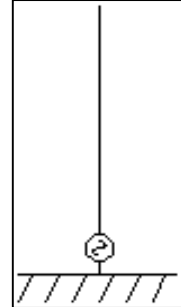




Radials for the Ground-Mounted HFp Vertical

Any ground-mounted quarter-wave vertical requires some sort of counterpoise. Although simply connecting the ground side of the feed system to earth ground can provide a degree of operability, metallic conductors (radials) make the counterpoise much more effective.

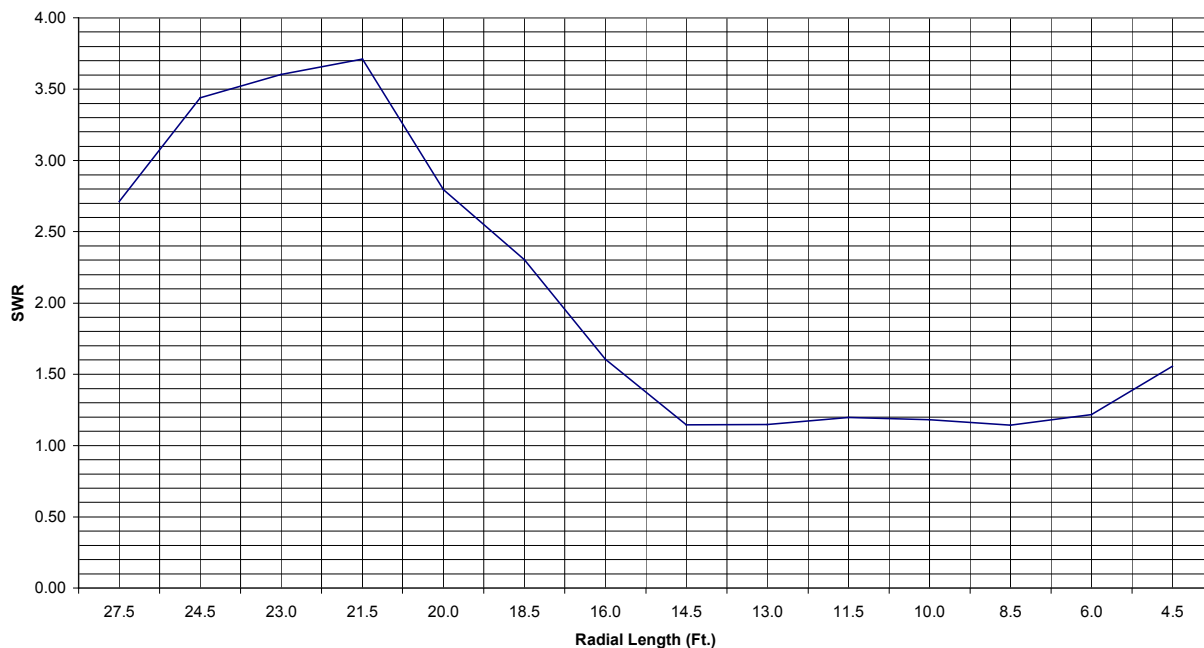
Many people putting up a ground-mounted vertical (especially if it's only for temporary use) think that radials of indeterminate length will work about as well as anything. Nothing could be further from the truth. In fact, it is possible that incorrectly-sized radials could render the antenna completely inoperative and useless.



Tests made with the Ventenna Company's HFp Portable HF antenna show conclusively that correctly-sized radial lengths (tuned radials) are critical to the antenna's proper operation.

An HFp was set up for 20-meter operation, and connected to a network analyzer so that the return loss at the base of the antenna could be measured (return loss is essentially the inverse of SWR - the data presented here has been converted to SWR). The HFp uses three radials, arranged at 120° angles for equal spacing around the base of the antenna. The radials were varied in length (all three being set to the same length for each measurement) from 27 ft. to 4.5 ft., and measurements taken of the return loss at different lengths. The accompanying chart shows the results of the tests.

Radial Length vs SWR (HFp - 20M)





Radials for the Ground-Mounted HFp Vertical (Cont'd)

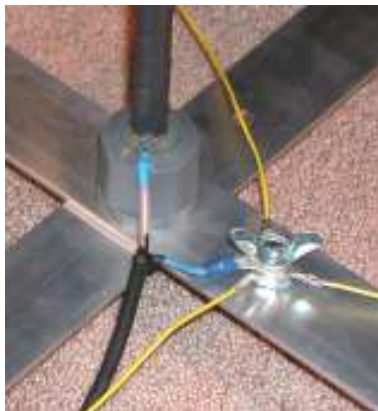
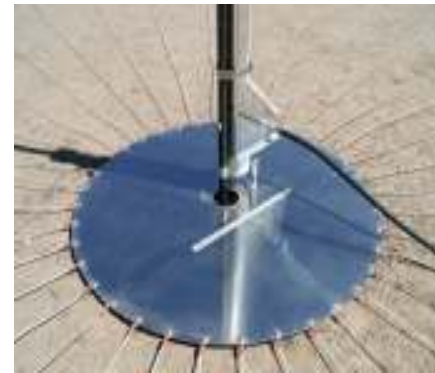
Although the quarter-wave length (which might be thought to be a correct radial length) is about 17.5 ft. at 20 Meters, it can be easily seen from the chart that the longest the radials should be is about 14.5 ft. In fact, any length between 14.5 ft. and about 6 ft. will work equally well, providing an SWR of about 1.15:1 to 1.2:1 across this length range.

It can also be easily seen that a radial length longer than 20 ft. renders the antenna essentially useless, with the SWR being over 3:1 at these lengths. (It is possible that even longer radial lengths would bring the SWR back down, but these tests were not made.)

Most modern radios will refuse to operate into a load mismatched as high as 3:1 SWR, and, even if the radio would transmit, as much as 1/3 of the power generated by the radio would be lost in the mismatch set up by the incorrectly-sized radials.

Number of Radials -

One other consideration is the number of radials. Often there is a "more is better" concept - that more radials will make the antenna perform better. Shown here is a home-brew antenna with lots of radials attached to a base plate. Obviously this is a difficult and time-consuming antenna to construct and set up.



Experiments made with the HFp show that more than three radials do not materially contribute to the effectivity of the antenna. Thus, the HFp is provided with three radial wires, wound on plastic spools, and marked at the correct tuned length for each Amateur HF band. The Laminated Card which is provided with the HFp shows how to set the radials to the correct length for each band.

Because the HFp is provided with a 1/4-20 stud on the base plate for the radial connection point, it is easy to experiment with radial lengths and with extra radials, if desired.

In Conclusion -

Correctly sized radials are critical to the operation of a ground-mounted vertical antenna. In addition, more than three radials do not materially add to the antenna's effectiveness.

The Ventenna Company's HFp-Vertical Antenna includes three radial wires and the instructions for easily setting the radials to the correct length for each of the Amateur HF bands. In addition the HFp provides the means for an interested person to experiment with both radial lengths and number of radials.