

# Building A Two Element Six Meter Quad

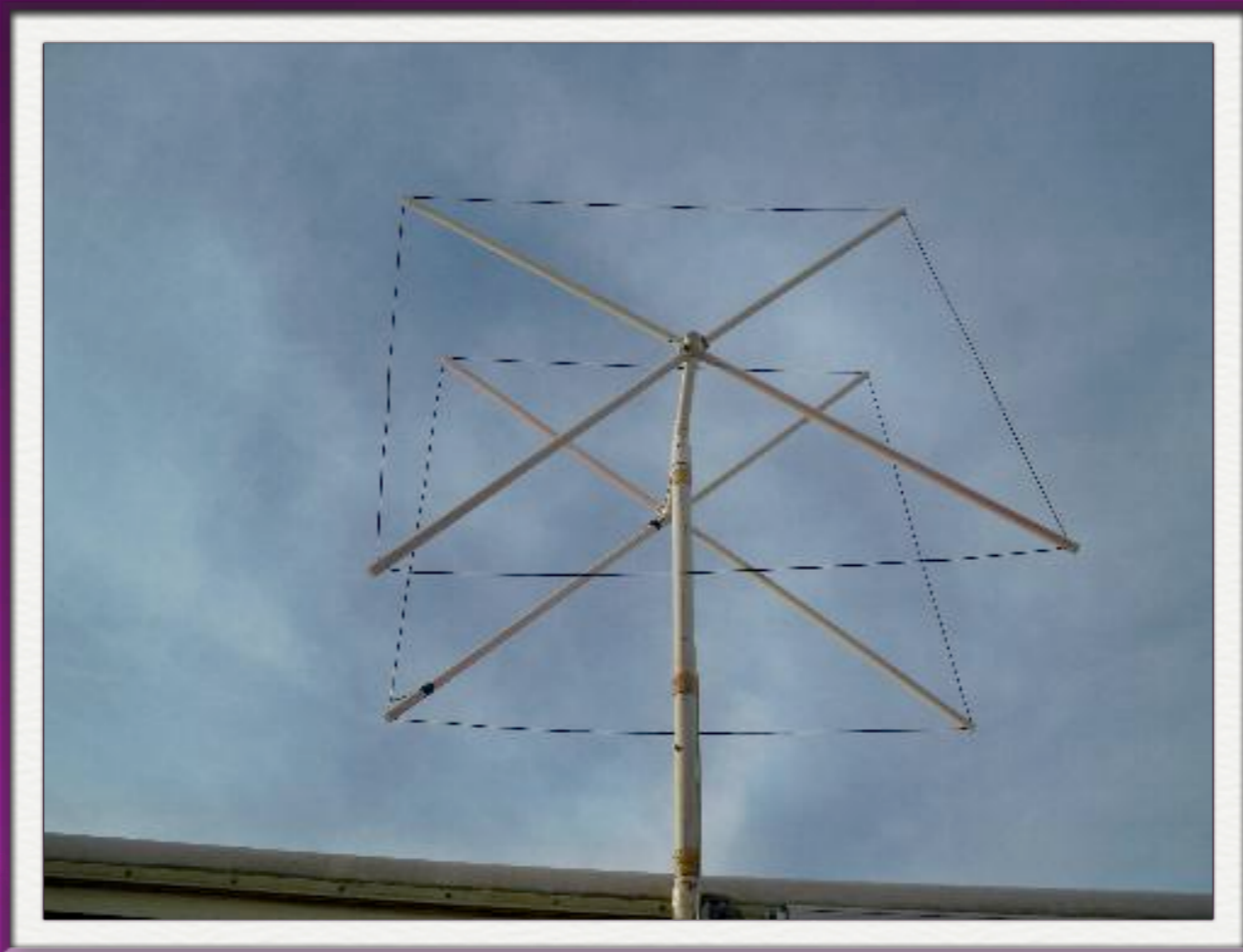
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Presented by John Kreider WA4YOG  
Vice President  
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Made from PVC pipe and capable of being disassembled in a few minutes.



