KD4OUN Extended Super-J

This is an inexpensive, high-performance homebrew antenna constructed almost entirely of 450-ohm ladder line. It only uses 300-ohm twin-lead and coax in the balun/impedance match, and final connection to the transceiver. None of the ideas here are totally original, and in fact are all contained and thoroughly documented in separate sections of the 1992 (and hopefully later) edition of the ARRL Antenna Handbook. However, to my knowledge, this is the only combination of all of them in one antenna.

I am giving all measurements in wavelengths A) to allow for the substitution of different transmission lines with different velocity factors, and B) it is very easily constructed for different VHF/UHF bands, and should even be practical on 6 meters. Once I even built one as an 11-meter base antenna for my mother and it worked beautifully, although it was rather long. Luckily she had a very high tree to hang it in.

Electrically, it is rather simple. The antenna itself is either a 2 or 4-halfwave, vertically stacked, end-fed collinear. Phasing of the elements (C-B and B-C in the 2-element picture below) is accomplished by the 1/4-wave phasing stub (A-B). The phasing stub is simply pulled back towards the antenna to form a circle and tied with a piece of string so it won't interfere with the driven elements. Since it is a total length of 1/2 wave out and back, the top section will be in phase with the bottom section, and will cause a significant gain at the horizon. The feed (D-C) is a standard J-pole-type shorted 1/4-wave and is fed with balanced line in order to take advantage of the low dollar cost (about $15.00/100ft). compact size, and fantastic loss characteristics of commercial 450-ohm ladder-line (comparable to 1/2" hard-line at 2 meters).

The ladder-line feedline can be any length as it is matched perfectly at both ends. I made mine 80 ft. long, and the resulting antenna rolled into a 1" x 10" disk that stowed easily in a school-sized backpack with room to spare for my HT, a small gel cell 12-volt battery, wrist rocket, 50-lb fishing line, and a bag of pogey bait.

The matching network at the radio end of the feedline is a combination of a 1/2-wave 4:1 coax balun and a1/4-wave feedline transformer.The coax from the radio feeds into the balun at 50 ohms, and is simultaneously converted from 50 ohms unbalanced to 300 ohms balanced. The idea is simple - the 1/2 wave of coax feeds the other line of the balanced line (the one not connected to the center conductor of the coax) 180 degrees out of phase. To match the 200 ohms balanced output of the balun with the 450-ohm balanced input of the feedline, I took advantage of the transmission-line theory that states that with a 1/4-wave section of transmission line, (input impedance) X (output impedance) = (transmission-line impedance) squared. To be totally honest, I was sitting in the classic "Thinker" pose in the office (also known as the library, loo, hideaway from kids etc) wondering how to make the match when it hit me that 2 x 4.5 was the same as 3 x 3. After working the math out to verify that 200 X 450 was indeed 300 squared, I used a quarter wavelength of cheap 300-ohm TV twin-lead (the kids weren't too happy when their cartoons went off the air, but I popped in a videocassette to hold them over till I made it back into town to buy more twin-lead) between the balun and feedline for a perfect match.

The antenna has been tested at several field days and as my primary base antenna for several years with very impressive results. It always amazes people by it's cheapness and performance having blown several commercial and tower-mounted antennas (it merely

hangs from a line that has been shot into a tree) away in strictly informal and unscientific tests (I'm making it into repeaters at 5 watts that my friend down the street can't do at 25). It is free for anyone to copy, use, and improve on, with the exception that if I find someone making and selling it commercially, I would pretty much demand due credit (preferably in the monetary sense :). The original plans were published in a much-earlier edition of our local club's newsletter as proof of the date of conception.

If anyone could do me a favor and perform scientific analysis testing on this design, I would really like to hear the results. As a single custodial parent, I barely have time to appreciate that it works so well, let alone play with it and develop it even more.

Subjects to look up for further documentation of the concepts used by the KD4OUN Super-J collinear:

These are all covered in depth in the ARRL Antenna Handbook.

