Garden Antennas

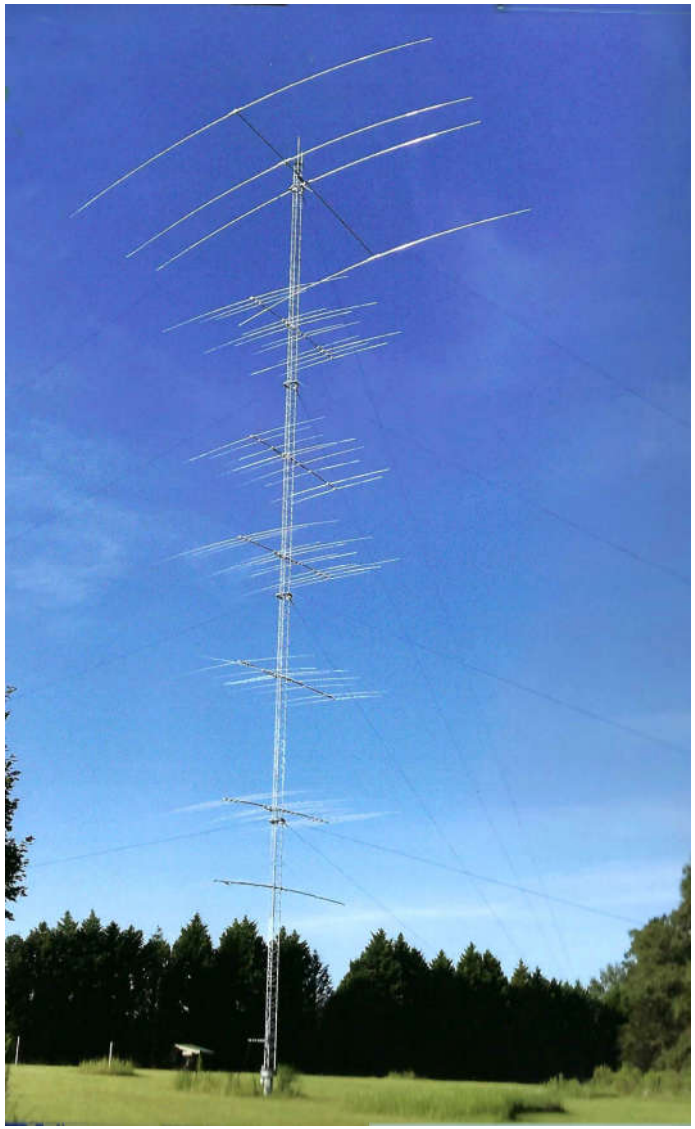
Frank M. Etzler, N8WXQ

Can you put this up?

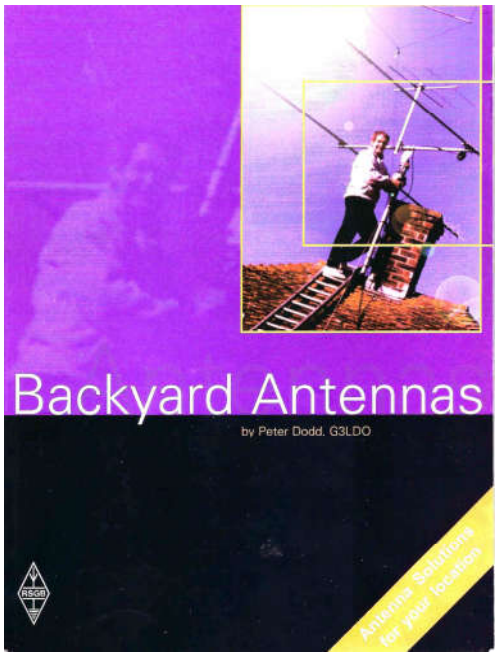
Ideal height for Yagi or Dipole is ½ λ

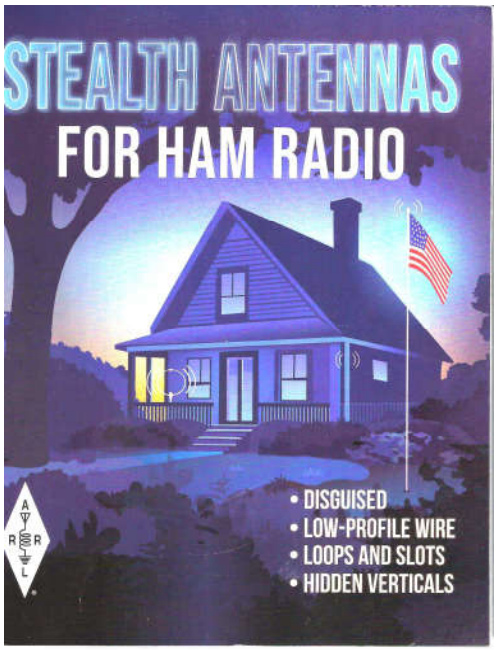
Your problem is:
No money
No space
Need portability

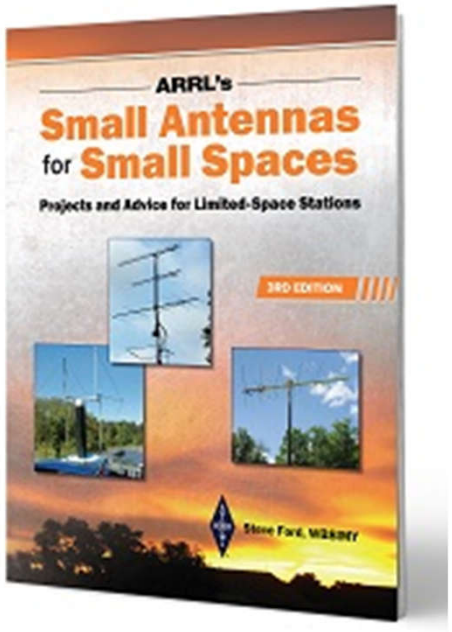
Goal is to erect an antenna that is as efficient as possible.

