It's easy, it's simple, and most important, it works. VE3ERP once again comes through with another project that can help us get on the air more quickly so we can have more fun.

The End-Fed Random-Wire Antenna

BY GEORGE MURPHY*, VE3ERP

How about this antenna? We already know the positives. What about the negatives and all the things we won't need anymore? The following is a list of the things we won't need anymore:

- NO minimum length (fits almost any available space)
- NO measuring
- NO pruning
- NO traps
- NO baluns
- NO hardware
- NO soldering
- NO feedline connectors
- NO feedline
- NO high SWR (always 1:1)
- NO cost, if you have some wire and a couple of insulators
- Can be strung straight, dog-legged, U–shaped, whatever . . .

It sounds too good to be true. But is it true? Yes.

Why is the end-fed random-wire antenna not more widely used? It is a matter of shrift. Traditionally, writers of amateur radio literature have always made short shrift of this antenna. I intend to make longer shrift of it by raising public awareness of its excellent properties.

A Story Goes With It

Over nearly 40 years I have operated from many QTHs. In every case, the first antenna I put up immediately upon arrival was an end-fed random wire. It only took a few minutes, and I was on the air almost as soon as the tubes in my QRP rig had warmed up.

Usually I eventually got around to installing a more exotic antenna, but I *always* left the random wire in place. Since there was nothing in it to go wrong, it made a good reference standard for evaluating any subsequent fancy-shmantzy antenna in which everything could (and frequently did) go wrong. Besides, an end-fed random wire often makes a better omni-directional receiving antenna than anything else on the antenna farm.

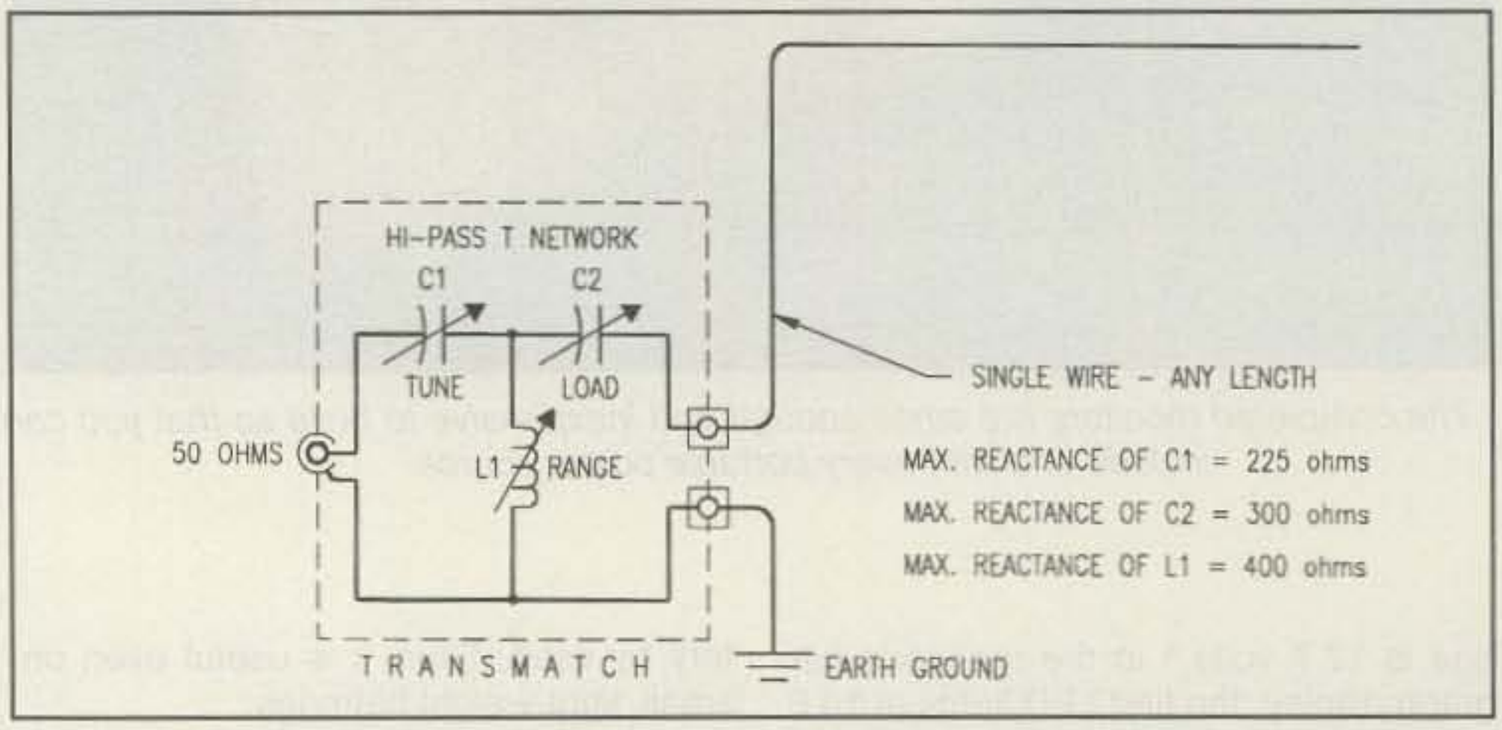

Fig. 1– The end-fed random-wire antenna is shown with a simple transmatch.

