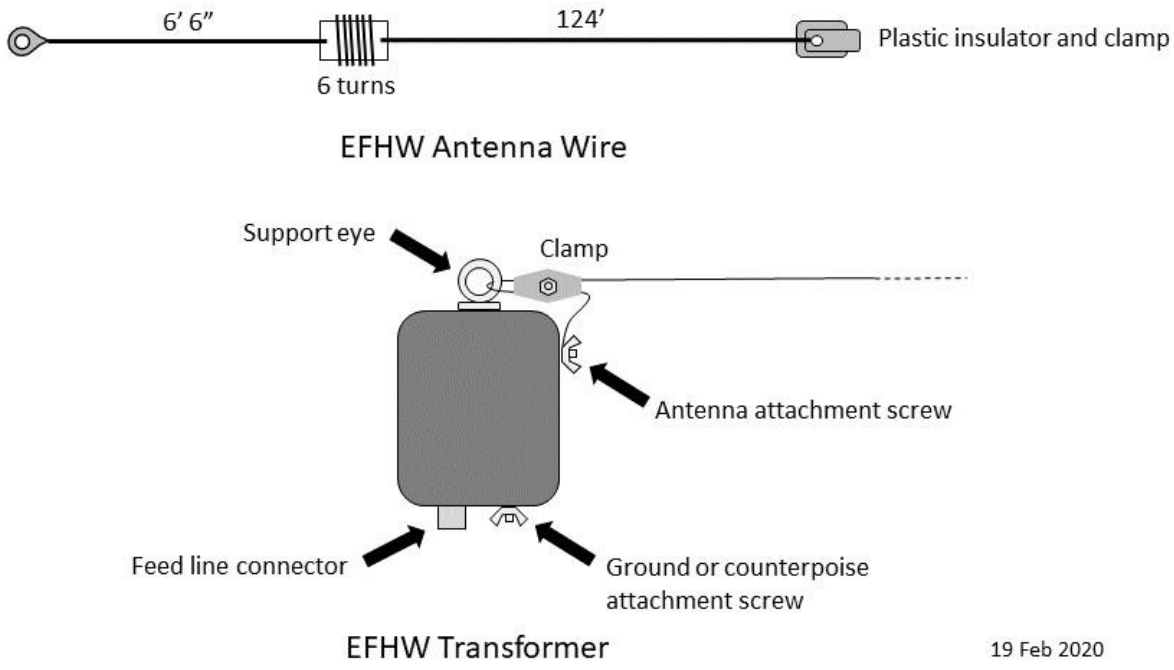
MANUAL: ENDFEDZ ALLBAND-KW 80-10 EFHW 1KW ICAS ANTENNA

The EFHW (End-Fed Half-Wave) antenna is one of amateur radio's oldest antenna designs. Originally known as the "end-fed Zepp," it was used by airships (known as "Zeppelins") suspended from the fed end with the free end hanging loose. The end-fed Zepp was driven with tuned feed line sections, making it primarily a single-band antenna.

The EFHW performs similarly to a resonant, half-wavelength dipole on 80 meters, radiating best broadside to the antenna. As long as the impedance at the end of the antenna is suitably high, the SWR will be low enough to be used on the higher HF bands without an antenna tuner. As operating frequency increases, the pattern develops multiple lobes at angles closer to the line of the antenna. Above and below the HF bands, transformer losses increase, impedance matching is not guaranteed, and damage to the transformer may result at higher powers.

The EFHW consists of the two components shown in **Figure 1** – the antenna wire and an impedance transformer unit. Designed to be used on 80 through 10 meters, the EFHW antenna wire is approximately one half-wavelength long on 80 meters. A 49:1 impedance transformer converts the high feed point impedance of the wire at its end to a value closer to 50 Ω, more suitable for use with coaxial feed lines.

Figure 1 – EFHW Transformer Unit and Antenna Wire



The 6-turn loading coil lowers the resonant frequency into the CW portion of the 80 meter and higher bands. (The antenna wire could also be tuned for the lower end of 80 meters without the coil but the resonance on the higher bands will be progressively higher in the bands.) If phone operation on the 80/75 meter band is preferred, capacitance can be added at the center of the antenna to raise the resonant frequency without affecting the performance on other bands. Cut the antenna at the halfway point and insert HV capacitors. 500 pf is approximately 3.7 MHz. Lower capacitance values will raise it further. Use capacitors rated at 5KV or higher. One way to be able to switch the antenna from CW to SSB, if you're able to take it down and put it up easily, is to install both capacitors and quick disconnect connectors to allow bypassing the capacitance for CW operation. (To state the obvious: you could also simply use an antenna tuner for 75m phone operation without altering the antenna).

