radio Works. This device acts as an interface between ladderline and coax, allowing easy antenna cable entry into the shack and simple tuner usage.

This simple antenna has been a standard for hams all over the world. Like the Carolina Windom, G5RV,

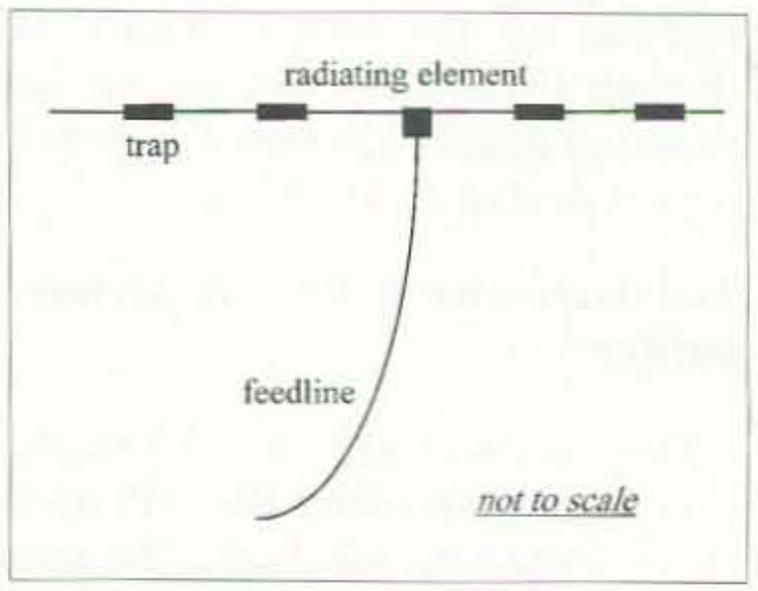

Fig. 4. *Trap dipole. Trap antenna length is a product of the number and types of traps used and the bands designed for.*

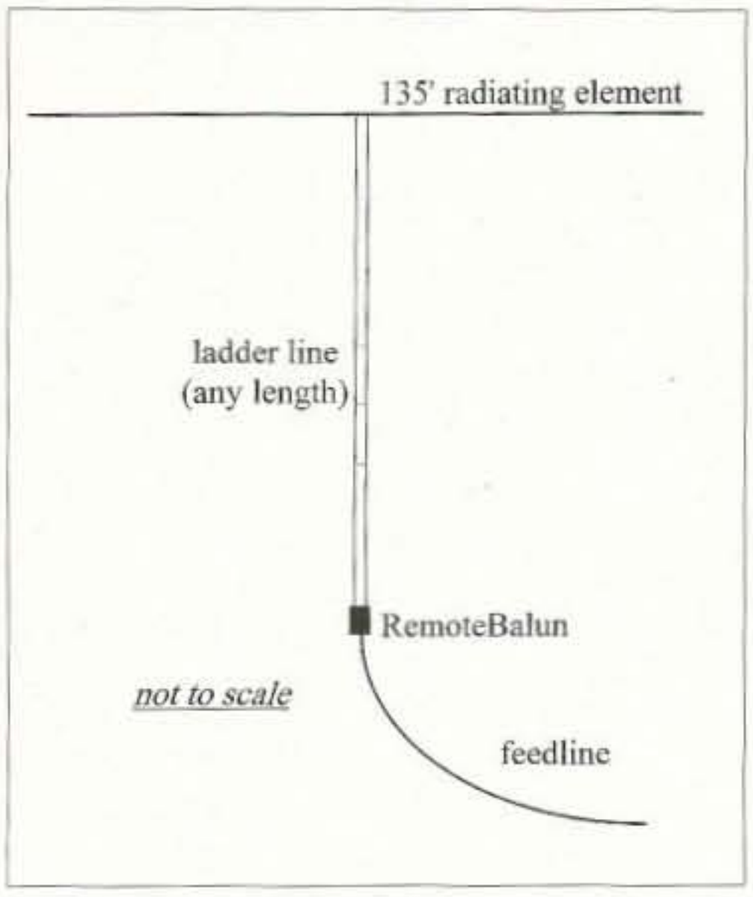

Fig. 5. Multiband dipole.

and trap antenna, it can be installed as a horizontal or inverted vee.

Double extended zepp

Similar in appearance to the previous antenna is the double extended zepp (see **Fig. 6**). Its advantage is a nearly 3 dB gain over a simple half-wave antenna on the band of design—and that improves as you move up through the bands. The antenna's major drawback is its sheer size. It is an excellent candidate for home-brew.

The double extended zepp is 1.28 wavelengths long at the design frequency. The original versions called for parallel feeders from the center of the antenna to the shack. The modern version uses a 4:1 balun at the end of a measured length of ladderline and coax to the shack.

