

Using a 49:1 HF Transformer

Recommended antenna topology: End-Fed Half-Wave (EFHW)

Short answer: a 49:1 transformer is normally used to feed an End-Fed Half-Wave (EFHW) antenna. In this application it is more accurately called a 49:1 unun, because it connects an unbalanced coax feedline to an unbalanced end-fed wire.

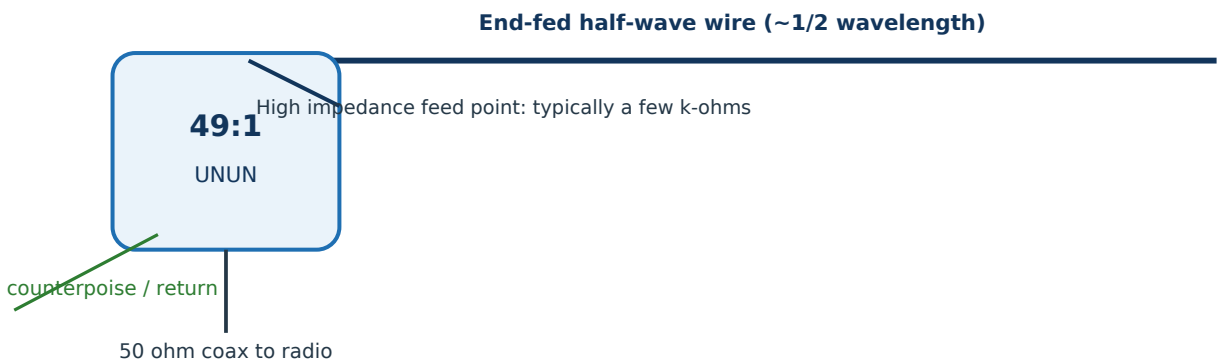
Why a 49:1 transformer fits an EFHW

A 50 ohm transmitter sees the transformer ratio as an impedance transformation. A nominal 49:1 ratio gives:

$$50\text{ ohm} \times 49 = \text{approximately } 2450\text{ ohms}$$

That is in the same general range as the high feed-point impedance found near the end of a resonant half-wave wire, which is often a few kilo-ohms depending on antenna height, surroundings, wire geometry and the return path.

Recommended topology



The basic arrangement is radio -> 50 ohm coax -> 49:1 transformer -> half-wave wire. A short counterpoise, the coax shield, or a combination of both provides the return path. A 1:1 common-mode choke can be added on the coax to control unwanted feedline current.

Starting wire lengths

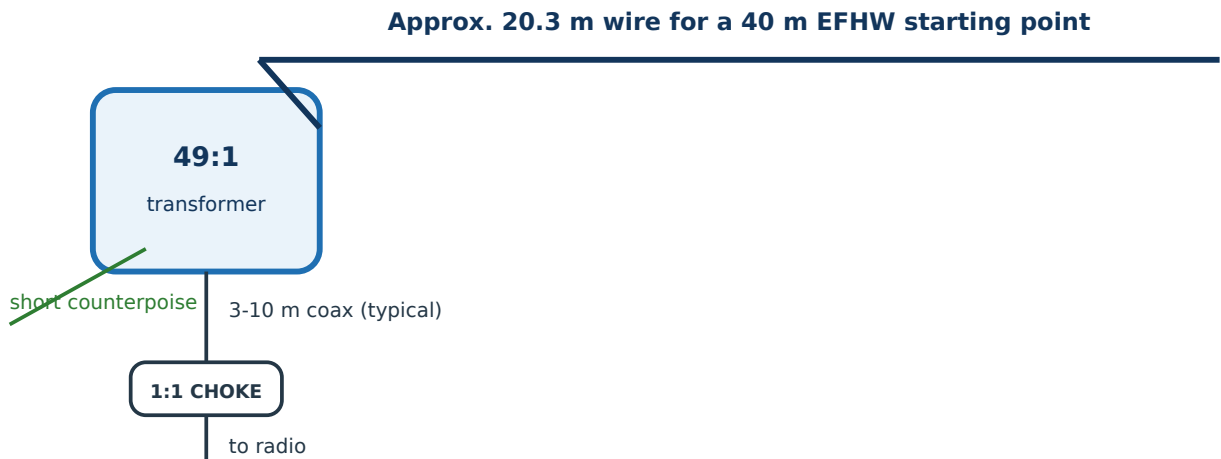
Lowest band	Approx. half-wave wire	Common multiband use
80 m	~40-41 m	80, 40, 20, 15, 10 m
40 m	~20-20.5 m	40, 20, 15, 10 m
20 m	~10-10.2 m	20, 10 m
10 m	~5 m	10 m

A useful first-cut formula for the total wire length is:

$$L \text{ (metres) approximately } 143 / f \text{ (MHz)}$$

For 7.1 MHz, for example: $143 / 7.1 = 20.14$ m. In practice, start slightly long - perhaps around 20.5 to 21 m - then trim the wire while checking resonance and SWR in the actual installation.

Practical 40 m EFHW example



A practical general-purpose HF arrangement is a roughly 20.3 m end-fed wire, a 49:1 transformer at the feed point, a short counterpoise or defined return path, and a common-mode choke farther down the coax. The precise choke position and counterpoise length can be adjusted to suit the installation and to reduce RF on the feedline.

Band	Approx. frequency	Why it can work
40 m	7 MHz	Fundamental half-wave resonance
20 m	14 MHz	Approx. second harmonic
15 m	21 MHz	Approx. third harmonic
10 m	28 MHz	Approx. fourth harmonic

Actual SWR on the harmonic bands depends strongly on the transformer, wire length, installation height, nearby objects and feedline/common-mode current. Treat the dimensions above as starting values rather than guaranteed final lengths.

What not to use a 49:1 transformer for

Conventional centre-fed half-wave dipole: its feed-point impedance is typically much closer to 50-75 ohms, so a 1:1 current balun is normally a better choice.

Non-resonant random wire: a 49:1 ratio is generally not the usual starting point. Random-wire systems commonly use other matching approaches, such as a lower-ratio unun together with an antenna tuner.

Practical setup checklist

- Choose the lowest band you want the wire to cover.

- Cut the EFHW wire slightly longer than the calculated half-wave length.
- Connect the wire to the high-impedance terminal of the 49:1 transformer.
- Provide a defined RF return path: short counterpoise, coax shield, or both.
- Install a 1:1 common-mode choke on the coax if feedline current is excessive.
- Raise and position the antenna as it will actually be used before final trimming.
- Trim a little at a time while monitoring resonance and SWR.

RF safety: the end-fed feed point can develop high RF voltage, especially at higher transmit power. Keep the transformer terminals and the first part of the radiator out of reach and use appropriate insulation and enclosure spacing.

Summary

For a 49:1 HF transformer, the most natural antenna topology is an End-Fed Half-Wave. A 40 m version using about 20 m of wire is a particularly useful starting point because it can also present usable harmonic resonances on several higher HF bands. Final tuning should always be done in the installed position.

Note: the term “49:1 balun” is often used informally, but for a coax-fed end-fed wire the device is normally functioning as an unun (unbalanced-to-unbalanced impedance transformer).