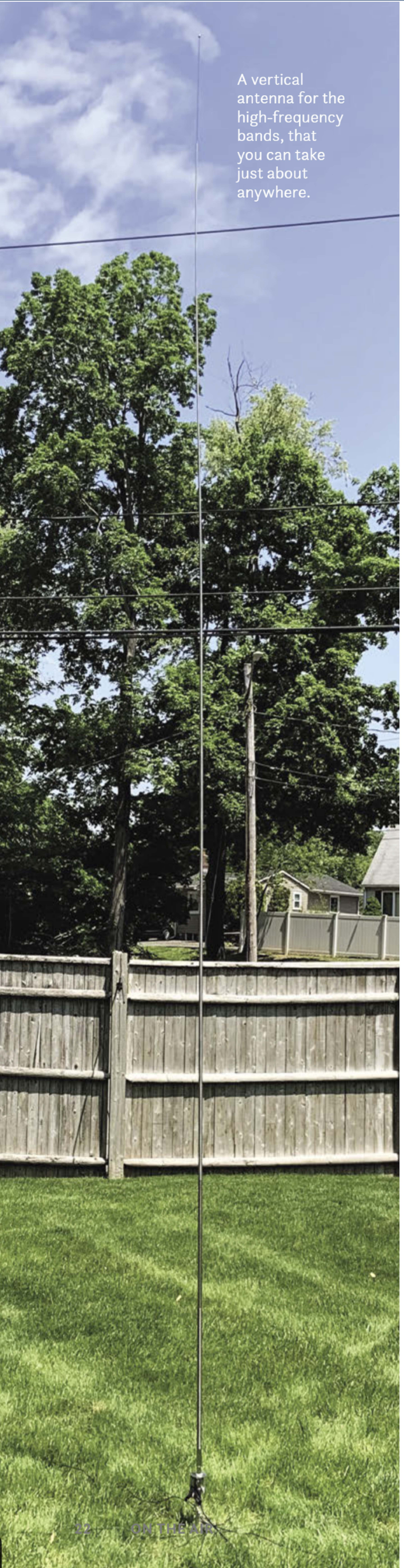


A vertical antenna for the high-frequency bands, that you can take just about anywhere.

PROJECT BUILD

A Portable Vertical Antenna for HF

CYCLE 25

As we move deeper into Solar Cycle 25, the bands above 20 meters will become increasingly active. You can be ready for 20 — as well as 17, 15, 12, and 10 meters — with this simple vertical antenna that sets up quickly and easily right on the ground.

Veteran amateurs often say that the best ground-mounted vertical antennas for the HF bands require many radial wires on or in the ground. In terms of maximizing performance, they're right. Research has shown that these antennas perform best with 50 or 60 *radials*, all of which are electrically connected to the ground side of the coaxial cable at the base of the antenna. Their purpose is to provide a *ground plane*, an electrical path to ground for the energy radiated by the antenna. In doing so, they "complete" the antenna circuit, somewhat like a lightbulb attached to a battery, so that energy can flow and radiate efficiently.

If a vertical antenna performs best with 50 or 60 radials, how could it possibly be portable? The short answer is: it couldn't!

Fifty or more radials is the ideal, but a vertical antenna can still perform reasonably well with far fewer wires — they don't have to be long, either. When it comes to ground-mounted vertical antennas, it is the *number* of radial wires — not their individual lengths — that plays the biggest role in performance.

Materials

- MFJ-1979 telescoping antenna ($70 – $80 from various amateur radio dealers and Amazon)
- Workman RV1 CB radio antenna single-groove mirror mount
- Support post, approximately 1 foot × 1/2 inch
- 60 feet of insulated 18-gauge wire (You can use uninsulated wire if you wish. Insulated wire is only suggested as a safety enhancement if you are using higher transceiver output levels [100 watts or more].)
- Coaxial cable of sufficient length to reach from the antenna to your transceiver. At lengths up to 50 feet, Belden RG-58 is adequate. For longer lengths, it is best to use a lower-loss cable such as LMR-240, especially if you plan to use the antenna on 10 meters.
- Metal alligator clip

Tools

- Wire cutters
- Soldering iron and solder
- Wire stripping tool or hobby knife
- Marker

This vertical antenna uses only six radials, yet it's capable of providing lots of operating enjoyment. Best of all, it can be set up in less than 10 minutes and will put you on the air on any band from 20 through 10 meters. And while it's intended for temporary portable operation, the antenna could also be used in a permanent home installation.

