How to Build an End Fed Half Wave Antenna (EFHW) from the ARRL kit

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W2SUB

Finished Antenna – 66 feet

Why this kit?

The advantage of an EFHW is the ease of construction, it's versatility in a variety of installation configurations (sloping, horizontal, L, etc.), no tuner is needed, and this one works on 4 bands: 10, 15, 20, and 40 meters. We chose a 250-watt rated antenna so you can comfortably transmit the full output power from many off-the-shelf HF transceivers (typically around 100 watts).

Who needs this antenna?

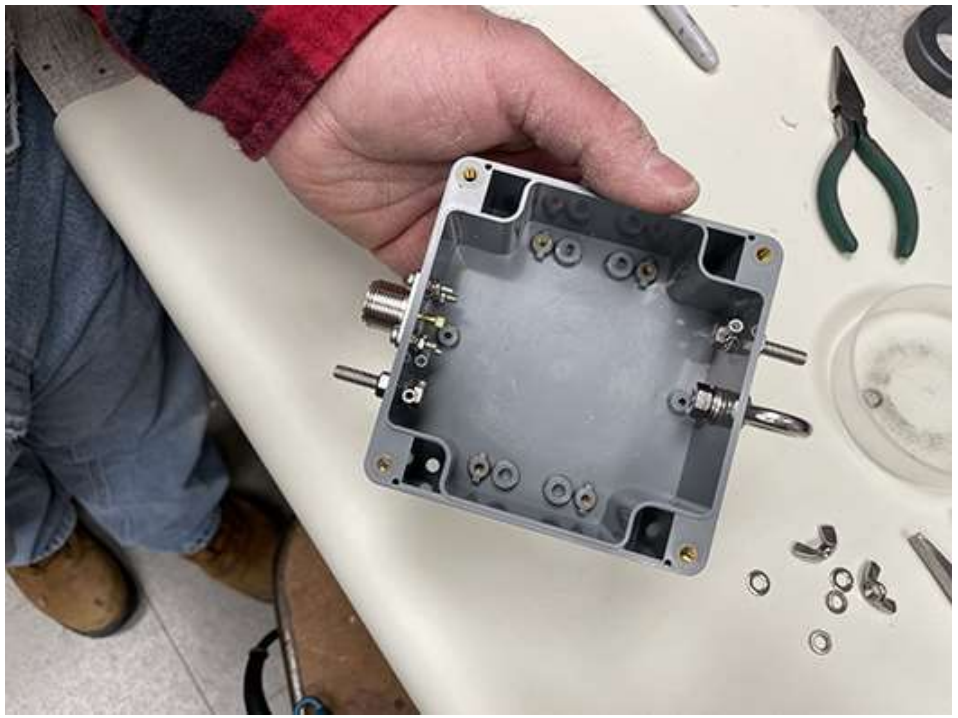
- New licensees. Build something, and you're no longer a licensee…you're a ham!
- New HF operators…and anyone seeking an antenna that covers the bands that will become increasingly active with Solar Cycle 25.
- Experts…because you'll appreciate a quality kit, and you'll end up with a great antenna you can take with you anywhere (think vacation).
- Radio clubs seeking a perfect kit for your next project building night!