Collinear arrays

J-poles

Transmission lines velocity factors

4:1 coax baluns

Phasing lines

Maritime Super-J antenna

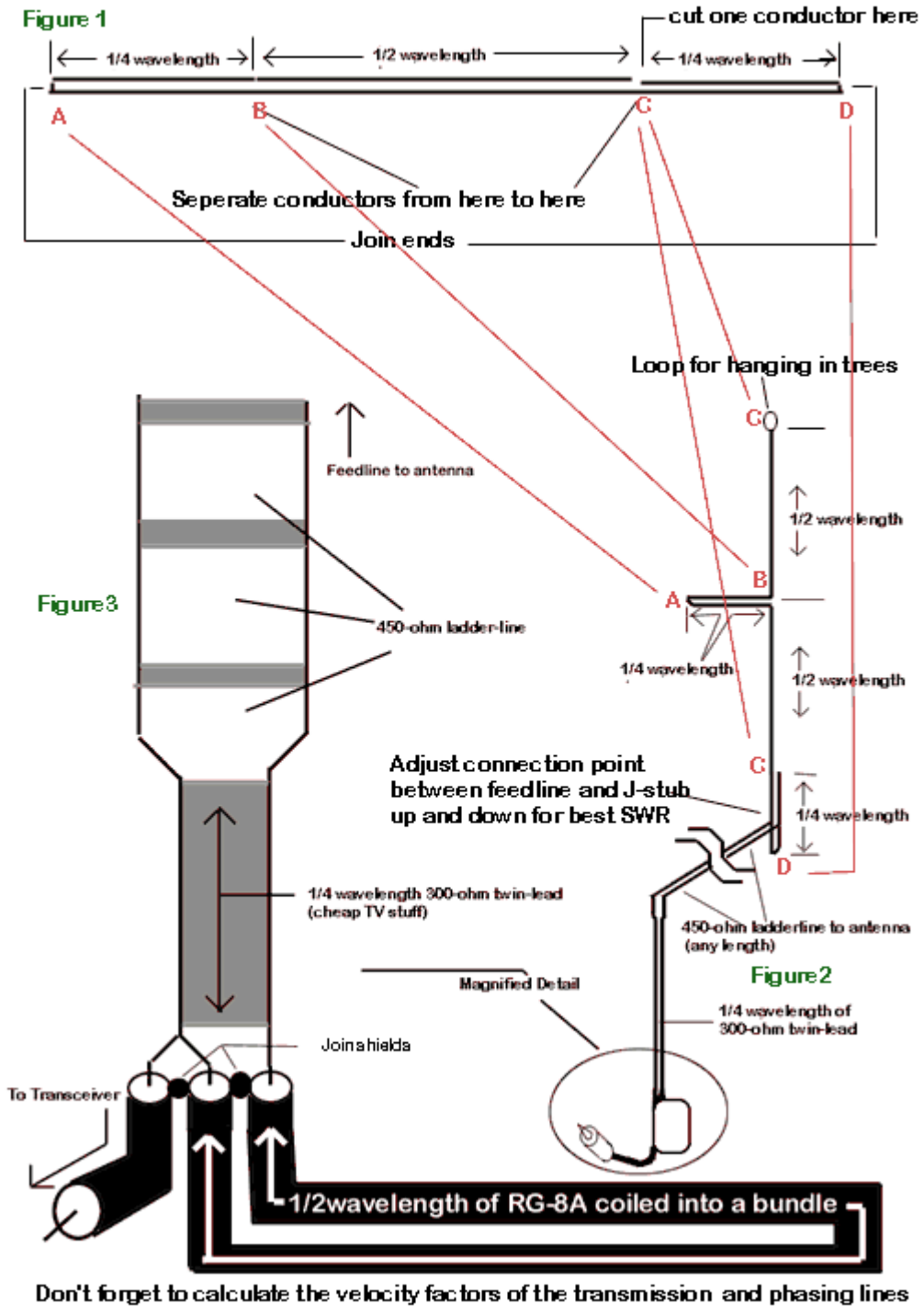
Mobile J-pole (uses the 4:1 coax balun at the feedpoint)

Transmission-line impedance transformation (1/4 wave transformers)

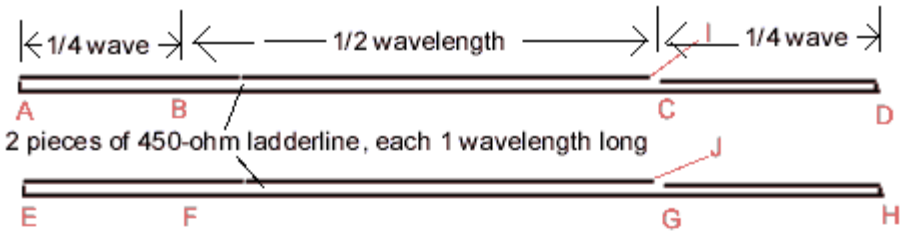
Transmission-line loss characteristics

I look forward to hearing your comments, questions, suggestions, success/horror stories etc. Please feel free to email me at gfloyd7@tfn.net

The straightforward simple version...



