AERIAL VIEW

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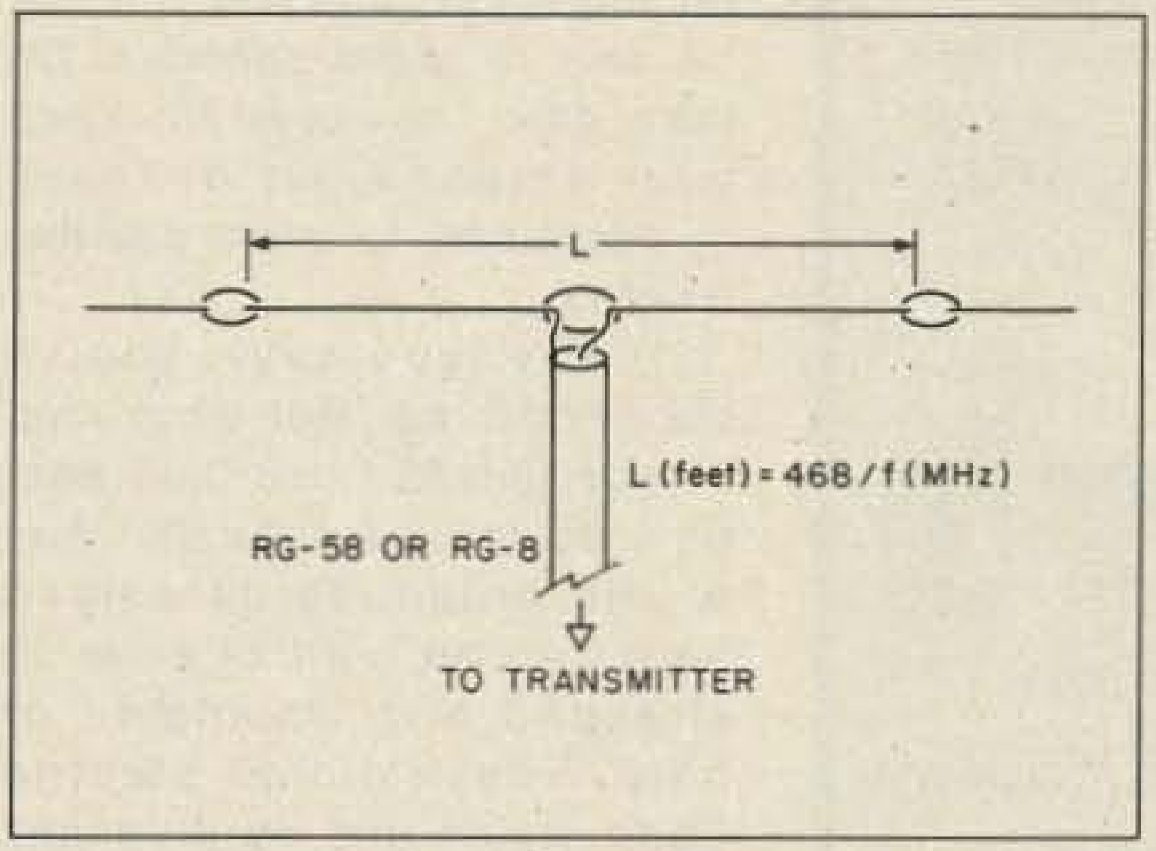
Do you build your own antennas? Or are you like the ham I recently overheard on one of the local repeaters who said that the only antenna he had ever erected was the rubber duck on his HT? If that could have been you, let me assure you that it is easy to build simple, yet efficient, wire antennas and have fun doing it. Besides that, you'll save money—and who doesn't want to do that?

