Building a CCD Antenna

The following instructions are for building a custom design antenna system called a CCD. These antennas are basically like a standard dipole in shape and how you feed it, however, they are typically closer to full wave than half wave. The design allows for standard match with a 52 ohm coax feed and is VERY resonant on the bands the particular model is designed for.

This is not an all band antenna. Basically, it's not a jack of all trades, it is a master at one, or in this case, two bands. Yep, it'll work on other bands with a tuner…so will bed springs. Just remember, the more resonant it is on the bands it's designed for, the less resonant it'll be on other bands. Unlike most antennas, these are not harmonically driven.

Early designs didn't have the luxury of computer modeling. We did. Or I should say Charlie, AD7MD, did as well as the genius to work with it enough to get dual band models to work far batter than any of the single band version of older designs. Just a note here. No, Charlie won't be designing CCDs for other bands. Trust me, they aren't that feasible on other frequencies. They could be built but they wouldn't have the properties these do simply because of the frequencies.

List of suppliers are at the end of these instructions.

So, on to the instructions.

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The CCD is basically a dipole design but with breaks at very precise intervals with silver mica capacitors. There is a chart below showing the various bands with lengths and values.

Boards:

The key to making the CCD is the insulator boards to mount the caps and wire to. These boards are available from Far Circuits. Each board is 1" x .5" and has mounting holds for 14 gauge wire on the ends and smaller holes for mounting the silver mica caps in the middle.

Earlier designs of the CCD had resistors to protect the caps from static discharge. These boards were designed with a narrow gap between the two pads to allow for arc over and protect the caps in sand and lightning storms.

Capacitors:

The capacitors are 500v silver mico caps and are available from Just Radios in Canada. They are high quality and typically 5%. The antenna, according to the computer model, could handle twice the legal limit. BUT IT CAN'T. We suggest 300 watts carrier modes and 800 PEP. No, you can't just put 1kv versions in and expect more power capability. We tried. They pop. The reason we found was the internal resistance of the caps will heat them up and they will eventually blow. 500v and kV capacitors have basically the same resistance and will pop at about the same levels of RF.

Wire:
We used the 14 gauge 19 strand slinky wire and if you can find it, use it. Great stuff, but the manufacturing gods decided to stop making it. Any 14 gauge should work. The best is bar wire and copper clad steel so it won't stretch as much. Bar because stripping the wire for each connection is going to bring about four letter words. And stripping may nick the wire reducing the over all strength of the antenna.

The Balun and end insulators:

We used a standard W2AU 4:1 balun. They worked just fine and can be ordered from just about any radio dealer. The end insulators are simply that. Nothing special about them at all.

BUILDING INSTRUCTIONS:

Visit the chart below to see the capacitor count and wire lengths needed for the bands you want to build for. These instructions will work for any of them.

To build the antenna using the boards we highly recommend a 'jig' to make sure the distances are measured perfectly. For example, if the distance is 57" it means center to center. So, from center roof one board to the center of the next board it should be exactly 57". And in the center where the balun goes, it's 57" from the center of the board to the center of the balun. And on the ends, it's 57"

from the center of the last board to the end of the loop in whatever insulator you use.

The first step is to install a cap in each board. The 500v caps should fit in the smaller holes that are closest together. Always insert caps and wire in from the non-metal side of the board and solder on the metal side with standard ROSIN core solder. If you are new to this, acid core is for plumbers, but electrical soldering. Insert the caps as far and evenly into each hole as you can. Don't lay them flat. Solder so that the board and wire is hot enough to melt the solder themselves and let it flow. Don't allow any gaps or open areas around the solder joint. This is going to be swinging in the weather and corrosion will grab a hold in any crevice it can find.

The boards, as you'll notice, can actually fit in a 1" slot and the cap and wire holes are on one edge. This is designed so they can fit in a two slots exactly the right distance apart when building them. As each board is finished it takes the place of the far board and a new one is put in the slot and the next measurement is done for you by your 'jig'. So, building the jig you use a dremel tool with a small router attachment and cut slots for the boards in a single board that is slightly longer than what you need. For example, if we need a 57" jig we would find a 65"+ board and cut two slots in it with the router to be exactly 57" from center to center. Make the slots narrow enough for the boards to just fit. Now you are ready to build. And your antenna will be very close to perfect in length.

Images showing the jig we used can be found on the CCDantennas.com site under 'Specs to build a CCD Antenna'.

When attaching the wire to the boards it's important to cut them to length before soldering. Leave enough to get though the hole and leave maybe a 1/16th inch amount of wire sticking through to the metal site of the board. Bend the leads to be right angles to the board just as it will be when it's in the air. You might need some weights to hold things in place as you solder, although the board should be in the jig and one end taught from the other end of the jig. Now, solder very carefully making sure the wire and board get more than hot enough to melt the solder on their own. Apply a generous amount of solder and allow it to wick through the hold and into the bend you made in each wire. This makes for a VERY strong connection. Again, don't allow for ANY gaps between the wire and board. The solder connection should be smooth and shiny all the way around the connection.

To make sure you don't go overboard and install to many caps, count them out and only have the exact number for each leg as you are building it. Start at one end and work towards the balun. When you run out of boards for the one leg you know it's time to install the balun. THEN you can bring out the other hand of the boards and finish building your antenna.

As you build you should check with a capacitor setting on most multimeters and test across the board right after you build it. It will not show the proper capacitance BUT it will show you generally the same number across each one. Or, if the board has a problem, it'll show a short. Or if your soldering job needs work it might show an open. Best to test this baby now than have to haul it back down the tower later.

There you have it. You might look at the instructions on the website and look at the pictures there too.

Good luck and enjoy your CCD!!

73 from Dave, AI7R and Charlie, AD7MD

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20 meter version
Sections are 35″ and the total size is 70ft
Qty: 22 – 100pf 5% silver mica 500volt capacitor

20/40 meter version (my favorite)
Sections are 57″ and the total size is 114ft
Qty: 22 – 270pf 5% silver mica 500volt capacitor

40/80 meter version
Sections are 92″ and the total size is 230ft
Qty: 28 – 500pf 5% silver mica 500volt capacitor

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Suppliers:

Boards: FAR CIRCUITS - www.farcircuits.net - 847.347.2432

Caps: Just Radios - www.justradios.com - justradios@yahoo.com
Balun: W2AU 4:1 balun from any ham supplier

Insulators: Pretty much any style will work