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I had a need for a portable 6 meter antenna that I could use while traveling in my RV. It had to have the capability of being disassembled for storage, and easily assembled for use at an RV campground. I wanted to be able to add a rotator to it and include the means to mount an additional antenna on the same rotator.

For home or permanent installations, the PVC pieces can be glued together, but for portable use, they fit snugly together, and can be used for short periods of time without any problems.

You will see that I have devised a way to “lock” the spreaders into the center crosses using the wires of the Quad to do so. This trick allows me to tighten the wires so that they have little sag while in use, but permits me to loosen them so that the spreaders can be disassembled.

The following photos and captions should be all that is needed to build this antenna.



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One question you might ask is why  $\frac{3}{4}$  inch PVC for the spreaders and not  $\frac{1}{2}$  inch pipe?

I found that by using  $\frac{3}{4}$  inch pipe, the center crosses of the  $\frac{3}{4}$  inch pipe were compatible with 1 inch tees that were cut to create the boom connections. The I.D. of the 1 inch tee, matches the O.D. of the  $\frac{3}{4}$  inch cross almost exactly. This is not the case when trying to mate  $\frac{1}{2}$  inch crosses and  $\frac{3}{4}$  inch tees. The  $\frac{3}{4}$  inch tee, when cut does not fit over the O.D. of the  $\frac{1}{2}$  inch cross.

An additional feature is that the larger size PVC is more rigid and therefore the dimensions are more stable. Note that this antenna is made with stranded #14 insulated wire. The dimensions given are for using that wire. #16 could probably be used with no changes in dimensions. If bare wire is to be used, all the given dimensions must be increased about 3% due to the velocity factor of the insulated wire.

I chose insulated wire over bare, since I would be taking the antenna apart and storing it in my RV. Bare stranded wire would have been more difficult to store, since it may have snagged on items while in storage.



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# Bill of Materials:

The following materials are needed to make the Quad:

- 2 – 10 foot lengths of schedule 20 x 3/4 inch PVC pipe
- 1 – 10 foot length of schedule 40 x 1 inch PVC pipe
- 2 – 3/4 inch PVC crosses – these have holes going in 4 directions
- 2 – 1 inch PVC tees – these have holes going in 3 directions
- 1 – 1 inch PVC cross OR Tee if you don't want to add any antenna to the center of the boom.
- 4 – stainless steel hose clamps 1-1/4 inch diameter (approx.)
- 1 piece of insulated #14 stranded wire 18 ft. 10-1/2 inches long
- 1 piece of insulated #14 stranded wire 19 ft. 5-3/4 inches long
- 3 pieces of 3/8" heat shrink tubing 2" long
- 1 length of 52 ohm coax to reach from the antenna to your rig or coax switch.  
(RG-8X, RG 213 or RG 58)
- 3/4" black electrical tape or 3/4" velcro strips (used to secure the coax to the antenna cross arms and boom)
- Coax Seal -- waterproofing goo



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Start by cutting the  $\frac{3}{4}$  inch pipe into the following lengths:

4 ea: 40 inches long (for the driven element)

4 ea; 41  $\frac{1}{4}$  inches long (for the reflector)

Drill  $\frac{5}{64}$  inch holes  $\frac{1}{2}$  inch in from one end of each piece. A different size hole is OK but be sure you can make the "J"s with what ever size hole you drill.

Be sure that the holes are centered so that the wire will go straight through the boom and not on an angle.

Now rotate each piece about 30 degrees moving the hole on each piece to the left. Drill a second hole in the boom at that rotation about 1- $\frac{1}{4}$  inch from the end. (see Fig. 1)

Drill this hole in 7 of the 8 pieces, only leaving one of the 40 inch pieces with a single pair of holes where the coax will be connected.



