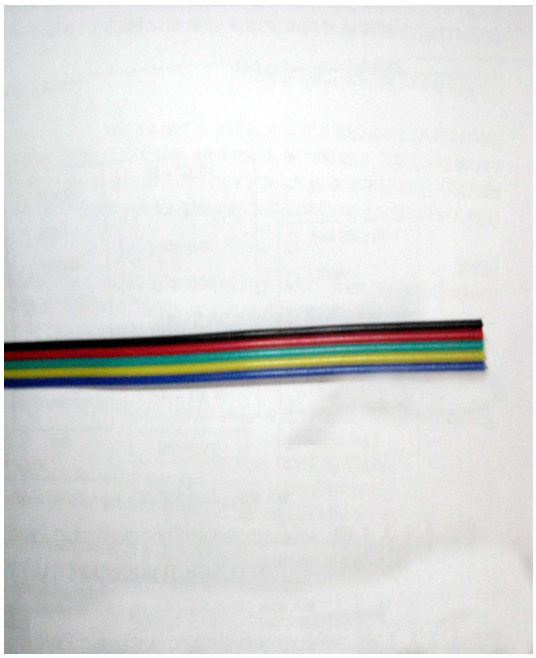
N4JTE; 6 BAND " RIBBON" $35 ANTENNA

This antenna article is geared towards new Hams and antenna builders looking for a very inexpensive 6 band antenna that can be efficiently fed with 50 ohm coax without a tuner.
The inspiration for this design resulted from a visit to my 82 year old neighbor's home who had asked me for some help in dismantling his amazing and incredibly beautiful model train set, and box up for his grandson. During this process I was intrigued by his use of 5 and 10 conductor 18 gauge flat insulated ribbon cable for all of the L.V. switching and action devices.

So Begins the Adventure.
To be honest I am getting more and more frustrated with some of the latest marketing ploys being used by commercial antenna manufacturers and their incredible, misleading and unsubstantiated miracle "all band" antennas that will sucker in some poor unsuspecting new ham who will spend his money on a heavily marketed, overpriced, and in some cases, Amazingly reviewed antenna // Toaster.



Mt plan was to use this relatively cheap insulated wire and find out if was actually possible to get 6 bands cleanly matched to 50 ohm coax. As this antenna was basically built for testing and performance evaluation the construction details are limited and somewhat primitive by most standards so I will leave it to others to refine and permatize, hi.

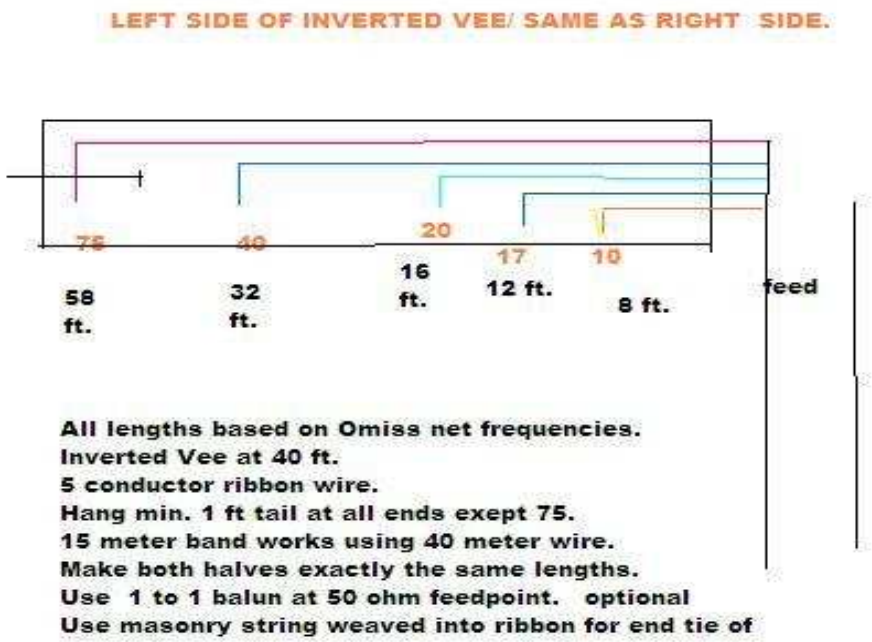
When I envisioned this concept my only real concern was how all the close spaced wires would inter react. The shorter dipoles will all present high impedance at the feed point when they are not driven forcing the feed line to pick the path of least resistance and best match for the frequency. The 40 meter wire will serve well on the 15 meter band as a center fed 1.5 wl wire.