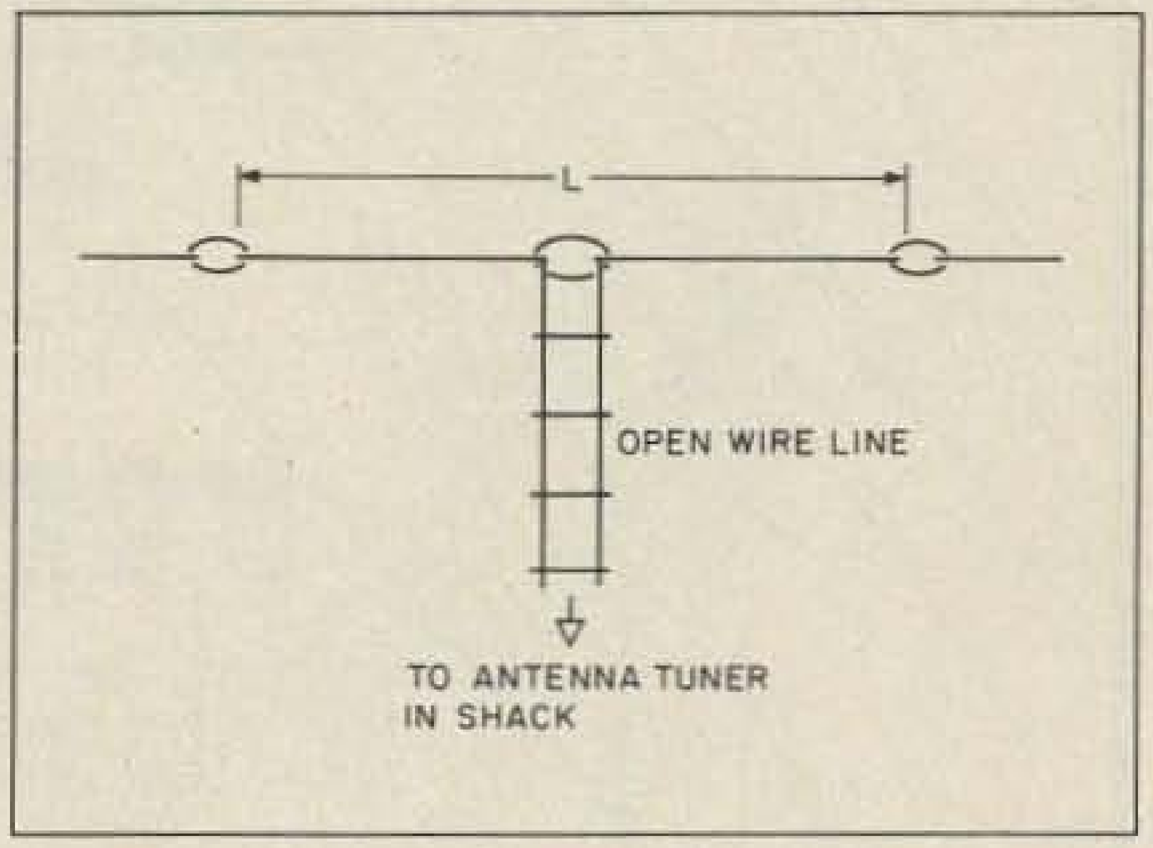
What appears to be number one in the simplicity department is the endfed wire (Fig. 1). After all, what could be more simple than attaching one end to the output jack of your transmitter and securing the opposite end to the top of the highest object available? That sounds great in theory, and they can work well in practice, but there are some problems that can arise with random length endfed wires.

Problems? What sort of problems? First of all, the impedance your transmitter "sees" will vary with the length of the wire. If the wire is 1/4-wavelength or a multiple thereof, in length it will have a low impedance at the transmitter, perhaps close enough to 50 Ohms to make your transmitter "happy."

