

## Ham 172 - Triad antenna hf-6

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**Objective:** Construct the low-profile, high-performance antenna with commonly available parts and tools.

**Mount.** A convenient mount is an electrical octagon box, nominally 4" across by 1.5" deep. The mount is rugged steel with eight sides, providing multiple configuration options. It is an indoor device, which must be sealed for exterior use.

**Tools.** The hand tools are a drill, 3/8-in and 1/2-in drill bits, with 5/8-in wrench. Tuning employs an antenna analyzer.

**Drill.** For the top, on a wide side of the mount, drill a 1/2-in hole to hold the antenna adapter. Going around clockwise, on the 135° short side and 225° short side, drill 3/8-in holes for the counterpoises. If available mounting space requires the counterpoise to be horizontal, drill the two holes on the 90° and 270° long sides. If desired, a 0.8-in hole can be cut in the bottom to feed the coax connector.

**Elements.** The radiator and counterpoises are quarter-wave devices, typically for mobile applications or custom-built. Select base, center, or continuous-loaded to fit the available space requirements. The parts are for 3/8" antenna stud.

**Assemble.** Connect the antenna adapter through the top hole. Assure the feedthrough is not shorted. Attach the radiator. Connect the two counterpoises with a 3/8" washer and nut. Attach the coax to the antenna adapter. Just below the mount attach 4 to 7 Mix31 ferrite beads over the coax.

**Install.** Configure the antenna in its operating location, since the site influences the impedance, SWR, and pattern. Moving may require re-tweaking the adjustments.

**Analyze.** Connect the antenna analyzer to the other end of the coax. When taking readings, stand away from the antenna to prevent body from interfering.

**Key.** Because the counterpoise design is to compensate for height and shape, all three elements interact and require adjustment. Adjust the radiator for frequency and the counterpoises for SWR.

**Tune.** Tuning is a three-step process. (1) Minimize counterpoise length and tune radiator. (2) Tweak counterpoise then radiator. (3) Recheck counterpoise then radiator.

An alternative which reduces the interaction while tuning is to remove one counterpoise. The antenna is now a bent dipole with a radiator and return. Make the adjustments as above. Add the second counterpoise and tweak to optimize SWR.

**Dual spacer.** If using two radiators, separate by metal bar, 3/4"x3". Drill two 3/8-in holes.

**Dualing radiators.** A second radiator for the same band, but tuned to a different frequency, widens the bandwidth. A second radiator on a different band creates dual bands. Use a counterpoise for each corresponding band. Place the metal spacer over the adapter and attach the lower frequency elements first, then tune as above. Attach the second radiator through the other spacer hole to have two radiators in parallel. Tune the upper band elements.

**Altitude.** The device can install at any height from dirt to an attic of 5-m (15-ft).

**Experiment** with different components and applications such as radiators and portable.

**Results.** Construction is straightforward with minimum tools. For 20-m and higher, the elements are nominally 24-in. 40-m needs a 36-in radiator, and 80-m needs 36-in counterpoises. Refer to the "Background" article for analysis of how the antenna works.

Qty	Component	Size	Source	#
1	Radiator	Quarter-wave inductor	ham web	1
2	Counterpoise	Quarter-wave inductor	ham web	2
1	Mount	4" electrical octagon box	hardware	3
2	Nuts, stainless	3/8"-24	hardware	4
2	Lock washers, stainless	3/8"-24	hardware	5
1	Antenna adapter, insulated	3/8"-24 to SO-239	Amazon	6
1	Coax	RG8x <50', RG-213/U >50'	ham web	7
7	Ferrite snap-on, Mix31	Palomar FSB31-to fit coax	Palomar	8
2	Mounting screws	Support dependent	hardware	9
1	Metal bar, for dual radiator	3/4" x 3", drill two 3/8" holes	hardware	10
1	Coax pigtail, if needed	RG-8x	ham web	11
1	Barrel connector, if needed	SO239 to SO239	ham web	12

