The Ultra-Simple 20

The simplest solution to any problem is the best …

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And they don't come much simpler than this 20-meter band transmitting antenna. It has been used, off and on, for 20 meter CW activities over the last 30 years—or more, starting at a time when occupational activities necessitated quite frequent moves of QTH. One of those moves meant being located in Minnesota for several years, in the 1970s.

The antenna can be used indoors or in a very restricted space outdoors. It can also be put up in a hotel room, used portable, on vacation, or as an extra "occasional" antenna. The design is low cost—the antenna needs a bare minimum of parts: just some wire, some fishing line and a good variable capacitor.

Simplicity itself

The base impedance of a λ/4 vertical antenna wire is usually between 20 and 30 ohms, depending on the grounding system—not 50 ohms, as is often assumed. For 50 ohms it will require some kind of matching device. However, if the antenna is lengthened to λ/3, then the impedance will have increased to 75 ohms, which is a common feedline impedance. But, as the length and impedance have increased, so has the inductive reactance, which will have to be reduced with a series capacitor.

As the antenna was designed for 20 meter CW operation, it was initially cut so that it happily covered from 14,000 kHz to well over 14,100 kHz. The output impedance of the transmitters that have been used with this antenna was 75 ohms. The usual transmit power has been up to about 10 to 25 watts, though 100 watts *was* used in Minnesota in the 1970s.

The simple design is shown in **Fig. 1**. It consists of 23 feet of wire, supported by nylon fishing line, which also acts as end insulation. A series variable capacitor (VC) is used to tune out the reactance. The variable used was a 60 pF, though 100 pF could be used. This variable should be a good-quality small transmitting type, though a wide-spaced, well-insulated, receiving type could be used up to about 20 watts. As it is at a high voltage point, it should be enclosed in a small plastic

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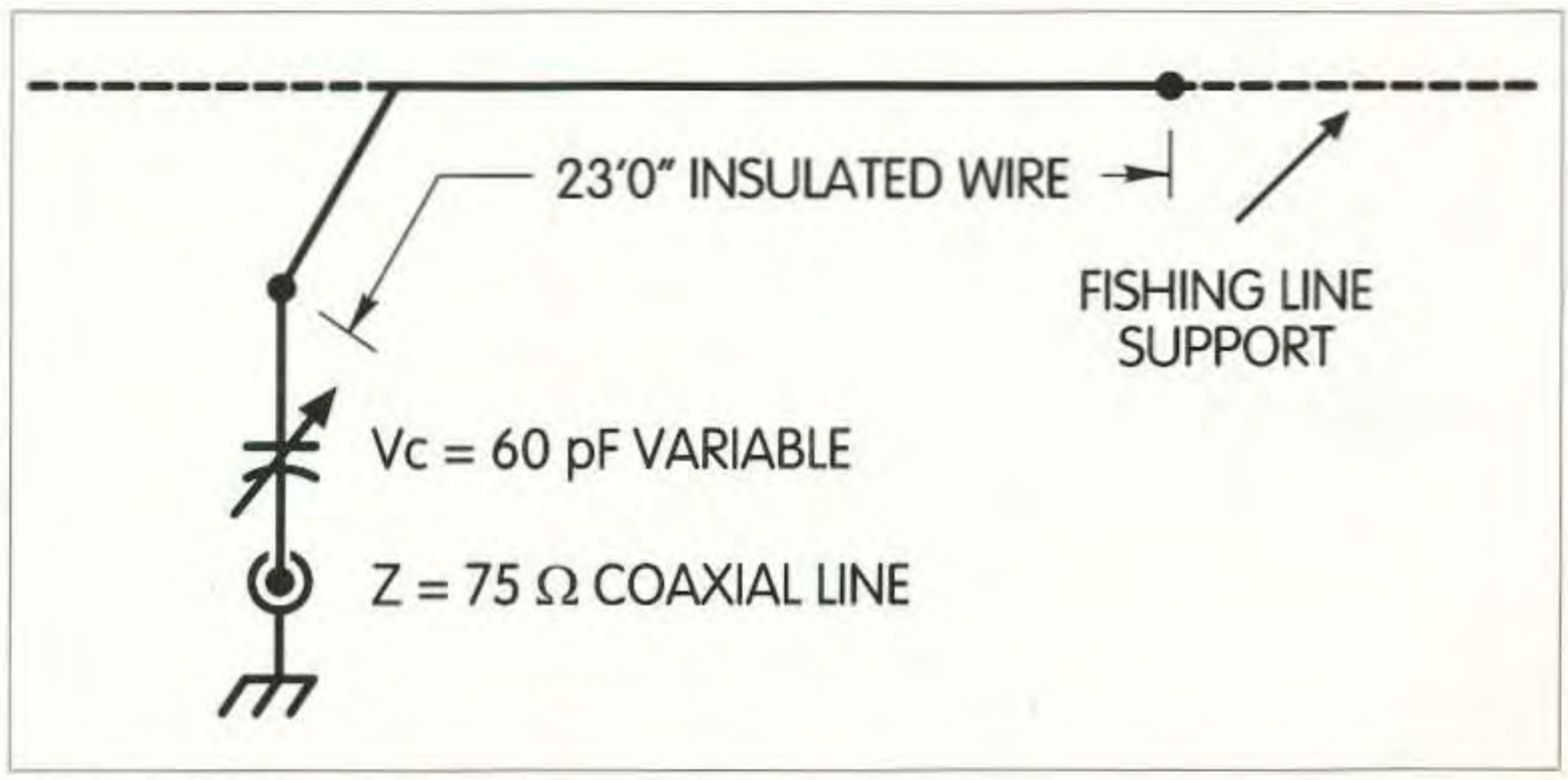