The Kit

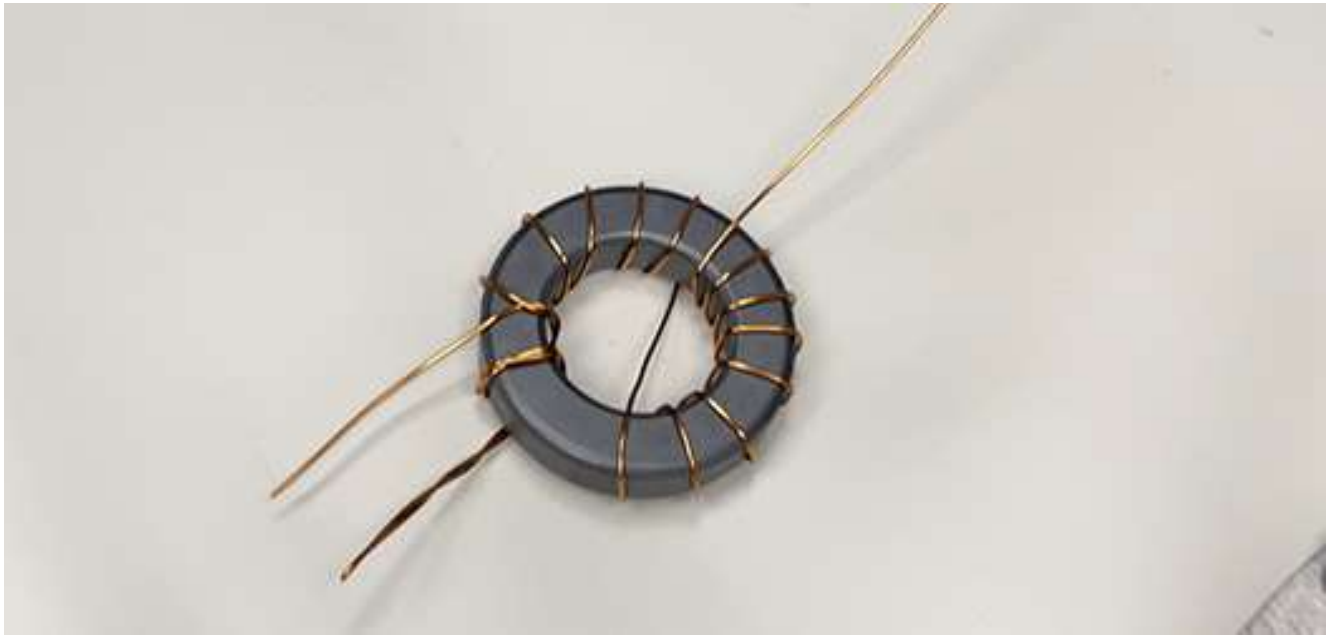
- Tools:
- Drill and drill bits (1/8 to ¾ in step bit, ¼ inch bit, 13/64 inch bit, 9/64 inch bit)
- Pliers
- Wire cutter
- Sharp knife or sandpaper
- Soldering iron and solder
- Screwdriver
- Marker

Start with adding hardware onto enclosure

- Drill out holes
- Mount external fittings and hardware
- PL-259 female (to feedline)
- Ground terminal (counterpoise)
- Antenna wire terminal
- Eyelet for hanging



Winding the toroid (Impedance transformer)