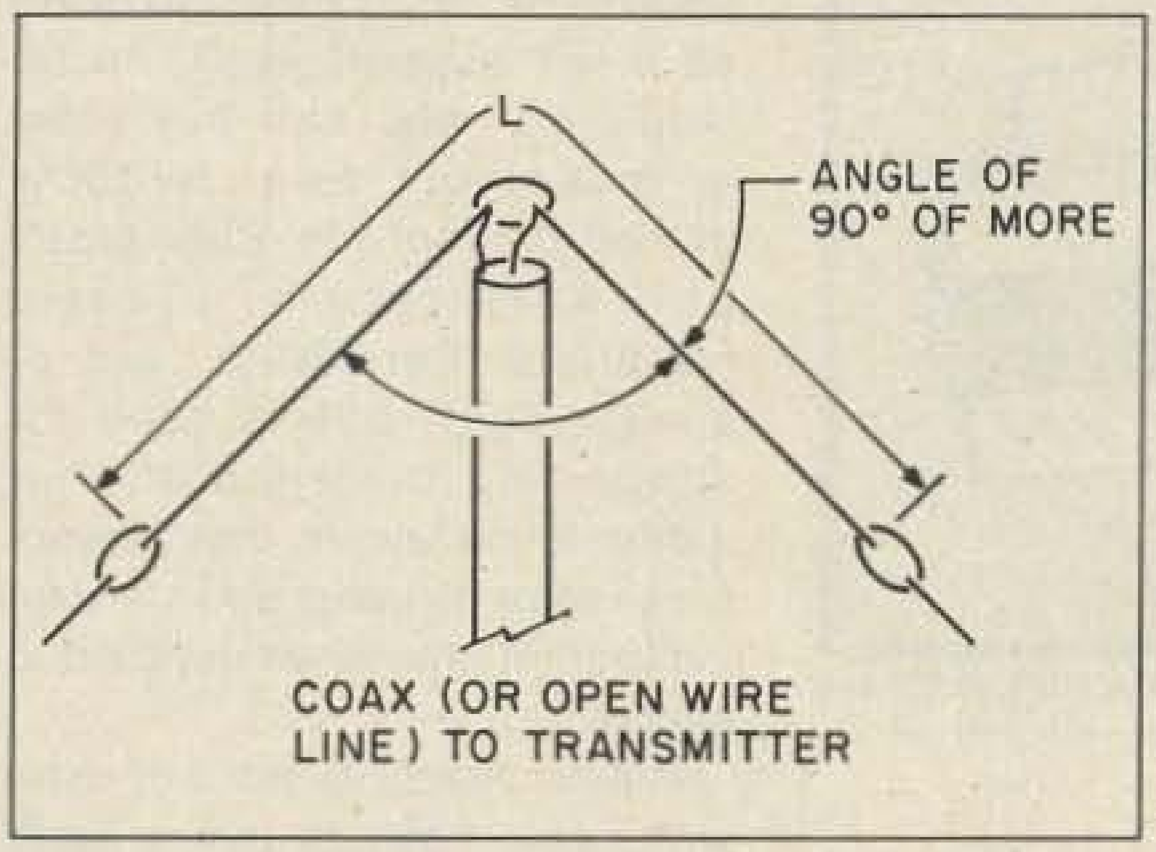
The odds are, however, that you will need some sort of matching device if your transmitter is going to put out full power (many modern transceivers reduce power output in the face of an swr of greater than 2:1). If the antenna is 1/2-wavelength long or some multiple of that