

Recycling TV Antennas for 2-Meter Use

“Green” that aluminum into something useful right in your own backyard!

Just as quickly as cable TV companies wire up neighborhoods for CATV service, home owners remove TV antennas, masts and dangling wires. The quality of reception and the overall appearance of the old homestead are immediately improved even before the ladder is hung in the garage and the scrap aluminum components are bent, bundled, and stacked curbside for the next trash pickup.

Wait a minute!

Are you sure you want to bid farewell to that mass of metal? These slowly disappearing aluminum skyline silhouettes are a gold mine of salvageable antenna construction material. When modified by a resourceful radio amateur, they'll become—with almost no cash outlay—a respectably performing Yagi antenna for the 2-meter band.

What's of Value In that Pile of “Junk”?

You may be surprised at what can be salvaged from discarded TV antennas and used for your VHF-antenna construction projects (see Figure 1). Obviously, the

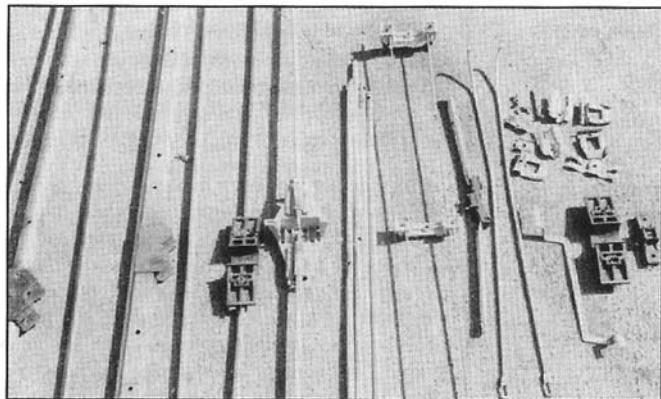
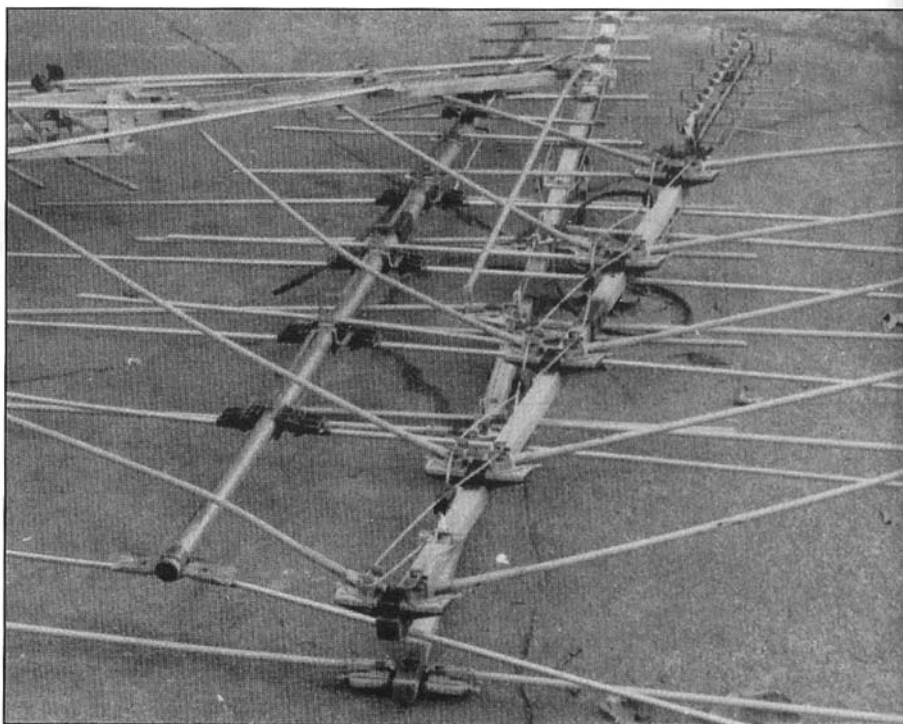


Figure 1—A gold mine of antenna components after complete disassembly. Note the two boom/mast clamps to the left. The two types of insulated elements are positioned at the center of the cluster. Either can be used in the project. U bolts, conspicuously absent, were rusted. Radio Shack replacements were used.