Fig. 1. *20-meter antenna.*

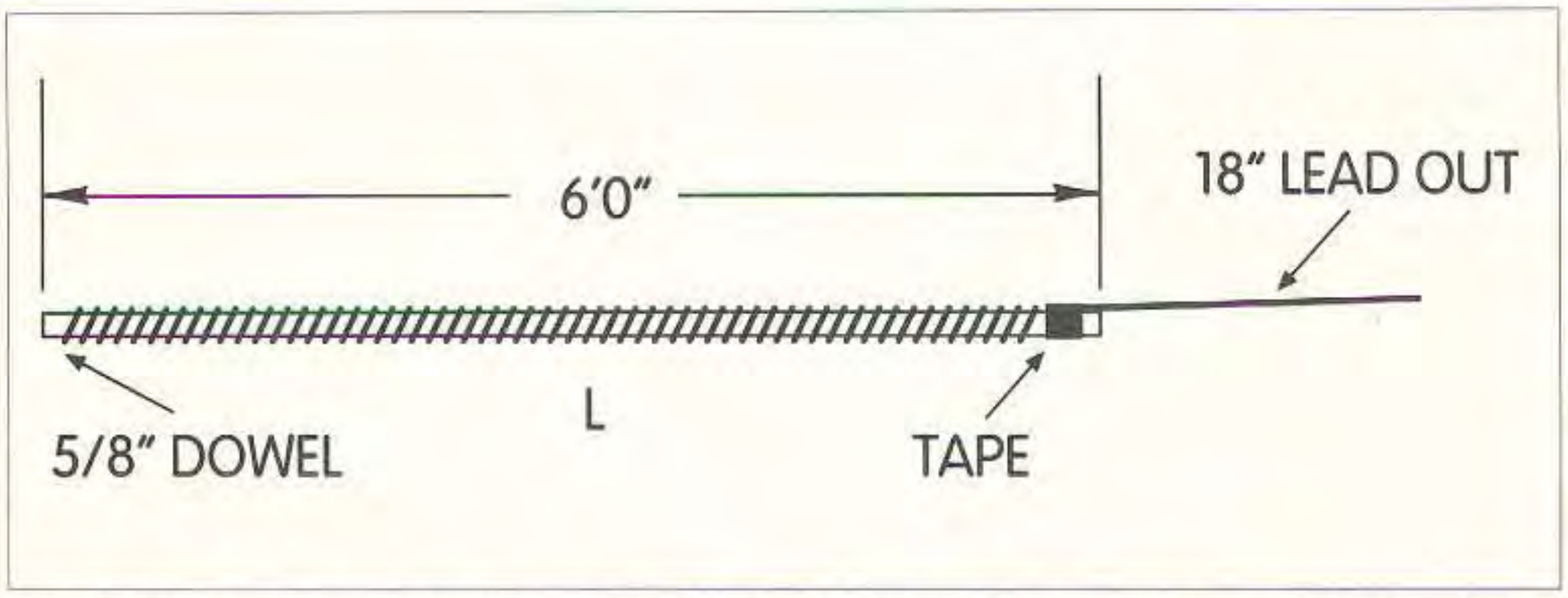

Fig. 2. Optional "artificial" ground. Wire windings are half an inch apart on the dowel.

