

The K4HRK ComBrella

Have it made in the shade at your next outdoor operation.

Bob Herklotz, K4HRK

My ComBrella project began as a novelty — a com radio and antenna integrated with an umbrella. I opened an umbrella one day and noticed that the ribs of the umbrella were similar to the drooping radials of a ¼-wave ground-plane antenna. I wondered if an umbrella could provide the ground plane for a 2-meter/70-centimeter antenna. I was excited to make it for additional utility to a traditional umbrella.

Preparing the ComBrella

I built my ComBrella with a metal-ribbed and end-tipped umbrella, which might be difficult to find today. For this reason, I'll offer two build procedures — one for older umbrellas with metal ribs and end tips, and the other for any umbrella with non-conductive fiberglass ribs. The materials (listed in Table 1) are needed for either version of the build.

If you're using a metal-ribbed and tipped umbrella, before you begin, you'll need to confirm direct (not just capacitive) continuity between the metal end tip and all the metal ribs. You may need to file down the

chrome or painted finish on the end tip to expose the bare metal. If you don't have continuity, you'll need to connect the coax shield to the metal ribs.

Metal-Ribbed/Tipped ComBrella Procedure

To begin, drill a ¼-inch hole through the end tip of the umbrella using a step drill rotated by hand for better control. The hole will need to accept 6 – 8 feet of RG174 coax connected to an SMA male connector (see Figure 1).

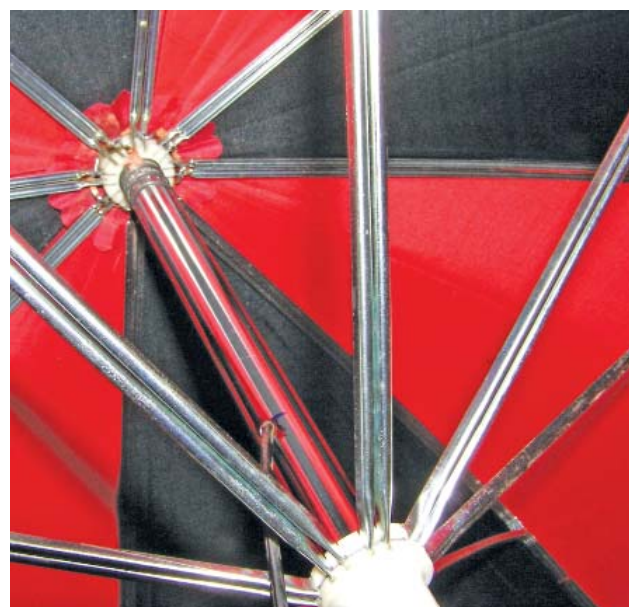
Beneath the umbrella canopy and above where the rib support struts lock into place, drill a 3/16-inch hole at an

Table 1 — Parts List

Quantity	Equipment	Comments
1	Umbrella	Can be either fiberglass- or metal-ribbed/tipped
1	Nagoya NA-771	A 15.6-inch VHF/UHF antenna
6 – 8 feet	Yotenko RG174 coax with SMA male/female connectors	Cut off the female connector to desired length
1	SMA female crimp connector	Depending on your radio, you may need a different style connector
As needed	RG58 coax extensions	Used to increase your antenna's height to your preference
1	PVC tubing	Will need to be tailored to your umbrella handle for mounting to a folding chair
1	De-solder wick	
1	Folding chair	Optional
4	Folding chair stakes	Optional



◀ Figure 1 — The SMA connector in the tip of the umbrella.



▼ Figure 2 — The ribs were joined using solder wick.

angle into the shaft to accommodate pushing the coax through. Start the hole perpendicular to the shaft, then angle the drill down toward the handle of the umbrella when the hole punches through. Deburr the hole and push the coax into it at the tip, and use a scribe with a pointed hook to capture the coax and pull it through.

When the SMA male connector is almost seated at the tip, apply epoxy to the shrink wrap directly beneath the connector nut (not to the nut itself) and seat the coupling into the hole. Confirm that you have good continuity between the connector nut and the top of the end tip. For aesthetics, you can complete the connection with a piece of shrink-wrap tubing.

To ensure good continuity between the ribs — which act as radials — interweave de-soldering wick among the ribs and secure a pigtail to the umbrella shaft with a spring (see Figure 2). This brings the radials to a common ground. The de-soldering wick is very flexible and folds nicely when collapsing the umbrella if you leave a little slack between the ribs/radials. The braid can be taped or wire-tied to the metal shaft.

If you can't get continuity from the coax connector to the metal ribs, just remove a ½-inch section of the coax covering, and secure it to the metal shaft with a spring or wire tie. This will ensure that the braid is making good contact with the shaft.

A heat gun was used to flatten a piece of thin-wall PVC tubing to make a socket for the transceiver's belt clip. Cut this to the length to secure the clip. I used duct tape to secure the PVC to the shaft at a convenient height.

The excess coax was coiled near the support struts to form a common-mode choke, and then routed to the handheld transceiver attached to the shaft assembly near the umbrella handle (see Figure 3). I attached an SMA female coupling to the end of the coax to mate with the radio. Depending on your radio, you may need an alternate connector. Finally, screw in a 2-meter/70-centimeter extended antenna into the tip of the umbrella. Take care not to over-tighten the antenna and dislodge the connector at the tip.

Fiberglass-Ribbed ComBrella Procedure

This procedure is for an umbrella with fiberglass ribs. These types of umbrellas are widely available, making them a great option for the ComBrella. The procedure is similar to the metal-ribbed version of the project, except for loosely wrapping wires around the fiberglass ribs, soldering the wires to the de-solder braid ring, and securing the wires at the end of the ribs.