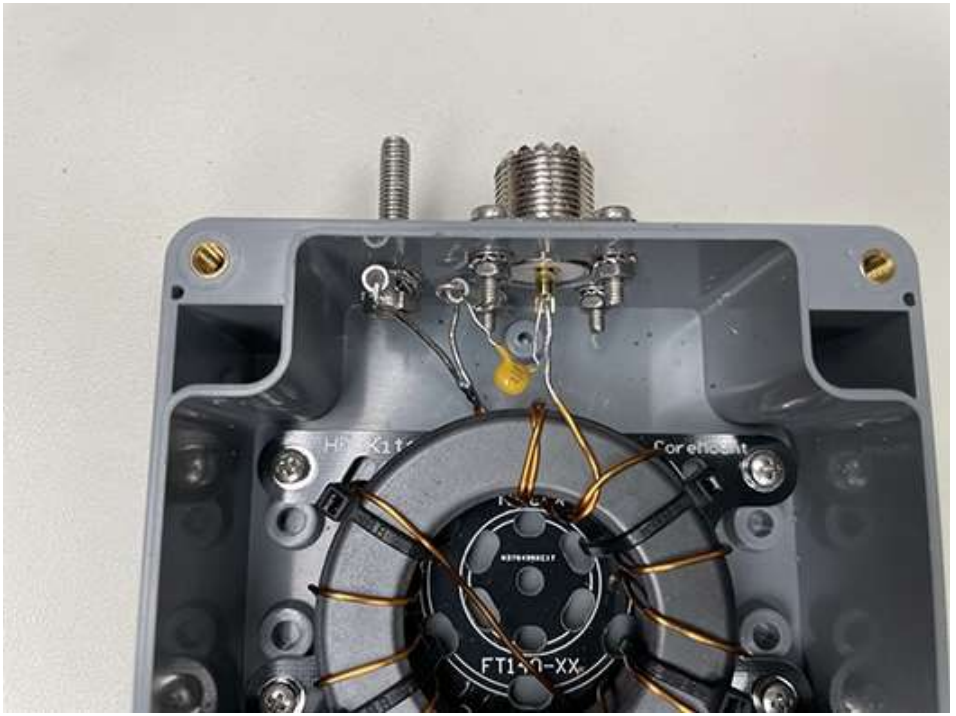


Find the point where the two pieces of wire become one, and place this on the toroid. Wrap the double part twice around the core. Then wrap the other 12 windings as shown, crossing the wire over to the other side of the toroid after the sixth wind.

Note: primary 2 turns, secondary 2+12 = 14 turns

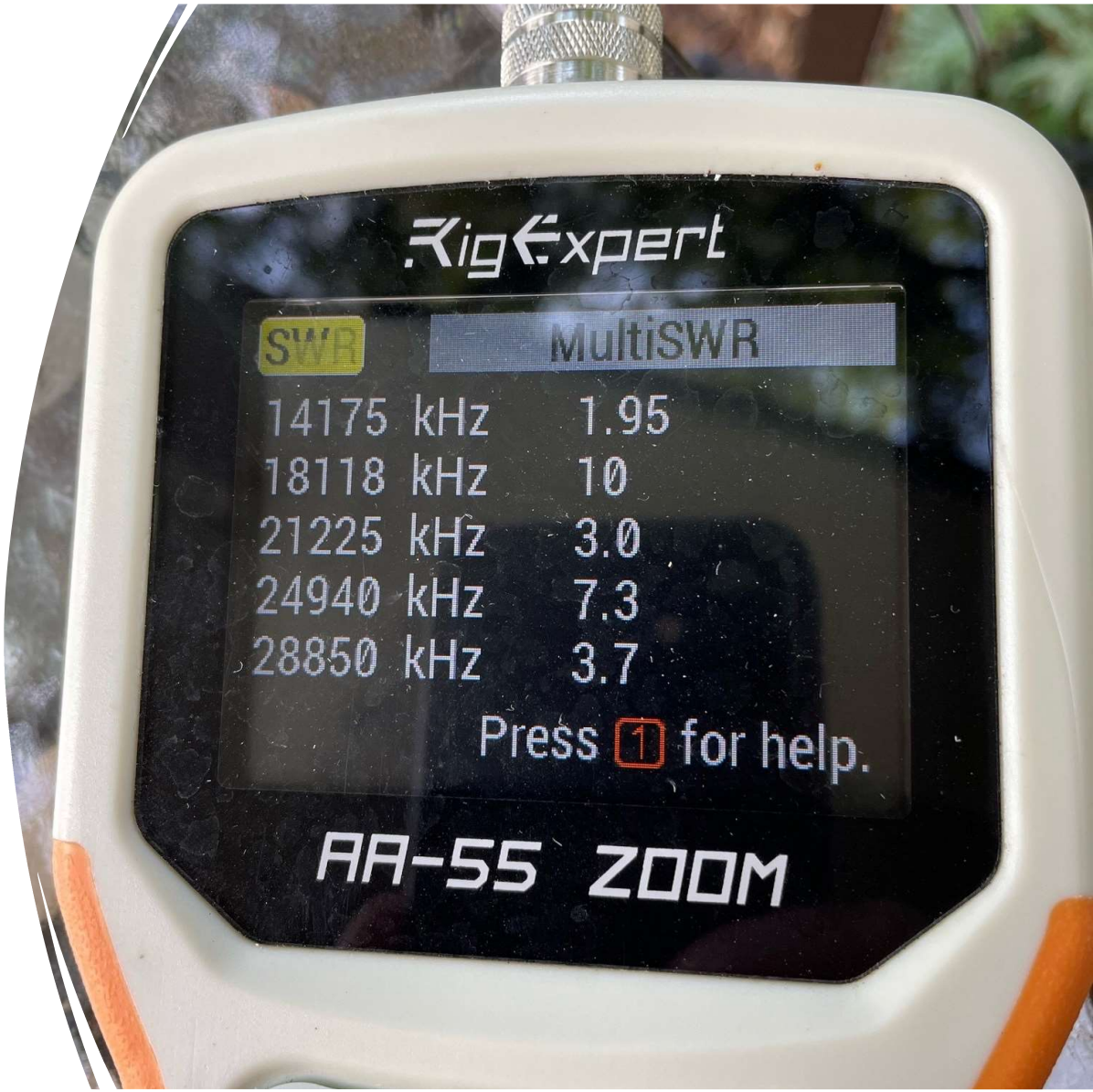
Why add a capacitor?

