

Does Your Ground Radial Kit Measure Up?

An inexpensive and easy to build ground radial system for temporary vertical antenna installations.

Ron Harger, WD8BCS

Since I reside on a treeless landscape, a good choice for a multiband HF antenna has been the trap vertical. I've used roof mounted versions at previous locations with good success, but for aesthetic reasons performing such an "extra vehicular installation" on the recently built two story home is prohibited. I purchased a

Hy-Gain DX-88 with optional ground radial kit that included 16 copperweld wires size #16 AWG. The antenna was installed in my backyard. It works very well, but the radial kit cost nearly \$100.

ARRL Field Day is my favorite ham radio activity and this antenna system has made the trek to our club's effort for the past

several years, radials and all. Breaking down the antenna itself is a snap, but winding up and then untangling and unwinding the radials can be quite a test of patience. I searched for a better way.

My inspiration was found at a Central Michigan Amateur Radio Club meeting. One of our members had brought his 2 meter

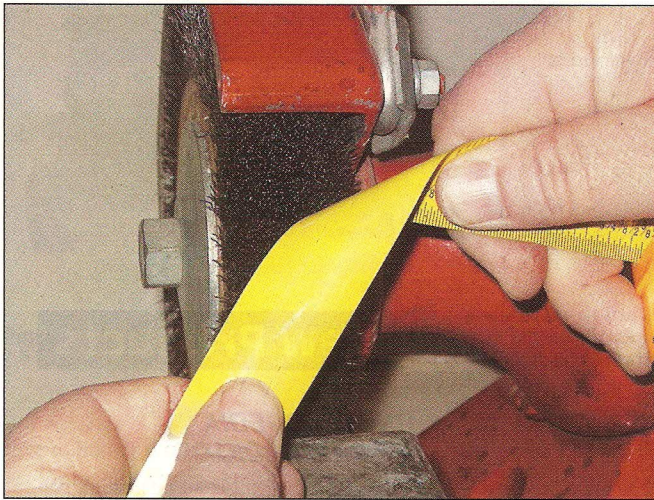


Figure 1 — New tape measure, ready for paint removal.

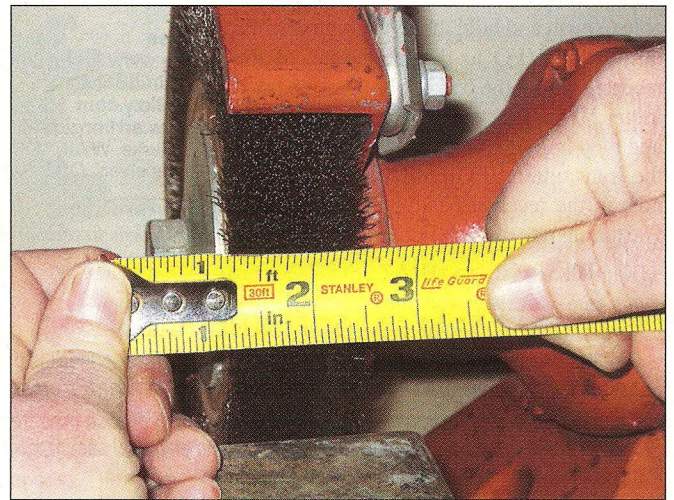


Figure 2 — Tape measure undergoing paint removal.

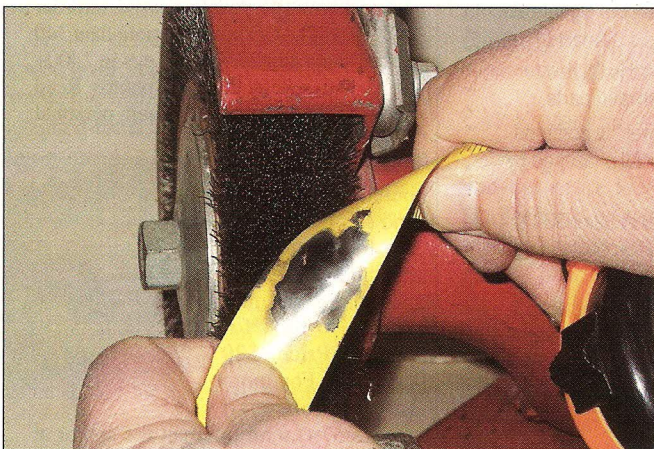


Figure 3 — Bare metal area exposed after paint removal.

