



END FED 20 Meter Half wave Antenna

Introduction

An end fed antenna is very convenient to use because a single support point puts you on the air quickly. Additionally, a half wave does not require radials for proper performance. However, an end fed half wave antenna often has quite high impedance, creating a mismatch with the usual transceiver impedance of 50 ohms.

To solve the impedance problem, a simple L-C antenna matching network can be inserted between the feed line and the half wave antenna wire. A properly designed matching network should present an impedance of 50 ohms with a half wave length antenna, and the capacitor should have the ability to handle the R.F. voltage.

Assembling the 20 Meter Antenna Matchbox

For the popular 20 meter band, a suitable inductor can be made with 26 turns of enamel coated # 22 copper wire wound on a T80-2 toroid as pictured on the lower left. Turns are counted by the number of times the wire passes through the toroid center. Trim the wire ends to extend about 1.5", and carefully scrape the enamel insulation off the last 3/8" to facilitate solder connections.

An effective capacitor can be made with a 9.5" piece of RG-174 coaxial cable. Start by stripping 3/8" of outer insulation from one end of the coax, and 2.5" from the other end. Next carefully cut away the shield from the short end with a scissor or diagonal cutter. On the other end, make an opening in the shield next to the remaining outer insulation. Carefully slide the inner coax wire through the shield. The trimmed RG-174 should look like the upper wire in the photo on the right. Finish the capacitor fabrication by applying some clear silicone caulk on the end with 3/8" outer shield removed, and slide a plastic screw protector over it. This will insulate the center conductor from the shield. This matchbox handles 100 watts.

Next, on the remaining coax end, strip 1/2" of insulation from the center conductor taking care to insure that the stranded conductor is not cut, then tin with solder. Crimp and solder a #6 ring lug connector to the end of the shield. The completed capacitor is shown on the bottom of the right photo.



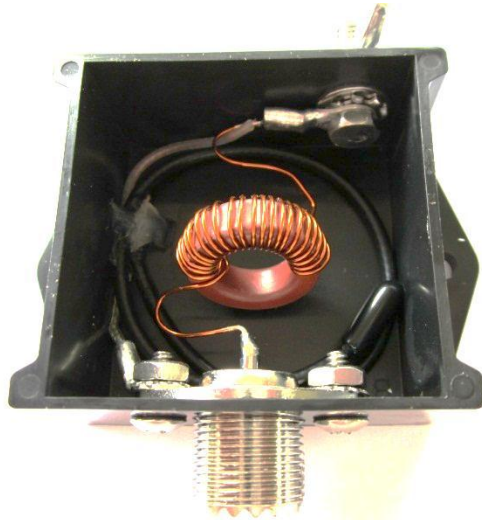
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EARC sells completely fabricated ABS enclosures with all holes machined for the matchbox project. If you are making your own enclosure, prepare the mounting box by drilling one 5/8" hole and two 9/64" holes for mounting the SO-239 coax connector on the lower side of the enclosure. Use the connector as a guide to mark for accurate drilling of smaller holes. Next, drill a 3/16" hole in the upper right side of the box for mounting the antenna connector. The completed enclosure is shown in the right photo.



Next connect the toroid and capacitor referring to the schematic diagram on page 3. Do this by connecting the tinned lead and one end of the toroid together and crimping, then soldering them into a #10 ring lug connector. Solder the remaining wire from the toroid to the center connector of the SO-239 connector. Position the toroid and capacitor inside the box as shown to allow securing the #10 ring lug to the 10-24 machine screw on the upper right box side.



Place the 10-24 machine screw through the #10 lug connector, followed by a lock washer, then a flat washer, and next insert it through the 3/16" hole in the upper side. Place a flat washer on the outside of the box followed by a #10 hex nut. Tighten the nut to hold securely. Position the capacitor in a loop on the bottom as shown, and secure the SO-239 connector with 6/32 machine screws, being sure the #6 ring lug is secured under the left hex nut. Apply a spot of silicone caulk to secure the wires from movement.

Next, place the wing nut on the antenna connector and your project appears as shown left.

