The 2-Meter Slot-Cube Antenna

John Portune, W6NBC

Few homebrew antennas have been more popular than the 2-meter J-pole made from ordinary copper water pipe. However, the J-pole's highly visible profile may be objectionable to some neighbors. If that's your situation, this may be the antenna for you. While still using copper pipe, you can build a less visible antenna with better performance than a J-pole.

Get high performance from a small package with this low-profile antenna made from copper pipe.

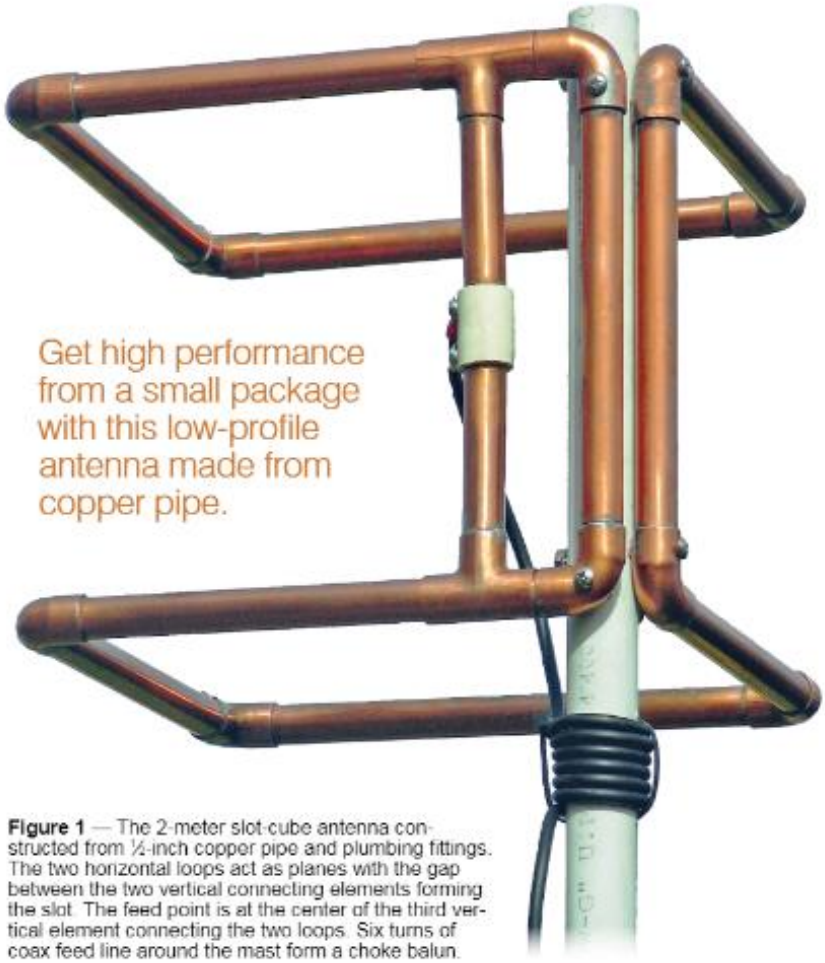

Figure 1 — The 2-meter slot-cube antenna constructed from ½-inch copper pipe and plumbing fittings. The two horizontal loops act as planes with the gap between the two vertical connecting elements forming the slot. The feed point is at the center of the third vertical element connecting the two loops. Six turns of coax feed line around the mast form a choke balun.

The Slot Cube

The diminutive 10 × 10 × 7 inch 2-meter base-station antenna shown in Figure 1 has the omnidirectional gain of a J-pole, but it is more efficient. No, it is not a halo — it is a folded skeleton-slot antenna. Halos are normally horizontally polarized. This antenna is vertically polarized by feeding the top and bottom loops in parallel (see Figure 1). Incidentally, this is a great antenna for 2-meter repeaters, which require vertical polarization.

The copper pipe loop portion of the skeleton-slot antenna is the equivalent of the solid plane in a classical slot antenna with the vertical space between the loops forming the slot. The whole antenna is folded vertically into a cube to make it omnidirectional. For high efficiency and good bandwidth (see Figure 2), the conductor is comprised of common ½-inch copper pipe and copper fittings, which are available at most hardware stores and home improvement centers. The average gain feature of *EZNEC* antenna modeling software shows a higher overall efficiency than a copper J-pole (see Figure 3).

Construction

Rather than working from a dimensioned drawing, a better way to construct the antenna is to simply cut the copper pipe sections to length, as shown in the "Materials List" sidebar. The pipe sections naturally fit together to form the cube. Use Figure 1 as an assembly guide. It's a good idea to dry fit and mark all the pieces before soldering.