What Are Its Shortcomings?

Hardly any. A transmatch is an absolute necessity. However, a transmatch should be used with *any* antenna. Why else would most current high-end commercial rigs have them built in, even though they are sometimes called the misnomer "antenna tuner"? Anyone who thinks the impedance at the input end of their feedline is a perfect match to the output impedance of their rig is living in la–la land.

The input impedance of a random wire antenna may range anywhere from 10 ohms to 2000 ohms. By its very nature, an end-fed single-wire antenna produces RF in the shack, since it starts radiating right at the transmatch. It is always a good idea to route the antenna wire away from RF-sensitive devices, but there should be no problem if all equipment in the shack is properly grounded and the transmatch is adjusted for 1:1 SWR. If possible, the ground terminal of the transmatch should go directly to a ground rod, but metal cold-water piping also works. Even if there are some plastic sections, there may be enough length of continuous metal to provide a usable counterpoise. In a high-rise hotel room if you can't get at the piping, a bed spring can provide an artificial ground, just as a car body does for a mobile whip. It's not great, but it's better than nothing.

How Efficient Is It?

A short random-wire antenna run along the ceiling in a basement apartment without a proper ground at the transmatch works better than a mobile antenna when the car is in a garage.

A random-wire antenna 1/4 wavelength or longer located 1/4 wavelength or more above ground level with a serious ground rod at the transmatch will work as well as or better than many dipoles, Zepps, and Windoms.

The most important fact about an end-fed random wire is that it always works. How well depends on how you follow these rules:

1. Outdoors is better than indoors.
2. High in the air is better than close to the ground.
3. Long is better than short.

*77 McKenzie Street, Orillia, ON L3V 6A6 Canada
e-mail: <ve3erp@encode.com>

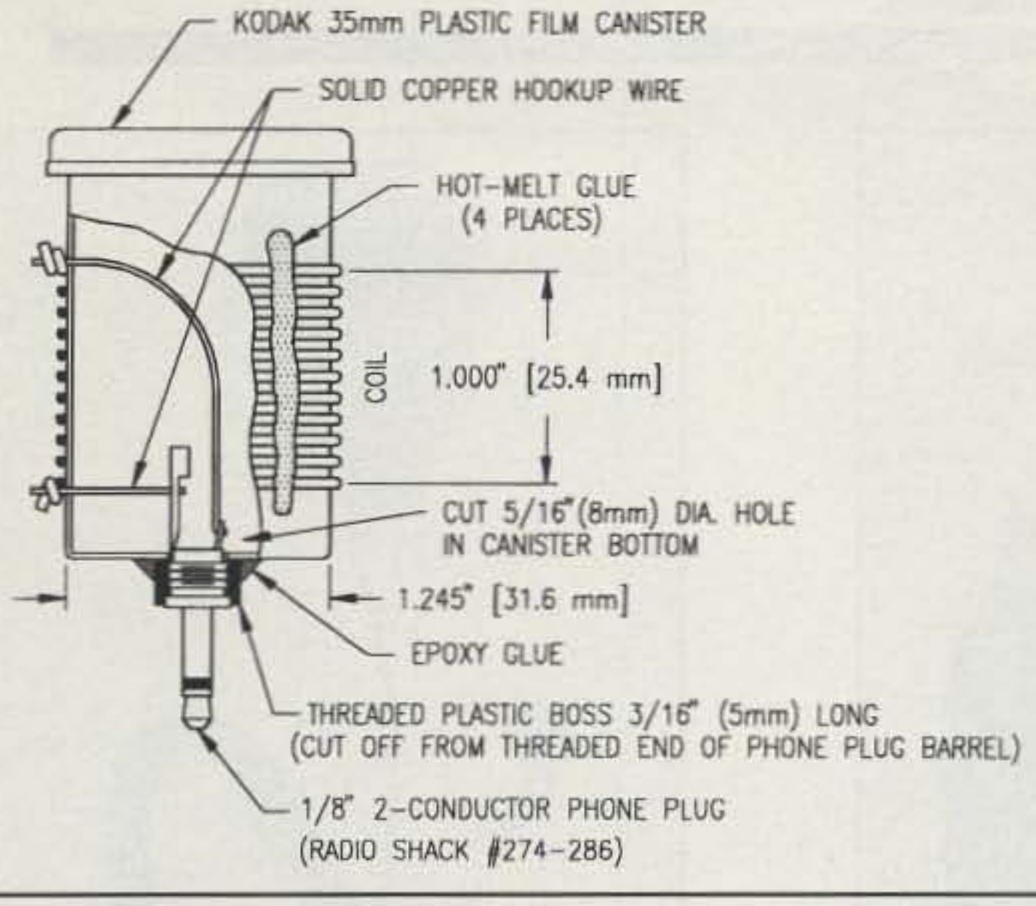

Fig. 2– A typical plug-in coil for QRP use.