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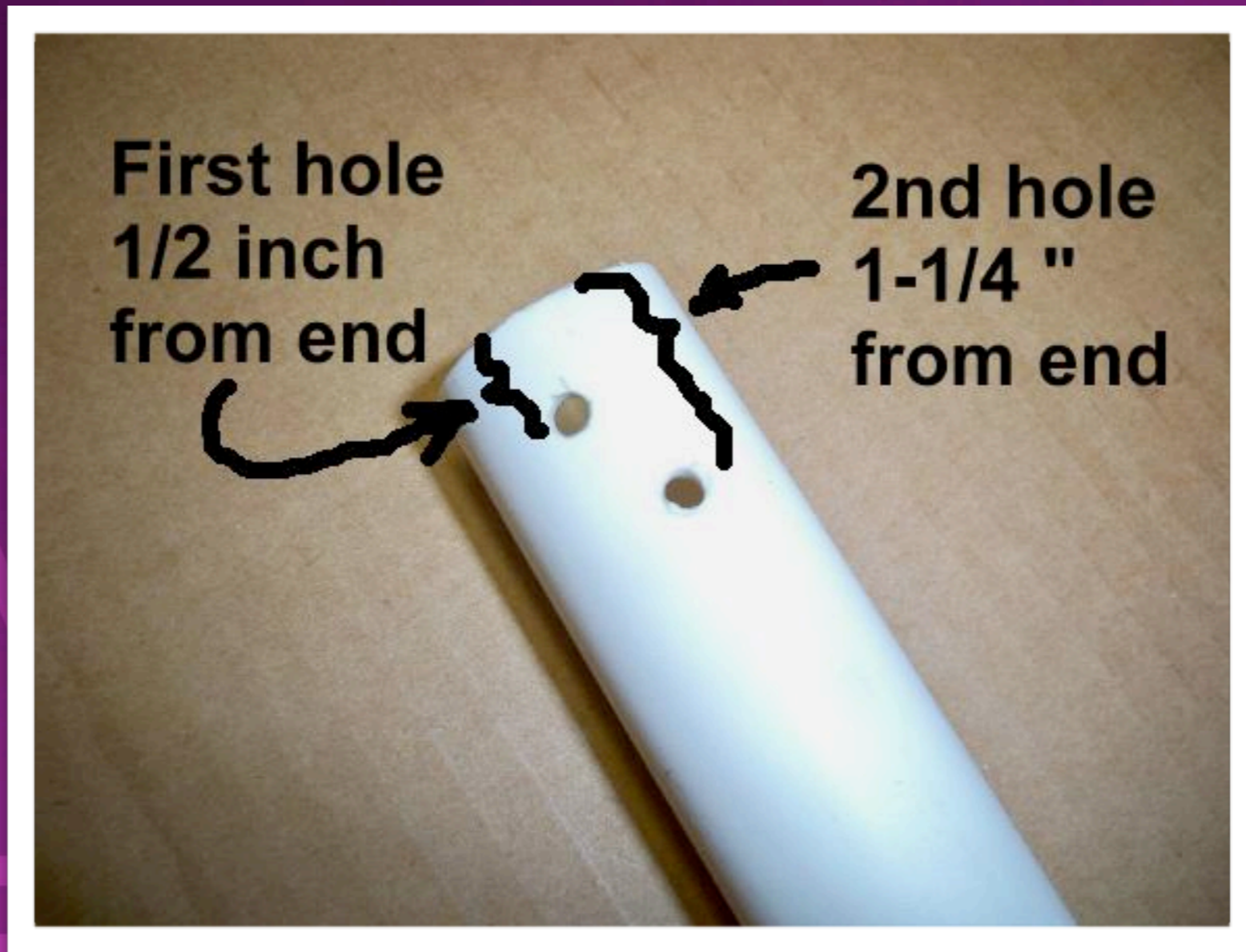


Fig. 1 Drill two holes in 7 of 8 pieces



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Next drill a series of holes as shown on the left to form an upside down "J". Do this on both sides of each tube.

Be sure to leave a gap between the holes on the right and the single hole on the left so that the wire will lock in two positions.



Then carefully use the drill to "connect the dots" and remove all the material between the holes. This forms the adjustable portion of the wire guide on each spreader except where the coax is connected on the driven element



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# Assembly of The Reflector

Strip both ends of the longer wire (19' 5-3/4") and twist the stranded wire to keep it neat.

Thread the wire through the 4 reflector spreaders.

