

A Simple Nondirectional Antenna for Ten Meters

Vertical End-Fed Half-Wave Radiator for Restricted Space

BY STEWART BECKER,* W7AYB

THERE are several reasons why a ham whose chief interest lies in the ten-meter band may not want to or cannot put up a rotatable beam. Such an antenna is expensive, it requires a sturdy support, many consider it an eyesore, it is difficult to adjust for maximum performance, it must be rotated to cover all directions and it makes a relatively poor antenna for ground-wave work when the band is "dead." On the other hand, a vertical antenna may not have the gain in a favored direction, but it is simple and inexpensive. It can be mounted on a light structure and does not have to be rotated to cover all directions. It is easy to adjust and furthermore it is a good antenna for ground-wave work.

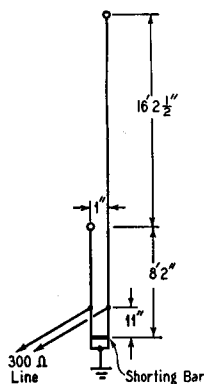


Fig. 1 — Dimensions for the 10-meter "J" antenna. The connecting point shown for the transmission line is suitable for a 300-ohm line.

The one complication that arises in the construction of a vertical dipole for 28 Mc. is that the transmission line from the center should be horizontal for at least one quarter wavelength in order not to interfere seriously with the radiation pattern. A quarter wavelength at 28 Mc. is about 8 feet, and a horizontal bar of this length on a vertical antenna is somewhat of a problem. After the one at W7AYB came down once too often, a substitute for the vertical folded dipole was sought.

A vertical "J" seemed like the answer except for the apparent requirement that it be made of aluminum tubing and be self-supporting. In my case, this was out of the question for several reasons. However, I had a lot of antenna wire

around the shack as well as some odds and ends of $\frac{3}{16}$ -inch polystyrene sheet stock. With these as a starter, the antenna shown in the sketch of Fig. 1 was built. Its performance has equaled that of the folded dipole. It has thoroughly demonstrated its worth as an all-around antenna for the ten-meter band, and it has the advantage that it can be connected directly to ground for static and lightning protection. The horizontal boom or lead-in is eliminated and it is one of the neatest-looking antenna structures that I have seen for some time. The antenna itself is practically invisible on the pole and a coat of white paint makes the whole outfit win the approval of the most fastidious XYL (well — almost, anyway!).

The "J" Antenna

The "J" antenna has been so named because it resembles the letter J in shape. In this instance, it consists of a half-wave single-wire vertical element which is fed at the lower end by means of a quarter-wave matching section of two-wire open line. The quarter-wave matching section is short-circuited at the lower end and, since this point is at zero potential with respect to ground, a wire can be run from this point directly to ground. It need not be disconnected when the antenna is being used. Then the transmission line from the transmitter is fed into this quarter-wave section at the proper point for correct impedance matching.

The dimensions given here are suitable for general coverage of the ten-meter band. The single-wire antenna and the two-wire matching section both are made of ordinary stranded antenna wire, although solid No. 12 or 14 would do as well. The system is fed with a 300-ohm ribbon-type transmission line. The antenna is 16 feet 2 1/2 inches long, the two-wire matching section is 8 feet 2 inches long and the 300-ohm line is tapped in 11 inches above the shorting bar at the bottom of the matching section. The spacing between the two wires in the quarter-wave matching section is one inch.

The Mast

Now comes the problem of supporting the antenna in a vertical position. The antenna with its matching stub has a total length of 24 feet 4 1/2 inches and, allowing 4 inches at each end for in-

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sulators and mounting, this gives an over-all length of approximately 25 feet. This is a little long for a single 2 by 4 and the extremely light weight of the antenna does not justify such a heavy support. All that is required is something that will stand up by itself because the antenna adds practically no burden to the support and the transmission line can be brought down along the support so as not to increase the suspended weight. This is one of the big advantages of this type of vertical antenna. If a vertical folded dipole is used, the antenna mast must be strong

enough to support the 8-foot horizontal bar for the transmission line which, in turn, must be strong enough to support the strain (with wind!) of the transmission line hanging from there to the roof of the shack.

After consideration, the best combination seemed to be a 14-foot 2 by 2 at the top, supported by a 20-foot 2 by 4 guyed at the point where the matching stub joins the antenna. Guys at this point or lower have little effect upon the performance, although guys above this point may affect both loading and the radiation pattern. The 2 by 2 should be set in a 2-foot notch in the 2 by 4, as pictured in Fig. 2G. Care should be taken to make a snug fit and then three 4½-inch carriage bolts should be used through the two members to hold them securely together.

This gives a mast 32 feet long and a very simple socket on the roof of the shack is all that is necessary to hold the bottom, because the guy wires do the real work of holding it up. At W7AYB, the 2 by 4 is bolted to the side of a cement-block garage at a corner where the garage joins the house. It has been up for almost a year without giving trouble, but bolting it to a brick or cement-block wall should be avoided, unless it can be done near a corner. A couple of coats of white paint after joining the two uprights will finish the mast.