A 100 pF capacitor can be soldered into place over the primary side of the transformer, to compensate for any (unwanted) secondary capacity. This will mainly be noticeable on the higher bands; 15 to 10 meters. If you will not be active on 15 to 10 meters, you may leave the capacitor out.



Hang the wire and test it!

- Test the antenna using the rig's SWR meter or antenna analyzer. Photo is before tuning.
- A standing wave ratio of approximately 1.5:1 or lower is a good match!
- Trim the antenna wire, a couple of inches at a time, to achieve a low SWR below 1.5 on 40m and 20m.



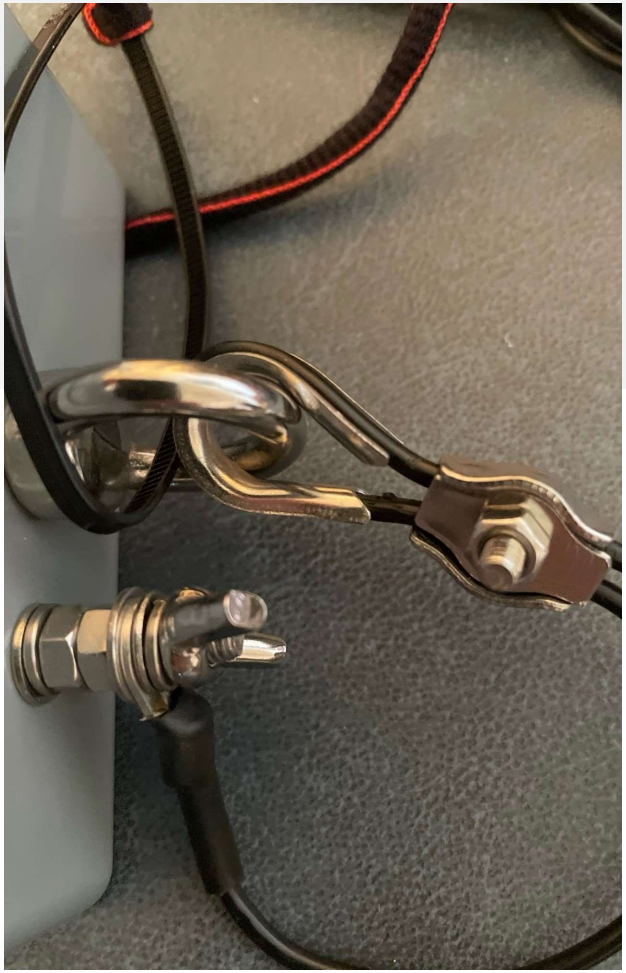
Get it as high as possible

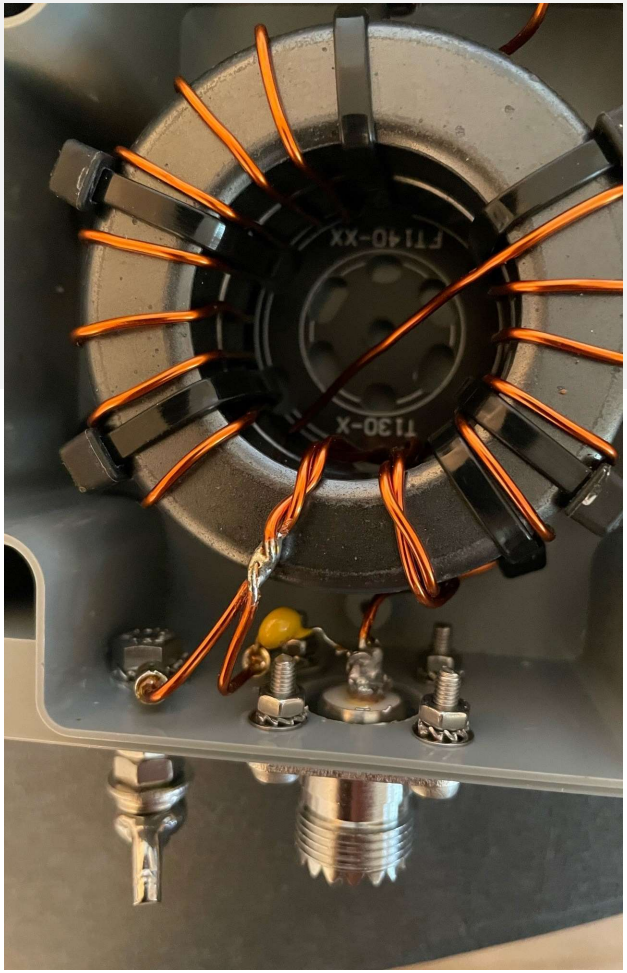
Applications for this Transformer 10m, 15m, 20m and 40m

- It's easy to come up with many antenna varieties that you can match with this 1:49 impedance transformer. In theory, it's possible to connect any half wavelength or a multitude of these to the transformer in order to get a resonant antenna. Here are a few examples:
- 16 feet of wire is a half wave for the 10-meter band.
- 33 feet of wire is a half wavelength for the 20-meter band and two times a half wavelength for the 10-meter band.
- 66 feet of wire is a half wavelength for the 40-meter band, but also a full wave for the 20-meter band, a double full wave for the 10-meter band, and three half-wavelengths for the 15-meter band.

Modifications and Upgrades

- Double or triple toroid to handle higher power from amplifiers