length, it will present a high impedance at the transmitter and you will definitely need an external matching device.



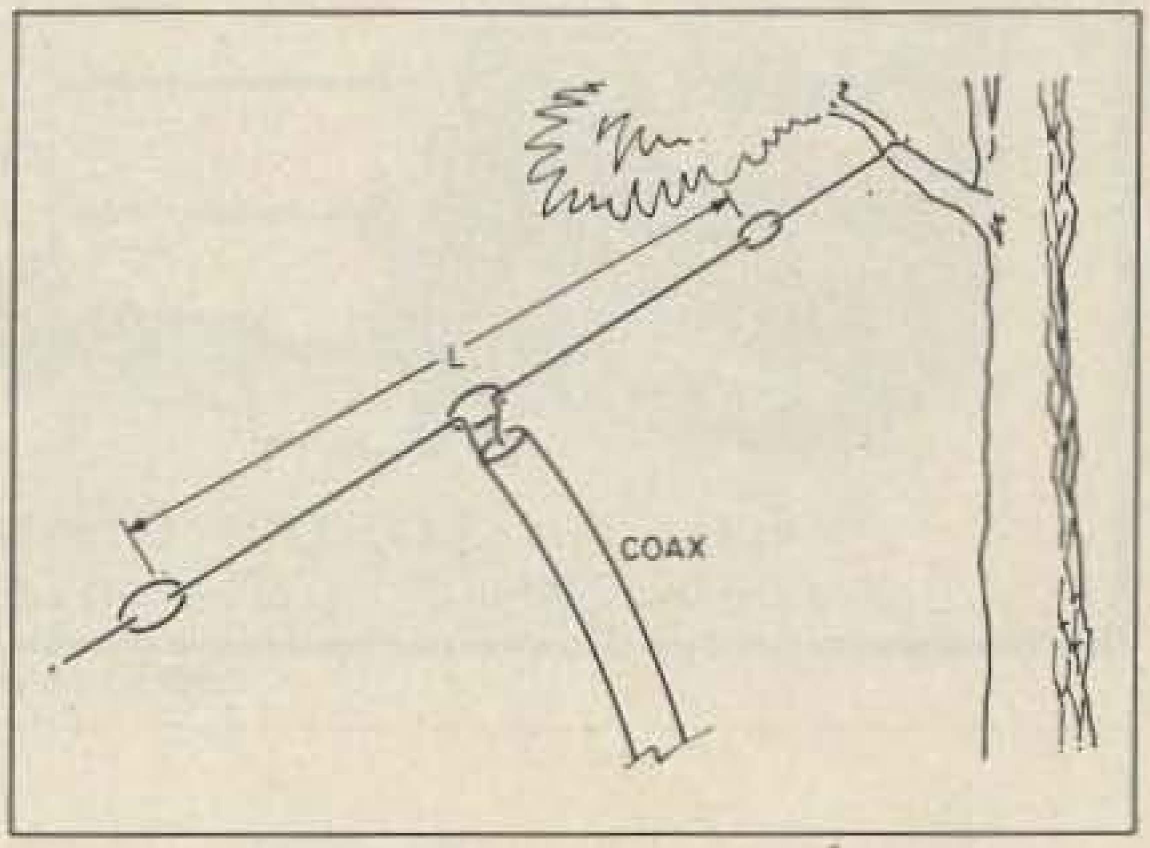
(a) A coax-fed dipole. RG-58 is suitable for moderate runs at the lower frequencies. Use RG-8 for long transmission lines, especially at 10 meters.