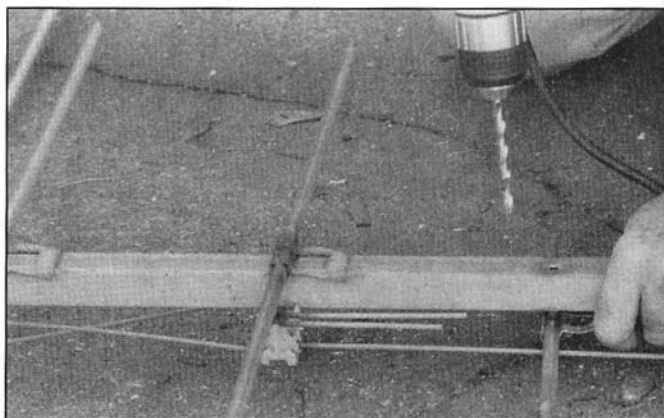


Figure 2—Drill out the rivets to remove the TV-antenna pieces. Notice the element-mounting hardware to the left; it grounds the element directly to the boom. Some of these clamps can be used to mount the directors. The phasing stubs visible below the boom can be discarded.

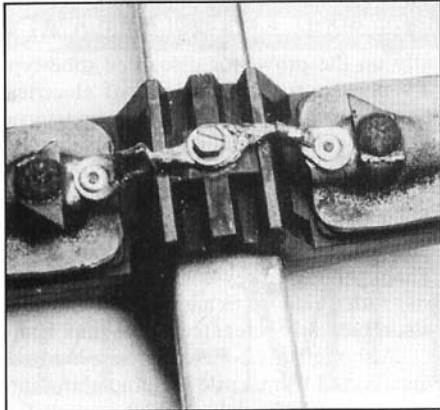


Figure 3—A director attached to the boom using an insulated mount. The two element sections have been bridged with short lengths of wire, solder lugs and pop rivets, and grounded to the boom with a self-tapping screw. Two of the antenna's original rivets and remnants of the phasing stubs are visible at the base of each element.

boom has value once the elements are removed. (A drill and an assortment of twist bits make short work of the rivets used in the original assembly.) If two similar TV antennas are available, making a stacked array is a viable option. Or, Long John high-gain Yagis can be constructed if two booms are butted and clamped together.

You'll find a variety of clamps used to secure the elements to the boom. Most attach the elements directly to the boom (see Figure 2), but at least one of the elements—the driven element—is insulated from the boom by a nonconductive support. Set one of these insulated elements aside to be used for the 2-meter antenna's driven element (discussed later). Driven elements can be used as directors, but their individual sections must be wired together (bridged) and grounded to the boom (see Figure 3).

The TV antenna's elements (rod stock, if you're lucky [*really* lucky!—Ed.]) can be cut to resonate on 2 meters. In addition, there are plastic boom-end caps and the boom-to-mast connecting hardware. If you're fortunate, the boom-mounting U bolt can be removed and reused if care and some Liquid Wrench are applied in the process. If the U bolt is too rusty, get a replacement from Radio Shack or one of the many other outlets.

Reconstructing the Antenna for 2-Meter Operation

For this project, we'll build a five-element Yagi as shown in Figure 4. If the TV antenna's reflector-mounting hardware is in good condition, leave that element attached to the boom. This element (the longest of them all) is usually grounded at its center point. Hacksaw the boom to a length of 5 feet 5½ inches and replace its end caps. The caps cut down on the wind load and should not be overlooked. (They

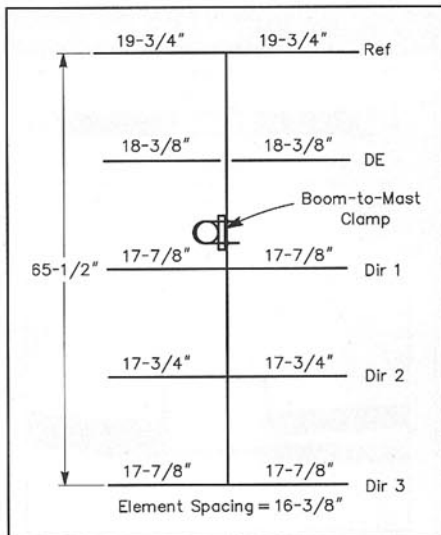


Figure 4—Dimensions of the five-element 2-meter Yagi. The stub is inside the driven element (see text).

also help decrease wind noise.—Ed.)

