

Tuned Feed Verticals

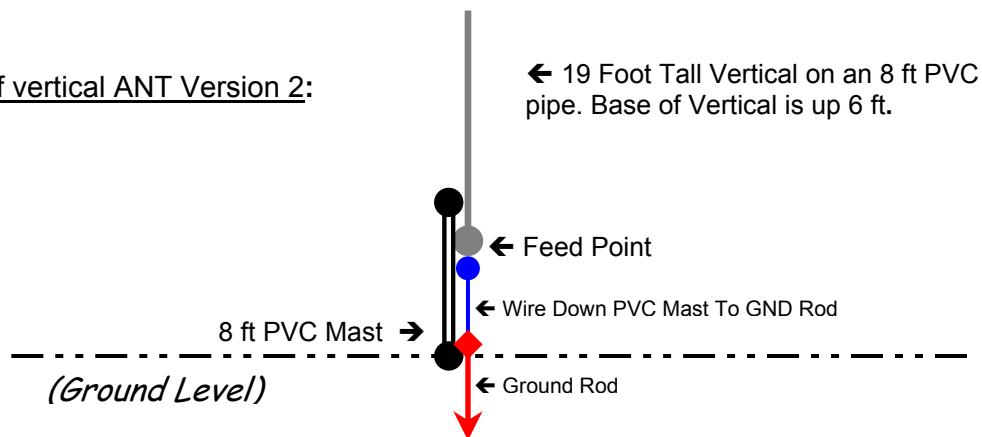
Did you know that you can feed a vertical antenna with 450 ohm ladder line, or even with 300 ohm window line (better because it fits standard TV hardware and standoffs)? You will be surprised how well it works. My former HB rooftop vertical had been fed with 300 window line for many years with great success on multiple bands. The narrow 300 Ω ladder line is probably still available from www.dxengineering.com, www.universal-radio.com, www.davisrf.com, and www.thewireman.com.

MY CURRENT INSTALLATION

My current HB vertical was moved off the roof and onto a ground mounted PVC mast in mid-October 2009, so I could avoid climbing on the roof for repair jobs during Iowa's icy or snowy winter weather. I currently have my 19 foot vertical mounted up 6 feet at the base using large hose clamps to attach it to the 8 ft piece of 1.5 inch ID PVC pipe, which also acts as an insulator. I also found that 1.5 inch ID PVC pipe fits perfectly over a steel "T" fence post, making assembly and dismounting very easy from the ground level.

Version 1 of my PVC mast-mounted vertical used a single 19 foot horizontal counterpoise wire suspended above ground under the adjacent patio roof. I developed version 2 of this antenna in the Autumn of 2011, and I substituted a vertical wire connected to a ground rod for the horizontal counterpoise wire. Both versions perform similarly, but I have much less RFI in the shack with version 2. Both versions used a feedline consisting of 14 feet of 300 Ω ladder line connected to an MFJ 962C tuner to match it to my rig. Although I can still work DX with it, operating the vertical closer to the ground is much less effective than when it was on the roof. It is easier to service now, but I paid a price for the move downward. Photos are on page 4.

Schematic of vertical ANT Version 2:



BACK TO THE STORY OF MY FORMER HB VERTICALS

In October 1994 I built a homebrew 20 M $\lambda/4$ wave ground plane (GP) vertical with 4 wire radials. The antenna was up 15 feet at its base on the roof of my ranch style house mounted in a 3 foot tripod with a PVC tubing sleeve as the insulator. With about 28 feet of 300 Ω ladder line from my tuner, I could work 40 through 10 meters with ease. I noted that on 40 M, I got poorer reports, however. So in November 1997 I altered the vertical to be resonant on 30 meters (a bit over 23 ft tall), but I left the radials at 16+ feet each. Wow! My signal reports on both 30 and 40 meters improved right away.

I began experimenting with with the size and number of radials after a big wind storm leveled the HB vertical in June 1998. I made the replacement antenna 20 feet tall (no reason, just that's all the aluminum I had left at the time), and continued using the four 20 M radials. Then I made the four radials each 20 feet long presumably to match the length of the vertical for the sake of balance. I could tell NO difference at all after lengthening the radials!

Later I went to only two 20 foot radials, 180 degrees apart and the signal reports from friends coast-to-coast whom I QSO'd very often remained exactly the same. About January 2000 just for kicks I went to just 1 wire radial 20 ft long. Still there was no real discernable difference on signal reports, and I could work DX easily with both QRP and 50 Watts. I had no RFI at all in the shack, and I was sold on the idea of tuned feeders.

Feeding a GP antenna with tuned feeders has also been mentioned a few times in Ham Radio literature over the years, and to me they are the next best thing to a beam. More recently after an ice storm in 2007, I had to remove a bent section of aluminum tubing in the vertical, but made up part of the missing length by attaching an automotive AM/FM replacement whip to the top of the vertical using hose clamps to secure it. So now the vertical and the matching radial are each 19 feet long. There is no specific reason or "magical" quality to 19 feet, that's just the only materials I had available!

