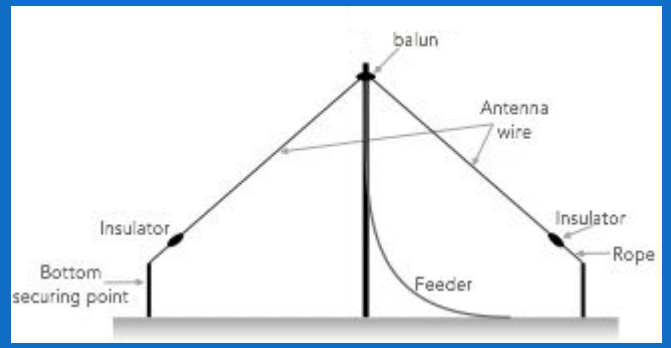
Building 80m/75m + 40m Inverted Vee for Field Day

V 1.1



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Why an antenna for these bands?

- On Field Day we want to make as many contacts as possible
- The 80m CW, 75m Phone and 40m bands are mainly night-time bands
- The 20m through 10m bands often shut down at night
- We want to work 80m/75m/40m bands at night, often using CW
- A fan inverted Vee with the center point at the top of the tower is a straight-forward way to do this
  - An inverted Vee is an omni-directional antenna, a dipole is directional
  - An inverted Vee presents a 50Ohm load, a dipole is 73Ohms
- Note that we will only be able to work one band at a time

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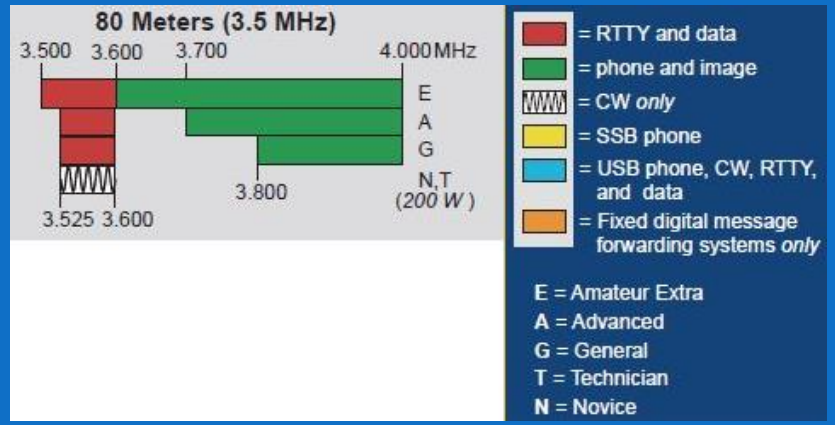
About 80m/75m

- 80m refers to the CW end of the band: 3.5 to 3.6MHz
  - ❖ FT8 on 3.573MHz is in this part of the band
- The Q of an antenna for this band is high, only a portion of the band will have an acceptable SWR
- We will make this antenna usable in both the CW and Phone parts of the band by marking where the resonant length is for both parts is, you will change between 80m & 75m by adjusting the wire length



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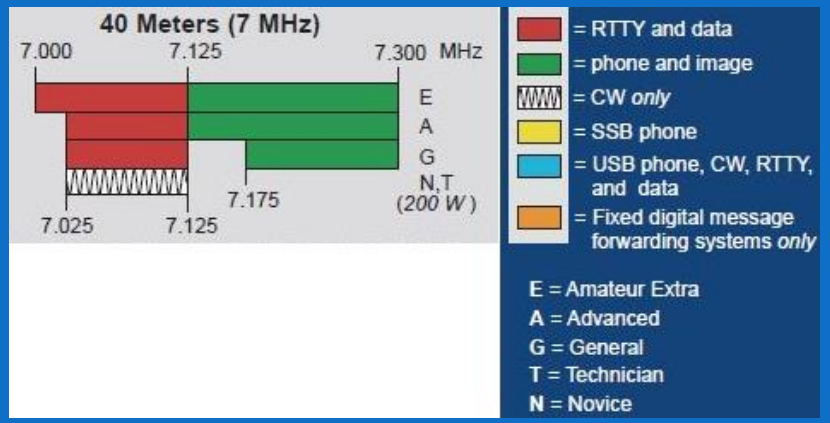
About 40m

- The second wire in the "fan" will be for 40m
- We will cut the 40m wire so that it is resonant to favor the lower part of the band where the FT8 frequency is
  - ❖ FT8 on 7.074MHz is in the lower part of the band
- For the upper end of the band we will use the radio's built-in tuner.