Materials List

(4) 8½-inch-long horizontal pipe sections

(4) 8-inch-long shorter horizontal pipe sections

(2) 7-inch-long vertical pipe sections

(2) 3¼-inch-long feed point halves

(10) pipe elbows

(1) pipe T **CORRECTION: 2-Pipe T's required**

(1) CPVC coupling

Begin assembly by cleaning the copper parts with steel wool. Then, separately solder together only the top and bottom loops on a flat surface using acid flux solder. Do not add elbows to the short ends yet. Next, assemble and solder the vertical sections. The already-soldered loops will hold the antenna in position for final soldering.

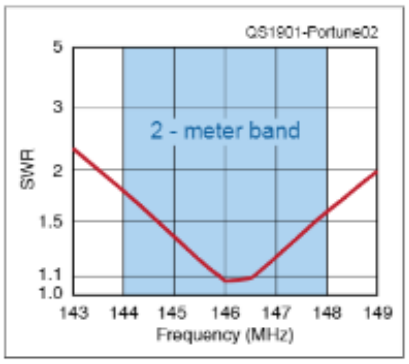

Figure 2 — SWR plot of the slot-cube antenna.

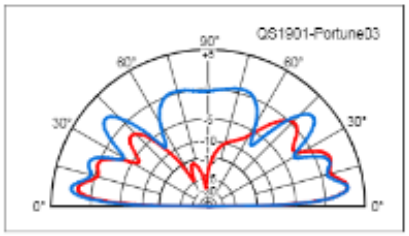

Figure 3 — Vertical radiation plot of the slot-cube antenna (blue) compared with a J-pole antenna (red).

Feed Point

Originally, I intended the feed point section to remain unsoldered and to slide for SWR adjustment. This required tedious filing out of the stops in the copper Ts to make this possible. Subsequently, I found that I could permanently solder the feed point section at the ends of the short loop sections.

There is a gap in the copper pipe in the feed point section inside the plastic coupling. Note that the coupling is CPVC, not common PVC. CPVC fittings are made to mate with copper pipe and will tolerate soldering temperatures. Connection to the antenna is made by drilling and tapping the CPVC coupling and copper pipe ends for 6-32 or 8-32 threads. Threaded holes are required for a positive connection.

Make up a short pigtail of RG-58 or Mini-8 coax with a connector on the end. Allow enough coax for a six-turn coax choke balun (see Figure 1). Secure it with a UV-stabilized tie-wrap through holes in the PVC mast. Weatherproof the coax ends with heat-shrink tubing and silicone sealant. For the remainder of the run to your rig, use larger-diameter, lower-loss coax, such as RG-8, RG-213, or LMR-400.

Mounting and Disguise

If you pole-mount the antenna, drill four 11/32-inch holes through the elbows and ¾-inch PVC mast section for 8-32 × 2 inch screws. Offset the holes to allow the mounting screws to pass. Alternately, the antenna may be set directly on your roof, keeping it level. Covering it with a small plastic dishpan or other plastic box will further obfuscate its function.

Previously, I published an article on a small compact transmitting loop antenna disguised as a working weathervane.[1] I consider the slot-cube antenna an improvement — it has superior performance and is far easier to build, while at the same time being suitable for the same method of disguise.

[1]J. Portune, W6NBC, and F. Adams, WD6ACJ, "A Weather Vane Antenna for 2 Meters," *QST*, Aug. 2005, pp. 35 – 38. Also available in the ARRL publication *Small Antennas for Small Spaces* by S. Ford, WB8IMY, or on the author's website, www.w6nbc.com.

Photos by the author.

John Portune, W6NBC, is an ARRL member and frequent contributor to *QST*. He has been licensed for 52 years and has held an Amateur Extra-class license since 1972. John has a BS in physics and also holds FCC Commercial General Radiotelephone Operator and FCC Radiotelegraph licenses. He retired as a broadcast television engineer and technical instructor at KNBC in Burbank and then from Sony Electronics in San Jose, California. You can reach John via email at jportune@aol.com or through his website at www.w6nbc.com.

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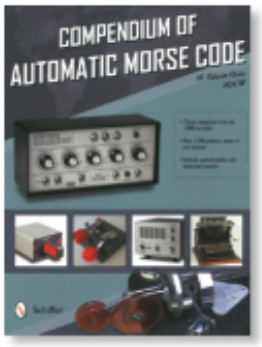
New Books