(b) Dipole fed with open-wire line. An antenna tuner is needed between this transmission line and the transmitter.



(c) Inverted vee. The length at resonance will be approximately 468/f, but will vary with the angle of the vee.



(d)Sloper. As with all of these antennas, try to bring the feedline off at right angles from the antenna.

Fig. 2. A variety of dipole antennas.

Another problem that can arise with the endfed wire is "rf in the shack." You'll know that you have this problem when your rig begins operating erratically and you get zapped if you come into contact with your equipment when the transmitter is keyed. (Talk too close to the mike and you'll get it in the lips.) Proper grounding can cure this problem, but you also can avoid it entirely by using an antenna with low impedance feed, such as a centerfed dipole.

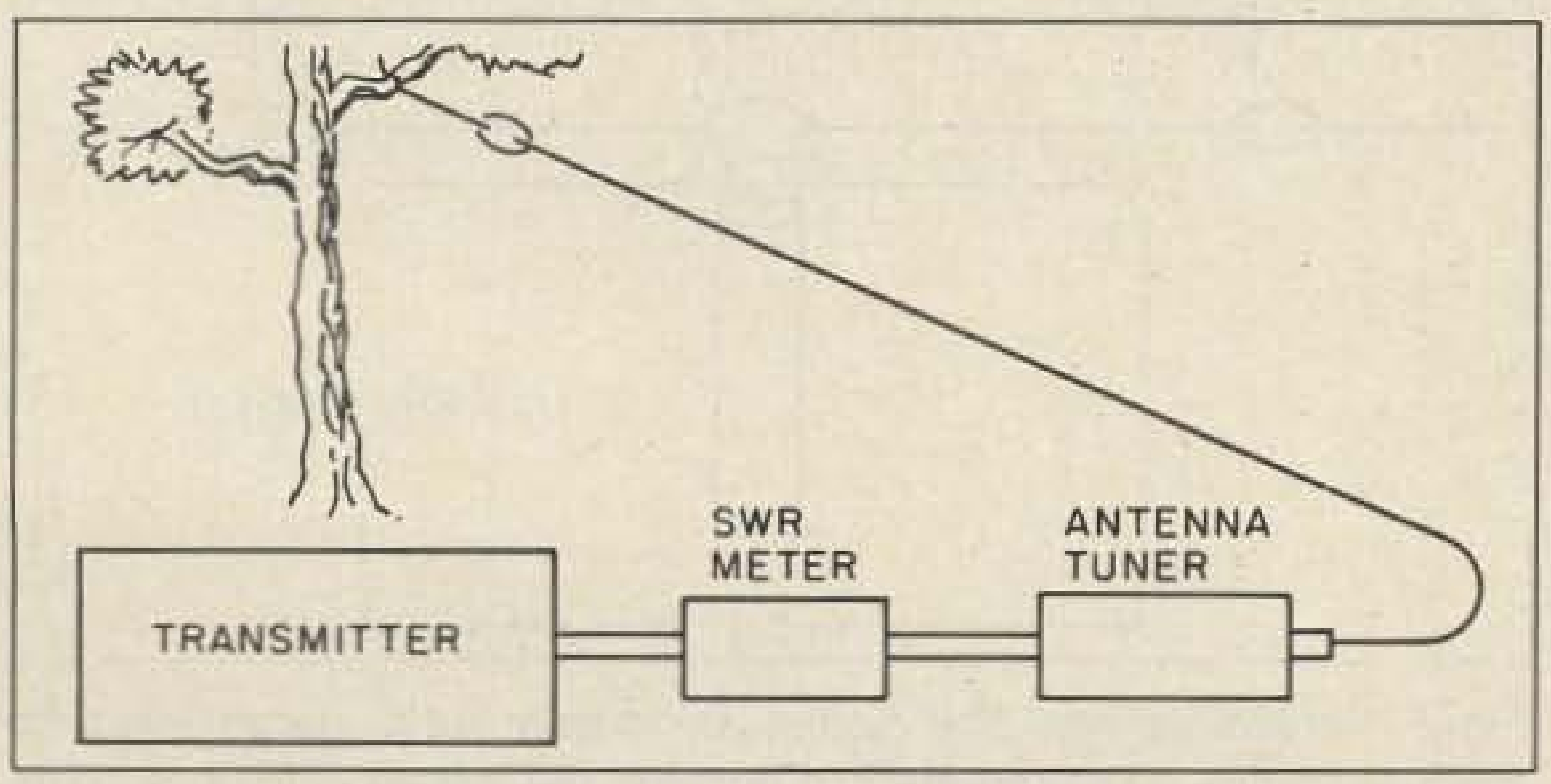


Fig. 1. Endfed wire with swr meter and antenna tuner installed for matching purposes.

When it comes to combining performance and simplicity, it's hard to beat the 1/2-wavelength centerfed dipole. You can feed it directly with coax, if you're interested in operating on a single band, or use open-wire line and a tuner to put the antenna to use on a number of bands (Figs. 2.(a) and 2.(b)). The dipole can be supported from its ends, from its center, thereby forming an inverted vee (Fig. 2 c), or from one end, producing a sloper—Fig. 2.(d). You probably learned that the impedance of a resonant half-wave dipole is 70 Ohms and that the antenna does not radiate off its ends, but when mounted relatively close to the ground the radiation pattern assumes a more omnidirectional shape, and the impedance is typically in the vicinty of 50 Ohms. The latter fact allows us to feed the dipole with common RG-58 or RG-8 coax. A 1:1 balun may be inserted at the antenna feedpoint in this case if you so desire, but you can obtain equal and perhaps superior results without a balun.

A third simple wire antenna is the full-wave loop (Fig. 3). It may be erected in the shape of a square, rectangle, or triangle. Due to space limitations, this antenna is more commonly used on 7 MHz and higher frequencies, where the size of the loop becomes more manageable. To match the impedance of the resonant loop to that of RG-58 or RG-8 coax, it is necessay to insert a 1/4-wave transformer formed from 75-Ohm coax (RG-59, for example); see Fig. 3. At right angles to the loop this antenna theoretically has a gain of about 2 dB over a dipole, but if mounted close to the ground (in terms of wavelength) I doubt that the full 2 dB will be realized.

Perhaps you would like to put up a dipole on 80 but, living on a small city lot, feel there isn't sufficient room. Well, there are ways around that. If necessary, you can bend the ends of the dipole to conform to the available space. Another solution is to use a shorter antenna. After all, a dipole does not necessarily have to be 1/2-wavelength long. The efficiency of, say, a 75-foot dipole on 80 meters will be only slightly less than that of a full-sized antenna. To use such an antenna, however, you will need to feed it with open-wire