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Components

- Wire
  - 14ga stranded, insulated wire
  - 133 feet for 80/75m
  - 66 feet for 40m

- Insulators
  - Four non-conducting insulators for the ends of the wires

- Balun
  - Each wire element connects here
  - Coax feed line connects here
  - A rope from this connects to the horizontal arm of the tower

- Rope
  - Four 50’ rolls of paracord

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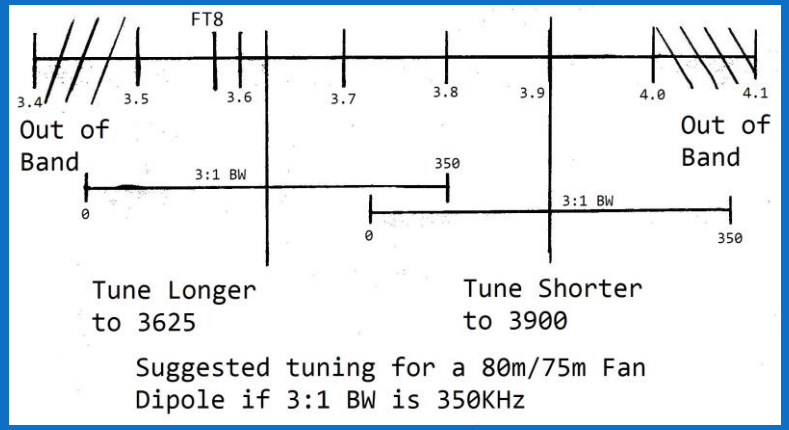
80m/75m Frequencies

So, what frequencies should we cut for?

- This is where experience comes into play. But no matter what frequency is selected, we are still going to have to tweak the length.
- 80m/75m
  - Since the band is 500KHz wide, the operator is going to have to go outside and adjust the length of the 80m wires or add a jumper to the end of the wire
  - I think the 3:1 SWR bandwidth is going to be 350KHz
  - I worked this out empirically. I drew a number line with the 80m/75m frequencies
  - Tune short to 3625KHz
  - Tune long to 3900KHz



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Element Length Calculations

There are lots of ways to calculate the length of the elements

- Do it yourself
  - Calculate 468/frequency (MHz) = dipole total length
  - Dipole total length * 0.95 = length for a VEE
  - Vee length/2 = length of each element
- Create a Spread Sheet
  - See: DCARC\019 - Presentations\2021-06-14 Building an HF Dipole\Vee Length Calculations.xlsx
- Use a web site calculator
  - No work on your part, just go to the site. Of course, you are trusting that their calculation is correct. It doesn't hurt to check against your calculator
  - I like this site: https://www.hamuniverse.com/dipivcal.html

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Element Length Calculations

- 80m Calculation 3.625MHz
  - 61 feet 3.9 inches

468 Divided by 3.625 Freq MHz

5 Percent smaller for the Inverted Vee

Your Inverted Vee's total length is 122.65 feet

Each leg of the Inverted Vee is 61.325 feet

- 75m Calculation: 3.9MHz
  - 57 feet no inches

468 Divided by 3.9 Freq MHz

5 Percent smaller for the Inverted Vee

Your Inverted Vee's total length is 114 feet

Each leg of the Inverted Vee is 57 feet

- 40m Calculation: 7.150MHz
  - 31 feet 1 inch

468 Divided by 7.150 Freq MHz

5 Percent smaller for the Inverted Vee

Your Inverted Vee's total length is 62.18 feet

Each leg of the Inverted Vee is 31.09 feet

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Element Length Calculations

- Here is a spread sheet that calculates the length for each 50KHz See: DCARC\019 - Presentations\2021-06-14 Building an HF Dipole\Vee Length Calculations.xlsx
- Note the column: "Change from Previous (in inches)"
  - ❖ This tells you how much to change the length in 50KHz increments
  - ❖ It shows how the difference in length for decreases as frequency increases
  - ❖ It shows how insensitive to small adjustments 80m/75m/40m antennas are

