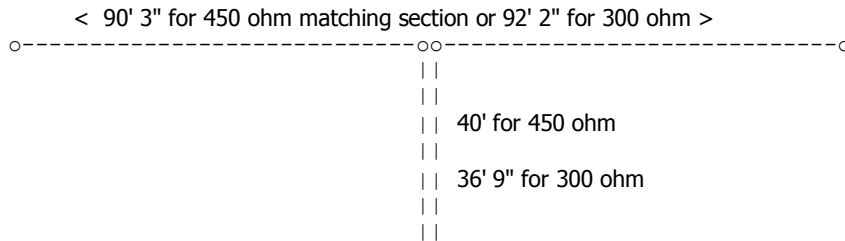


Multiband Wire Antennas By Ed Humphries - N5RCK

The March 1991 issue of CQ Amateur Radio contained yet another discussion of multiband wire antennas. In his column "Radio FUNdamentals", Bill Orr, W6SAI writes about the original W9CXX multibander with its' complex copper tubing matching section. He then goes on to discuss the popular G5RV developed by R. Varney, which is widely built and commercially available. Orr points out the deficiencies of the G5RV: when built in the original design it delivers reasonable SWR on the 7, 14, and 24 MHz bands, but into a 75 ohm coax feedline that is awkward to load up on modern transceivers; when built with 50 ohm coax the SWR is poor on all bands, but it performs reasonably well when used with a "transmatch" antenna tuner.

The column skips over an intermediate antenna design discussed in the March 1986 issue of Ham Radio. Bill's column back then pointed out that W5ANB first proved you could successfully modify the G5RV, load it with 50 ohm coax and run without any antenna tuner. But the best design (so far HI) he discusses in both articles is the one by ZS6BKV. Brian Austin used computer modeling to help him design a 5 band tuner-less antenna. Orr's CQ column reprints the design using only the dimensions for a 300 ohm matching section (I presume TV flat lead qualifies). In his original column Orr also presented the figures for using 400 (handmade open-wire leads) or 450 ohm (ladder-line) as the matching section. Since 450 ohm ladder-line is somewhat stronger than the commonly available 300 ohm TV lead-in, I'm here giving both sets of figures so you can make your own choice.

The ZS6BKV Antenna



At the end of the matching section Orr recommends a 1:1 balun; others would say that several loops of coax at the feedpoint will do as well to help keep RF off the feedline. The feedline to the transceiver is common 50 ohm coax; RG 58/U is fine for HF for most runs. This antenna should give low SWR on 7, 14, 18, and 24 MHz bands. At 28 MHz the SWR is really only good from 28.5 to 29.0. Tests showed the best SWR curves when the antenna was erected at about 42 feet above ground. When run as an inverted-V (90 degree) the resonant frequency came down 80 kHz for 14 MHz and 125 kHz for 24 and 28 MHz. The March '86 article printed SWR curves, and the March '91 article printed field patterns for all 5 covered bands.

· Origin: Ham Echo Moderator / HDN Coordinator (214) 226-1181 (1:124/7009)

Comments by Ed Lawrence, WA5SWD: This is a great antenna for use without a tuner. It deserves much wider attention than it has garnered. It works exactly as N5RCK has described above. I called him and got his permission to reprint this information in our PARK newsletter. Permission was granted subject to retaining the authorship information.

I built one of the 450 Ω ladder-line models, per these plans. Before I found out that the 'Experts' said that it would not work that way, I used it on all HF bands WITH a tuner, 160 meters up, for Field Day. Worked fine, as long as no choke balun was used!

Now, as to the details: The two feedlines listed above are essentially the same electrical length, a half wavelength at 10.95 MHz, or 44.95 feet long.

All is not lost if you have some other twinlead you wish to use. If you know the Velocity Factor of your twinlead, multiply 44.95 ft. times the VF. If not, then connect the twinlead to your antenna analyzer and trim it to show an open at 10.95 MHz. This is not to imply that you can use any old twinlead. It must be near 450 Ω or 300 Ω .