You can also adjust SWR by changing the number of turns on the loading coil. Removing turns will raise the resonant frequency. This requires removing the ring terminal (a new terminal will be required), pulling the short end of the antenna wire through the coil form holes, unwinding the desired turns, re-threading the wire through the coil form holes, and reattaching the wire to the antenna attachment screw (without a terminal). When the desired SWR and frequency are achieved, attach a new ring terminal and replace strain relief thimble and wire clip hardware.

Figure 2 shows some of the most common ways to install the EFHW. In Figure 2A (top), the impedance transformer unit is supported by a cord or rope and the antenna wire is stretched out horizontally or sloping toward the ground. (The support eyebolt is not electrically connected to any part of the antenna.) In Figure 2B (bottom), the impedance transformer unit is at or a small height above ground level and the antenna wire is elevated at the far end or in the middle. Antenna configuration is generally not critical but it is helpful to understand feed line interaction and counterpoise function.

In Figure 2A, the ground attachment screw of the transformer is not connected and the outer surface of the coaxial feed line shield becomes part of the antenna, carrying significant common-mode RF current for at least ¼-wavelength from the transformer. If this causes RFI or other undesired effects, a choke balun or "line isolator" may be used at a distance from the transformer to reduce the current. Do not use a choke balun at the transformer unit in this configuration because it will block this current path, reducing the antenna's effectiveness.

In Figure 2B, a counterpoise or ground wire (not provided) is connected to the transformer's ground attachment screw. The transformer should be secured to a sturdy support. In this configuration, a choke balun can be used at the feed point without affecting antenna performance. A ground rod (not provided) or a counterpoise can be used but not both at the same time. The counterpoise wire can be up to ¼-wavelength long and should be approximately under the antenna wire with the far end unconnected. (Counterpoise length and orientation will affect SWR.)