Frequency (MHz)	Length of One Side of Vee (ft)	Feet	Inches	Change from Previous (in inches)
80m/75m				
3.500	63.51	63	6.17	
3.550	62.62	62	7.44	10.7
3.600	61.75	61	9.00	10.4
3.650	60.90	60	10.85	10.2
3.700	60.08	60	0.97	9.9
3.750	59.28	59	3.36	9.6
3.800	58.50	58	6.00	9.4
3.850	57.74	57	8.88	9.1
3.900	57.00	57	0.00	8.9
3.950	56.28	56	3.34	8.7
4.000	55.58	55	6.90	8.4

Frequency (MHz)	Length of One Side of Vee (ft)	Feet	Inches	Change from Previous (in inches)
40m				
7.000	31.76	31	9.09	
7.050	31.53	31	6.38	2.7
7.100	31.31	31	3.72	2.7
7.150	31.09	31	1.09	2.6
7.200	30.88	30	10.50	2.6
7.250	30.66	30	7.94	2.6
7.300	30.45	30	5.42	2.5

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Assembly Instructions

- Wire
  - Cut two wires to the length of 65 feet each (we're giving ourselves room for corrections)
    - Put some colored tape at the point that is 61' 4" from the starting end
    - Put some different colored tape at the 57' point
  - Cut two wires to the length of 33 feet each
    - Put some colored tape at the 57' point that is 31 from the starting end
- Insulators
  - Attach a paracord to one side of each insulator
- Balun
  - Solder one 65' length and one 33' length to a solder lug and attach to each of the screw terminals
  - Connect the coax feed line to the SO-239
  - Tie a rope from top of this device and route it through the arm of the tower

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Assembly Instructions

- Pull the balun to the top of the tower
  - The rope you attached routes through a pulley connected to the Perkolator on the top of the tower and tie the rope off. The center of the Vee needs to be away from the tower's metal because the metal will detune the antenna.
- Wire Elements
  - Stretch the 65' wires out to the metal pipe end points that have been installed for them. Feed the wire through the insulator hole and pull it to the 57' tape. Wrap the remaining wire back onto the 57' wire so that none is dangling.
  - Stretch the 33' wires out to the metal pipe end points that have been installed for them. Feed the wire through the its own insulator hole and pull it to the 31' tape. Wrap the remaining wire back onto the 33' wire so that none is dangling.
  - Attach a rope to each insulator wire and pull them up snug but with some slack

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Tuning

- WARNING: Do NOT assume that the wire color is the same on both sides of the Vee for the same band.
  - IE: One 80m leg might be blue and the other green
- Tune the 80m element first
  - ❖ Move the tape marking the 65’ point so that it shows the spot for this adjustment
  - ❖ Using the MFJ-259 Antenna Analyzer, adjust the length of both sides (equally) so that the lowest SWR is achieved on 3.625 MHz
- Tune the 75m element next
  - ❖ Now adjust the insulator and rope so that the 57’ tape is in the spot on the insulator.
  - ❖ Using the MFJ-259 Antenna Analyzer, adjust the length of both sides (equally) so that the lowest SWR is achieved on 3.9 MHz
  - ❖ Tie them off so that the 65’ wire is on top and the 33’ wire is 2 to 3 feet below.

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Tuning

- Tune the 40m element
  - Start with the 31’ marking tape at the proper spot on the insulator.
  - Using the MFJ-259 Antenna Analyzer, adjust the length of both sides (equally) so that the lowest SWR is achieved on 7.150 MHz

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Done

- We are done, start making contacts!

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References

http://www.seed-solutions.com/gregordy/Amateur%20Radio/Experimentation/IVee80.htm#Design%20Formulae

W:\My-Ham Radio\DCARC\019 - Presentations\2021-06-14 Building an HF Dipole\Vee Length Calculations.xlsx

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