

Modifications to the Channel Master 4221HD Antenna to Improve VHF Performance

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This article describes the modifications required to improve reception performance on VHF channels 9, 11, and 13 for the Channel Master (CM) 4221HD antenna. [Note that this mod only applies to the new HD version not the older CM4221 with the screen reflector.] It involves replacing the dipoles with longer ones and adding longer reflector rods to those already in place. A certain amount of skill with hand tools is required but it is not complicated or hard in any way.

This results in a predicted improvement of about 10 dBi for channel 9 over the original, 12 dBi for channel 11, and 2 dBi for channel 13. Interestingly, the antenna-modeling software predicts that these modifications also slightly improve the performance in the UHF band as well. This mod is completely reversible if you decide you don't like the results.

A CM4221HD modified in this fashion has been in use at my location for several months and receives high VHF respectively well.

Materials needed

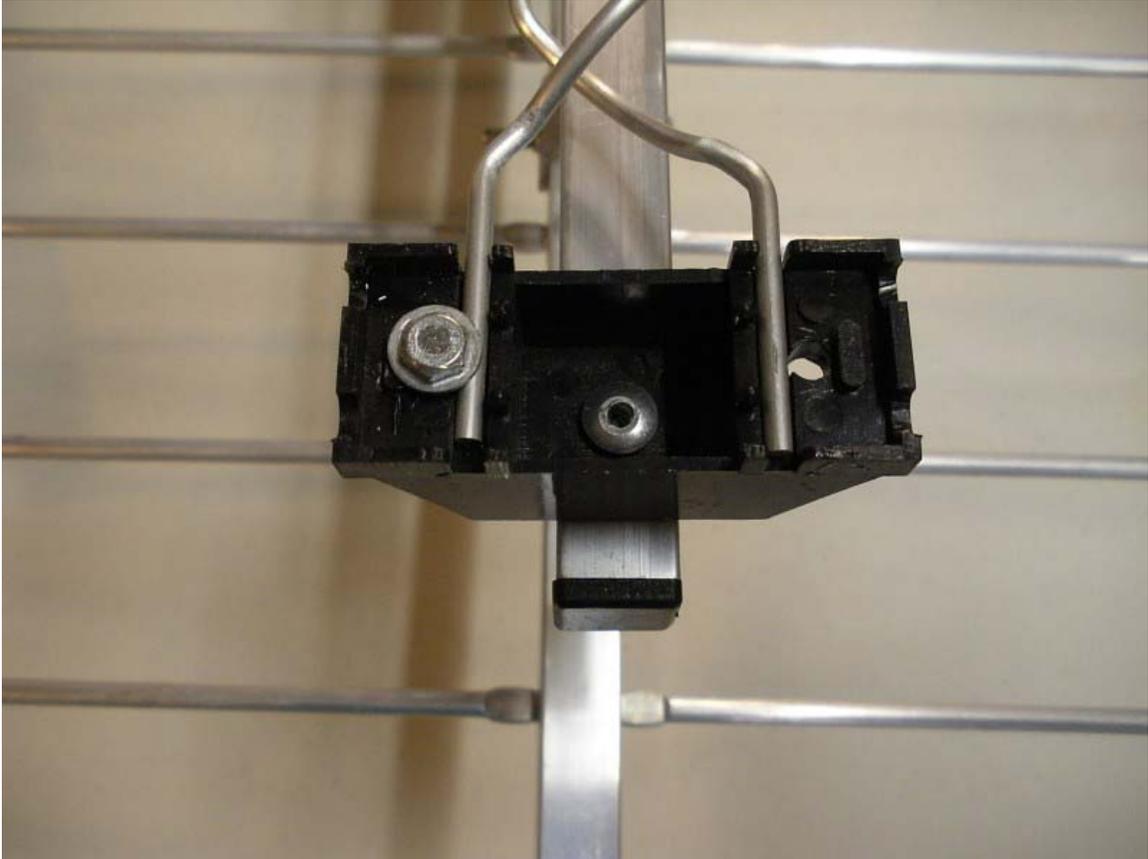
144 inches of 5/32-inch ER4043 aluminum welding rod (source: weldingsupply.com) for new dipoles.

One surplus or defunct TV antenna to produce 16 pieces 32-inch-long 3/8-inch (or so) diameter aluminum tubing for added reflectors.