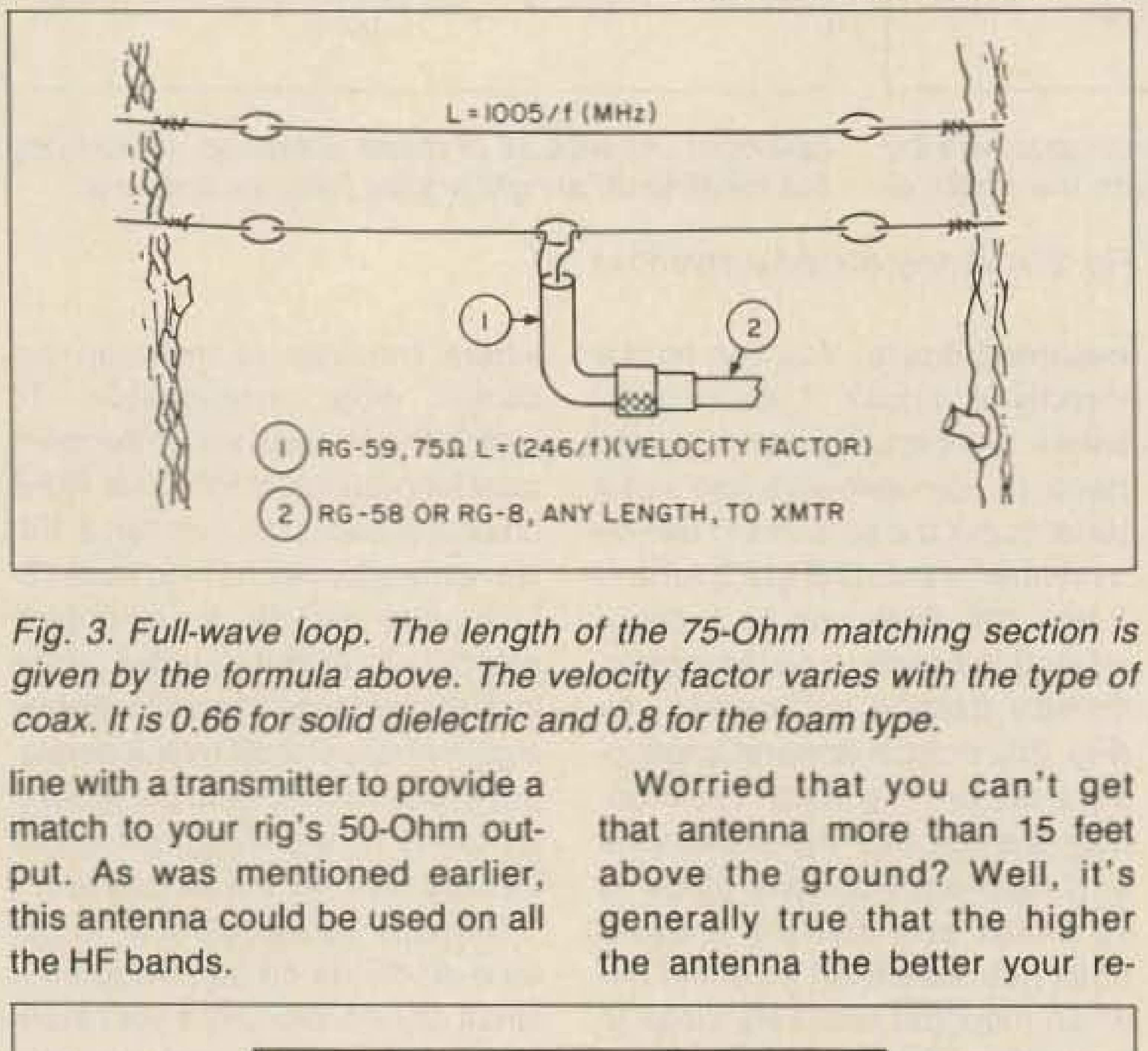


Fig. 3. Full-wave loop. The length of the 75-Ohm matching section is given by the formula above. The velocity factor varies with the type of coax. It is 0.66 for solid dielectric and 0.8 for the foam type.

line with a transmitter to provide a match to your rig's 50-Ohm output. As was mentioned earlier, this antenna could be used on all the HF bands.

Worried that you can't get that antenna more than 15 feet above the ground? Well, it's generally true that the higher the antenna the better your results will be, but that doesn't mean that an antenna in close proximity to the ground won't work at all. You may not be the strongest signal on the band, but you will still be able to make contacts. Do take care, however, to keep your antenna out of reach of passers-by to avoid possible rf burns.

"Okay [you say], you've convinced me. But what kind of wire should I use, and what do I do for insulators?" Any of the antennas described here can be built of solid or stranded wire, insulated or bare. The National Electric Code states that all antennas should be constructed of at least No. 14 wire, but it is fair to say that most hams use whatever is handy, so long as it will support itself. As for insulators, you can buy them or make your own. Suitable materials include Plexiglas™ and a variety of plastic materials. Parachute cord or similar light rope is good for supporting the ends of your antenna: be aware that plastic-type ropes disintegrate in a relatively short time when exposed to sunlight.