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box, for safety and dust protection, and fitted with a short insulated shaft.

A good ground is essential, and the ground lead should be as short as possible. Using, say, a 12-foot length of wire to a water pipe could introduce all kinds of problems, as it would be over λ/8 long at 14 MHz!

Quick and slick

In the typical installation shown in **Fig. 1**, the antenna length of 23 feet represents λ/3 at 14,030 kHz. This frequency was selected from experience, on the basis that though the electrical length might change somewhat (if the antenna was bent somewhat or erected horizontally or sloping), it could still be used in the CW spectrum, 14,000–14,100 kHz or more. Past experience shows that this has held good, in various installations, in various places.

Fig. 1 is an in-room layout, with the antenna running diagonally across the room. The far end is supported by monofilament fishing line. The other end drops down for (typically) four feet, to the variable capacitor (VC) and transmitter. The angle of the bend should be much more than 90°, and supported with fishing line, as shown. A 90° bend should be avoided.

The transmitter end of the antenna goes to a good-quality variable capacitor, which should be mounted in a plastic box. An insulated shaft, with coupler, should be between VC and control knob.

The coaxial socket is also mounted in this box, and the outer conductor should be connected to a good ground, with a short lead (more on this later).

The suggested antenna wire is 20-gauge stranded PVC-covered. If the antenna is erected outdoors, this wire should be examined every few months, as extremes of temperature may cause the PVC covering to deteriorate. Also, strong braided fishing line should be used to combat winds and storms.