I am aware that a fan dipole uses the same single feed concept but I believe the Ribbon antenna eliminates all those extra tie off points while maintaining the resultant extra effective radiated height, especially if used in a flat top configuration. Certainly less obtrusive and much less work.

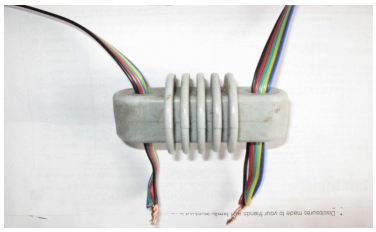
BUILDING IT:

Well you have to start somewhere, so I chose the OMISS net frequencies available at www.omiss.net, as my starting point for the band frequencies and wire lengths. I have built more than enough monoband Inv. Vees at this location with insulated wire so I use my own formula of 450/ freq. to achieve what I'm after with minimal pruning.

You need to approach this antenna one side at a time. The ribbon wire I purchased was only available in 50 ft. lengths so I knew the 75 meter wire would need about 8 more feet to each end to reach 75 meters. It's best to unroll and stretch the wire out to remove the "wire memory". That accomplished measure out your 5 chosen ¼ wl lengths and mark or tape off. As the 75 wire is pretty much done after adding the required wire, separate the next wire, and carefully peal back to the taped off marker and cut off excess. Continue this process for the remaining wires up to the 10 meter point. Yeah I know it seems like a lot of wasted wire but at 6 cents a foot you'll get over it !



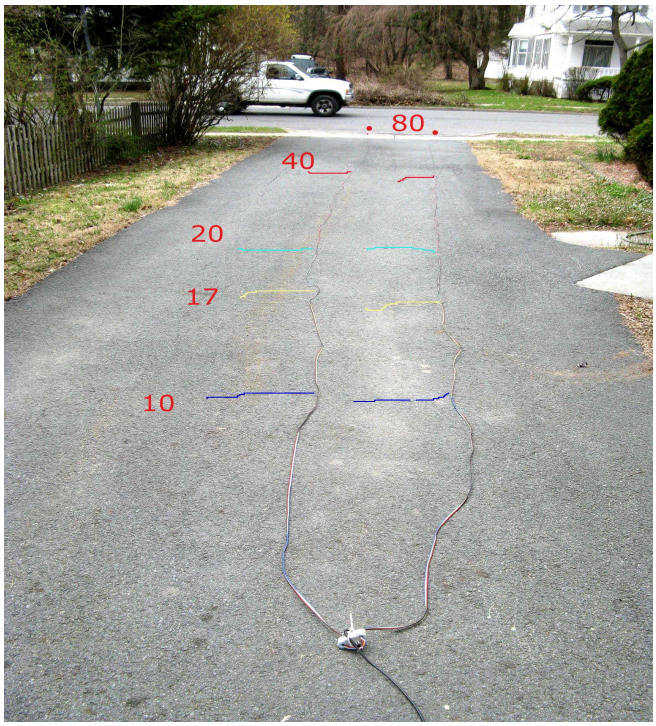
Repeat the process with the other half of your antenna. I just laid them along side each other and matched all the lengths. Be careful to use a dull knife or fingernail file to separate the wires so as to not break the insulation.
After cutting all your wires to length you will need to have some kind of center support and feedline connector in mind before stripping and soldering the 5 conductors together. In my case I pushed each one thru a ceramic insulator and then carefully stripped and soldered together in preparation for feedline attachment.



The ends of half wave dipoles are at high rf voltage and if too close to others will add unwanted capacitance and tuning problems. For starters I just separated the adjacent wires by about a foot and let them dangle down.

FIRST ATTEMPT.

