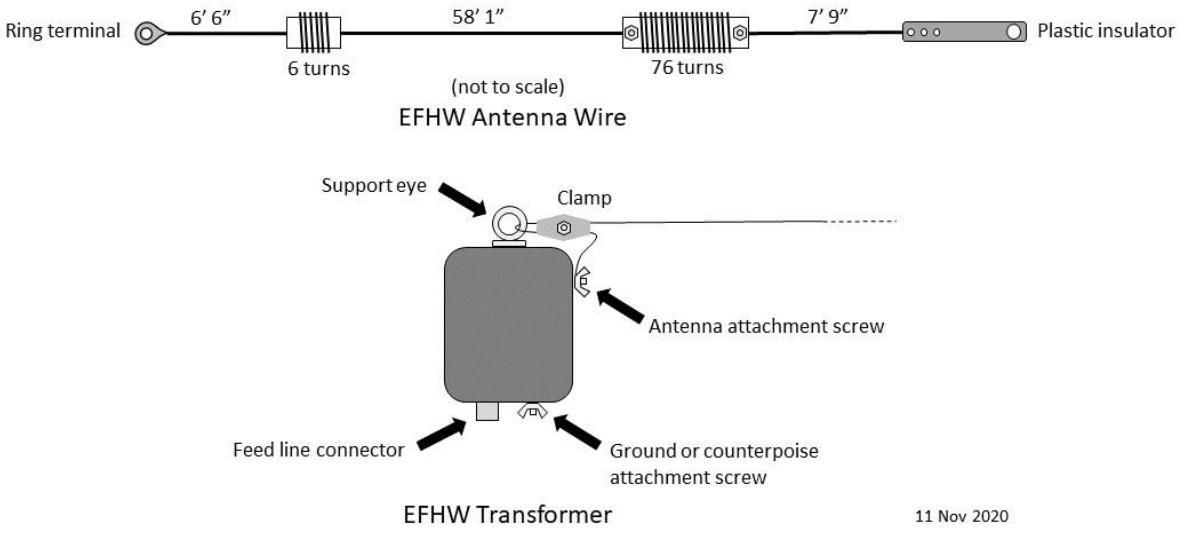
MANUAL: ENDFEDZ 80-10-JR-KW EFHW 1KW ICAS ANTENNA

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 and 40 meters, radiating best broadside to the antenna. As long as the impedance at the end of the antenna is suitably high, the SWR will 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 80-10-JR-KW consists of the two components shown in **Figure 1** – the antenna wire and an impedance transformer. Designed to be used on 80, 40, 20, 15, and 10 meters, the EFHW antenna wire is approximately one half-wavelength long on 40 meters with a coil and extension that add 80 meter operation. 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



Changing the Resonant Frequency

The 6-turn loading coil lowers the resonant frequency into the CW portion of the 40 meter and higher bands. (The antenna wire could also be tuned for the lower end of 40 meters without the coil but the resonance on the higher bands will be progressively higher in the bands.)

You can also adjust the resonant frequency 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 the strain relief thimble and wire clip hardware.

The frequency of minimum SWR on 80 meters can be adjusted higher in the band by removing wire from the 7' 9" section. (As shipped, the 80 meter band segment is centered on 3.55 MHz.) Each inch removed moves the minimum SWR frequency higher by approximately 11 kHz. The effect on 40 meter operation is relatively insignificant. The minimum SWR observed overall on 40 meters will be approximately 1.5:1 to 1.7:1 with coverage of 2:1 or less for most or all of the band available.

The antenna is not designed for a low SWR on the 30, 17, or 12 meter bands but can be used with an antenna tuner and low-loss coaxial feed line to minimize losses due to the high SWR on those bands.

Installing the Antenna

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** (bottom), 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.)

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 versus frequency will greatly assist adjusting SWR as the antenna is moved.