If you want to orient your soon-to-be 2-meter antenna for vertical polarization, move the boom-to-mast clamp 90° from its original mounting position. At a point slightly off the boom's center position, drill

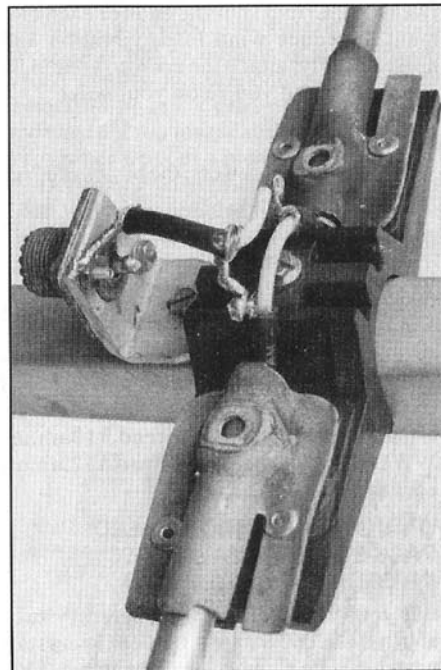


Figure 6—A close-up of a fully modified 2-meter driven element. The two top-mounted rivets that originally secured the element to the insulator have been removed. Two new pop rivets at the side of each element section affix the element-mounting hardware to the insulator. The inductive-stub ends are just visible exiting each element section. An L-shaped bracket secures the optional SO-239 connector to the boom. A short length of RG-58 coaxial cable connects the matching stub to the SO-239.

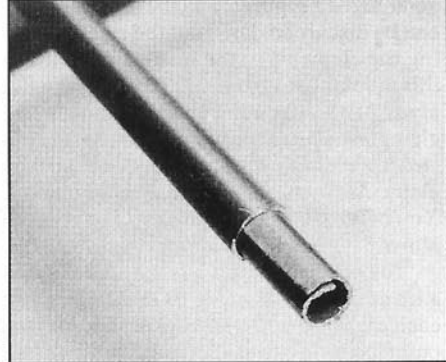


Figure 5—Close-up of a short length of scrap (rolled) TV element folded in on itself and used as an internal butt-joint splice to increase the length of too-short elements. Mounting hardware is placed over the joint, drilled through, and attached to the boom with a self-tapping screw.

two ¼-inch-diameter holes through the boom using the U bolt as a guide. Make certain that the boom-to-mast clamp won't interfere with the mounting of the first director (the one closest to the driven element). If necessary, move the clamp position slightly for clearance. Its position (within reason) isn't critical for balance or rigidity.

For this antenna, we're using an element spacing of about 0.2 λ. After trimming the remaining directors to length, attach them to the boom, spaced accordingly. Use bolts, self-tapping screws, or pop-rivets. To fabricate elements of sufficient length, it may be necessary to butt two shorter pieces and couple them with a 3 or 4-inch-long sleeve.¹ Such sleeves can be fabricated from short lengths of element tubing. If the element is a continuous tube, slit it lengthwise. If the element is a rolled tube (split down its length), carefully fold it into itself (see Figure 5) using a vise or pliers to obtain the correct OD. Secure the element to the boom at the butt joint with the TV hardware.

Driven-Element Construction

We'll use simple inductive coupling to drive the array. First, disassemble all the components from the original TV antenna's driven element. Keep the insulator and the two element sections. The remaining parts of the subassembly—including the phasing stubs (the crisscrossed wires on the

¹Considering the weathered, oxidized and corroded condition of most (if not all!) of the metal you're likely to encounter when using junked TV antennas, think about ensuring good contact at metallic joints during reassembly. Buff the mating metal joints (not all the aluminum) and apply an antioxidant. For a discussion on fighting corrosion and some hints as to which products to use, see Scott Roleson, KC7CJ, "Fighting Antenna Corrosion," *QST*, Apr 1993, pp 24-26—Ed.

antenna; see Figure 2 and the lead photo)—can be discarded. Drill out the rivets securing the elements to the insulator. Reattach this assembly to the insulator using the flat areas of the clamp. For this element, the element-to-boom fastenings must not obstruct access to the interior of the driven elements at the midpoint (see Figure 6). You need to keep this path clear in order to allow passage of the matching stub.

