

By Steve Ford, WB8IMY

The Classic Multiband Dipole Antenna

It's easy to understand why hams have had an almost 100-year love affair with wire antennas. They are inexpensive and remarkably easy to install. And for such little effort and expense, they are capable of surprising performance.

One of the simplest wire antenna designs is also one of the oldest: the random-length dipole fed with an open-wire feed line. You can put this antenna up almost anywhere, in almost any configuration and get on the air right away. The only trick is matching the input impedance of the antenna system to the output impedance of your transceiver ($\pm 50 \Omega$). More about that in a moment.

Building the Antenna

Begin by cutting two equal lengths of stranded copper wire. These are going to be the two halves of your dipole (*di* pole = "two poles"). Don't worry too much about the total length of the antenna. Generally speaking, make it a half-wavelength long at the lowest frequency you hope to operate. Using the formula...

$$468 \div \text{Frequency in MHz}$$

...you'd make the antenna about 66 feet in total length if you chose 40 meters (7 MHz) as your lowest frequency band.

Connect one end of a length of 450- Ω ladder line (available from most ham dealers) to the center insulator of the antenna (see Figure 1). Feed the ladder line into your house, taking care to keep it from coming in contact with metal.

The next step is to connect the feed line to the transceiver. One way to do that is through an adjustable matching device known as an *antenna tuner*. Not just any tuner will do, though. Look for a "balanced" tuner, or a tuner with a *balun* (a balanced-to-unbalanced transformer) built in. The ladder line connects to two terminals on the back of the tuner and a short length of coaxial cable connects the tuner to your radio.

Tuning Up

Ladder line offers low RF loss on HF frequencies, even when the SWR is relatively high on the feed line going to the antenna. Just apply a signal at a low power level to the tuner and adjust the tuner controls until you achieve the lowest SWR reading. (Anything below 2:1 is fine.) You'll probably find that you need to readjust the tuner when you change frequencies. (You'll *definitely* need to readjust it when you change bands.)

You may discover that you cannot achieve an acceptable SWR on some bands, no matter how much you adjust the tuner. Changing the length of the feed line may resolve this problem.

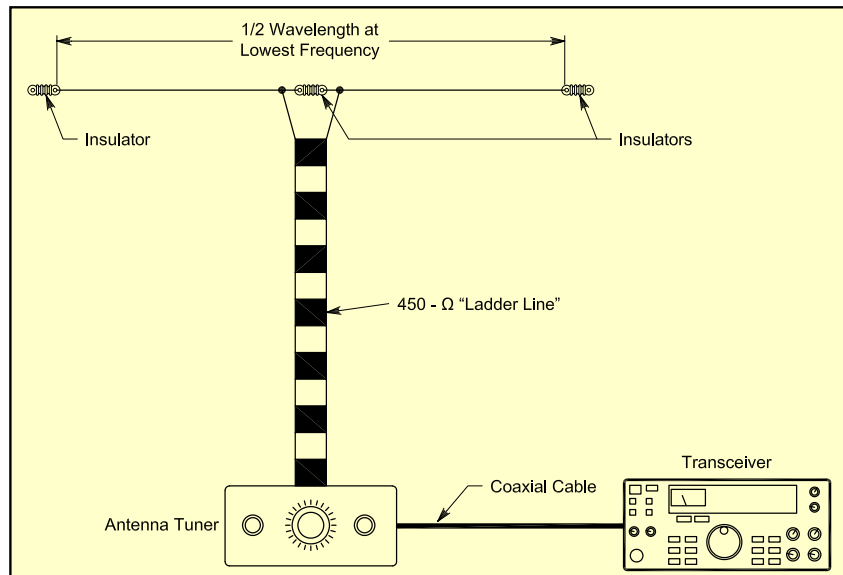


Figure 1—The classic open-wire feed line dipole antenna is easy to install and offers surprising performance on several bands. You can install it in almost any configuration; it doesn't have to be strung in the traditional horizontal "flat top" shown here.

But what if you own a radio with a built-in antenna tuner? These tuners aren't designed to work with open-wire feed lines, but a compromise is possible. Many *QST* advertisers sell external baluns. You can attach the ladder line to one side of the balun, then run a short (less than 10 foot) section of coax from the balun to the radio. As with the manual tuner, the built-in tuner may not achieve a match on all bands.

The Ladder Line Mystique

It's fair to ask why more hams don't use open-wire feed lines. The reason has much to do with convenience. Ladder line isn't as easy to install as coax. As I've already noted, you must keep it clear of large pieces of metal (a few inches at least). Unlike coax, you can't bend and shape ladder line to accommodate your installation. And ladder line doesn't tolerate repeated flexing as well as coaxial cable. After a few months of playing tug o' war with the wind, ladder line may break.

Besides, many hams don't relish the idea of fiddling with an antenna tuner every time they change bands or frequencies. They enjoy the luxury of turning on the radio and jumping right on the air—without squinting at an antenna tuner's SWR meter and twisting several knobs.

Even with the hassles, you can't beat a ladder-line fed dipole when it comes to sheer lack of complexity. Wire antennas fed with coaxial cable must be carefully trimmed to render the lowest SWR on each operating band. With a ladder line dipole, no pruning is necessary. Simply throw it up in the air and let the tuner worry about providing a low SWR for the transceiver.

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