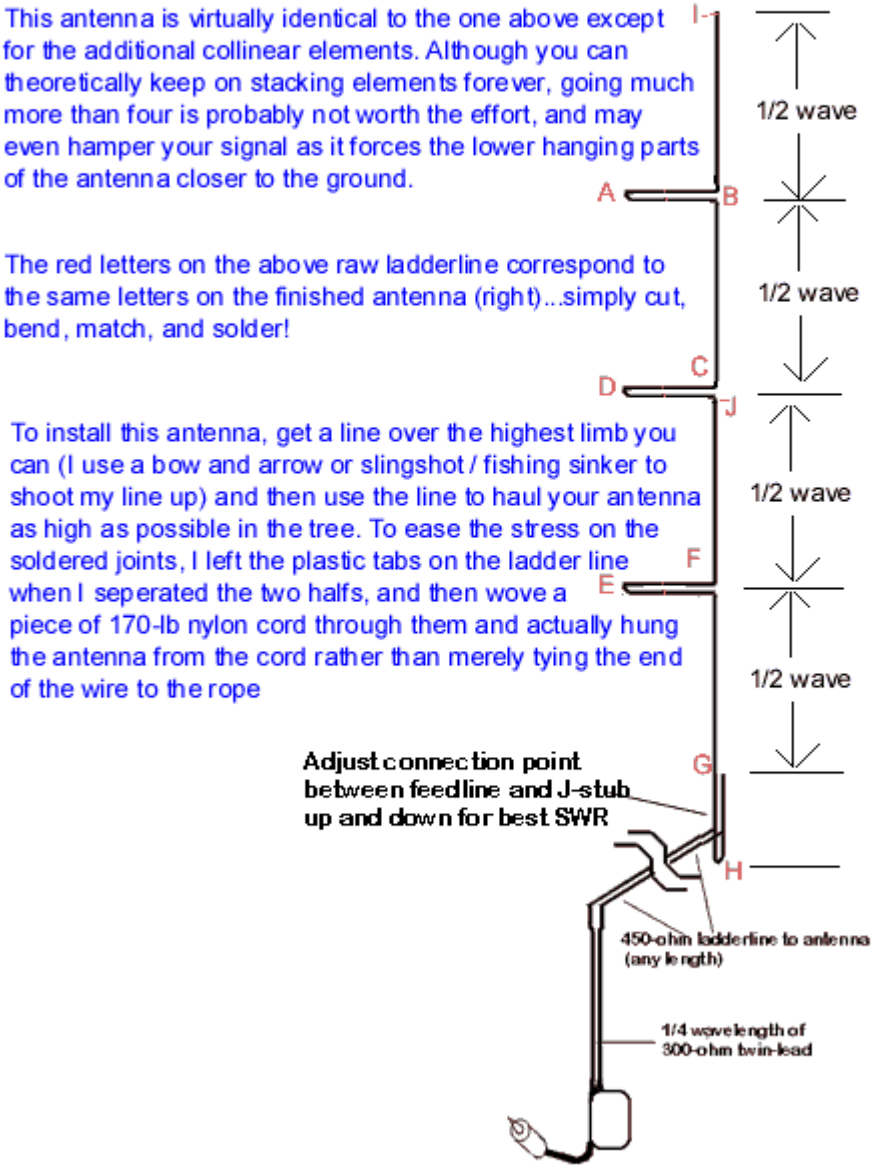
And for even better performance.....



This antenna is virtually identical to the one above except for the additional collinear elements. Although you can theoretically keep on stacking elements forever, going much more than four is probably not worth the effort, and may even hamper your signal as it forces the lower hanging parts of the antenna closer to the ground.

The red letters on the above raw ladderline correspond to the same letters on the finished antenna (right)...simply cut, bend, match, and solder!

To install this antenna, get a line over the highest limb you can (I use a bow and arrow or slingshot / fishing sinker to shoot my line up) and then use the line to haul your antenna as high as possible in the tree. To ease the stress on the soldered joints, I left the plastic tabs on the ladder line when I seperated the two halfs, and then wove a piece of 170-lb nylon cord through them and actually hung the antenna from the cord rather than merely tying the end of the wire to the rope



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