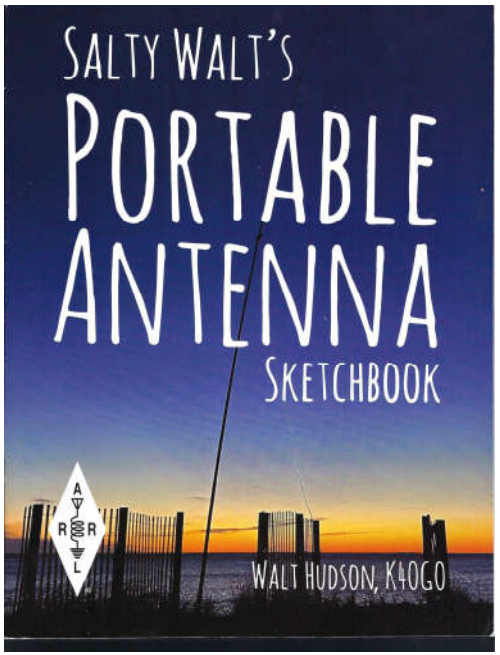


Resources


Backyard Antennas
by Peter Dodd, G3LDO
Antenna Solutions for your location


STEALTH ANTENNAS
FOR HAM RADIO
• DISGUISED
• LOW-PROFILE WIRE
• LOOPS AND SLOTS
• HIDDEN VERTICALS


ARRL's
Small Antennas
for Small Spaces
Projects and Advice for Limited-Space Stations
3RD EDITION


SALTY WALT'S
PORTABLE
ANTENNA
SKETCHBOOK
WALT HUDSON, K4OGO

Antenna Basics

- Full sized dipole and vertical antennas with radials are very efficient.
- Short antennas have reduced efficiency.
  - A 10 ft. whip is < 1% efficient on 160m.
- Transformer baluns and ununs can be very lossy. Loss increases with transformer ratio. 49:1 UNUNs usually have large losses. Loss goes up with ratio.
- A multiband single wire antenna supports only 3-4 bands at most.
- For a single wire antenna, the radiation pattern varies between bands.
- Ideal height for a horizontal antenna is ½ λ unless NVIS is desired.
- Vertical wires are useful between 1/8 λ and ¾ λ.
- Long vertical wires send radiation upward.
- Don't bend wires at high current points.

Some Commercial Solutions

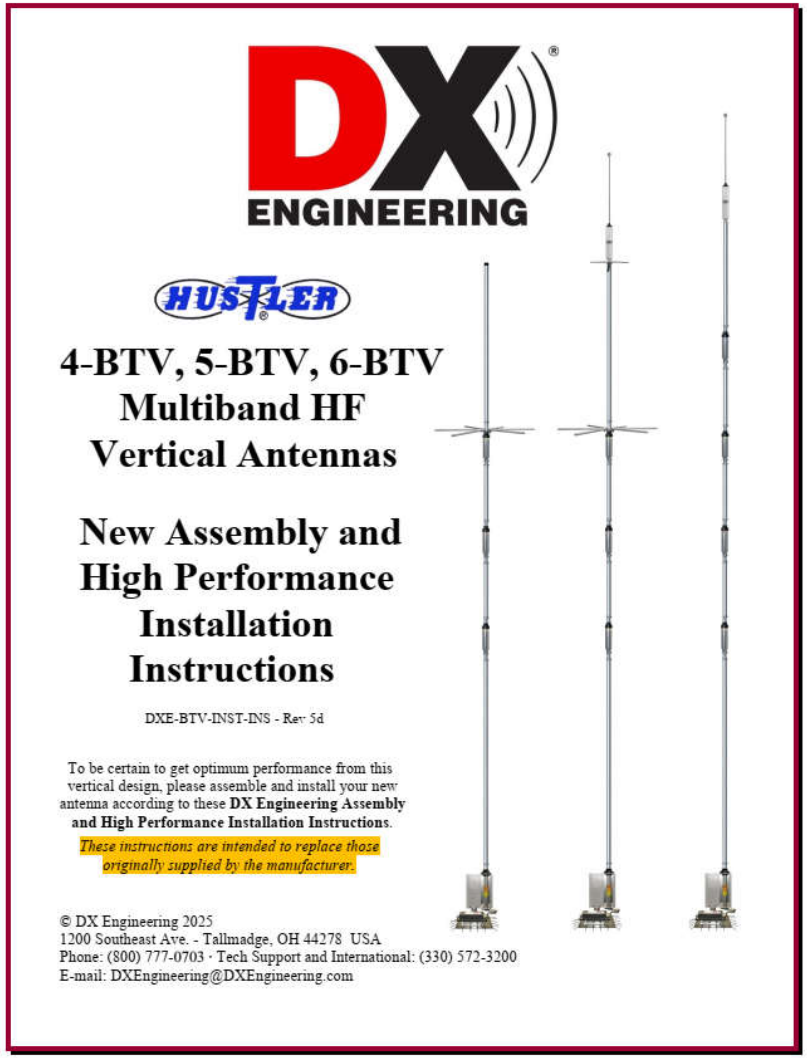
GAP Antennas

Vertical Dipoles may require counterpoise wires

These antennas generally don't cover 30m
Narrow banded on 80m

https://gapantenna.com/

Hustler BTV series



DX Commander

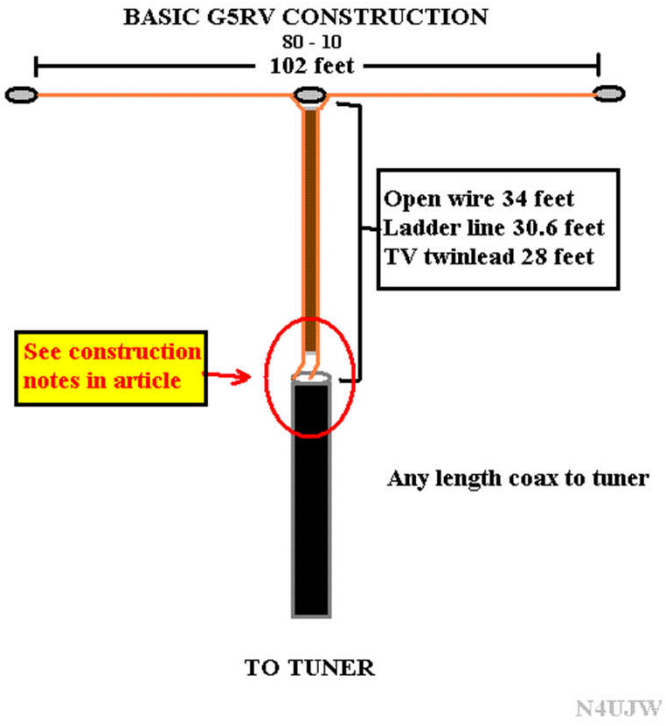
- Design is a fan vertical.
- Simple design
- Available from DX Engineering.

https://dxcommander.com/

Vertical Antenna Honorable Mentions

- Diamond Antenna BB7V Multi-Band Vertical Antennas BB7V
  - No radials, 18ft not so efficient
- Moonraker GPA-80FHP Fiberglass HF Vertical 80-6M Antenna 11-203
  - Requires radials, Needs wide range EXTERNAL tuner. (Remote Tuner?)
- *These above antennas will have reduced efficiency*

G5RV



Also consider ZS6BKW antenna.