To construct the stub (see Figure 7), cut a length of RG-58 cable to $18\frac{3}{8}$ inches. At each end of the cable section, remove the outer covering and dielectric, and solder the shield braid to the center conductor. Cover the shorted ends of the stub with heat-shrink tubing or electrical tape to keep them from shorting to the driven element. At the stub's center, remove about 1 inch of outer covering. Use a razor blade or sharp knife to carefully cut through only the braid (not the dielectric) at the stub midpoint (see Figure 7B). Unravel the braid away from the center point. Twist and tin the braid making certain not to melt the dielectric. Later on, these two braid leads will be connected to the coaxial feed line.

Attach the driven-element assembly to the boom $16\frac{3}{8}$ inches from the reflector. Slide the taped ends of the stub into the driven element. Center the two tinned braid leads over the boom. Solder the feed line directly to the stub's braid leads. Or, install an SO-239 or BNC connector as shown in Figure 6, connecting the stub's leads to it. Once you've made the connections, protect this area from the weather with a layer of noncorrosive silicone sealant. If you've constructed the antenna as described, you'll find the inductive coupling network (stub) provides a low SWR over the entire 2-meter

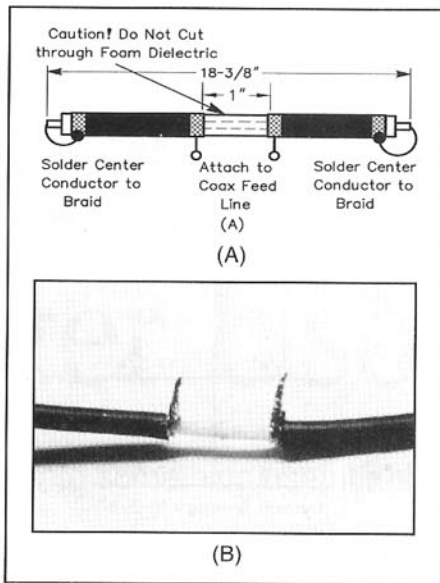


Figure 7—At A, preparing the driven-element stub. Use a razor blade or sharp knife to carefully cut through the coax braid only (not the dielectric) at the stub center. Unravel the braid away from the center point. At B, a close-up of the stub. The shield is carefully cut through on the center line. The twisted and tinned braid leads are connected to the coaxial feed line.

band, so you shouldn't have to do any tweaking. Crimp shut the ends of each element to reduce wind load, vibration and noise. Finally, attach the array to your mast and rotator and you're on your way!

Summary

To ham homebrewers, the buzzword "re-

cycling" sounds like déjà vu all over again. I can remember when hams were continually on the prowl for discarded tube-type TV chassis for their wealth of electrical components and the heavy duty transformers they contained. Before the trash pickup got to them, they were unceremoniously carted home and picked clean of the hundreds of parts that subsequently filled the junkbox. Only then—like the carcass of a Thanksgiving turkey—was the gutted chassis, with its cut wires and empty tube sockets, reluctantly relegated to the junk heap.

Although this 2-meter antenna has been resurrected from a pile of scrap aluminum components, it's no Frankenstein monster. We've recycled a valuable resource, completed a worthwhile project and improved signals by many decibels with a minimal cash outlay. Sounds like an undeniably good deal to me!

Ronald (Ron) Lumachi, WB2CQM, has been licensed since 1962. Over the years, Ron penned a number of articles for many Amateur Radio and electronics magazines (many for CQ, as I recall—Ed.) on topics ranging from quad and Yagi antenna design to small, homebrew projects. Ron also wrote for boating, gunsmithing, photography and machine-shop journals. Once an avid DXer, he now frequents 40, 75 and 160 meters from his New York city and eastern Pennsylvania homes, and can be found on many traders' nets looking for components to use in his homebrew projects. Ron recently retired from the New York City school system as an assistant principal. You can contact Ron at 73 Bay 26th St, New York, NY 11214-3905.

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