My goal with this initial attempt was to see basically where or if ,I would get full power out. This would give me the best indication of what was actually radiating and at what frequency. You cannot expect, nor limit yourself, to a 1 to 1 swr as being your goal. The meter will serve only as a guideline to where your wire length and height works in the real world of your backyard.
A quick look at any antenna book will show the relationship between height above ground and radiation resistance in ohms. This inv. Vee at 43 ft. is even a little more tricky to predict especially when the 75 meter antenna is only at .175 wl high and the 10 meter antenna is at 1.2 wl above real ground.
All 6 antennas should range between 20 and 90 ohms with the ends at 10 ft. above ground. The results of the first attempt were very interesting in that at least I was getting full power out somewhere close to the 6 bands of interest. I had my doubts because of introducing the 17 meter antenna into the mix which is not an even multiple of the lowest band, usually considered a no no on multiband antennas



FIRST TRY RESULTS		
75----------	4.179m	short
40----------	7.290m	short
20----------	14.190m	okay
17----------	17.800m	long
15----------	21.553m	long
10----------	27.713m	long

SECOND ATTEMPT:

I use an eye hook stuck into the top of the fiberglass pole with a masonry string to allow easy up and down access for the cutting and tuning process. I started by adding about 4 ft to each end of the 75 wire and after some diddling ended up with around 3.95m. the only band affected by this change when scanning thru the bands was the 40 meter wire which changed it's apparent resonant frequency to 6.9M and the 15 meter wire also dropped in frequency. A quick trip to the backyard to shorten each end of 40 wire by one foot made no change on the resonance. I then separated the forty from the 75 by dangling about 3 ft. at each end. Obviously the end effect was kicking in because I ended up at 7.1m, close enough for my needs and the 15 meter wire was happy in the middle of the SSB portion.

SECOND TRY.
75----------3.95m
40----------7.1m
20----------14.190m
17----------17.800m
15.----------21.300m
10----------27.717m

THIRD ATTEMPT:

The only bands left to fine tune were the 17 and 10 meter wires which were still too long, so I cut off 6 ins. From both ends of each antenna. The 17 meter ended up at 18.135 and the 10 meter at 29.5 in the FM portion of the band which I actually prefer these days.

THIRD, FINAL TRY, I'm lazy:
75----------3.95m
40.----------7.1m
20----------14.190m
17----------18.135m
15----------21.360m
10----------29.500m

RECAP:

The whole tune/recut exercise took about 6 hours and resulted in a 6 band antenna that will radiate full power out without a tuner. Due to the fact that there are no traps, no loading coils, no tuners and no ladderline needing a balun to match, the only losses will be in the feedline due to it's length and not the result of any mismatch at the antenna feedpoint. I do not have the necessary brain power to model this design and would appreciate a peer review on the modeled radiation resistance and resultant antenna patterns.
Point of interest; The 60,30 and 12 meter bands had around a 3 to 1 swr and were showing 60 to 70 watts out without a tuner. Probably work well with auto tuner.

IF YOU BUILD IT:

1; A simple Plexiglas T, or equivalent with double slots for the ribbon wire and two small holes to tie wrap the coax should be more than enough after waterproofing to ensure stability and strength for a center supported light weight antenna such as this.
2; The 75 wire ends up holding the whole antenna up, so I would attach some masonry string to the center insulator and tie wrap at the band end dangles and a couple of more at the 40 and 80 wires with the string going to tie off points. By tie wrapping you will also prevent the wires from separating at band junctions.
3; Attach small non conductive weights at the drop wires after final tuning.

4; Use a tuner at higher powers to attenuate harmonics and any possible spurious transmitter outputs.
5; If 10 conductor wire is available you can double up the wires for each band providing an increase in bandwidth and power handling. FYI, I had no problems with the 5 wire at 500 watts ssb.

FINAL COMMENTS:

I am not going to waste everyone's time by recounting all my log entries while testing this antenna. I will tell you it is a joy to run from 75 to 10 meter fm and be able to hear what is going on and respond to a cq without fumbling around with antenna switches and tuners. This antenna is nothing more than 6 inv vees at 43 ft. that perform to the laws of physics and will serve you well if you are committed to a little sweat equity to get it working efficiently.
You will not be disappointed with this $35 antenna.
BUILD ; DON'T BUY !

Tnx for reading,
Bob N4JTE