FULL-SIZE, DOUBLE-SIZE and HALF-SIZE (sometimes called the "JR":

Band Coverage	**3.5 - 28 MHz (most popular)**	**1.8 - 28 MHz**	**7 - 28 MHz**
Length of Antenna	**102 ft (31.1 m)**	**204 ft (62.2 m)**	**51 ft (15.55 m)**
Matching section :			
- Open wire	**33.7 ft (10.28 m)**	**67.5 ft (20.56 m)**	**16.9 ft (5.14 m)**
- Ladder line	**31.3 ft (9.54 m)**	**62.6 ft (19.08 m)**	**15.6 ft (4.77 m)**
- "TV" twin lead	**28.5 ft (8.69 m)**	**57 ft (17.38 m)**	**14.3 ft (4.35 m)**

https://www.hamuniverse.com/g5rv.html

G5RV **Radio Communication,** July 1984, pp. 572-575.

G5RV, The ARRL Antenna Compendium Vol 1, 1985

Doublet Antenna

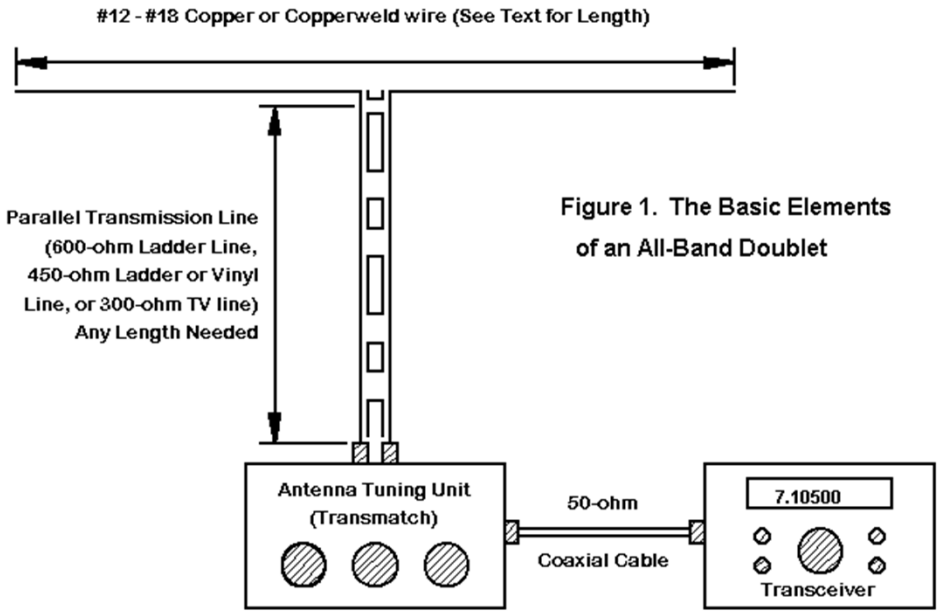


Figure 1. The Basic Elements of an All-Band Doublet

a. 130-140' (best, if you have the room and want the strongest results on 80 meters.
b. 90-110' (works second best on 80 meters, with good results on all other bands).
c. 65-75' (good for 40 meters through 10 meters, but not for 80).

See K5OHY
https://www.youtube.com/watch?v=eSS1dw3e50c
Too long leads to poor radiation patterns.

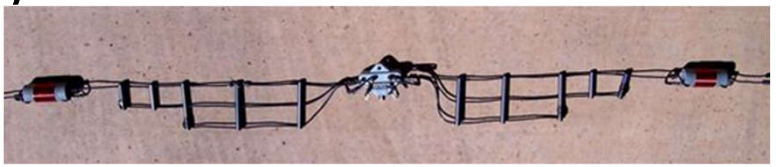
https://ftp.unpad.ac.id/orari/library/library-sw-hw/amateur-radio/ant/docs/Introducing%20the%20All-Band%20Doublet.htm

Other Horizontal Antennas

- **Alpha Delta Antennas**

  https://www.alphadeltaradio.com/dx-series/model-dx-cc

  Some models are quite short due to traps.



- **OCF and EFOCF antennas**
  - **(see *https://shop.rf.guru/pages/efhw-vs-efoc-two-voltage-driven-antennas-two-smart-solutions*)**

Remote Tuners

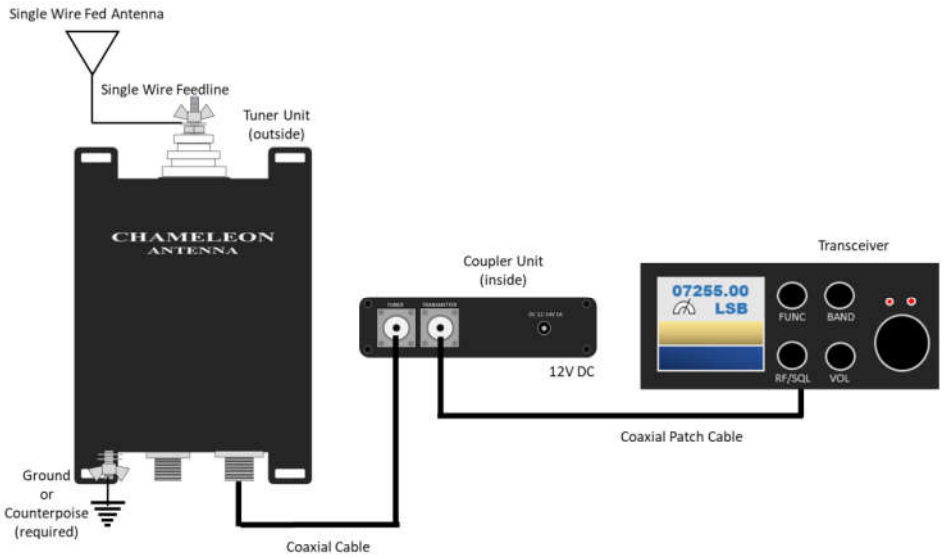


Figure 8. Single Wire Antenna Tuner Connections.