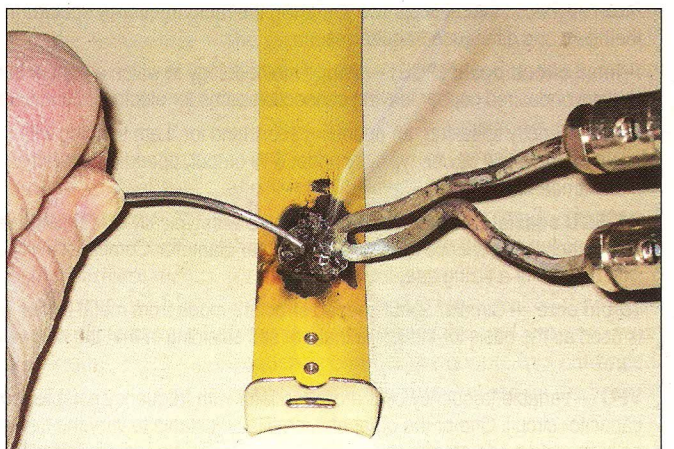


Figure 4 — Tinning the exposed metal area with solder.

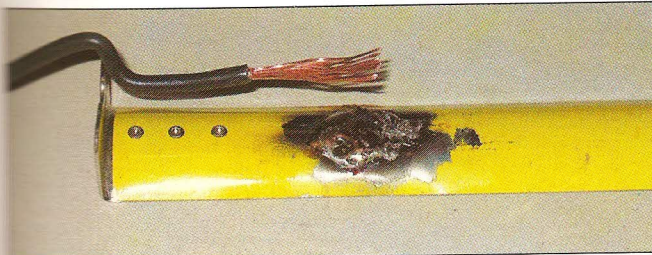


Figure 5 — Stranded hookup wire, #14 AWG, flattened out ready for soldering.

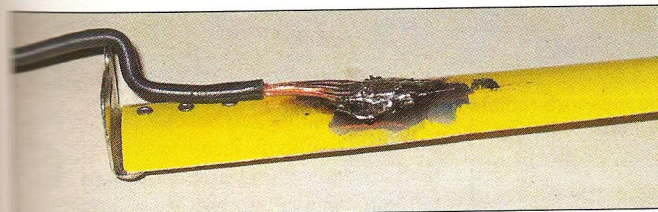


Figure 7 — Stranded hookup wire, #14 AWG, soldered to bare metal area.



Figure 9 — Tape measure with soldered wire, fully retracted, ready for ring terminal.

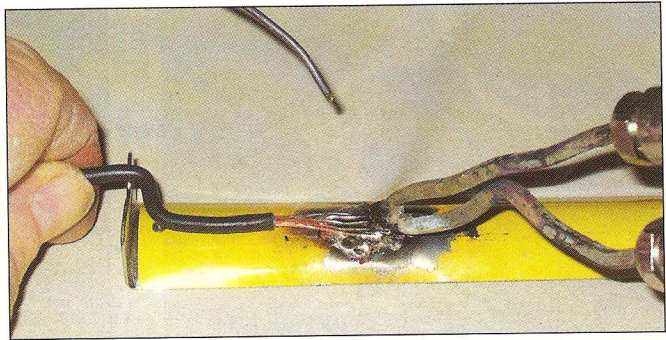


Figure 6 — Soldering the #14 AWG stranded hookup wire to bare metal area.

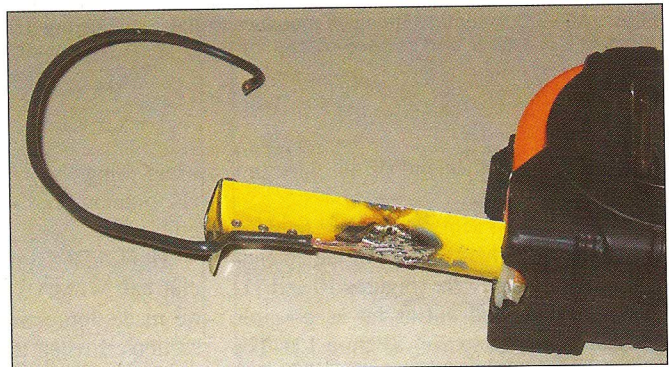


Figure 8 — Stranded hookup wire, #14 AWG, ready for ring terminal.

"tape measure" Yagi antenna to show. This antenna has been featured in a recent issue of *QST*.¹ It occurred to me that if I could find a relatively inexpensive source for a large quantity of metal tape measures, I might just have something that would be quick to deploy, and even quicker to tear down! The other benefit is that the bright yellow paint on the tape measure is highly visible. This would be a definite plus in temporary installations such as Field Day, where the occasional errant observer may wander into your radial "trap." In addition, many times I have tripped on my own radials while setting them out or retrieving them (Copperweld is nearly invisible once laid on the ground).