APPROXIMATE LENGTH OF A 1/4 WAVELENGTH WIRE		BAND (m.)	QRP COIL DATA — ALL COILS #30 ENAMELLED COPPER WIRE WOUND ON 1.254" (31.6mm) Dia. FORM					CAPACITOR APPROXIMATE MAX. VALUES (pF)	
metres	feet		FREQ (MHz)	COIL uH	NO. TURNS	LENGTH inches	LENGTH mm	C1	C2
39.6	130.0	160	1.800	32.8	36	1.00	25.4	393	295
20.4	66.9	80	3.500	18.5	27			203	152
10.2	33.4	40	7.000	9.1	19			102	76
7.1	23.2	30	10.100	6.5	16			71	53
5.1	16.7	20	14.000	4.3	13			51	38
3.9	12.9	17	18.068	3.7	12			40	30
3.4	11.1	15	21.000	3.1	11			34	26
2.9	9.4	12	24.890	2.5	10			30	22
2.6	8.4	10	28.000	2.1	9			26	19

Fig. 3– A chart of QRP coil data so that you can wind your own. As you can see from fig. 2, it's a good thing you saved all those film canisters. They do come in handy.

4. The better the ground connection, the better the signal.

How Do You Work It?

You can use a commercial transmatch or build your own. In either case, hook up everything as shown in fig. 1. If you are using an in-line SWR bridge, install it between the rig and the transmatch.

Fig. 1 shows it all. C1 and C2 are variable capacitors. L1 is a variable inductor — a roller inductor if you are rich, a tapped coil and selector switch if you are not, or individual plug-in coils if you are, like me, too cheap to buy a switch. Tune the receiver to a signal close to your chosen operating frequency. Adjust L1 (or plug in the appropriate coil) for maximum signal strength. Tweak C1 and C2 to peak the signal.

To check the transmitted signal some sort of RF meter is required. If your transmitter has a meter that indicates SWR, RF output, or both, then you are in business. With my QRP rig (which is devoid of all unnecessary fripperies) I use an inexpensive field-strength/SWR meter (Radio Shack No. #21–523) which requires no connection to anything; it just sits somewhere in the shack and sniffs RF with its tiny antenna.

Tune up your transmitter into a dummy load. In CW mode put a carrier on the air for a few seconds and tweak C1 and C2 for maximum output and/or minimum SWR as shown on your meter. That's it. You are all set to work the world on a hank of wire.

Homebrewing A Random Wire Antenna System

All you need is a hank of wire, a couple of fleamarket air-spaced variable capacitors, a miniature 1/8 inch phone jack, and the wherewithal to construct a few plug-in coils[1] as shown in figs. 1, 2, and 3.[2] Solder the hookup wire leads to the phone plug before mounting it in the canister. When soldering the coil ends to the hookup wire leads, be quick and very careful, as the plastic canister melts easily!

If you want to design a single multi-band tapped coil and you have a computer, you can do it using *HAMCALC*[3] software programs "Single Wire Antenna Systems" and "Coil Equation Calculator" (these programs were used to compile fig.3).

Please note that neither side of either capacitor is connected to ground, so the capacitors need to be insulated from any metal chassis or enclosure.

In Conclusion . . .

If you are a new, inexperienced ham who knows nothing about antennas, or an old, experienced ham who knows everything about antennas, try an end-fed random-wire antenna. It just may surprise you.

Footnotes

1. You don't have to build *all* the coils shown in fig. 3. Build one at a time and see what it will do. Any one of the coils may cover more than one band, depending on the capacitors you have. Experiment! That's what ham radio is all about!

2. The coils shown in figs. 2 and 3 will handle the output of most QRP rigs. For higher power rigs, you may want to use a heavier duty tapped coil and selector switch.

3. *HAMCALC* is *free* software containing more than 200 programs of interest to amateur radio operators. It is written in GWBASIC in order to cram as many programs as possible onto a 3 1/2 inch 1.44 Mb floppy disc. It will run in either MS-DOS or Windows computers, as long as the computer has a GWBASIC.EXE file installed in its root directory. For a free *HAMCALC* diskette, send US $5.00 (US $6.00 if you also want a GWBASIC.EXE diskette) to the author at the address shown at the beginning of this article.