When feeding an antenna with coax, I like to use a small piece of Plexiglas as a center insulator, with a female coax connector (SO-239) mounted right on the Plexiglas (fig. 4). This makes it a simple matter to connect your feedline or to remove it later, if necessary. Be sure to waterproof the connection with Coax-Seal or a similar product to keep water from invading the line and ruining the coax.

If you want to use open-wire feedline, you will probably have to construct your own, but that is not a difficult task. Once again, small strips of Plexiglas are suitable for insulators. You can also use things like hair curlers, or other household items that are nonconductors. Their length is not critical, but try to keep the spacing of the wires relatively constant (3 to 6 inches). Try to keep this line at least 6 inches away from other wires or surfaces. It can be somewhat awkward to bring such a line into the shack. One way to do so is to secure the end of the line near the shack, and run a short length of 300-Ohm twinlead between your tuner and the main transmission line. This will probably result in an swr "bump" on the transmission line, but since the line is a low loss type this should create no problems. Any reflected power will be re-reflected by the antenna tuner, travel back up the transmission line, and be radiated by the antenna.

As I mentioned earlier, a dipole fed with open-wire line may be used on several bands with the aid of a tuner. If you want to avoid the hassle of open-wire line and an antenna tuner, but want to operate on more than one band, there are a couple of options available to you. One is to make separate dipoles with separate transmission lines for each band. Or you can use one coax feedline with the dipoles connected in parallel (Fig. 5). Using the latter method will probably result in a narrower bandwidth between 2:1 swr points, but it will allow you to get on two or more bands with a single coax feedline.

So there you have some simple wire antennas that are not difficult to build, and provide good performance. Why not give one a try? ■

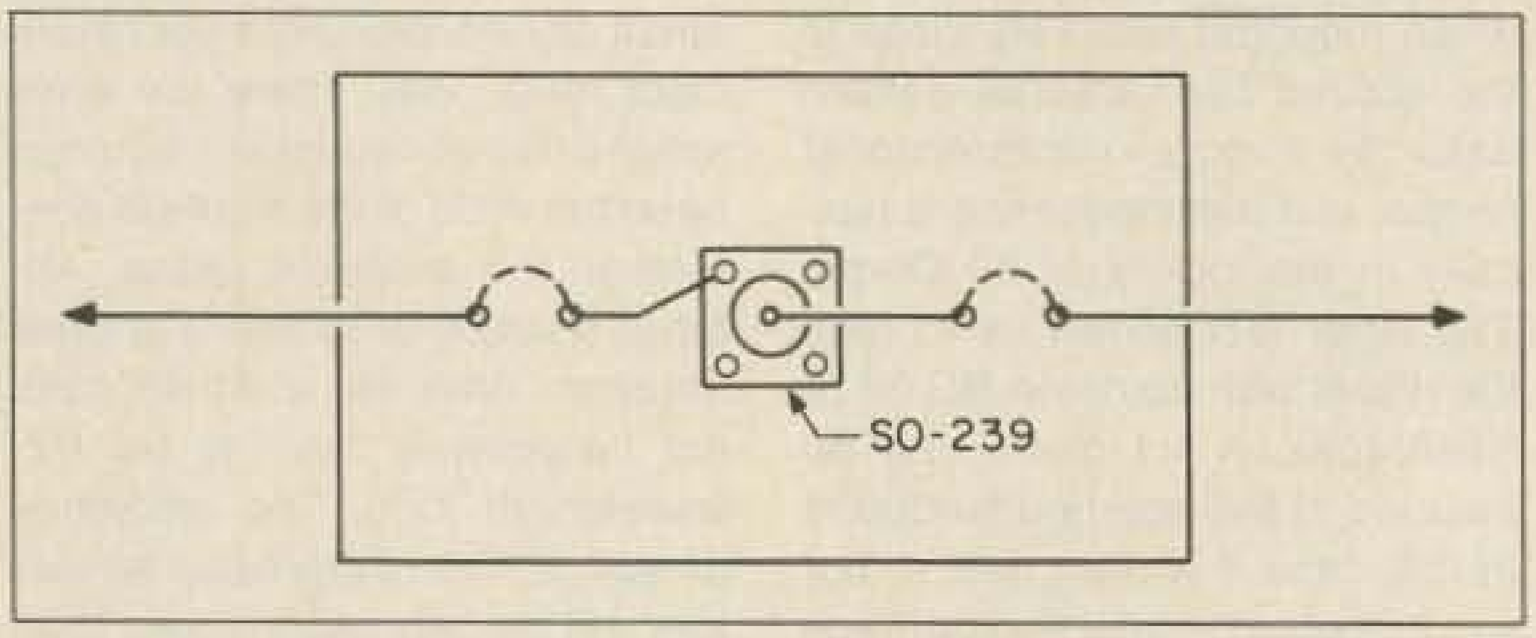


Fig. 4. Center insulator for dipole constructed from Plexiglastm sheet and female coax connector. The antenna wires are woven through holes in the Plexiglas to relieve strain on the SO-239 connections.