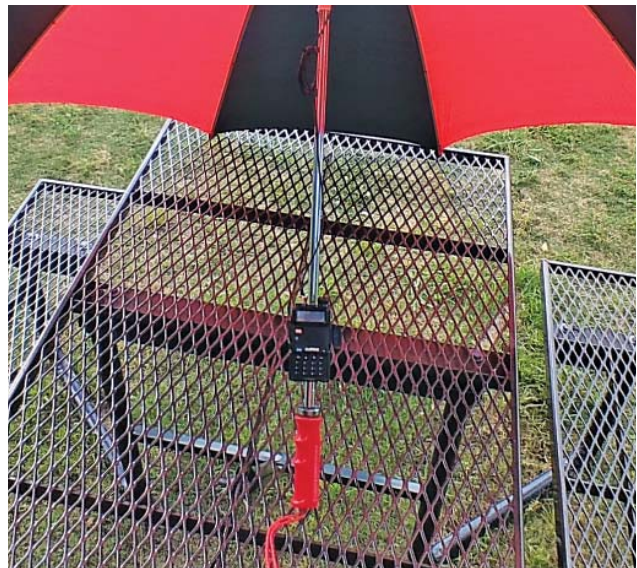


Figure 3 — The handheld transceiver mounts on the shaft of the umbrella.

The fiberglass-tipped umbrella has a plastic end tip, so we won't make the connection to the radials there. Use the same drilling procedure above for drilling the holes in the end tip and shaft, using a small step drill rotated by hand. The hole should be beneath the canopy about a centimeter from where the shaft emerges.

Push the RG174 coax from the tip end through to the hole in the shaft beneath the canopy. You will encounter a few obstructions in the shaft, but if you wiggle and rotate the coax, you'll eventually see it at the hole below the canopy. Grab it with a hooked scribe or similar tool and pull it through. Apply epoxy to the bottom of the connector nut and seat the connector to the tip.

Next, loosely wrap any small-gauge stranded insulated wire from the de-solder braid location around each fiberglass rib to the end of the ribs, with an inch extending past the ribs. One or two turns around each rib is all you need.

With the plastic umbrella shaft, you will need to connect the radials to the coax braid. Remove the covering from the coax, as detailed above, and then extend a pigtail from the de-solder braid to the exposed coax braid. Wrap it around the coax a few times and use a wire tie to secure it. The pigtail can be soldered to the coax braid; just be careful not to burn through to the dielectric. Each wire should be pulled under then over the de-solder braid closest to each rib. Then solder the



Figure 4 — The ComBrella can be folded easily for storage or transport.

wire to the braid on the side facing down toward the handle. Use heat-insulating material, such as kitchen-variety sheet silicone, to prevent burning the fabric. With the wire loosely wrapped around each rib, push the wire ends into the holes at the end of the ribs where the fabric is threaded, leaving a little slack. When the umbrella is folded, the ribs straighten and lengthen slightly.

Snip off the ends of the radial wires, leaving about a centimeter of overhang. The holes at the end of the ribs should hold the wire with a friction fit, or you can secure the wire at the rib end with small wire ties or a dab of adhesive to each hole.

To complete the build, gently screw in the antenna.

SWR and Performance

I used a NanoVNA to measure the standing wave ratio (SWR). Both antennas gave a relatively flat reading on the VNA of 1.5:1 from 144 – 148 MHz. The SWR for 420 – 450 MHz was 1.2 – 1.8:1. When connected to my 5 W 2-meter/70-centimeter handheld radio, both bands easily hit our local Maury County Amateur Radio Club

repeater 15 miles away without any elevated altitude. I received several full-quieting reports.

Practical Applications

Our Maury County Amateur Radio Club in Columbia, Tennessee, has monitored the Chickasaw Trace bicycle races for many years at the local park, with two major races each year. I set up at our operating location with the ComBrella inserted into a PVC mast. I mounted it on a folding chair with a screw through the PVC to prevent the ComBrella handle from sliding down the mast. See the front cover of this issue for a look at this setup.

We use a simplex frequency, and my signal with the net control was full quieting. From a low spot, I could hit our local repeater about 20 miles away and talk to other hams effortlessly. Gaining extra antenna height is easy by simply adding another PVC coupling, a PVC section, and a length of extension coax. My folding chair has provisions for staking it to the ground to prevent the setup from crashing down. The ComBrella's fold-up capability facilitates carrying it for field work (see Figure 4). Relief from the sun or rain is also a real advantage for both the radio and the operator.

Mounting the PVC Mast

I duct-taped a short, smaller-diameter PVC section to one of the folding chair's rear legs to act as a receiver and then just slid the larger-diameter section over it. The PVC sections were chosen to provide a good fit for the umbrella handle. Dense foam spacers were used at the attachment points to allow the chair to fold normally. You may need to use a different approach, depending on your chair and the diameter of your umbrella handle.

A Shady Design

While this may be a novel antenna design, I'm pleased with its performance and utility. If you build this folding 2-meter/70-centimeter ground-plane antenna, you'll have contacts made in the shade.

All photos by the author.

Amateur Extra-class operator Bob Herklotz, K4HRK, was licensed in 2014. He is a member of the Maury County Amateur Radio Club in Columbia, Tennessee. A retired auto industry maintenance planner and instrument-rated pilot, Bob is winding down his "retirement business," Fresh Aero Aviation, a manufacturer of aircraft LED lighting products and tools. He looks forward to spending more time on other pursuits, like ham radio. He can be reached at robherk@gmail.com.

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