Place a piece of heat shrink about 2" long over one end of the wire. Overlap the two ends 1 inch and twist and solder them together. Slide the heat shrink over the soldered connection and heat to waterproof the link.



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You will now have a loop with the wire through the four outer ends.



Position the wire in the inner part of the "J" as shown above, on all 4 spreaders.



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Insert the four spreaders into one of the two  $\frac{3}{4}$ " crosses. After you seat the pieces snugly into the crosses move the wire to the outer part of the "J" as required to give more tension to the element. You may not need to move the wire on all 4 spreaders. This will depend on the precision with which you drilled your holes.



Be sure that the holes are lined up so that the wire runs in a "flat" loop when assembled. Your reflector is now completed.



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# Preparing the Boom

Before assembling the driven element we must use the  $\frac{3}{4}$ " cross as a form for cutting and fitting the 1" tees that will be the boom connections.

Cut off half of the long side of the tees with a hack saw. Then shape the cut area so that it will fit over the  $\frac{3}{4}$ " crosses as shown on the following pages.

It is easier to make the pieces fit to the cross before the spreaders are placed into the cross.



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When completed, the two modified tees will fit over the crosses as seen to the left. Use two hose clamps to fit one tee to the completed reflector. It should fit so that the hose clamp pulls the tee snug to the smaller cross, and does not try to deform it. If you have cut away enough material the two pieces will fit easily together.



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Cut two pieces of the 1 inch PVC 11 inches long. Place these into the 1 inch cross as shown below. The rest of the 1" PVC can be used in conjunction with other pieces of mast and/or a rotator to raise the antenna to your desired height.