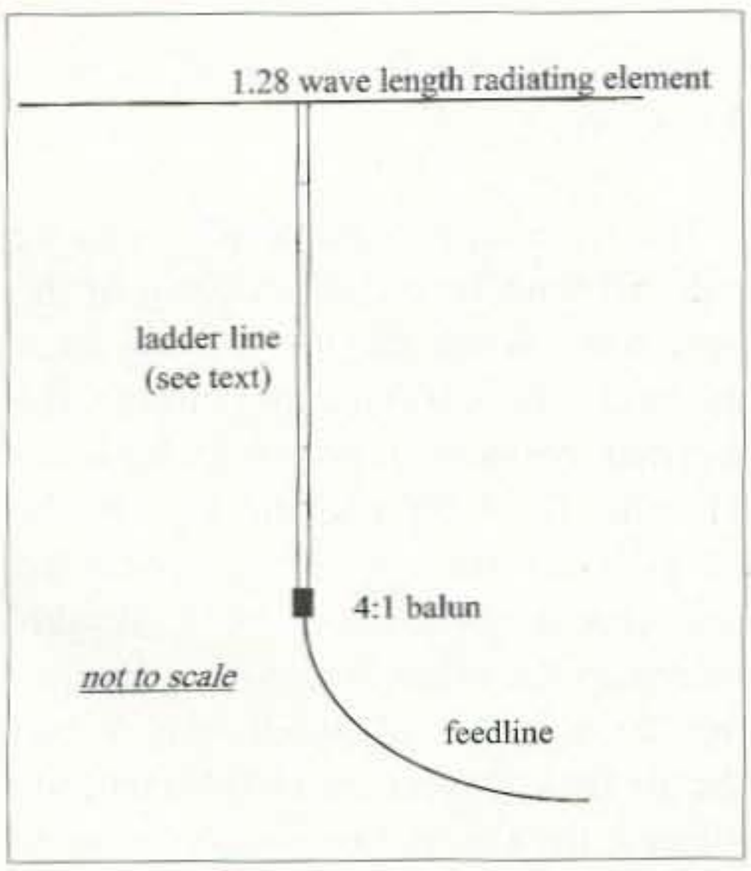

Fig. 6. Double extended zepp.

An 80-meter version would be 343 feet long overall, with the ladderline 29.5 feet long before the 4:1 balun. A 40-meter version would be 171 feet and 14.7 feet, respectively. There is no reason that ladderline could not be used from the feed point to the shack, as with the multiband centerfed antenna.

The double extended zepp can be installed horizontally or as an inverted vee.

Endfed zepp

An often overlooked home-brew multiband antenna is the endfed zepp (see **Fig. 7**). Based on an antenna originally used on the zeppelin airships, it is a capable half-wave design providing multiband use and gain on frequencies above that of design. Careful planning must be used with this antenna to prevent RF from entering the shack via the feedline.

The feedline must be one-quarter wavelength and the main element a half wavelength long. Although the diagram shows the feedline leaving the main element at right angles, this is not a requirement. The feedline can be brought into the shack and connected directly to a tuner, or a RemoteBalun™ could be used.

The endfed zepp can be used on bands above that of design and provides gain over simple dipoles. End feed may allow easier antenna installation in some instances. This antenna is a home-brew project.

The dimensions for an 80-meter endfed zepp call for 450-ohm ladderline to be 67 feet long and the main element to be 134 feet long. A 40-meter version would be 67 feet and 33.5 feet, respectively.

Safety note

When installing any antenna, be aware of your surroundings. *Do not* install an antenna in such a manner that it could fall onto a power line or another's property, or onto persons. Follow good engineering practice, such as outlined in the various publications of the ARRL and required by the National Electric Code (and your local electrical safety code).

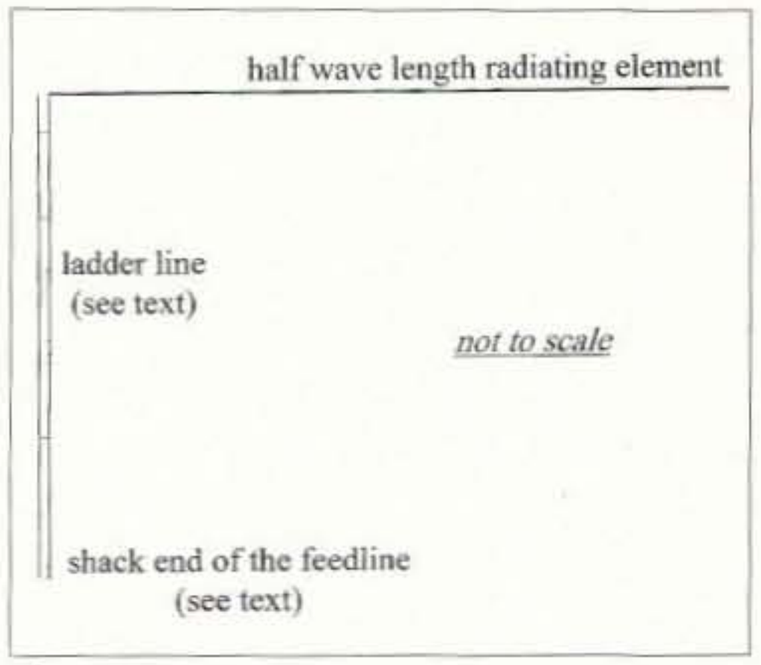

Fig. 7. Endfed zepp.

Suppliers

The following antenna suppliers sell products as indicated:

Antennas West
Box 50062
Provo UT 84605
(801) 373-8425
Constructed antennas

Davis RF Co.
P.O. Box 730
Carlisle MA 01741
(800) 328-4773
[www.davisrf.com]
Wire, feedlines, rope, insulators

The Radio Works
P.O. Box 6159
Portsmouth VA 23703
(800) 280-8327
[www.radioworks.com]
Constructed antennas, wire, feedlines, rope, insulators, RemoteBalun™

SPI-RO Manufacturing, Inc.
P.O. Box 2800
Hendersonville NC 28793
(800) 728-7594
Constructed antennas

Van Gorden Engineering
P.O. Box 21305
South Euclid OH 44121
Constructed antennas, traps, insulators

The Wireman, Inc.
261 Pittman Road
Landrum SC 29356
(800) 727-9473
[www.thewireman.com]
Wire, feedlines, rope, insulators 73