Build a 64:1 Antenna Matching Auto-transformer
by PA3HHO (edited by WU6X)

The halfwave, end-fed antenna has a feed point near 3,200 ohms. The popular 9:1 end-fed antenna matching device will bring the feed point down to something an antenna tuner will match … but, why not use a proper impedance-matching device and be able to work the fundamental halfwave antenna frequency plus all bands below that … without a tuner or radials?

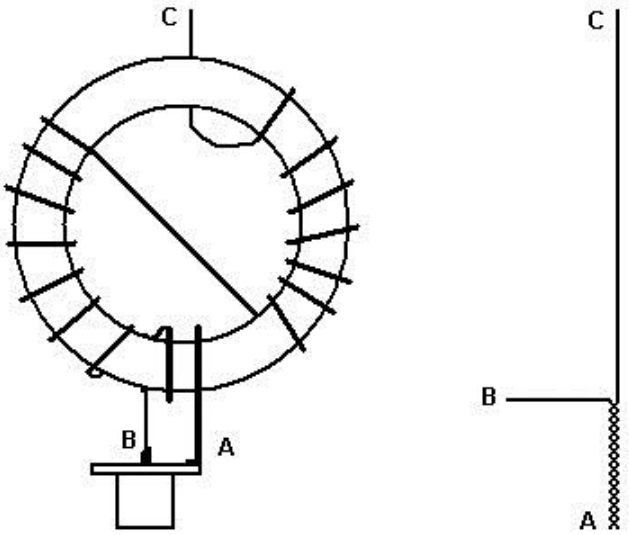
The 64:1 auto-transformer (UNUN) in this article will do just that by matching the 3,200 ohms input of an end-fed wire to the 50-ohm output of the transceiver. The primary to secondary winding ratio is 1 to 7, thereby providing the 50-ohm to 3,200-ohm match. An Amidon **FT-240-43** core is used and sells for $8 at Amidon www.amidoncorp.com. A single FT-240-43 can handle 400 watts and is shown here. You can stack (2) FT-240-43 cores to handle twice that.

I used 18ga enameled transformer wire, but 18ga solid, **insulated** "doorbell wire" will work just as well. Start with a 48" length and cut 8" off one end. Tightly twist the 8-inch piece onto one end of the 40-inch piece. Now, using this twisted piece, starting where the twisted windings end, tightly wind the twisted section (back) onto the toroid at point B (see schematic), leaving the 40 inches to dangle through the toroid.

Make two windings back with the twisted pair, B to A. You should have enough twisted section to make 2 full turns. Cut any excess wire off, leaving about 1½ inch on both ends of the twisted section for soldering to the SO-239. You can remove a tiny bit of insulation (point A) and solder the ends of the twisted windings together; this end will connect to the ground-side of the SO-239. I use a 2-hole SO-239 as it mounts easier to a box that is slightly curved. The other end of the twisted winding is the "hot" input; the center of the SO-239 panel connector (see photos).

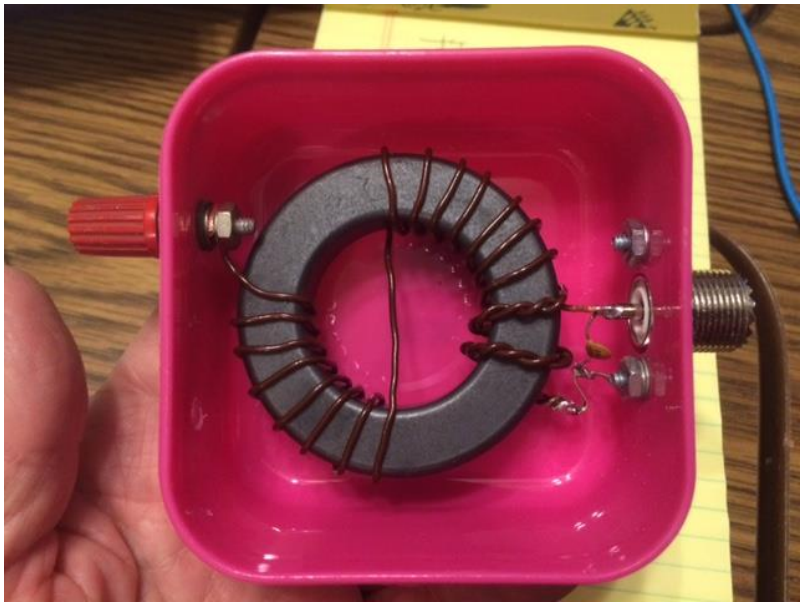
Now from point B (where you started winding back) tightly wind the remaining wire forward to make 7 single windings. Then push the wire THROUGH the core to the other side and make 7 more windings. Cut excess wire (leave 1½ extra for soldering). This end, will be the connect point of the antenna wire binding post.