Antenna Construction

The rest is easy. From the polystyrene sheet or other insulating material, cut up six single-wire insulators, as shown at B in Fig. 2, and five two-wire insulators as shown at C. Seventeen ½-inch metal brackets (Fig. 2D) will be needed for fastening the insulators to the mast. These can be made or purchased for a few cents. One angle will be used on each of five of the single-wire insulators and two angles will be used on each of four of the two-wire insulators. The remaining four will be used on the uppermost double insulator to which the free wire of the matching section is anchored. A pair of small coil springs, shown in Fig. 2F and H, is also required to keep the wire taut over a long period of time. The top supporting strip, A, is screwed to the top of the mast. This may be a piece of polystyrene strip, but it is safer to make it of metal, or at least bakelite, which will take the strain without danger of snapping off.

Now measure off a piece of antenna wire 34 feet long and fasten one end to the top insulator fitted with the spring. Then string the polystyrene-strip insulators along the wire, placing the single-wire insulators toward the anchored end of the wire. At 24 feet 7 inches from the top end of the wire, loop the wire through the eye of the bottom spring and double the wire back on itself. Holding the two strands together, pull the wire until both springs are under reasonable tension and then anchor the bottom spring. While

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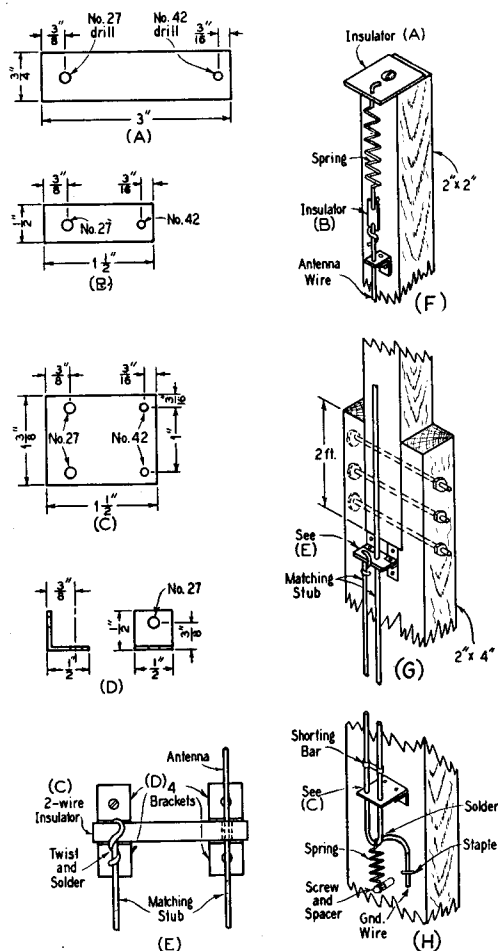


Fig. 2 — Detailed sketches of parts and assembly of the simple "J" antenna. A — Top antenna anchorage, 1 required. B — Single-wire insulator, 6 required. C — Two-wire insulator for matching section, 5 required. D — Metal angle pieces for fastening insulators to mast, 17 required. E — Method of mounting two-wire insulator at top of matching section. Four angles are used here. F — Antenna insulator and spring assembly at top of mast. G and H — Details of mast and antenna assembly.

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Antenna for Ten Meters

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the wire is still under tension, place a mark on the mast at a point exactly 16 feet 2½ inches from the top end of the antenna wire. Fasten the uppermost double-wire insulator to the mast at this point with four angles.

Now feed the open bottom end of the wire through the second hole in each of the two-wire insulators. Pull the end of the wire up through the second hole in the anchored two-wire insulator until the whole system is under tension and then anchor the end of the wire to the insulator, cutting off any excess. The rest of the insulators may now be lined up along the mast, spaced out evenly and fastened in place.

The antenna is now complete except for placing the shorting bar at the bottom of the J and connecting the transmission line from the transmitter. The shorting bar is simply a piece of copper wire soldered across between the two wires of the matching section, exactly 8 feet 2 inches below the top double insulator. Now solder the 300-ohm transmission line to the matching section exactly 11 inches above the shorting bar and you are ready to put the pole up and go on the air.

A grounding wire is desirable and can be fastened to the 2 by 4 with staples. Leave a loop of slack at the top of the ground wire to allow the bottom spring to do its work. The 300-ohm line also can be fastened to the 2 by 4 using very large staples of the sort used by electricians. Use a piece of insulating material over the line so that the staple does not come in direct contact with the line when the staple is hammered in.

The dimensions given should be satisfactory for operation over the entire ten-meter band if the antenna is fairly well in the clear with no near-by conductors or other objects which might alter the antenna impedance. If a check shows the standing-wave ratio to be excessive, or if a different type of transmission line is used, the system may be adjusted by following the procedure outlined in the *A.R.R.L. Antenna Book*.

A lot has been said about polarization and vertical antennas on 10 meters. But extensive comparisons between this antenna and a horizontal folded dipole have failed to show any significant difference in either DX or local ground-wave work. Any slight discrepancy in favor of the horizontal seems to be more than outweighed by the nondirective characteristic of the vertical.

Two-Meter Station

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This converter has been designed to give good 2-meter reception with a minimum of complication. It is nearly equal in performance to the best that it is possible to build, and it may be made to hold its own in top-flight company by the addition of a low-noise r.f. amplifier. The 2-meter beginner who becomes a dyed-in-the-wool addict may want to take this step eventually, but meanwhile he will have a smooth-working receiver that will enable him to hear anyone he can work with low power, and probably a good deal more.

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