FREQUENCY DEVICES™, INC.

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Half-Wave Dipole Antenna Kit

The half-wave center-fed dipole is one of the most popular antennas in use by Ham Radio operators. In free space the center-fed half-wave antenna has an input impedance that is a close match to 50 ohm coax and to most radios that have a 50 ohm output impedance.

Our half-wave antennas are built using #14 hard drawn 7/22 stranded wire (7 strands of #22 twisted together) to meet the National electrical Code for antennas. Hard drawn wire is preferred in antennas because it will stretch less than soft drawn wires. Testing has shown that #14 bare 7/22 is a good, low resistance wire that radiates well[1].

The half-wave antenna has maximum gain off of both sides of the antenna (see Figure 1). Off of the ends of the antenna the gain is the lowest. This means that when you install the antenna you must points the two sides of the antenna in the directions you wish to communicate the most. This does not mean that the antenna will not work at all off the ends but the gain will be less.

Figure 1 shows the ideal free space radiation pattern of the half-wave dipole. This pattern will vary depending on how high you install the antenna, what kind of ground is located below the antenna, what buildings and structures are close to the antenna, etc.

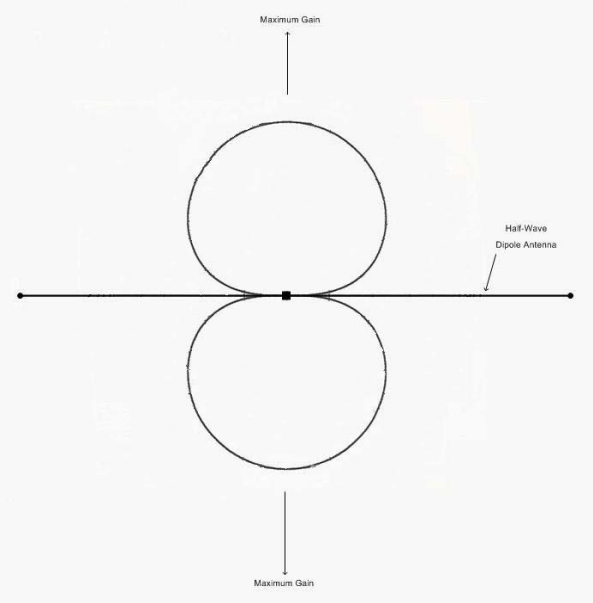

Figure 1

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Installing the Antenna

There are two main ways to install the half-wave antenna: as a straight dipole and as an inverted V. In either case the antenna will work better the higher you can put it up.

As a straight dipole you tie ropes to both end of the dipole and raise it as high as is possible. If what you are tying both of your ropes to are both fixed objects like buildings or towers you should have no problems. If, like most people, you are using trees then you have to allow for the trees to move. It is better to only tie one end securely and to use a spring or pulley and weight system to hold the other end. Most of the Antenna Handbooks that are available will go into detail about how to do this.

To install the half-wave dipole as an inverted V you need three tie points but only one of them needs to be up high. Using a rope tied to the top-center eye bolt on the Dipole Center Insulator pull the center of the antenna up as high as possible. Tie off the two ends to supports that are lower down. Again, if the supports can move, use springs or a pulley system to reduce the strain on the wires.

There are several alternate ways that people have installed half-wave dipoles and have had some success. Some people have installed them in their attic and stretched them from end to end. Others, who did not have much room, have installed them with twists and turns in various places. Be sure to use insulators and any point where the antenna wires can touch. If you do something like this you will have to carefully tune the antenna as is explained in the next section.

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Tuning the Antenna

The Half-Wave Dipole Kit antenna will need to have its length adjusted to tune the antenna to the frequency that you want to use it on. On the higher frequencies you should be able to tune the antenna to the center of the band and it will then work over the whole band. The 80 Meter band is so wide that you will have to pick a portion of the band over which you want to operate and tune for the center of that portion.

Tuning the antenna is done with some kind of meter that will measure reflected power. SWR bridges or watt meters are commonly used. Most transceivers now have a SWR bridge built in and that will work fine. You need to tune the antenna because of many factors like how high it is installed, what kind of ground is below it, what kind of buildings or structures are nearby, etc.

To tune the antenna first refer to the chart below and pre-cut both ends of the antenna to be about 12 inches longer than the lengths given for the frequency you want to use. Both sides of the antenna should be the exactly same length. Then install the two end insulators at the end of the wires using the extra 12 inches. Do not solder or permanently attached the ends at this time.

Next install the antenna as close as possible at the point that you will be leaving it permanently. Check the SWR at intervals over the whole band and record the readings. Most likely the antenna will be too long which means that the antenna will be tuned below the frequency at which you want to use it. This will be shown by the SWR increasing as you move up in frequency across the band. If this is true shorten both ends of the antenna in stages until the lowest SWR point is at the center frequency of the band or the frequency you will to use it at the most. At that time securely wrap the wire at the ends by the End Insulators and you can then solder the two wires together or tie them off with cable ties.

The chart below is based on the number that most people use for calculating how long a half-wave antenna should be for a given frequency. That number is 468

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divided by the frequency in MHz^2. That will give you a length in feet for the overall antenna length. Each side of the antenna should be the same length so each side will be one-half of that length. For instance if you want to tune your antenna to 14.25 MHz then 468/14.25=32.84 feet or 32 foot 10 inches. Each wire on the antenna should measure one-half of that number or 16 feet 5 inches long from the center of the Center Insulator to the end of the wire in the End Insulator. That is the length you should start with to tune your antenna. Don't forget to add 12 inches to the end of the wire to have some to wrap around the End Insulator.

BAND	CENTER FREQUENCY		OVERALL LENGTH				EACH SIDE LENGTH			
80M	3.550	MHz	131	Ft -	10	inches	65	Ft -	11	inches
80M	3.700	MHz	126	Ft -	6	inches	63	Ft -	3	inches
80M	3.850	MHz	121	Ft -	7	inches	60	Ft -	9	inches
40M	7.050	MHz	66	Ft -	5	inches	33	Ft -	2	inches
40M	7.200	MHz	65	Ft -	0	inches	32	Ft -	6	inches
30M	10.125	MHz	46	Ft -	3	inches	23	Ft -	1	inches
20M	14.075	MHz	33	Ft -	3	inches	16	Ft -	8	inches
20M	14.175	MHz	33	Ft -	0	inches	16	Ft -	6	inches
20M	14.250	MHz	32	Ft -	10	inches	16	Ft -	5	inches
17M	18.118	MHz	25	Ft -	10	inches	12	Ft -	11	inches
15M	21.100	MHz	22	Ft -	2	inches	11	Ft -	1	inches
15M	21.275	MHz	22	Ft -	0	inches	11	Ft -	0	inches
15M	21.375	MHz	21	Ft -	11	inches	10	Ft -	11	inches
12M	24.940	MHz	18	Ft -	9	inches	9	Ft -	5	inches
10M	28.300	MHz	16	Ft -	6	inches	8	Ft -	3	inches
10M	29.000	MHz	16	Ft -	2	inches	8	Ft -	1	inches
10M	29.400	MHz	16	Ft -	0	inches	8	Ft -	0	inches

1. Rudy Severns, N6LF, "Conductors for HF Antennas," *QEX Magazine*, November/December 2000, pp 20-29, see Table 6.
2. H. Ward Silver, N0AX, "Hands On Radio – Experiment 92 – The 468 Factor", *QST Magazine*, September 2010, pp 53-54.