Typical Uses for Remote Tuners

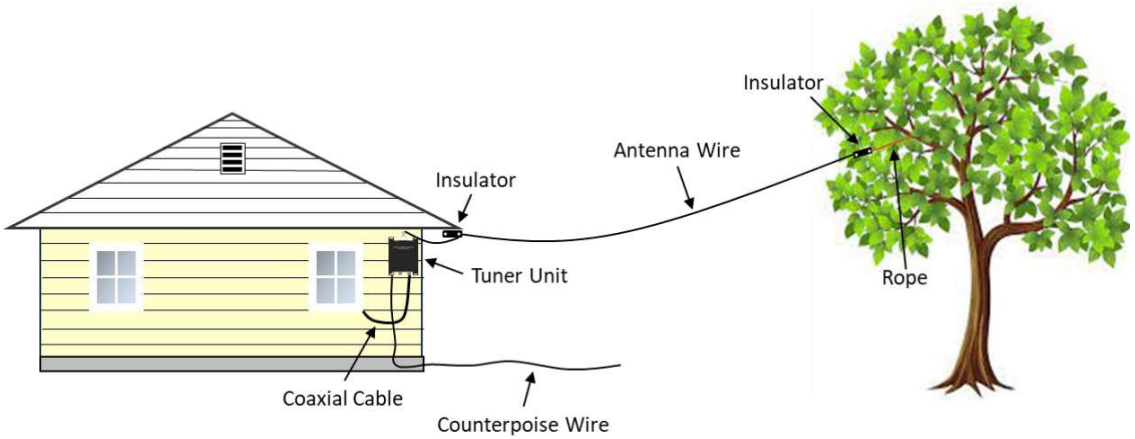
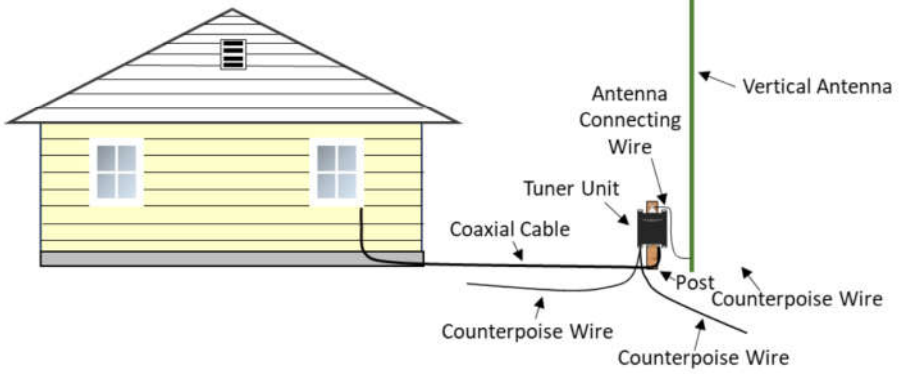
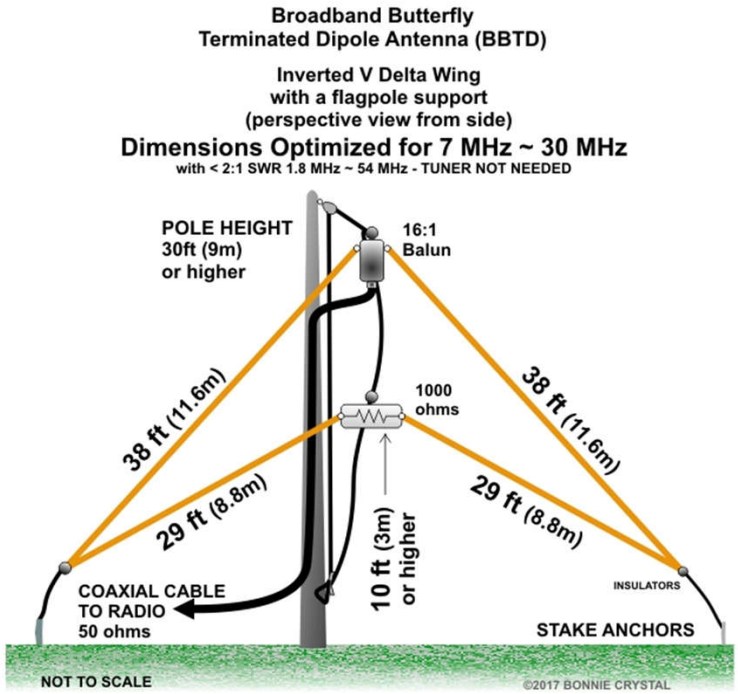


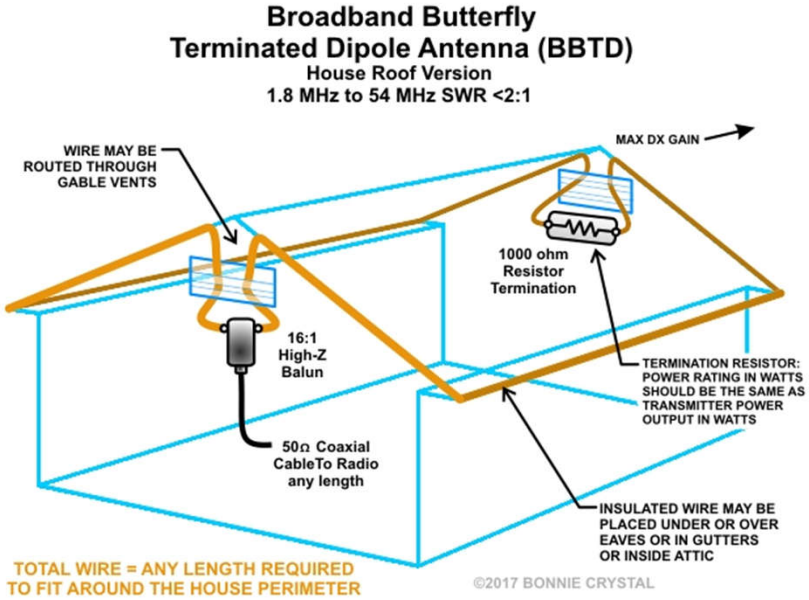
Figure 5. Random Wire Antenna.