After the meeting, I hit the web and quickly found what I was looking for — a

25 foot × 1 inch tape measure for around \$2 at harborfreight.com. I placed an order for 16 of them and then set out to figure how to connect them to the base of the antenna. When the tape measures arrived, I began by carefully buffing the paint off of a small area on the underside about 2 inches from the end, using the wire brush on my bench grinder (see Figures 1-3). The exposed area was tinned (Figure 4), and then I stripped ½ inch of insulation from one end of a 5 inch long piece of #14 AWG stranded hook-up wire. The strands were flattened out (Figure 5) and soldered to the exposed bare metal area (Figure 6), and kept as close as possible to the tape (Figures 7 and 8). Even with the wire soldered on, the tape will still fully retract (Figure 9). I found that as long as I didn't over flex the tape measure in that area, the solder stayed solidly bonded. I finished it off by soldering a small ring

..... Hamspeak

ARRL Field Day — An ARRL operating event in June of each year in which hams typically operate for 24 hours from temporary locations using emergency power and portable equipment to simulate emergency conditions and have fun. See www.arri.org/field-day for details.

Copperweld wire — Kind of antenna wire with a steel core for strength and a copper outer plating for low resistance at RF frequencies.

HF — High frequency. That portion of the radio spectrum between 3 and 30 MHz. Often called *short waves*, these frequencies are characterized by long range propagation via ionospheric refraction.

Radials — the portion of a usually vertical antenna, designed to provide an artificial ground or a connection to real ground. The multiple radials project radially from the antenna base in multiple directions.

Trapped vertical — Kind of multiband vertical antenna in which parallel resonant traps are used to electrically isolate sections of the antenna to provide resonant operation on more than one frequency range.

¹Notes appear on page 40.

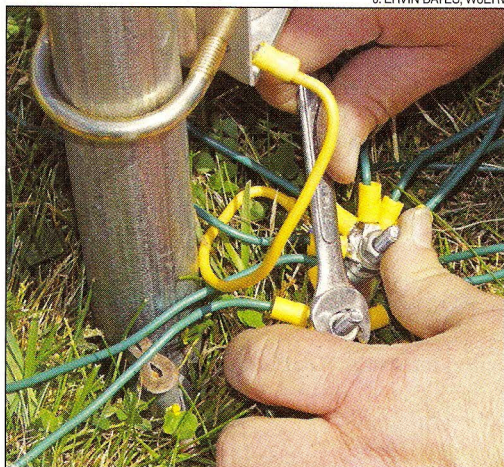


Figure 10 — Connecting the tape measure radial wires to a $\frac{3}{8}$ inch U bolt at base of trap vertical.

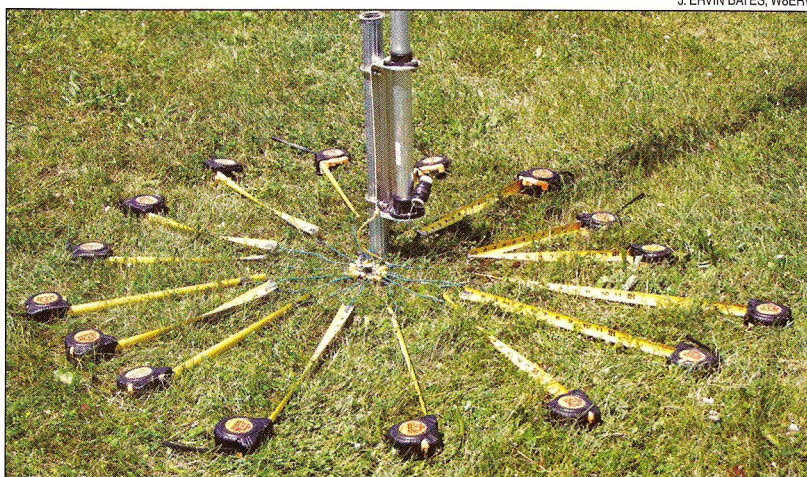


Figure 11 — Tape measure radials connected to base of trap vertical, ready for deployment.

terminal to the other end of the wire (not shown).

When ready to deploy, each tape measure is first connected at the base of the antenna with stainless hardware (Figures 10 and 11), and then extended out as far as possible maintaining even spacing (Figure 12). The built in tape lock is used to keep things in place. It doesn't appear to be necessary, but one could use large metal staples at each of the far ends to anchor the tape measure housings to prevent movement of the radials in the wind. The weight of the housings themselves (in most weather conditions encountered) has been enough to keep them in place. To tear down, I just unbolt the ring terminals at the base of the antenna first, then release each tape lock one at a time and box them up, ready for the next Field Day or other temporary installation.