At the heart of the project is an MFJ-1979 telescoping "whip" antenna. When this article was written, the MFJ-1979 was the only all-metal telescoping antenna with sufficient length to operate at a quarter wavelength on the 20-meter band when fully extended (about 17 feet).

When collapsed, the MFJ-1979 is only 27 inches in length. Like all telescoping antennas, it collapses by sliding one section of tubing down into a slightly wider section. This makes it possible to easily "shorten" the MFJ-1979 from a quarter wavelength on 20 meters, to quarter wavelengths on 17, 15, 12, and 10 meters. As solar activity increases with the onset of Solar Cycle 25, the bands above 20 meters will become increasingly attractive.

Another feature of the MFJ-1979 is that it has a so-called "3/8-24" threaded stud at its base. This is a common connection method for mobile antennas, which means that you can screw the MFJ-1979 into almost any type of mobile antenna mount. This is a key feature of this antenna system, as you're about to see.

Step 1

Cut the insulated wire into six 10-foot lengths. Strip about 1 inch of insulation from one end of each wire.

Combine the bare ends of the wires into a single wire and solder. To this connection, solder a single wire about 6 inches in length. These are your radials, and the part that's a single wire will ultimately attach to the ground side of your antenna system. For this project, we used a large alligator clip, which makes attachment quick and easy (see ①).

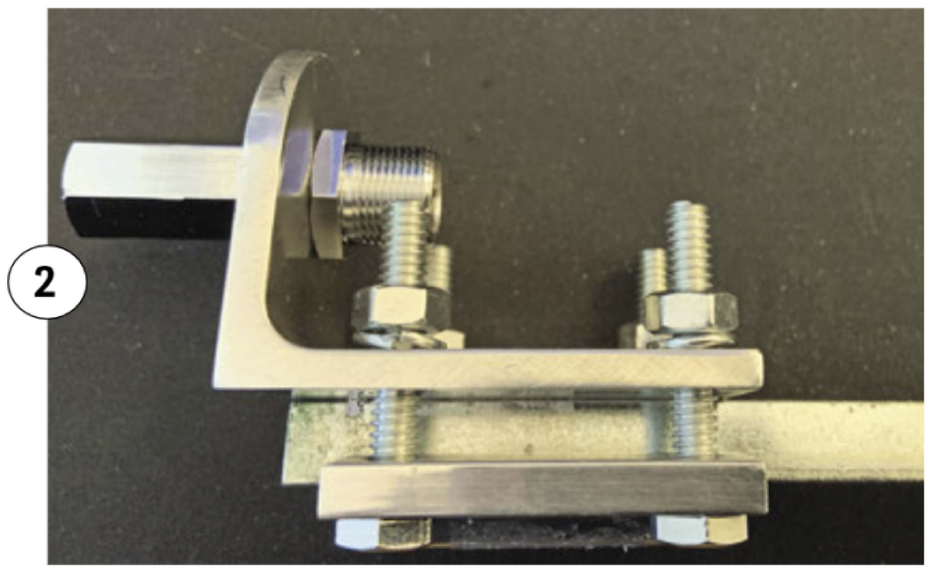
1

Combine the bare ends of the radial wires into a single wire, and solder them all together. To this connection, solder a single wire about 6 inches in length. This will attach to the ground side of your antenna system. To make the ground attachment, we soldered the single wire to a large alligator clip.

Step 2

Loosen the nuts and bolts on the Workman RV1 mount and remove the portion of the clamp that includes the groove. Rotate this piece so the groove is now vertical with respect to the antenna connection. Loosely reattach the nuts and bolts.

Slide your support pipe into the space between the clamping plates. In the example shown here, we used a 1-foot piece of solid stainless steel as the support (see ②). You can also use a copper pipe, wood, or even PVC, as long as it's strong enough to support the antenna, yet thin enough to fit inside the clamp. Tighten all four nuts.



2

Loosen the nuts and bolts on the Workman RV1 mount and remove the portion of the clamp that includes the groove. Rotate this piece so the groove is now vertical with respect to the antenna connection. Loosely reattach the nuts and bolts. Slide your support pipe – a 1-foot piece of stainless steel in this example -- into the space between the clamping plates and then tighten all the nuts.

Step 3

Take the antenna mount outdoors to your chosen spot, attach your coaxial cable to the mount, and then drive the support post into the ground. Depending on your soil conditions, you may need a hammer to get the post into the ground.

Next, you'll need to attach the wire, which has your six radials connected to it, to the mount. There are many ways to do this. In our example, we used a large alligator clip that simply attached to one of the mount's bolts (see ③). This is a good approach for a temporary installation. You might also dispense with the alligator clip and simply wrap the wires beneath the support nuts, and then tighten the nuts to hold the wires in place.