Here's the schematic for the 64:1 auto-transformer. Note the primary wire (A to B) is doubled:

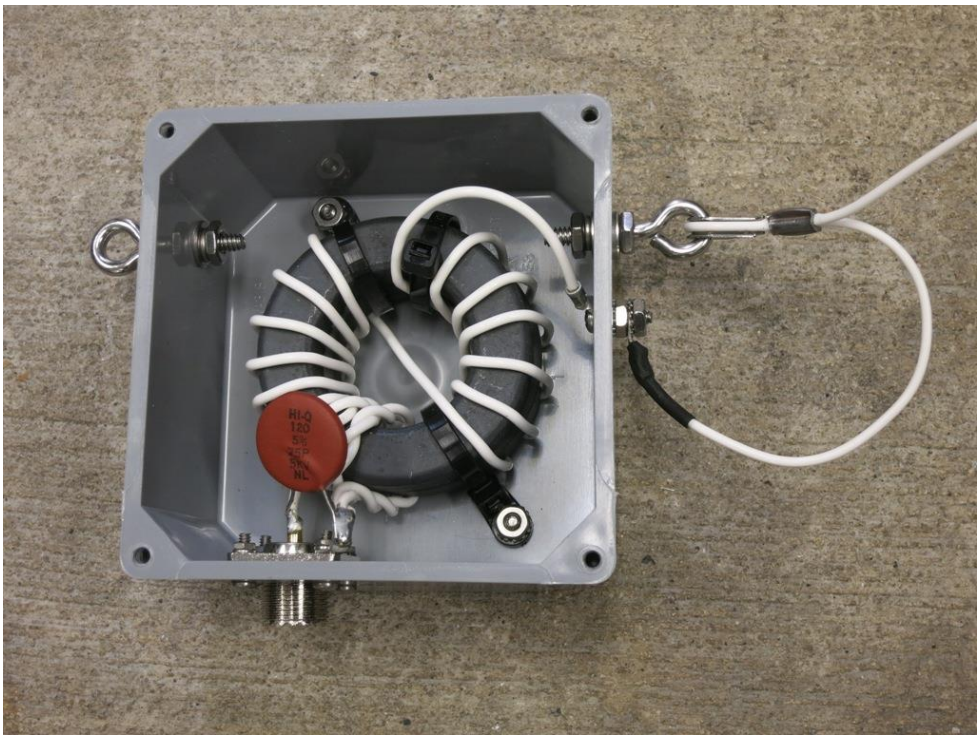


Solder a 150 pF ceramic disc capacitor, preferably 500V or better across the primary side. This cap “shortens” the antenna for 10m to compensate for the impedance of a full-wave on that band. I sourced 1kv ceramic caps from Frys Electronics that work perfectly.

The following picture shows an example of the finished product, less the eye-bolt strain reliefs on the case to hang it and hold tension from the antenna wire before it connects to the standoff. My version (see below) was built in a light-weight Tupperware container.



Another version built in with a water-proof electrical box (hardware store) by KM6AB showing eye-bolt strain reliefs in place.



TESTING

Testing is easily accomplished by placing a 3.2k carbon resistor from the antenna connection point to ground, then checking the input SWR with antenna analyzer such as a Rig Expert or MFJ. Spreading the coils apart on the toroid can be used to fine-tune the SWR.

SUMMARY

The 64:1 auto-transformer will provide a perfect match to a halfwave-length long wire antenna and allows multi-band operation without the use of a tuner or ground radials. Issues with common mode RFI coming back to the radio is significantly reduced. A common mode choke, clamped around the coax, is still recommended at the radio. A 64-foot length of insulted 14ga, stranded antenna wire is the perfect length to work 40 through 10 meters. Use roughly twice that length for 80-10. Test the unit by placing a 3.2k carbon resistor from antenna connection to ground, then look at the input SWR with antenna analyzer such as a Rig Expert or MFJ.

This antenna system is excellent for portable use because of its size and simplified station setup (no tuner), and works well in an inverted "L" configuration, placing the transformer at the bottom of a non-conductive mast, then running the wire up the mast and out horizontally to a tree or bush. I use a zip tie at the top of the mast to support the wire.

Parts List:

(1) Amidon FT-240-43 toroid core
48-inch pieced of 18ga, insulated wire (enameled transformer wire or doorbell wire)
(1) 150pf, 500v minimum, 1kv volt (better) capacitor (ceramic works fine)
(1) 4-inch square box, Tupperware or waterproof electrical box from hardware store
(1) SO-239 panel connector w/mounting hardware
(1) Single conductor binding post

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