Compendium of Automatic Morse Code

By M. Edwin Goss, N3CW

Reviewed by Robert Weinstock, W3RQ

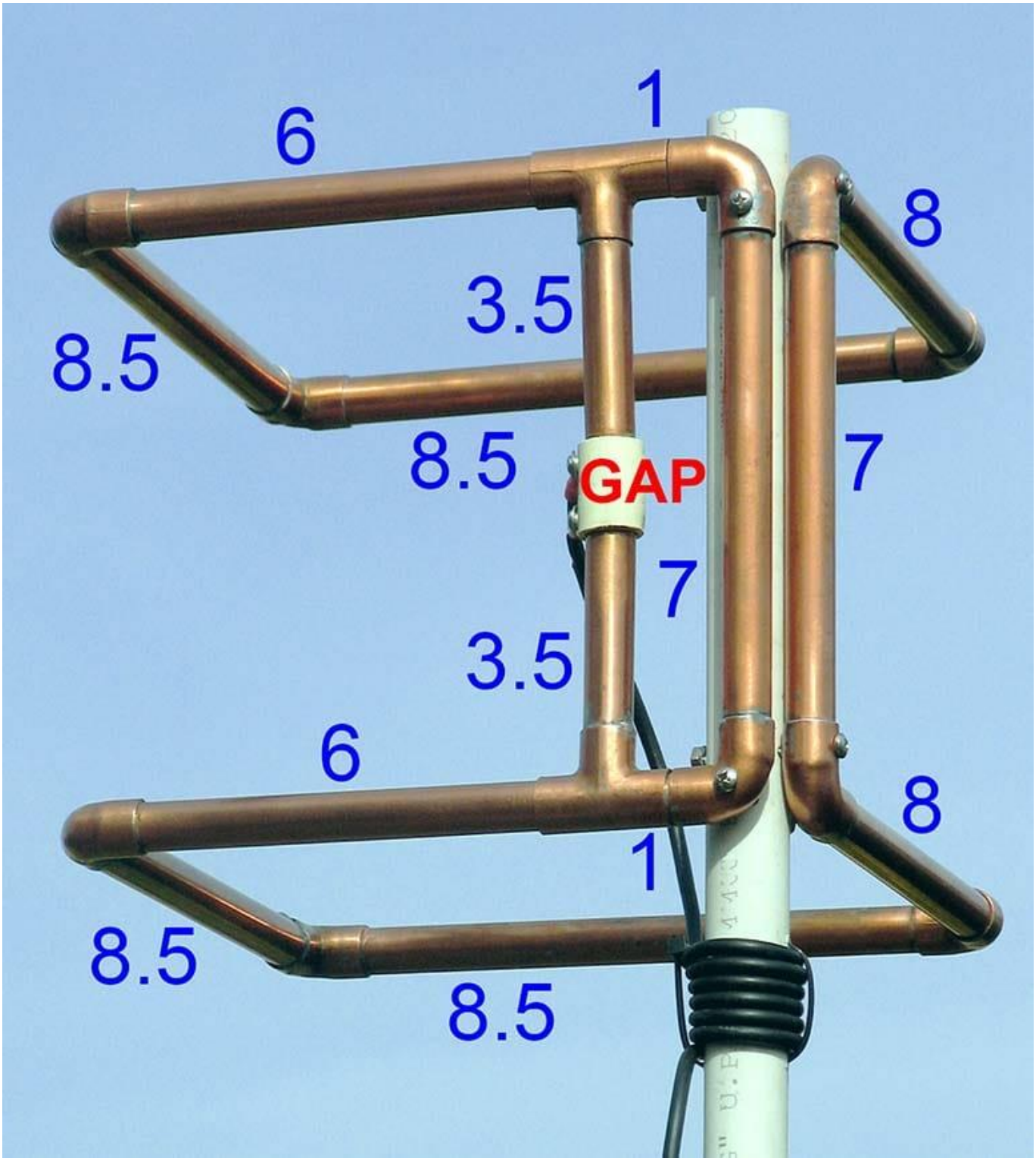
Ed Goss is a CW man at heart; his call sign, N3CW, says it all. Several years ago, Goss set out to chronicle the history of automatic Morse code technology. The result is this book, a comprehensive treatment of a very specialized — some might say arcane — subject.



In 15 chapters, Goss takes the reader from the early days of telegraphy, with code readers, oscillators, and Morse trainers, to the advent of the electronic keyer (with every step in evolution from tubes, to transistors, to integrated circuits, and microprocessors), including the various permutations of paddles, and, finally, today's keyboard-based and computer-interfaced devices. There are chapters about paddle design, adjustment, and maintenance. The book contains appendices on types of keying, strategies for learning Morse code, fascinating trivia, an unusually detailed table of contents, an index, and a bibliography. Goss credits each one of his sources, which is no mean feat when the book contains over 1,100 images.

Compendium of Automatic Morse Code is an easy, delightful read. The book, a hefty hardcover edition, will be equally at home on your bookshelf or your living room coffee table.

Schiffer Publishing, Ltd; 303 pages, with more than 1,100 photographs and graphic images. ISBN 978-0-7643-5131-0. $75 publisher's retail price; selling at $61 on Amazon.com as of September 2018.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