Arrange the radial wires on the ground like spokes on a wheel (see ④), with each one extending as straight as possible from the base of the antenna. Try to arrange the wires evenly around the base. Use rocks, sticks, or whatever might be available to hold down the ends of the wires.

3

Take the antenna mount outdoors to your chosen spot, attach your coaxial cable to the mount, and then drive the support post into the ground. Attach the wire that connects to your six radials to the mount. In this example, we used a large alligator clip that simply attached to one of the mount's bolts.

Continues on following page.

PROJECT BUILD

Step 4

Screw the MFJ-1979 into the mount (as seen in (4)) and extend the antenna to its full length, starting with the top section. Route your coaxial cable away from the base of the antenna to your operating position.

Step 5

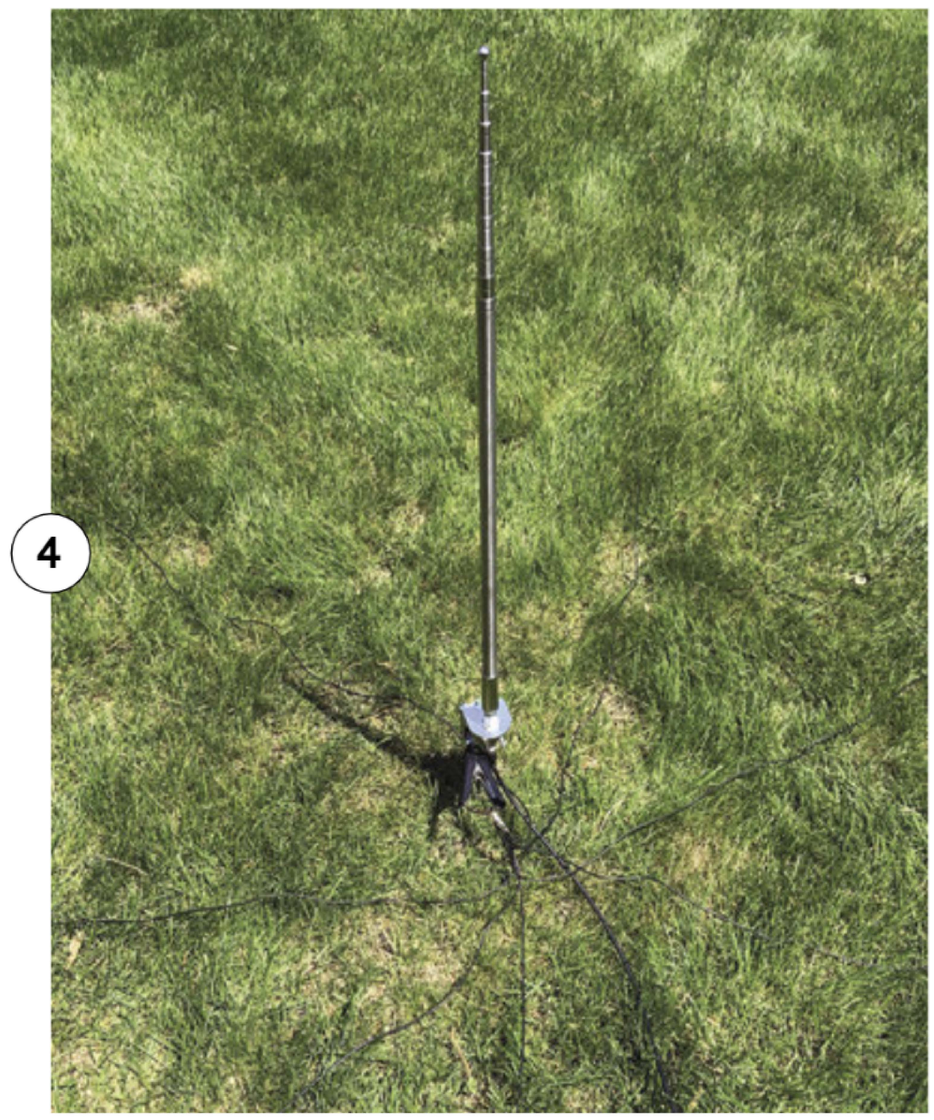
Using the SWR meter at your transceiver, transmit a low-power 20-meter signal and check the SWR reading at your desired frequency. Chances are it will be 1.5:1 or less throughout the 20-meter band.

If the low-SWR point occurs at the bottom of the band, you may want to slightly collapse the second section of the antenna (the second section from the bottom) and measure again.