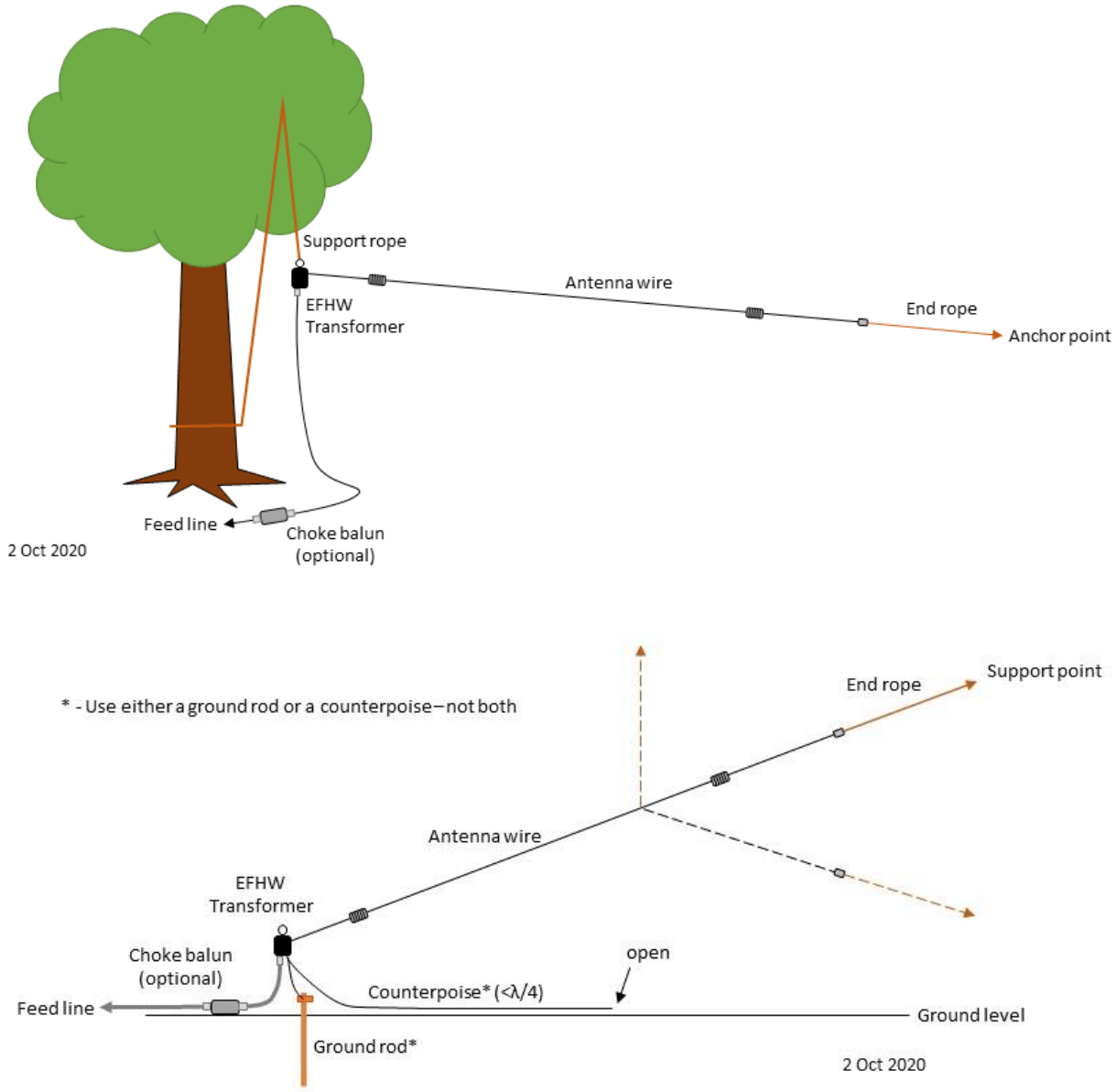


Figure 2A (top) and 2B (bottom) – Typical EFHW Installations

Installation Checklist:

1. In Figure 2A, secure the 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 the support rope or cord to the eyebolt 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 a thin layer of 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 below 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
Frequency coverage:
80 meters 100 kHz <2.1 SWR
40 meters 250 kHz <2.1 SWR
20 meters 350 kHz <2.1 SWR
15 meters 450 kHz <2.1 SWR
10 meters 800 kHz <2.1 SWR
Weight: 1 lb, 5 oz (0.6 kg)
Radiator wire length: 70’ 9” (21.6 m), including coils
Radiator wire type: #18 AWG Polystealth
Hardware: All stainless steel
Connector: SO-239

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