As reported by Rudy Severns, N6LF, if fewer than 16 radials are used, trimming to resonance can increase efficiency by as much as 3 dB over not trimming.² If 25 foot tapes are connected to the end of 10 foot wires, each radial could be easily tuned back and forth regardless of the band in use (for 7 MHz and up). Also taking note of the length seen on the tape and reusing this value on future deployments could increase setup speed and repeatability. This approach will also cut down on your copper wire bill as you will be able to reuse your radials regardless of frequency. Rudy's work does indicate that

when using 16 or more $\frac{1}{4}$ wavelength radials, pruning does not significantly increase efficiency.

How did the system play? Operating with club call W8MAA from Lansing, Michigan, we made 366 contacts on HF phone in 64 sections. I recall tripping only once during deployment. Retrieval was even easier, and no one needed rescuing from our radials!

Notes

- ¹J. Hanson, W1TRC, "Adapting a Three Element Tape Measure Beam for Power Line Noise Hunting," *QST*, May 2007, pp 28-30.
- ²R. Severns, N6LF, "Experimental Determination of Ground System Performance for HF Verticals — Part 1 and 2," *QEX*, Jan/Feb 2009, pp 21-25 and pp 48-54; also R. Severns, N6LF, "An Experimental Look at Ground Systems for HF Verticals," *QST*, Mar 2010, pp 30-34.

J. ERVIN BATES, W8ERV

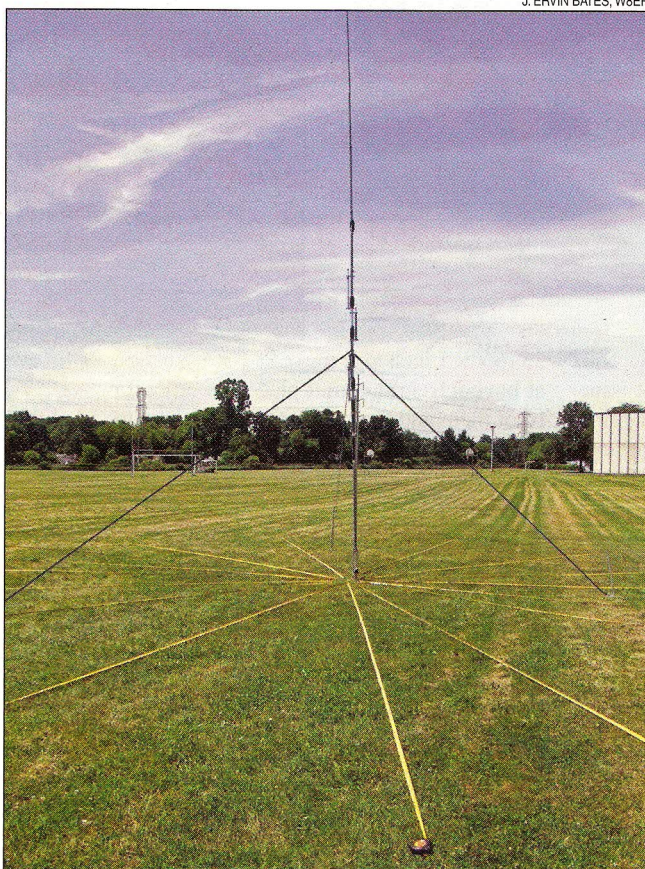


Figure 12 — Tape measure radials, fully deployed at 2009 ARRL Field Day, on the grounds of Gardner Middle School, Lansing, Michigan.

Photos by the author except Figures 10-12.

ARRL member Ron Harger, W8BCS, earned his Novice class license in 1974 under the tutelage of his father Dan Harger, W8BCI (SK). He upgraded to General a year later and to Amateur Extra in 2009. Ron is active in the Lansing/Ingham County (MI) ARPSC/RACES® group, as well as serving as the primary net control station for the Lansing area SKYWARN nets. Other than ARRL Field Day, his favorite Amateur Radio activities are 40 meter CW ragchewing and antenna experimenting. Because of his association with Bob Berger, K8RDN, he is now experiencing the digital modes and traffic handling. He is employed as a data and RF engineer by a cable television company in Michigan, is happily married to a very patient wife, and has two lovely "tweens." Ron can be reached by email at wd8bcs@arrrl.net or 5685 W Columbia Rd, Mason, MI 48854.

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