Starting with the second section from the bottom, collapse the antenna about 6 inches at a time and continue making SWR measurements to find the lengths that provide the lowest SWRs on 17, 15, 12, and 10 meters. Each time you determine a low-SWR point, place a mark on the antenna using a permanent marker (see (5)). This will allow you to quickly adjust the antenna to this length in the future.

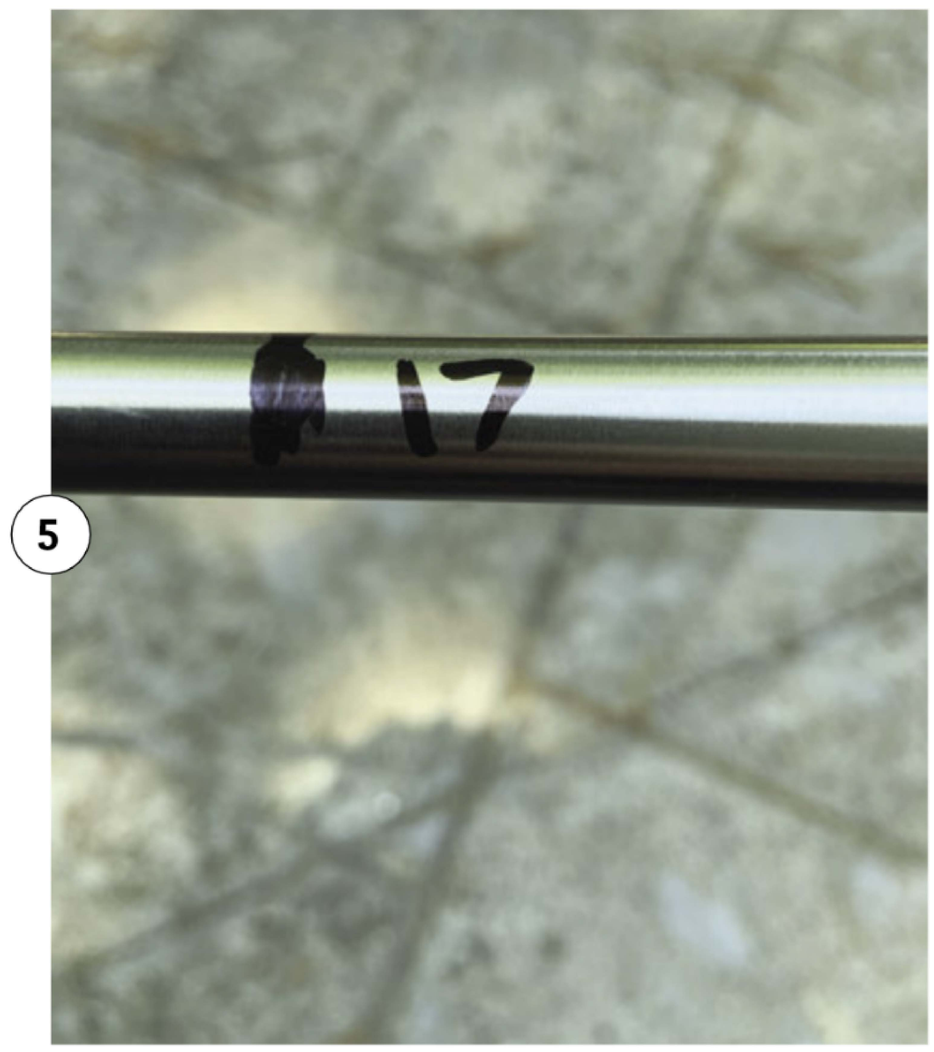
This part of the project can be somewhat tedious because you must make a measurement, adjust the length of the antenna, make another measurement, and so on. The good news is that if you mark the low-SWR points on the antenna, you'll only need to do this once. Assuming you don't set up the antenna in a new environment where it is next to a large piece of metal, the low SWR points should remain approximately the same.

If you can purchase or borrow an antenna analyzer, it will make this step of the project *much* easier. See the article "Analyzing Your Antenna System," in this issue.



4

Arrange the radial wires on the ground like spokes on a wheel, with each one extending as straight as possible from the base of the antenna. Try to arrange the wires evenly around the base. Once the radials are in place, screw the MFJ-1979 antenna into the top of the mount.



5

Each time you determine a low-SWR point, place a mark on the antenna using a permanent marker. This will allow you to quickly adjust the antenna to this length in the future. In this photo you can see that we've made a mark for the low-SWR point for the 17-meter band.