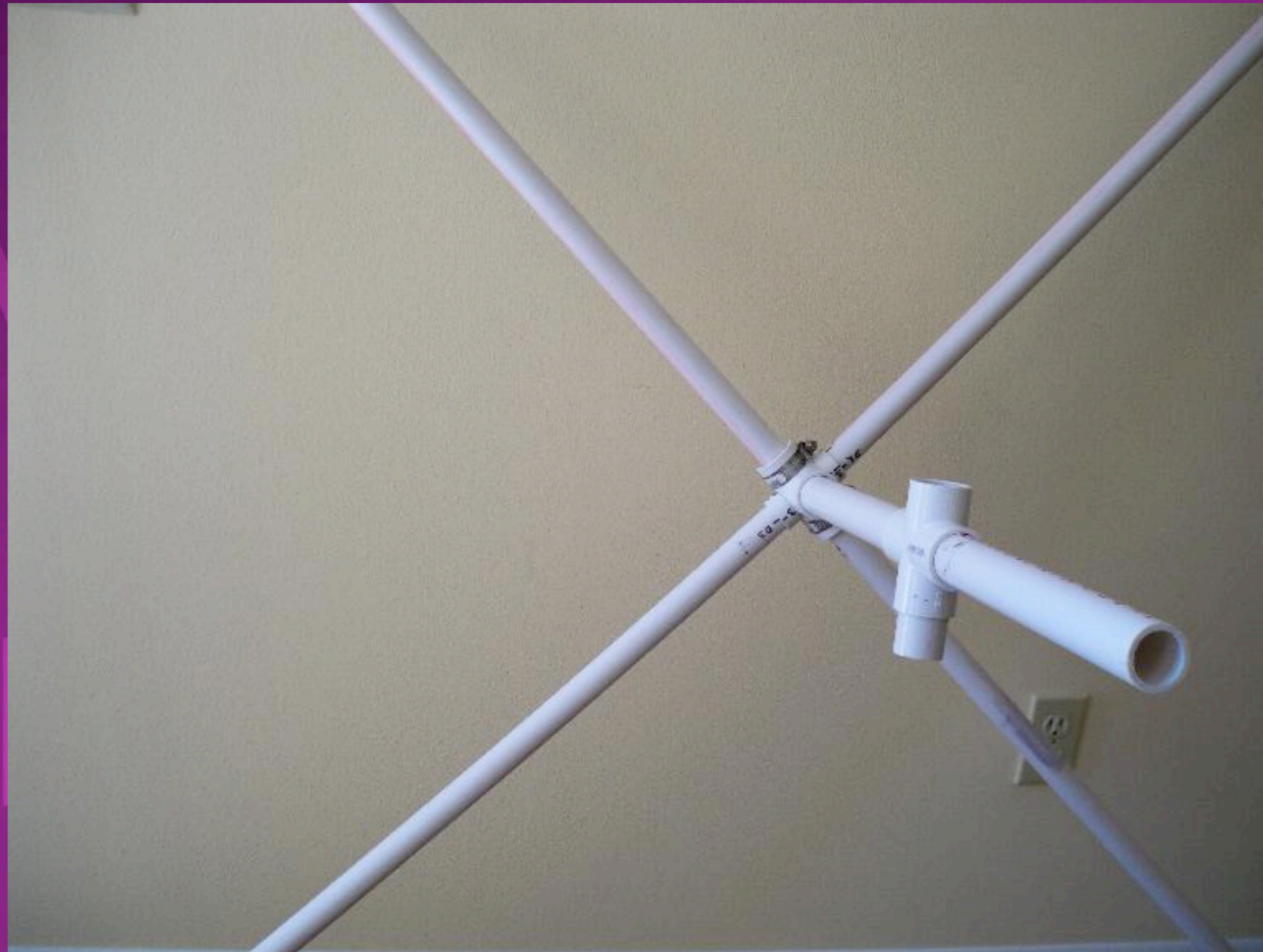


NOTE: I use the short stub at the bottom to go into a 1" to 1-1/4" adaptor that then fits into my rotator. The upper 1" opening is where I can insert the mast to my Elk 2M/440 Log periodic antenna.



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If you put all the pieces made together, you will Now have 2/3 of the antenna that looks like this:



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# Assembly of the Driven Element

We are now ready to assemble the driven element. It is put together somewhat similarly to the reflector.

Prepare the remaining #14 wire by stripping 1 inch of insulation from each end.

Prepare a length of 52 ohm coax (RG8-X, RG-58 or RG 213) by stripping the outer jacket back about 1-1/2 inches.

Then remove the center conductor from the braid or comb the braid out so that it can be separated from the center conductor. Twist the braid into a strand and strip about 3/4" of the insulation away from the center conductor. These dimensions are not critical, but they do contribute to the length of the driven element.



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As we did with the reflector, thread the #14 wire through the four 40" spreaders. Be sure that the bare ends of the wire are near the one element without the "J" cut into the end. This is where the coax is to be connected.

Place a piece of shrink wrap 2" long over each end of the #14 wire. Now carefully wrap the center conductor of the coax to one stripped end and solder it. Do not overheat.

Next wrap the other wire around the braid of the coax and solder it in place. Again, be careful not to overheat it.

Slide the two pieces of shrink wrap over the soldered connections and heat them. Take a small amount of coax seal and seal the remaining area of the connection and tape the gooey stuff in place to completely waterproof the connection. See the photo on the next page.



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For a permanent installation, use Black tape to secure the coax to the spreader, for a "knock down" antenna, and use some loops of velcro to secure the coax.



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As you did with the reflector, assemble the driven element by placing the 4 spreaders into a  $\frac{3}{4}$ " cross, and move the wires in the "J" cuts to tension the wire.

Attach the remaining modified tee to the cross with two hose clamps, and attach the element to the boom so that the wires are in parallel to the reflector.

If you do not anticipate taking the antenna apart, you can use PVC cement to secure all the joints as you assemble the antenna. Otherwise, you may choose to only cement the three boom parts together.



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This antenna can be erected in several configurations:

For vertical polarization, place the driven element so that the coax is running out the spreader to one side, and the antenna is in a "diamond" configuration.

For horizontal polarization, place the diamond shape so that the coax is at the bottom of the element.