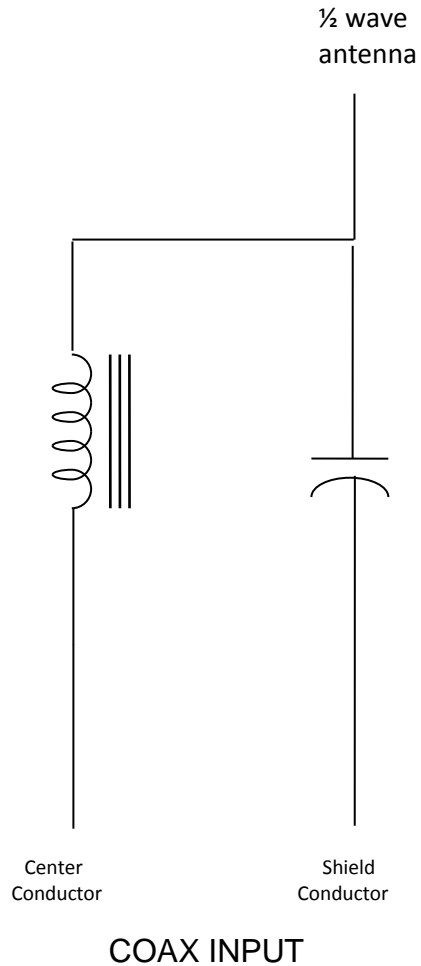
The only remaining assembly step is to securely glue the box cover in place with PVC cement.

Tuning the Antenna

The antenna wire is delivered about 1½ feet longer than the 33' design to allow for minor tuning. However, most users can use the delivered antenna without any trimming and still have acceptable performance and SWR. A desirable characteristic of this antenna is that it performs well without an antenna tuner. If SWR adjustment is needed, start by connecting the matchbox to the antenna wire. Tune an antenna analyzer or transceiver to the center of the 20 meter band, 14175 MHz, and check the SWR. If antenna trimming is required, proceed to incrementally adjust the antenna length in 1" intervals until SWR reaches the desired value, usually a SWR of less than 2:1.



L-C ANTENNA MATCHING NETWORK SCHEMATIC



20 meter End Fed Matchbox Parts List

- 1 small plastic enclosure and cover
 - 1 powdered iron toroid T80-2 or larger
 - 36" solid enamel insulated copper wire 22 AWG
 - 9.5" RG-174 coax cable
 - 2 6-32 x 3/8" machine screws
 - 2 #6 lock washer/nut combination
 - 1 10-24 x 3/4" machine screw and nut
 - 2 #10 flat washers
 - 1 #10 lock washer
 - 1 #10 wing nut
 - 2 #10 wire lugs
 - 1 #6 wire lug
 - 1 plastic screw protector 1/8" ID
 - 1 SO-239 panel mount connector
 - 1 33' insulated stranded wire antenna 18 AWG
- Few drops of clear PVC adhesive to secure cover in place
Clear silicone caulk to secure wires

Do not place a balun in the coax line. Doing so will interfere with antenna performance. The end fed antenna works well in horizontal, sloper, and vertical configurations.

Observe established safety practices when working with antennas, and avoid proximity to power or utility wires. Permanent installations should be equipped with appropriate static and lightning protection.

Keep amateur radio safe and fun!

Chuck Hanebuth NH7XL
Emergency Amateur Radio Club (EARC)



ORDER A COMPLETED 20 METER END FED ANTENNA FROM EARC

If you would like to have an assembled 20 meter end fed antenna but don't want to take on the construction effort yourself, volunteers at the club will build one for you!

Volunteers at the Honolulu Emergency Amateur Radio Club (EARC) carefully assemble and test 20 meter end fed antennas for \$42 including priority mail shipping anywhere in the U.S. A 33 foot stranded 18 AWG antenna wire is included.

Proceeds go to the club to promote amateur radio activities. To order, make payment via PayPal, to our fundraising chairman chanebuth@yahoo.com for \$42 for each 20 meter antenna. Be sure to include your name and mailing address in the remarks section of the PayPal payment.

We ship promptly and you will likely receive the order in 7 days or less. If you have any questions, please email Mr. Hanebuth at chanebuth@yahoo.com.

Thank you for your interest in the activities of Honolulu Emergency Amateur Radio Club and amateur radio.

Visit the club website at <http://www.earchi.org>.