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Horizontally Polarized Two-Meter Triangle Loop Antenna

This omnidirectional horizontally polarized antenna is easy to build.

Several of my friends and I like to get on 2 meters SSB for a rag chew session each week. Some of us use the same vertical antenna we use for FM, while others use horizontal Yagi beams. You can imagine the chaos this causes, because the beams must be rotated often, and cross polarization adds to the dilemma.

We desired an inexpensive horizontal, omni-directional antenna that each of us could easily build. We investigated the halo, folded-dipole halo, the big-wheel, and the squalo antennas. Each of these have their good points, but would involve a complicated build, while others would be difficult to mount on a tower leg rather than the top of a mast. We found that these antennas are being sold at $65 to well over $150 on the internet.

The Triangle Loop

Randy Terrell, K9BCT, came up with a triangular halo using a gamma match feed, but we both found that a loop feed (**Figure 1**) works much better and is easier to implement. The result is this simple Triangle Loop Antenna made from the parts in **Table 1**.

The saddle block is the size of the mast or tower leg on which the antenna is to be mounted. It is available at Ace Hardware, Grainger, or eBay. Prices vary from $3 to $12 depending on source and mast size.

Randy used a Pittsburg 40" rule from Harbor Freight ($1.98), but I chose to use a 1-1/8" wide 36" rule from Ace Hardware ($6.59) because I broke my Harbor Freight rule when I tried to bend it too sharply in the square jaws of my vice. The Ace Hardware 36" rule is slightly thinner and is higher quality aluminum. I also clamped a round screwdriver in the vice with the rule, bending the rule around the screwdriver shaft so the bends are not too sharp. I learned my lesson!

Table 1
Materials for the Triangle Loop Antenna.

Qty.	*part*
1	36" aluminum rule (yardstick)
1	chassis mount UHF connector
4 ea.	#4-40 x ½" machine screws and nuts
9"	#12 AWG solid copper wire
1	#10-32 x ¾" machine screw and star nut
1	#10-32 x 1" Nylon machine screw
3	Nylon #10-32 nuts
1	Stauff saddle block clamp assembly.

The Build

Figure 2 shows the antenna dimensions. Drill a hole at the 16" mark, for the #10-32 machine screw that will secure the end of the feed loop wire.

Center the Saddle Block at 18" mark on the rule, then match-drill the rule for the mast Saddle Clamp assembly's mounting bolts.

Drill and mount the UHF connector at the 20" mark. Scrape the surface of the rule to make good contact and use antioxidant compound (for example Noalox).

Figure 1 — The Triangle Loop Antenna fed by a secondary loop.

Match-drill the holes for the #440 screws that will hold the UHF connector on the rule.

Bend the first half inch, and last half inch of the 36" rule 60° in the same direction (that is, *up*).

The rule is then bent 120° in the opposite direction (that is, *down*) at the 12" mark and again at the 24" mark to form the triangle, with the two ½" ends parallel.

Drill a thru-hole in the ½" parallel ends and install the #10-32 Nylon screw and three Nylon nuts (see **Figure 1**). The Nylon screw and three nuts will be used to adjust the resonant frequency of the antenna.

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Install the UHF connector using the 4 #4-40 screws and nuts.

Solder one end of the 9" wire to the center pin of the UHF connector, then form an 8" diameter half loop, using the extra 1" of the 9" wire to form an "eye" used to secure it to the rule with the #10-32 machine screw and star nut at the 16" mark, using Noalox after scraping the aluminum when securing the "eye" to the rule.

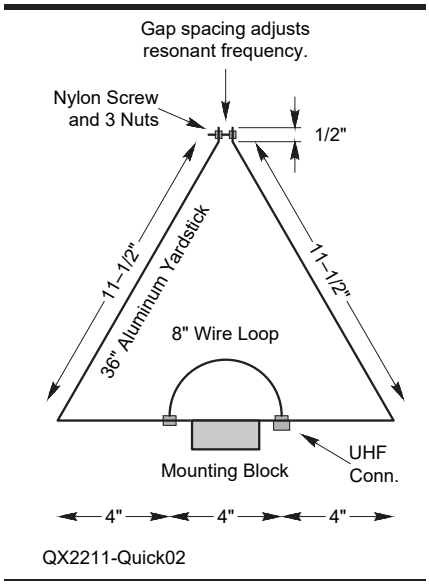

Figure 2 — The dimensions of the Triangle Loop Antenna.

Figure 3 — The Triangle Loop Antenna mounted on a mast.

Install the Saddle Clamp Assembly.

Mount the Triangle Loop Antenna on a mast or tower leg.

Set the resonant frequency with an antenna analyzer. This antenna is very forgiving, and is adjustable from below 139 MHz to above 148 MHz by adjusting the gap with the Nylon screw.

Results

The Triangle Loop Antenna mounted on a mast is seen in **Figure 3**. My cost to build the antenna was less than $10 plus the cost of the Saddle Clamp Assembly, and it took me less than an hour to build the antenna. The bandwidth is 2.16 MHz at the 2.15 SWR points. Resonance is 144.200 MHz, and the Return Loss is 36 dB. The impedance at resonance is 49.4 Ω resistive with a reactance of −1.43 Ω.

Testing the triangle Loop with a fellow ham who lives about 10 miles from me, I rotated the Triangle Antenna to point 0°, 90°, 180°, and 270° from his bearing and confirmed it is omnidirectional. I am making no claims about the gain of the triangle loop because I have not measured that, but 4*nec*2 modeling indicates the Triangle has a modest gain over a dipole.

I am anxiously looking forward to the time we all have these Triangle Loops in use, it will make it much easier for us to chat amongst the half dozen of us scattered around the county. This antenna is a very good addition to my station.

Stacking for Gain

Two of these triangle loops can be stacked, one above the other with a ⅝ wavelength vertical spacing, and used with a phasing harness consisting of a UHF "**T**" connector, and two identical coax cables each having an electrical length of ¾ wavelengths (an odd number of ¼ wavelengths) at the resonant frequency. This will increase total omnidirectional gain by 3 dB.

Remember that an electrical wavelength in coax is shorter than the physical wavelength because of the cable velocity factor. Use a VNA or antenna analyzer capable of measuring the cable's electrical length. Cable manufacturer's stated velocity factor is accurate to only ±10%.

Richard Quick, W4RQ, is a retired electronics and metrology engineering technician and an Amateur Extra-class licensee, first licensed in 1977. He is a member of the ARRL, and is an avid CW enthusiast. Richard has co-authored the articles, "Does Your Antenna Need a Choke or Balun," March 2017 QST, *"Live Trees Affect Antenna Performance," February 2018* QST, *and "Small Gap Resonated Loop Antenna," September 2018* QST.

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