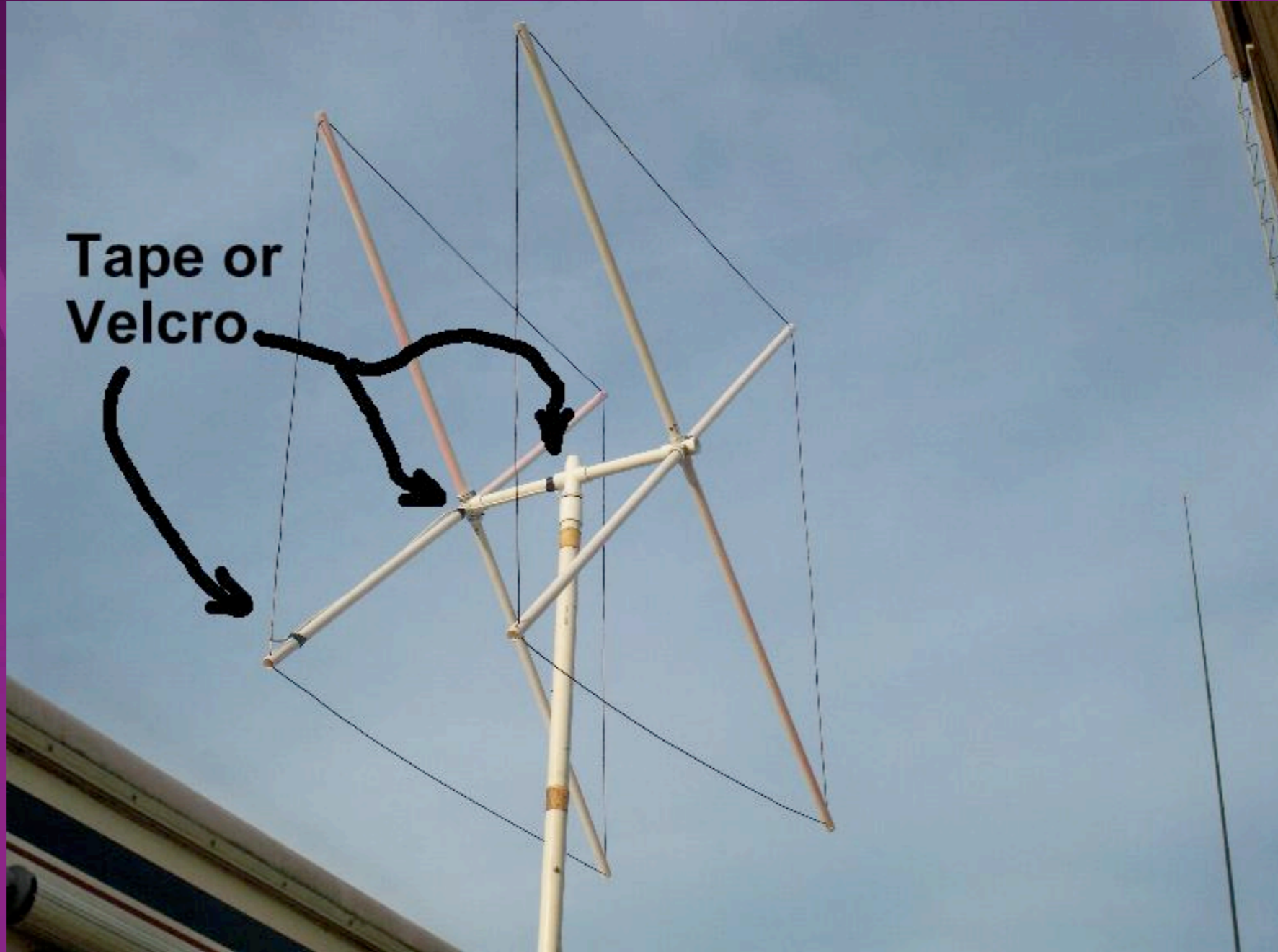
OR if you prefer, you can configure the elements so that they look like a square with the spreaders at a 45 degree angle to the mast. This keeps the antenna higher above the ground or adjacent structures.

See the Following Photo:



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Tape or  
Velcro



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This antenna is designed resonant at about 50.1 MHz. The SWR should be less than 1.5:1 from 50.0 to 50.6 MHz.

The element spacing is designed to give a 50 ohm match.

If you want wider spacing and about 0.4 dB more forward gain, you can increase the spacing to about 14 inches on each piece of the boom and by using 75 ohm coax.



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