Best Choice →



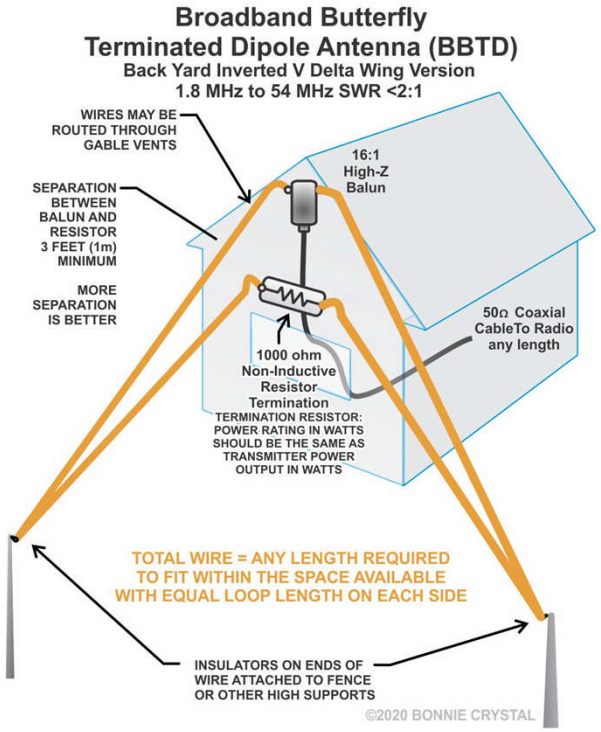
Broad Band Butterfly Antenna

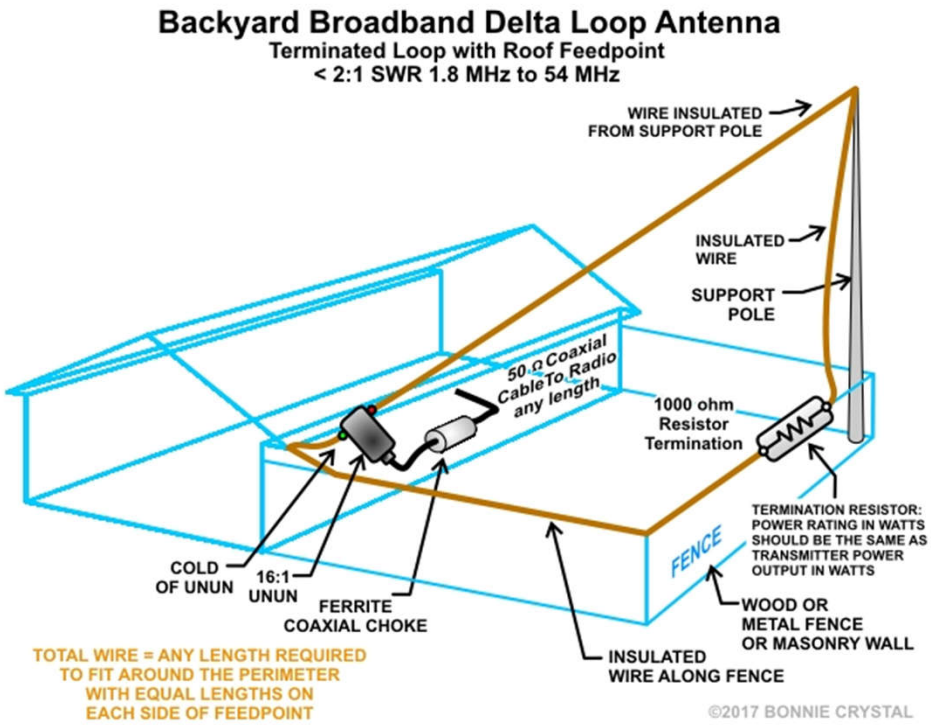




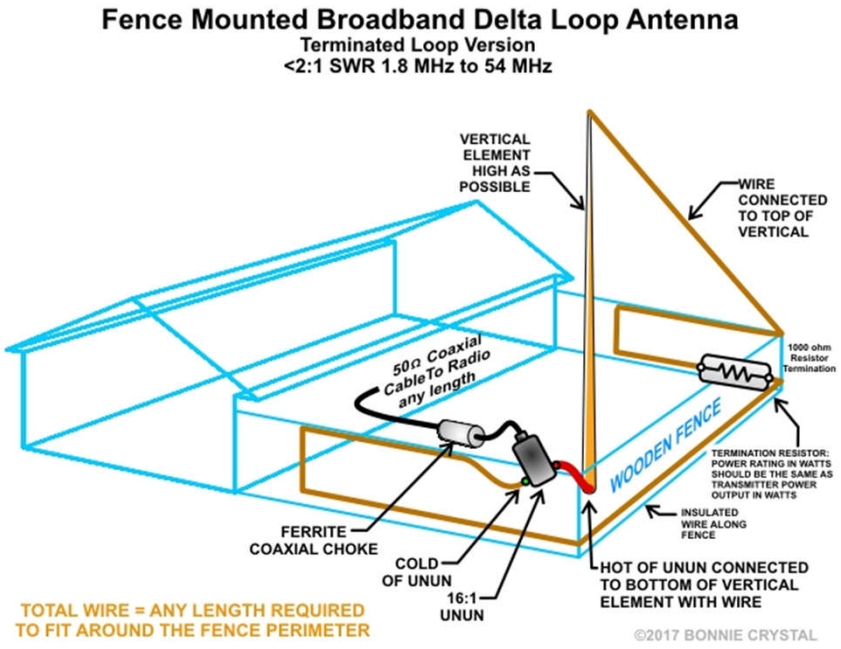
https://hflink.com/antenna/#BTSL

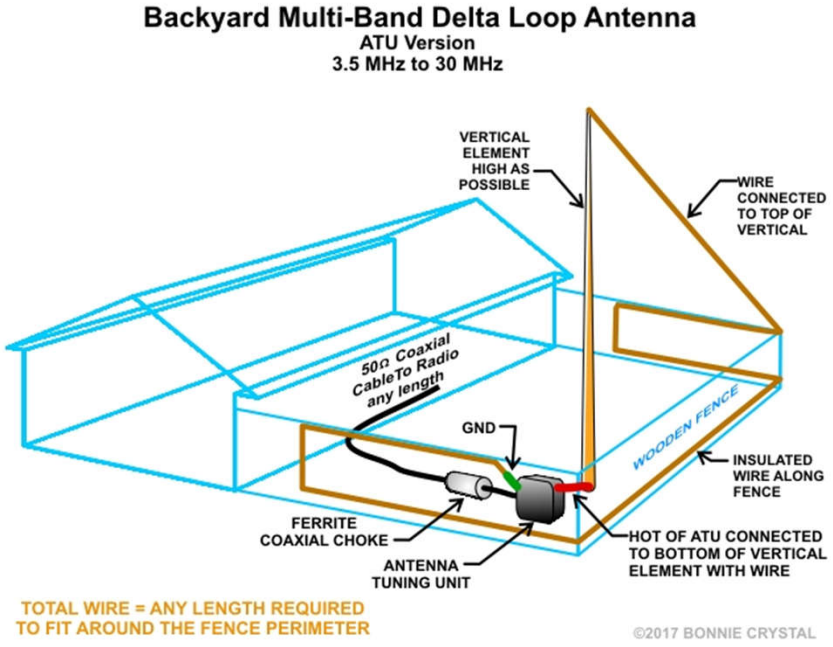
Broad Band Butterfly Antenna





Broad Band Butterfly Antenna





Useful Construction Items

4X4 pipe clamp

Used to attach mast to 4X4

Allows mast to be secured
With out guys.