I have built and used a 300 Ω version using two runs of 75 Ω coax (RG-59/U) as a replacement for the 300 Ω balanced feedline. Since the Velocity Factor of RG-59/U is 0.66, each coax for the transmission line was 44.95 ft. x 0.66 or 29 ft. 8 inches. This modification allowed me to wind it around my metal supporting mast with no change in the operation of the

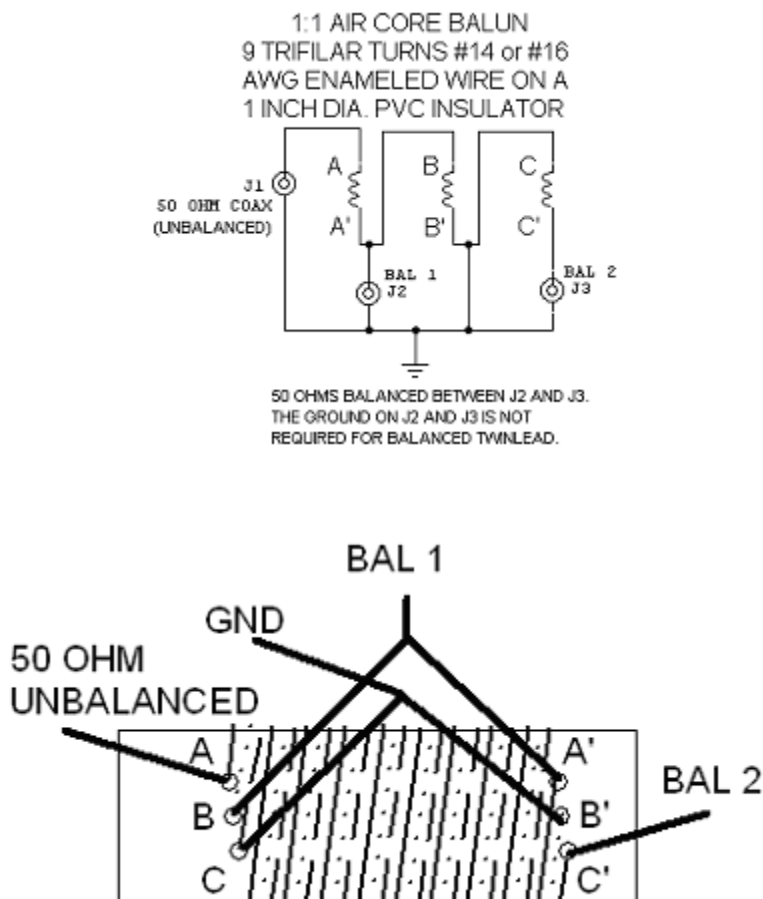
antenna. This would not have been possible with unshielded twinlead. I did not use a balun of any type, but just tied the coax directly to the center conductors of my two runs of 75 Ω coax, connecting the shields all together. Yes, this part is screwy, but it worked.

A much better answer would be to use an HF 1:1 air balun. (I don't like ferrite baluns.) I had built these in the past but did not have the equipment to take data. I had used 13 trifilar turns for a 3 to 30 MHz balun, but found the version shown here on the Internet, also claiming to work from 3 to 30 MHz. According to that source, to make a 1:1 air balun, tightly wind 9 trifilar turns of #16 enameled copper wire along a 1 inch diameter insulator, such a short length of PVC pipe. This forms three closely coupled inductors. All three windings are then wired in series. The common point of first two windings acts as a voltage divider, forming one balanced output. The third winding gives the inverted phase needed for the other balanced output.

Study the diagrams below. Call the windings A, B and C. The ends are then (A), (A'), (B), (B'), (C), (C'). Connect the coax input to (A), (A') to (B), (B') to (C). (A'B) is output Balanced 1, (B'C) is the coax shield, and (C') is Balanced 2. This 1:1 air balun should be good for over a KW. I used AWG #16 wire.

Being of a suspicious nature, I built this 1:1 balun and tested it. I loaded BAL 1 and BAL 2 each with a 27 Ω carbon resistor. I then swept the SWR from 1 to 101 MHz. The SWR was high up to 6.9 MHz, was quite low from 7.0 to 75 MHz, rising again past that frequency.

This balun is only useful for 40 through 6 meters. Since the ZS6BKV works from 40 meters up to 10 meters, it IS useable on this antenna. I'll still build the 13 trifilar turn version and test it, but not for this article.



Note that the A winding is shown as solid line, the B winding as a series of dots, and the C winding as a series of dashes. That is to aid in visualizing the trifilar winding. For clarity, the interconnections are shown with excess lead lengths. These should be kept short but there is no need to be extreme at 30 MHz and low impedance. Drawings in these comments by Ed Lawrence, WA5SWD