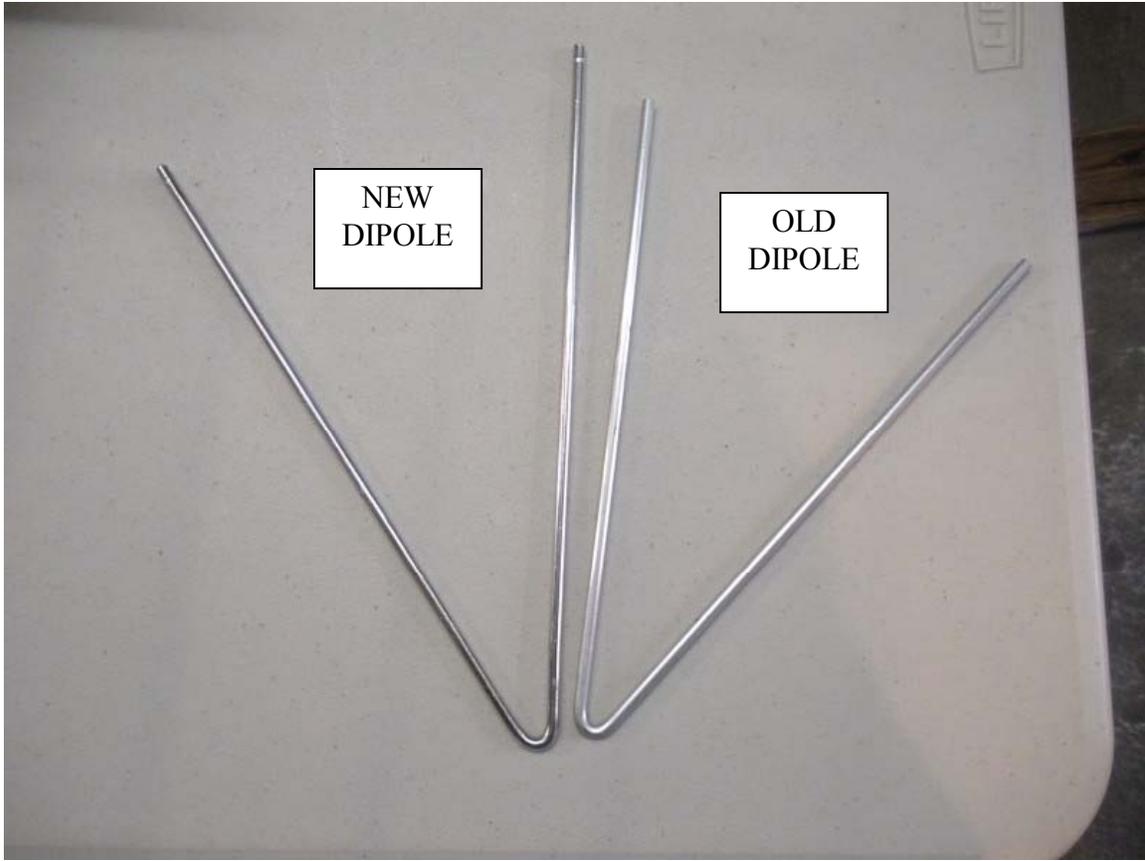
Plastic multi-purpose ties.

CH 4221HD Disassembly

Carefully pop off the cover where the vee-shaped dipole joins the feed system.



Unscrew the bolt holding the dipole in place and set aside for reuse. Verify that the original dipole measures 8 inches from tip to the center of the bend of the vee. The replacement dipoles will measure 9 inches between the same points.



Save the original dipoles for reinstallation if you decide the results are not to your liking.

Fabricating the replacement dipoles

Cut a piece of 5/32-inch aluminum welding rod to 18 inches and bend to the same shape as the original dipole. Preparing a jig from a couple of pieces of scrap plywood or other wood in the following manner best facilitates this.



Referring to the photo, nail a small piece of plywood or other suitable material along one edge of a larger piece of plywood. Drill a 3/16-inch hole near one end of the plywood but away from it equal to the width of the welding rod so that when the shank of the drill is left in place as a pivot for the welding rod, the rod fits neatly between the drill and the plywood when it is bent.

Using one of the original dipoles as a guide, place it into the jig and mark the vee shape on the plywood with a pencil so the new one can be bent to the same angle. Put a nail into the plywood next to the plywood 9 inches from the drill pivot to act as a stop. [Tip: It may be useful to cut the new dipole a bit long to facilitate trimming the dipole to the correct length after being bent but this is not critical.] You may have to experiment a bit to find the best location for the end nail. It should be about one inch beyond the end of the original 8-inch dipole when it is placed in the jig. Put a couple more nails along the length of the dipole rod to hold it in place.

Bending of the rod is best done with a short piece of rigid tubing that will fit over the welding rod and keep the rod straight during bending. Place the 18-inch rod into the jig between the drill pivot and extending down to the nail stop 9 inches away. Holding the rod firmly against the plywood, slip the rigid tubing over the other end of the rod and bend the rod around the drill shank down to meet the mark thereby achieving the same angle as the original.

It may be necessary to compress the angle of the vee a bit in a suitable device such as a bench vice to get the angle right and prevent the plastic dipole cover from cracking or splitting, as the dipole must fit into the grooves of the cover. [I almost cracked one the first time.] Trial fit the new dipole to make sure the dipole fits properly into the plastic grooves of the antenna.

Verify that the dipole indeed measures 9 inches from tip to the bend and install in place of the original dipole. Fasten with the bolt removed previously and snap the cover back in place. Continue with the remaining seven dipoles.

Adding new reflector tubes

This part of the mod retains the current reflectors and adds longer elements to them. Prepare 16 aluminum 3/8-inch tubes (exact diameter is not critical) each cut 32 inches long salvaged from a surplus or discarded TV antenna or other source.

Attach them to the original 16 horizontal-reflectors behind the dipoles with plastic multi-purpose ties. Solid aluminum rod could be used but will result in a heavier antenna.



Install the modified antenna at your preferred location. I would appreciate feedback on your results.

If your aim is to improve channel 13 only, the addition of just the new 32-inch reflectors will do the job better, giving an improvement of 4.9 dBi over the original. When you add in the lengthened dipoles, the gain for channel 13 is not as great.

Disclaimer

This modification is done at your own risk. You may not like the results. If not, simply return the antenna to its original configuration. This may not work for everyone. This mod is not approved by Channel Master in any way and they could probably do a better job, but as the old saying goes: "Nothing ventured, nothing gained."