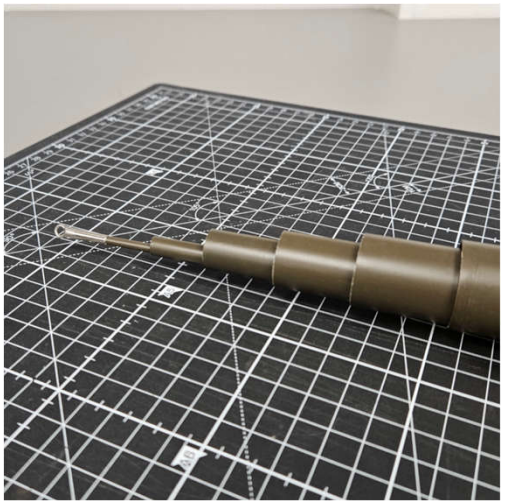
https://www.3starinc.com/3s-sq4-clamp-and-square-u-bolt-for-4x4-post-supports-pipe-1-66-4-od?search_string=4+x4+pipe+clamp&s_tit=1

4X4 pipe clamp

Fiberglass masts

For wire vertical and Dipole designs

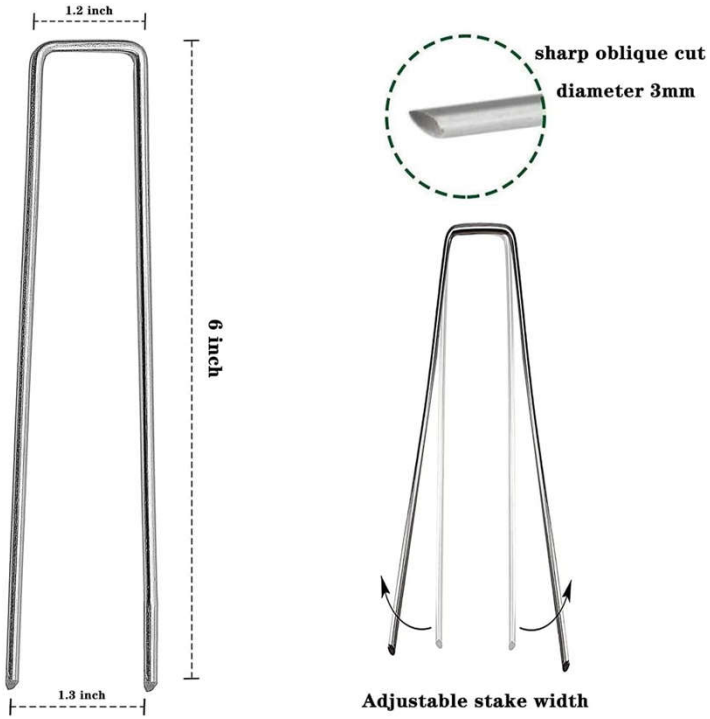
https://www.gigaparts.com/intellitron-am-2306k-34ft-telescopic-fiberglass-mast-with-quick-release-clamps-7ft-sections.html



https://dxcommander.com/product/10m-original-pole-dx-commander/

https://tn07.com/32-portable-antenna-mast

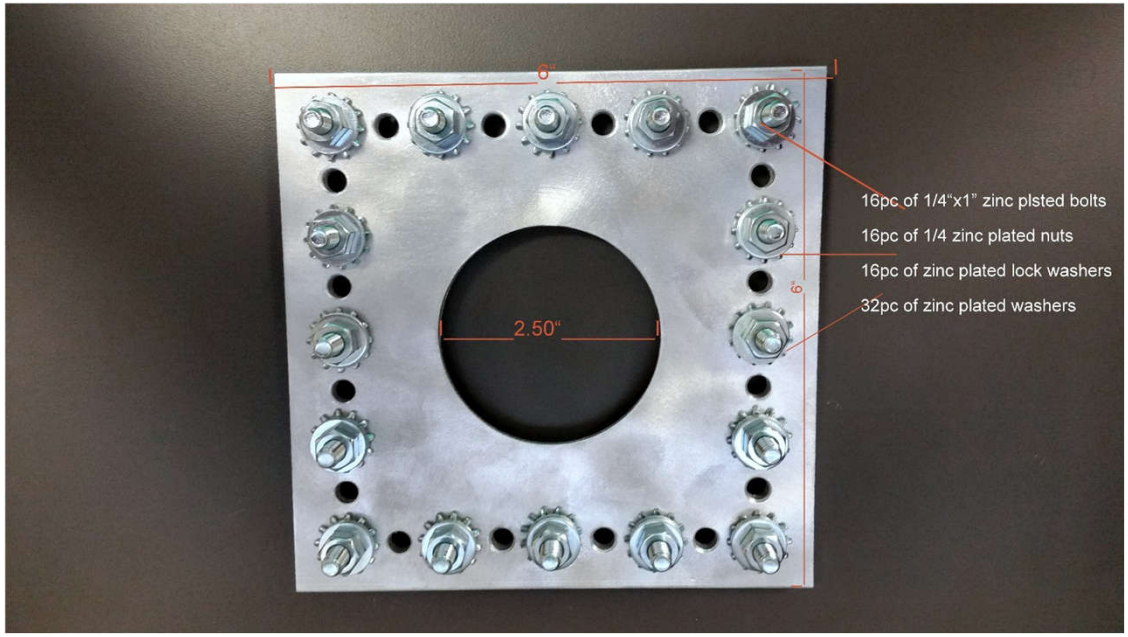
Lawn Staples



Flex-Weave Antenna Wire

- https://www.davisrf.com/antenna-wire/flexweave.php
- 12 and 14 gauge wire available

Radial Plate



SSS solutions

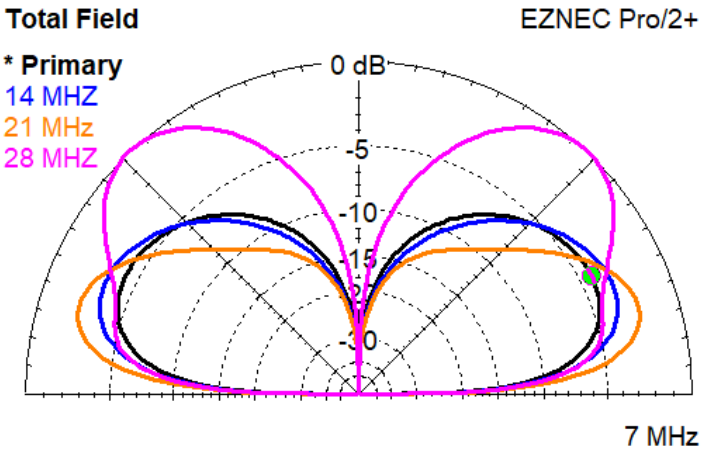
https://www.ebay.com/str/yz4iz0?_trksid=p4429486.m3561.l161211