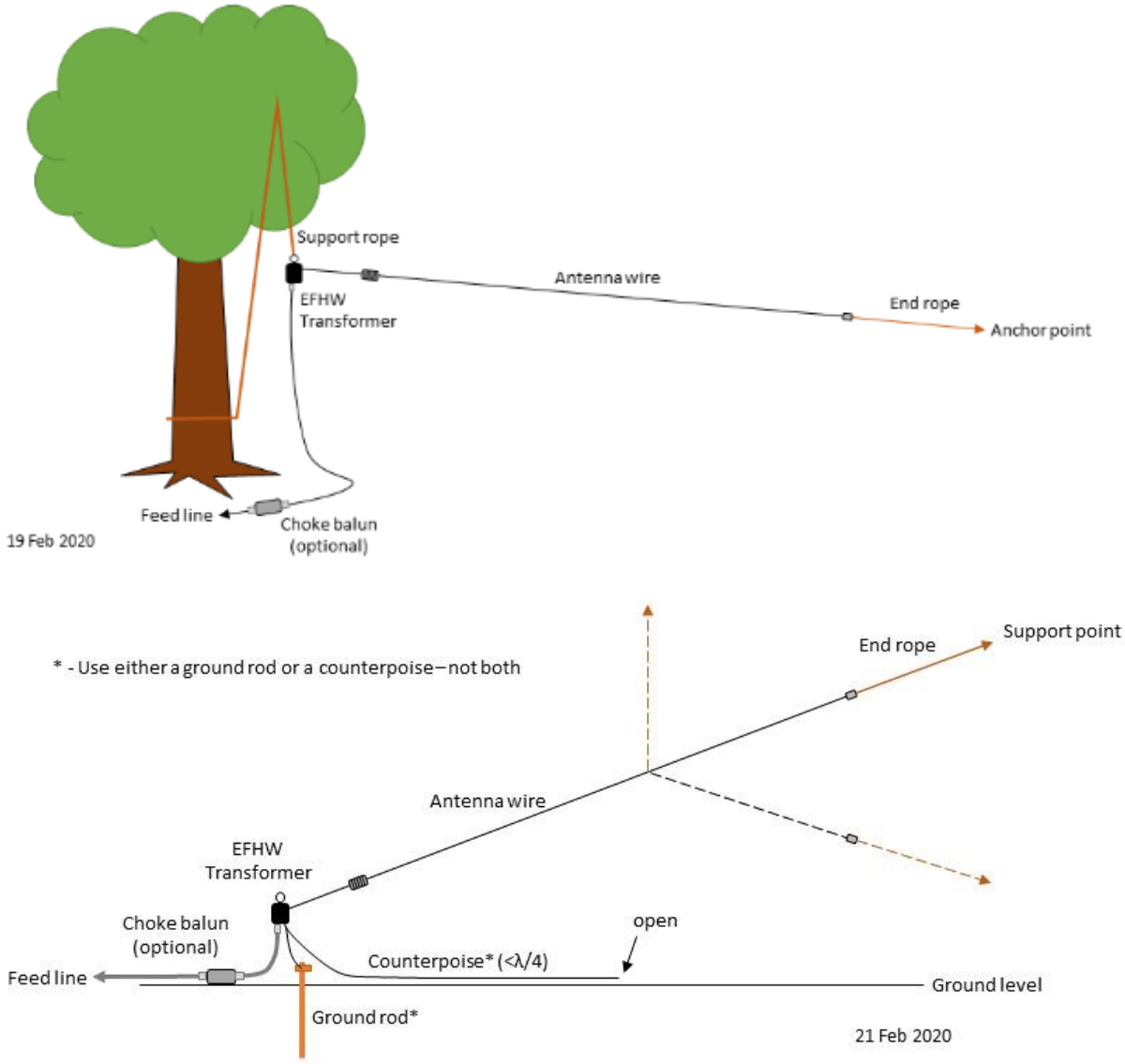


Figure 2A (top) and 2B (bottom) – Typical EFHW Installations

The EFHW's SWR will be affected by height above ground, type of ground, feed line interaction, and any nearby conductive surfaces. Raising, lowering, or re-orienting the antenna may be enough to move the SWR minimum point to the desired frequency. An antenna analyzer with a graphic display of SWR vs frequency will greatly assist adjusting SWR as the antenna is moved.

You can also adjust SWR by changing the number of turns on the loading coil. Removing turns will raise the resonant frequency. This requires removing the ring terminal (a new terminal will be required), pulling the short end of the antenna wire through the coil form holes, unwinding the desired turns, re-threading the wire through the coil form holes, and reattaching the wire to the antenna attachment screw (without a terminal). When the desired SWR and frequency are achieved, attach a new ring terminal and re-attach the wire thimble and wire clip strain relief hardware

Installation Checklist:

1. In Figure 2A, secure support rope or cord so that it is ready to lift the EFHW transformer into position. It is not recommended to support the transformer with the antenna wire. Attach support rope or cord to the eyelet on the top of the matchbox.
2. Attach the support rope or cord to the EFHW antenna wire end insulator.
3. Attach the coax feed line to the transformer feed line connector, then waterproof appropriately.
4. Optional: Attach either a counterpoise wire or a wire connecting to a ground rod to the transformer ground attachment screw. This is the wing nut on a 10-24 thread bolt next to the SO-239 connector. (Use either a ground rod or counterpoise, not both). For permanent installations, use anti-oxidation compound or connection protection grease on the ring terminal.
5. Position the antenna:
    a. In Figure 2A, lift the transformer unit into position and secure the antenna wire.
    b. In Figure 2B, stretch out the antenna wire and secure. Do not kink the antenna wire.

Installation Notes

1. **Support:** The antenna requires a single support — such as a tree, pole, or portable mast — that can both support the transformer and any tension on the antenna. Light-duty cord or twine (not supplied) is sufficient to support the antenna.

2. **Waterproofing**: For the wire attachment screws, coat the ring terminal with anti-oxidation compound before installing. For the feed line connector, use a good-quality electrical tape such as Scotch 33. Assuming the feed line will hang below the feed point enclosure, start wrapping tape on the feed line PL-259 and work toward the enclosure. Wrap the entire connector all the way to the enclosure and finish with two wraps that cover the exposed SO-239 threads.

Specifications

Polarity: Depends on mounting configuration
Design Z: 50 ohms
Power handling: 1 KW ICAS
Weight: 2 lb, 3 oz (1.05 kg)
Radiator wire length: 132’ 8” (40.43m)
Radiator wire type: #18 AWG Polystealth
Hardware: All stainless steel
Connector: SO-239

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