<u>M</u>ultiple <u>M</u>ono <u>B</u>and <u>C</u>enter <u>F</u>ed <u>H</u>ertz (MMBCFH)

Antenna System - Construction Information (How it is Built)

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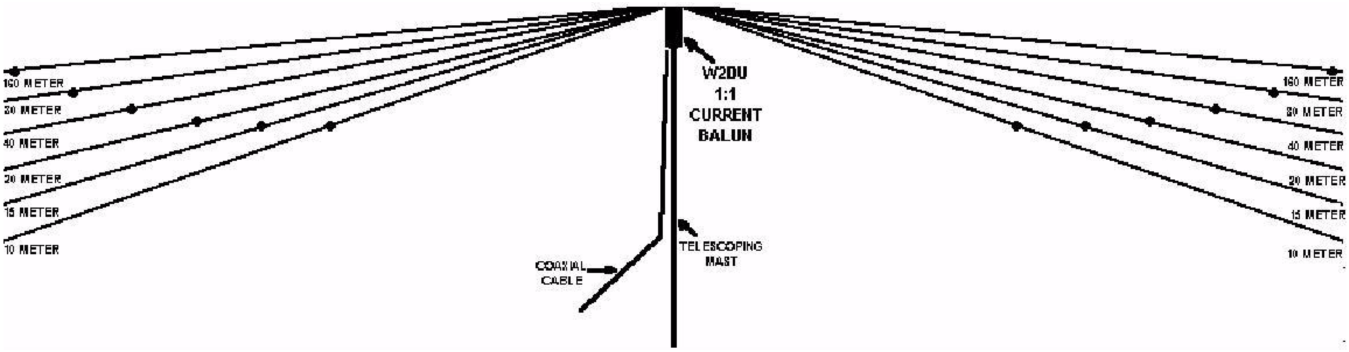

Figure 1—Common Multiple Mono Band Center Fed Hertz Antenna

This construction information was learned from numerous personal installation experiences, over a Professional RF Communication-Electronics Career and in the Hobby of the Amateur Radio Service.

A <u>"Hertz"</u> Antenna is an Antenna ½-wavelength long or any even or odd multiple of a ½-wavelength long. The "<u>Basic MBCFH</u>"is commonly referred to as a "<u>Basic Dipole</u>" and the "<u>MMBCFH</u>" is commonly referred to as a "<u>Fan Dipole</u>".

Both a ½-wavelength long "<u>M</u>ono <u>B</u>and <u>C</u>enter <u>F</u>ed '*<u>H</u>ertz*' (<u>MBCFH</u>) Antenna System", and a ½-wavelength long <u>"M</u>ultiple <u>M</u>ono <u>B</u>and <u>C</u>enter <u>F</u>ed '*<u>H</u>ertz*' (<u>MMBCFH</u>) Antenna System", mounted in Inverted-'V' configuration, work equally well.

The Antenna wire leg pairs can be positioned left and right of a center Balun or center Insulator on the support, in any configuration as long as the apex angle at the feed point and any bend in the wires is not less than 90 degrees. Any angle less than 90 degrees causes mutual coupling between the wires. The most convenient mounting height above earth ground for the center Balun or Insulator was found to be between 30 ~ 40 feet. End insulators are connected to the wire leg ends so that they can be tied off at either ground level or up to a 6 ~ 10-foot height above the ground level by the use of rope.

I persanlly use a a quantity of 'Two' Fan Dipoles mounted in Inverted-'V' configuration at my Amateur Radio Service Primary Licensed Fixed Station. The leg pairs on Fan Dipole #1 are for the Medium Frequency (MF) 160 Meter Band and the High Frequency (HF) 75, 40, 20, 12 and 10 Meters Bands and the leg pairs on Fan Dipole #2 are for the 17 and 15 Meter Amateur Radio Service Bands. The assembled antennas have only 1 support (30 foot tall Rohn 25G tower), 2 Baluns (W2DU 1:1 current type), 2 Coaxial Cable RF feedlines (100 feet of Belden 9913) and 16 end insulators (Ceramic Dog Bone Style). The entire Antenna System fits into my 80 feet wide by 52 feet deep fenced in back yard.

To have minimal headaches during the installation of a Fan Dipole mounted in Inverted – 'V' configuration do the following:

1. Cut the individual Dipole wire lengths for ½-wavelength long at the desired frequency of resonance using the standard formula (Length in Feet (L) = 485 / f MHz). Then cut the total length of the wire in half so that each leg is ¼-wavelength long. (Example for a 160 Meter Dipole for a frequency of 1.800 MHz the formula is: L = (485 / f MHz) / 2 = (468 / 1.800 MHz) / 2 = 269.4 feet / 2 = 134.7 feet long for each leg).

2. Mark all the individual wire leg pairs with the appropriate band number (Example; 160, 75, 40, 20, 12, 10 Meters etc.) and attach one wire leg from each band to each side of the center Balun or Insulator.

3. Connect the end insulators to all the individual wire legs so they can be tied off at either ground level or up to a 6 ~ 10 foot level.

4. Raise the Balun or Insulator to the desired height with all wires legs hanging freely straight down.

5. Start with the pair of wire legs cut for the lowest frequency first and stretch them out to the mounting level height, so that a suitable apex angle of not less than 90 degrees is obtained.

6. Adjust the pair of wire legs to obtain the lowest Standing Wave Ratio (SWR) possible on the RF Feedline at the *'single resonant frequency"* the legs were cut for. This indicates that the best impedance match has been obtained between the Antenna feedpoint impedance and the Coaxial Cable RF feedlines characteristic impedance. If a low-loss Coaxial Cable is used, an SWR of 3.0:1 on the feedline at the band edge is satisfactory. By using a Transmatch at the input end of the feedline at the station operating position, a proper impedance match for your 50 Ohm input and output designed impedance of any station equipment in-line before it can be obtained.

7. Once the first pair of wire legs are tuned, stretch the next lowest frequency pair of wire legs out and adjust them the same as the first pair.

8. Recheck the SWR of the first pair of wire legs and readjust if necessary.

9. Repeat steps 6 and 7 until all pairs of wire legs are done. (Example; if there are pairs of wire legs for the 160, 75, 40 and 20 Meters bands; start with the 160 Meter band wire legs first, then 75 Meter wire legs, then 40 Meter wire legs and last 20 Meter wire legs.

10. The individual wires do not have to be directly 180 degrees across from each other.

11. The individual wires can be bent or sloped to conform to the available space as long as any bend in the wire does not decrease to less than 90 degrees. (Example; the leg pairs can form the shape of the letters ‘S’ or ‘Z’).

12. The wire legs can form the letter ‘V’ laid down on its' side to shorten the overall length with the peak of the 'V' raised to the apex height.

13. The wire legs can form the letters 'M' or ‘W’ laid down on its' side to shorten the overall length with the peak of the 'M' or 'W' raised to the apex height.

14. The ends can be spaced evenly around in a circle to look like the ribs of an umbrella, or spokes of a wagon wheel. Also some ends could face East and West and the other ends can face North and South.

15. During Transmission and Reception the RF Alternating Current (RFAC) will follow the path of least impedance. This means the wire legs cut for the electrical resonance of the RFAC will appear as low impedance and the other wire legs will appear as high impedance.