DX Engineering has excellent plates as well

Guy Raised Attachment Point

Standoff with Pulley for Raising Wire

Multiband Verticals – Rybakov Antenna



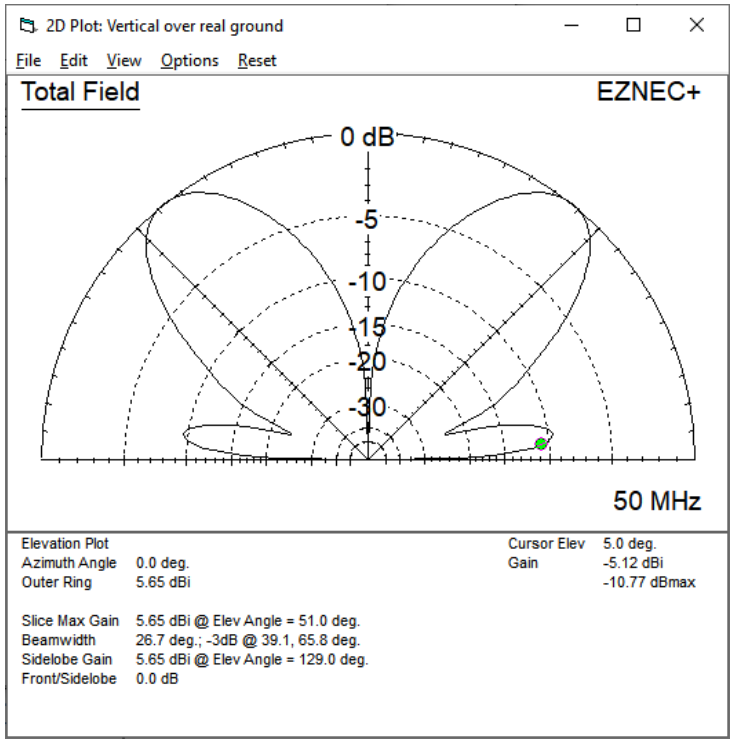
Elevation Plot		Cursor Elev	27.0 deg.
Azimuth Angle	0.0 deg.	Gain	-0.62 dBi
Outer Ring	3.58 dBi		0.0 dBmax

Slice Max Gain	-0.62 dBi @ Elev Angle = 27.0 deg.
Beamwidth	45.7 deg.; -3dB @ 9.3, 55.0 deg.
Sidelobe Gain	-0.62 dBi @ Elev Angle = 152.0 deg.
Front/Sidelobe	0.0 dB

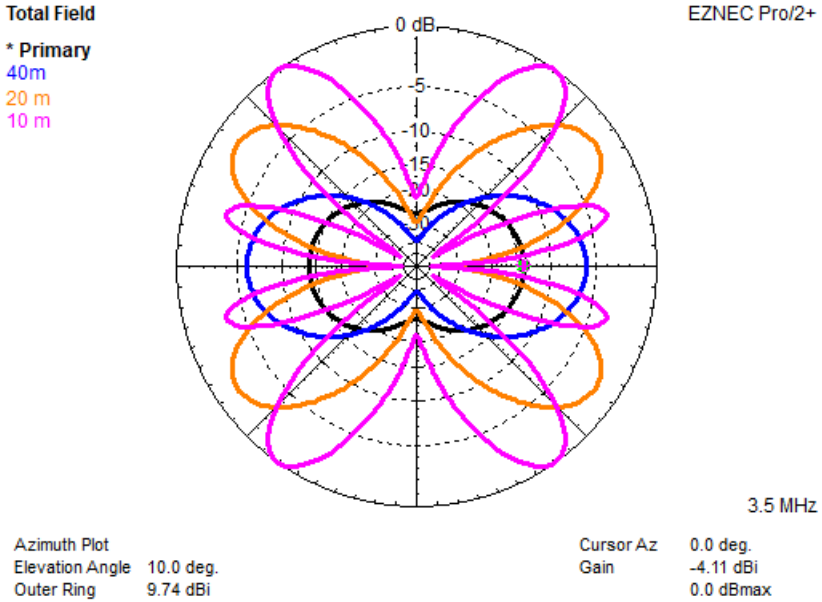
- 3/8 λ on 20m – 26 ft tall
- Covers 40 to 10 meters
- Uses tuner and 4:1 unun
- Very useable patterns on bands

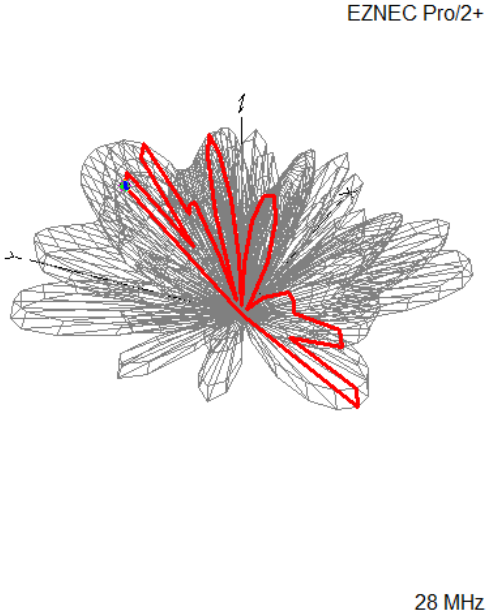
Radiation Patterns – Rybakov Antenna

- Antenna lengths of 0.8 – 1.25λ give high angle radiation.



Multiband dipoles – 135 ft @ 66ft





As frequency increases pattern becomes complex with deep nulls.
Avoid wires that are too long for the desired frequency.

Antenna Heights in Wavelengths

Height Wavelengths	20 Meters	17 Meters	15 Meters	12 Meters	10 Meters
¼	17 ft	14 ft	12 ft	10 ft	9 ft
3/8	26 ft	20 ft	17 ft	15 ft	13 ft
½	35 ft	27 ft	23 ft	20 ft	17 ft
5/8	43 ft	34 ft	29 ft	25 ft	22 ft
¾	52 ft	41 ft	35 ft	30 ft	26 ft
1	69 ft	54 ft	46 ft	39 ft	34 ft
1 ½	104 ft	81 ft	69 ft	59 ft	52 ft
2	139 ft	109 ft	93 ft	79 ft	69 ft
3	208 ft	163 ft	139 ft	118 ft	104 ft

Table 2: *Height in wavelengths for versus height in feet*

Frequency vs Antenna Length (Ft.)