JOHN KRAUS ON ELEVATED RADIALS:

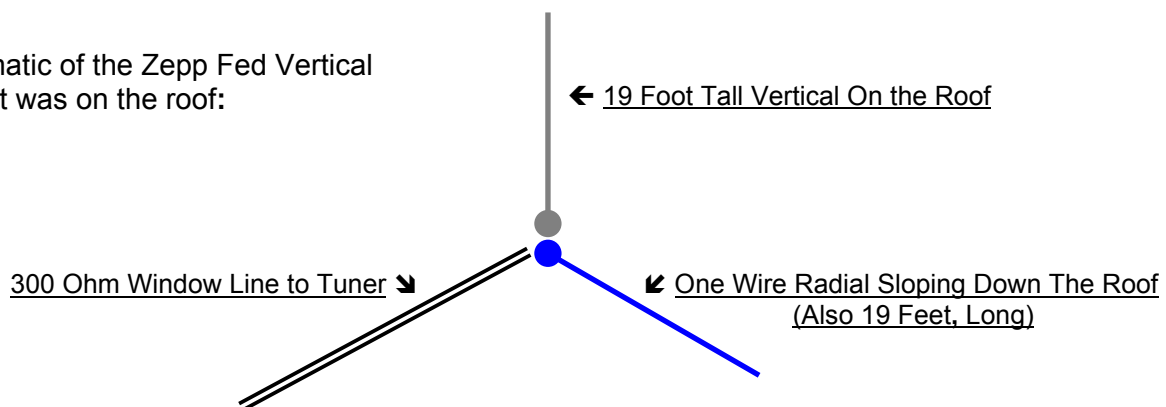
Here is an E-mail message I received from ZL1DD concerning whether one really "needs" 4 radials on an elevated Vertical GP:

According to G3VA in RSGB RadCom "Technical Topics", many years ago, the famous John Kraus W8JK was given the job of designing omnidirectional base station antennas for the then new mobile VHF service. The result was an elevated 1/4 vertical with 2 radials. Know-it-alls said it would not be omnidirectional, so Kraus added two radials simply to keep them quiet... And then it got into the books!

73,

Barry (Baz) Kirkwood PhD, ZL1DD (ex ZL1BN, ZL4OK, etc.)
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Schematic of the Zepp Fed Vertical when it was on the roof:



THE SKY IS THE LIMIT

I want you to know that you can feed nearly ANYTHING with tuned feeders. The main thing that keeps us ladder line users smiling, is that you can feed nearly ANYTHING METAL with it! It doesn't have to be resonant and it doesn't have to be balanced (symmetrical) either, although balance is *better* since it might avoid feed line radiation and RFI inside your shack.

That said, a ground plane vertical does not need special length of radials when used with ladder line. However, if you like balance, the radials should be the same length as the vertical element is tall. Please remember I am talking about a vertical ground plane (GP), and NOT a ground mounted vertical.

So what about my vertical with just 1 counterpoise wire sloping down the roof? It was not specifically a ground plane, but behaved much more like a tuned feed doublet (often called a CF Zepp) which has half the antenna pointing vertically upwards, and the other half oriented like one of the legs of an inverted vee. However, the bottom line is that it performed very well for me.

A true GP is always elevated above the actual earth. Mine was on the roof of my ranch-style house, up 15 feet at the base. A ground mounted vertical with radials lying on the ground or buried a short distance below ground is VERY different than what I described above. The radials for ground mounted verticals are DETUNED by the proximity of the soil, and so it is NOT necessary for them to be exactly a quarter wave long. The most important thing is that there be **LOTS** of them.

For example, my low band inverted L wire (a form of bent vertical) has about 12 radials buried underground, they are a little bit longer than the height of the vertical leg, and they are NOT resonant quarter wave radials. The radials are each about 30 feet long because it was simply convenient for me to put them in that short. By the way, this antenna is very close to the house, so the radials only cover 180 degrees of arc extending from the west, through north, around to the east. There are no radials SE, S, or SW of the antenna, yet it seems to work like a champ in all directions!

I've seen some recent writings about low band verticals or Inverted L's that have the radials elevated with very good results and increased field strength. How do they elevate the radials if the antenna is ground mounted? They mount them on wooden poles or tree limbs, and the radials first extend up from the base of the vertical at an angle to the first support on their way radially out away from the base of the antenna. I bet it's hard to mow the lawn near that setup, HI.

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PVC Mast, Red Wire To GND, + GND Rod



Close-Up Of Ground Rod + Wire From Feeder



Feedpoint Of The Vertical - 300 Ω Line



Looking Upward At The Vertical. Pix Taken While Lying On The Ground.