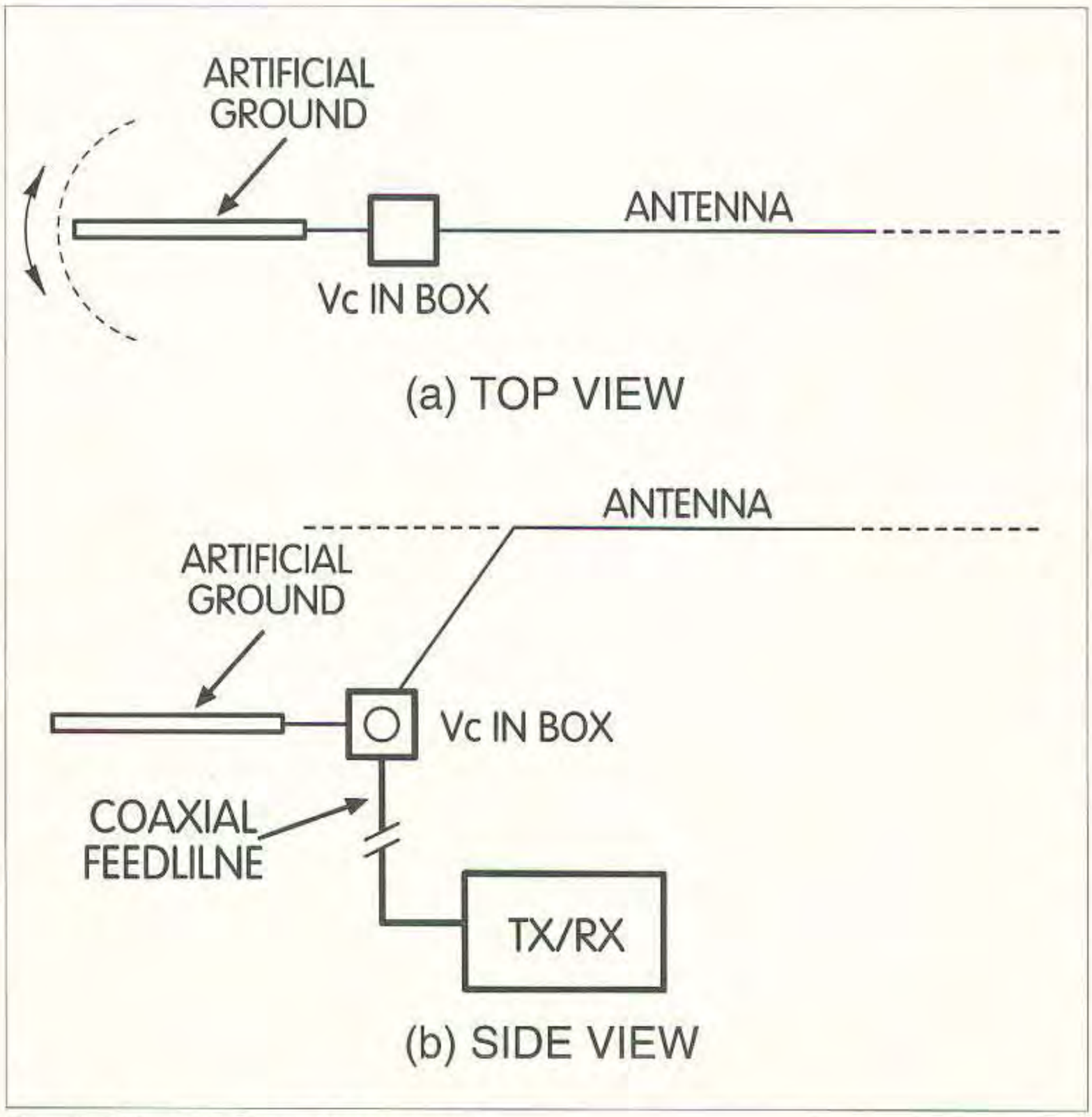

Fig. 3. Orientation of artificial ground.

Grounding alternatives

The ground connection lead should be as short as possible, and certainly not exceeding four or five feet. It can be taken to a convenient *metal* water pipe, if this exists. But make certain that the pipe is at ground potential!

An alternative ground used has been a λ/4-wave wire dropped out of a window, when required, with VC (in box) mounted just inside the bottom edge of the window frame.

Another successful ground was a metal frame window about 16 feet wide. The VC box was mounted on the wall, near a top corner of the window frame, and a six-inch lead clipped to the metal frame. The coaxial feedline dropped down to the transmitter, which was located directly below on a table. The antenna ran diagonally across the room. The same setup also worked well with an antenna outdoors in a very confined space.

You can see that the grounding technique used will depend on the prevailing circumstances, and may

require some individual initiative and experimentation.

An "artificial" ground

A popular "artificial ground" is shown in **Fig. 2**. It consists of 36 feet of 20-gauge stranded PVC-covered wire, wound on a 5/8-inch diameter wood dowel, or plastic tube. The wire turns should be spaced half an inch apart. The wire is extended by a further 18 inches to form a connecting lead.

The artificial ground has been particularly successful, and used at several QTHs. With a little practice it is easy to set up.

Fig. 3b shows this "ground" erected behind, and in line with, the antenna. Indoors, it should be mounted well clear of walls (hidden house wiring and pipes) and at least 30 inches above floor level. Top view (**Fig. 3a**) shows it in line with the antenna. However, it can be oriented up to 90° either way, to obtain the best loading, and to neutralize the effects of surrounding objects—hidden or otherwise.

It's a personal choice

I personally consider this antenna to be a low-power device, using up to 25 watts. No doubt it could be upgraded by individual operators using a more robust higher-voltage variable capacitor (VC) and ceramic insulators to replace the fishing line technique. However, with 15 watts low power CW, it has been found to be quite adequate. It has not been used higher up the band with SSB, and possibly this would mean a small amount of antenna length pruning. The antenna should be connected to the rig with 75-ohm coaxial feedline via a low-pass filter.

First, tune the receiver to 14,030 kHz and rotate VC for maximum signal. Recheck at 14,000 and 14,100 kHz—the VC should not need retuning.

Again, at 14,030 kHz, feed low transmit power into the antenna, and slightly rotate VC (if required) for maximum radiated signal on a nearby field strength meter. A check should be made that harmonic radiation is not occurring. Readjust VC to eliminate if needed. Recheck again at 14,000 and 14,100 kHz, and gradually move up the band to find the maximum usable frequency. If a portable TV is available, then place it under, or near, the antenna, as a simple practical TVI check.

If TVI should occur, (1) check and experiment with the ground system and (2) ensure that the antenna is clear of house wiring, which may be hidden. On one occasion when used with a 50-ohm transmitter, an existing "T" ATU was inserted into the coaxial line, as a simple quick means of matching the 50-ohm transmitter to the 75-ohm antenna. This also proved to be a most effective eliminator of TVI.

The basic concept is very simple. No doubt individual experimenters can produce variations to suit particular circumstances. Quickly assembled and erected nearly anywhere, the simple design lends itself to very confined space situations—and to almost any ham's needs! 73