- Heavier 18 gauge wire for toroid windings to handle higher currents from higher power levels
- Thimble in cable turn to provide stress relief on the antenna wire





Toroid Windings – Theory

- Impedence of rig + feedline = 50 Ohms
- Impedence of end fed wire = 2450 Ohms
- Impedences need to match for maximum power transfer
- 2450/50 is 49:1 resistance ratio
- The transformer consists of 2 primary windings and 14 secondary windings. This gives a ratio of 1 to 7. The voltage is therefore seven times higher than the source voltage and the current is seven times lower than the source current.
- This results in an impedance transformation of 7 x 7 = 49. That increases the impedance of 50 Ohm by a factor of 49, that makes it a total of 2450 Ohms.
- $P = i^2r$ Power is product if current squared and resistance
- $r = P/i^2$ If resistance needs to go down by 49:1 then the current must go down by 7:1, this determines the turn ratio above or vice-versa for step up

How to buy this kit - $69.95

- https://home.arrl.org/action/Store/Product-Details/productId/133267

Specifications

- Bands: 10/15/20/40
- Power rating: 250 W PEP
- Impedance network type: 49:1 with included ferrite toroid
- Wire antenna length: includes 66 feet (approx. length) of strong, flexible, and low weight wire
- Coaxial cable feedline sold separately
- Required assembly tools (you supply): drill and drill bits, pliers, wire cutter, sharp knife or sandpaper, soldering iron and solder, screwdriver, marker
- Assembly instructions: arrl.org/end-fed-half-wave-antenna-kit