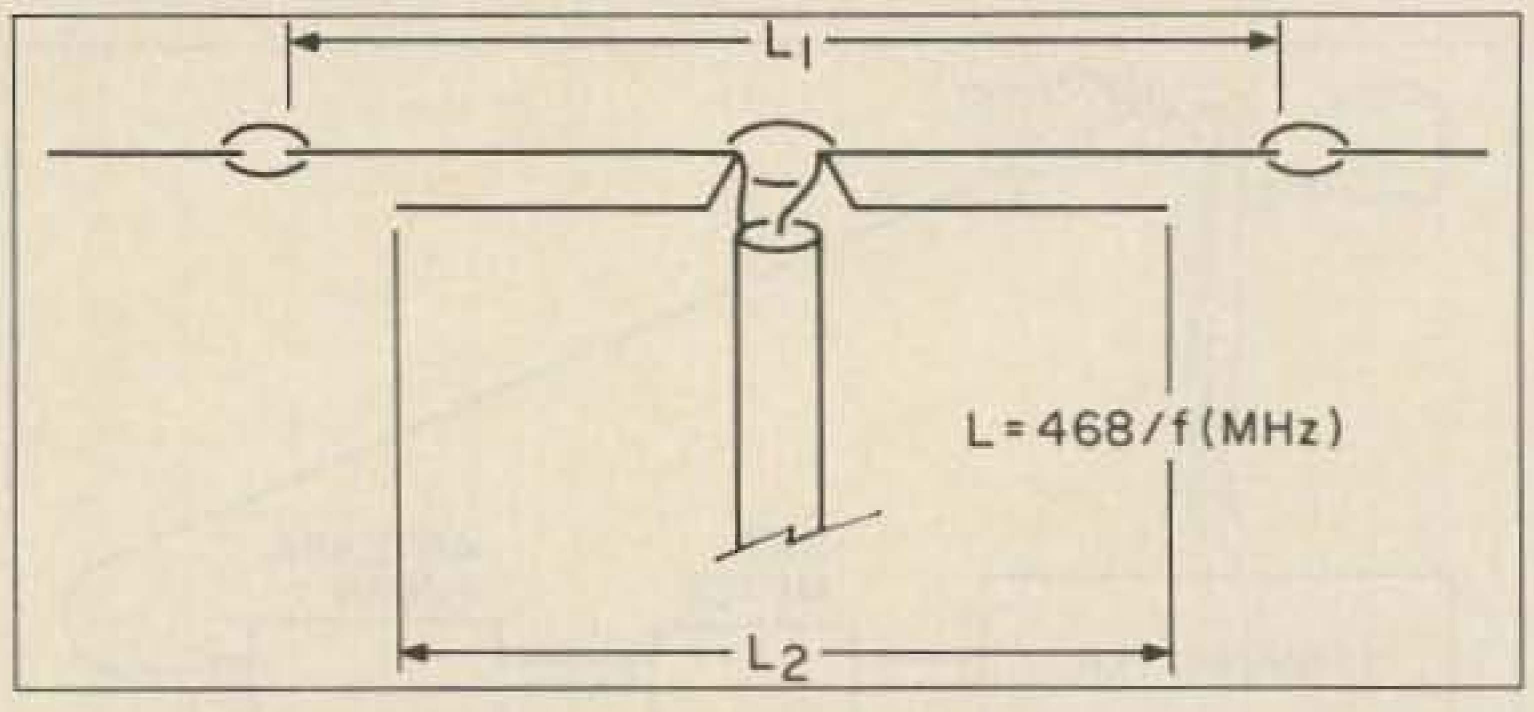


Fig. 5. Parallel dipoles. The dipoles are initially cut to length using the formula shown, then trimmed to achieve resonance. There is some interaction between the two dipoles, so recheck the resonance points after trimming the second dipole.