Freq	1/8 λ	1/4 λ	1/2 λ	3/4λ
1.8	65.0	130.0	**260.0**	390.0
1.9	61.6	123.2	**246.3**	369.5
3.5	33.4	66.9	**133.7**	200.6
3.9	30.0	60.0	**120.0**	180.0
7	16.7	33.4	**66.9**	100.3
10.1	11.6	23.2	**46.3**	69.5
14	8.4	16.7	**33.4**	50.1
18.1	6.5	12.9	**25.9**	38.8
21	5.6	11.1	**22.3**	33.4
24	4.9	9.8	**19.5**	29.3
28	4.2	8.4	**16.7**	25.1

Other Non-Resonant Vertical Antennas

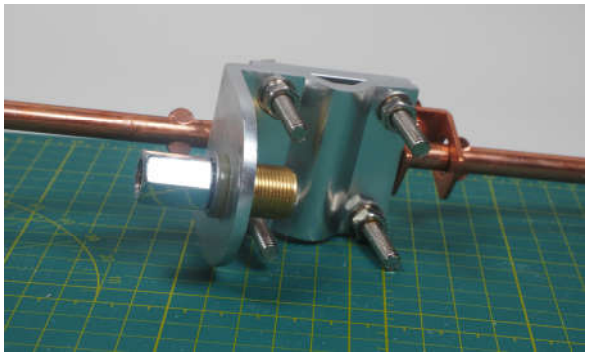
- 4:1 UNUN
  - 17.5 ft 20 -10 m
  - 43 ft 80-17m

- 9:1 UNUN
  - 29 ft 60 - 12 m band limit
  - 35.5 ft 80- 15 m band limit
  - 41 ft 80-17m band limit
  - 58 ft 80- 30m band limit
  - 71 ft 160 -30 m band limit

  - *See Salty Walt for more info.*

Constructing a Non-Resonant Vertical (or ¼ Wave)

- Wire on Fiberglass Mast.
- Telescoping Whip
  - 25 ft whip https://chameleonantenna.com/collections
  - 17 ft whip
  - 34.5 whip *https://www.alphaantenna.com/product/alpha-ss34-foot-stainless-steel-whip/*
  - Spike mount *https://chameleonantenna.com/collections*
  - Mirror mount on ground rod
- Aluminum antenna



Antennas to be Modified

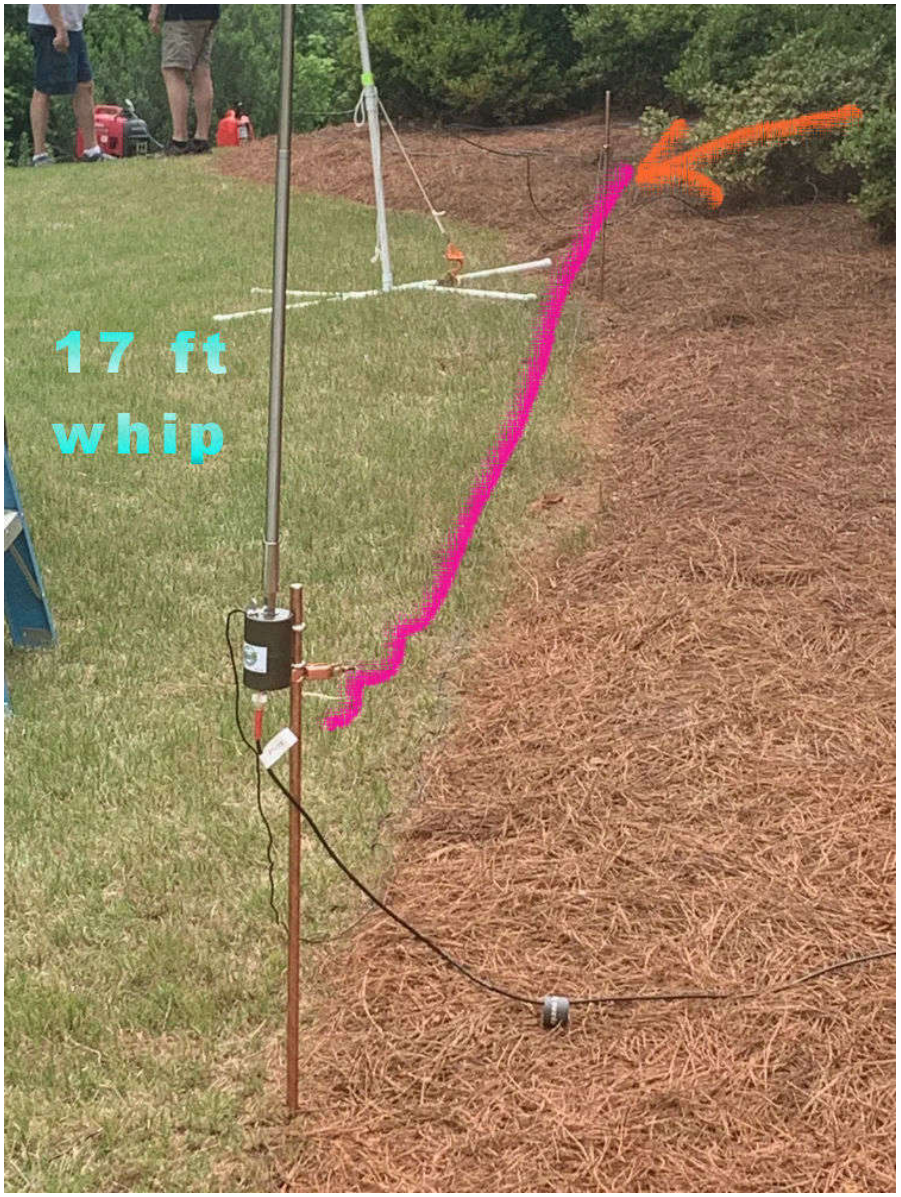
- COMTEK 30VA 30 Meter Vertical Antennas
  - Antenna, Vertical, HF, Monoband, Adjustable, 3,000 W, 30 meters, Non-tilt Bracket Mount, 24.0 ft Height. Requires additional tubing.
  - Available from DX Engineering.

- Zero Five Antennas 27 foot HOA 10-40 meter multiband vertical antenna with UNUN. Requires Radials.
  - *https://zerofive-antennas.com/product/27-foot-hoa-10-40-meter-no-radial-multiband-foldover-vertical-with-unun/*
  - *Vendor site has a lot of bad antenna advice.*

HOA Friendly

- TN07 My Go2 Antenna
  - *https://tn07.com/my-go2-antenna*
  - 100 W SSB 25W Digital

- Also consider Gutter Antenna
  - *https://www.alphaantenna.com/product/hf-emcomm-hoa-buster-uhf-hf-antenna-gutter/*
- Ham Stick vertical and dipole
- Large whip (e.g. 102”) with auto screwdriver coil.



Overview

- There is no best antenna.
- There are a variety of antenna solutions for various environments.
- Tuning and Antenna to 1:1 SWR does not indicate the antenna is efficient.
- Consider the radiation pattern of your antenna.
- Be thoughtfully creative.