

40 M to 6 M OCF Spiral Dipole building Instructions

The mechanical details of this antenna are must be followed to yield a ready to use antenna. A SWR meter will not provide enough information for trim tuning or feed point adjustments. You MUST be exact in cutting the dipole wire elements for primary frequency (and harmonics) to be correct. For now let's stay with the known configuration. This configuration provides good results on 40, 20, 15, 10 and 6, lesser output but very usable on 30, 17 and 12 meters. It even work well on 2 meters but size it not a problem for 2M. Now the step by step instructions used by my local radio club members for the 40M to 6M spiral dipole shown in Figures 1 and 2, this antenna consists of two spirals, BALUN and feed line.

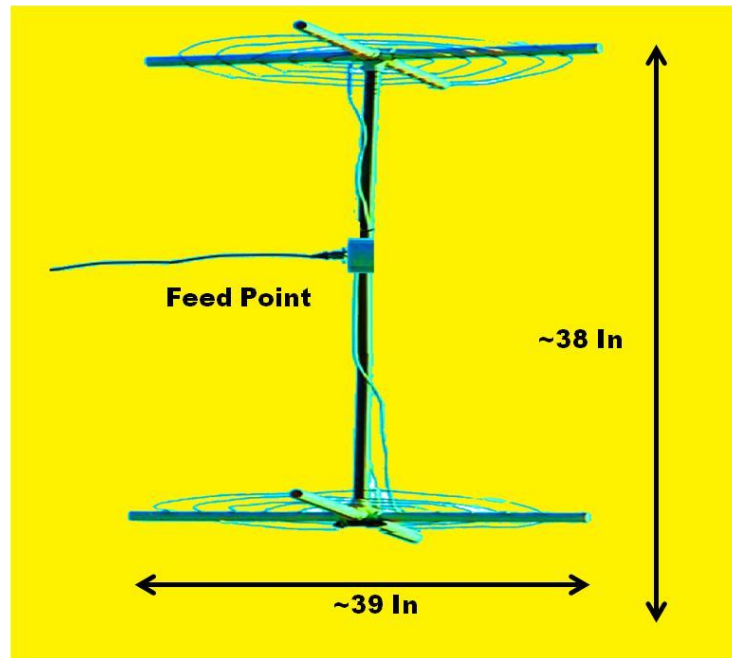


Figure 1 –40M Spiral Dipole with simple PVC construction and very portable for a 40M antenna

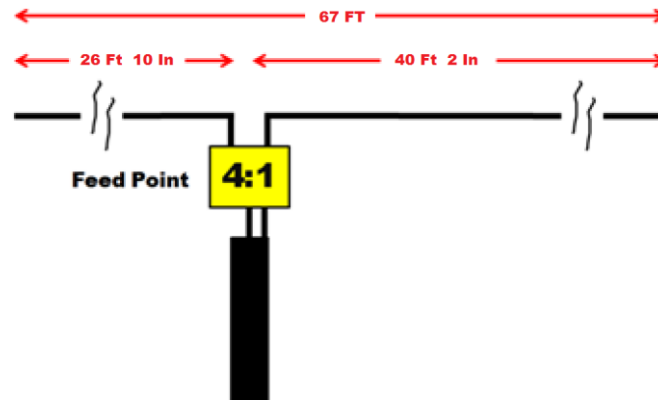


Figure 2 –40M Spiral Dipole is a classic Windom OCF 40/60 split dipole with a 4:1 BALUN Match Feed

Parts List for 40 M OCF Spiral Dipole	Quantity
#14 AWG Solid THHN Wire (any color)	70 Ft
4:1 Current BALUN	1
Schedule 40 PVC Pressure Pipe (Water)	-
½ Inch Pipe	12 Ft
¾ Inch Pipe	3 Ft
½ Inch 90 Deg Cross Tee SSSS	2
½ to ¾ Male Adaptor TS	2
PVC Cement	1 Oz
Fasteners (plain steel)	-
¼-20 x 1 Inch Hex Head Bolt	2
¼ Flat Washer	2
¼ Split Washer	2
¼ x 1 Fender Washer	2
¼-20 Hex Nut	2
#6 x ¾ Inch Sheet Metal Screw	3
15" X ~ ¼" Cable Ties (~ 50 lbs strength)	2
~ ¼" Cable P-Clip #6 Hole	1
Hot Glue 12mm, 380 Deg Hi Temp, 6" Stick	2

Figure 7 – Parts List for 20M T-Match Spiral Dipole

Tools needed to build Spiral Dipole
Electric Drill
¼ Drill Bit
7/64 Drill Bit
Handsaw to cut PVC pipe
25 Ft Tape Measure
7/16 Socket & Ratchet or Nut Driver or Wrench
Screw Driver (for #6 Screws)
Needle Nose Pliers
Wire Cutters
File or Sand Paper
Fine Felt Tipped Marker - two colors
2 X 9 Inch Cardboard – Blank
Hot Glue Gun 380 Deg Hi Temp

Figure 8 – Tools needed to build Spiral Dipole

40 M Step-by-Step Assembly

40 M Step A1 – Cutting Pipe



Cut 1 piece of $\frac{3}{4}$ PVC Pipe to 36 Inches. Cut 8 pieces of $\frac{1}{2}$ PVC Pipe to 18 Inches. The sizes can be off by $\frac{1}{2}$ Inch but all 8 pieces must be equal to the eye ($\pm \frac{1}{2}$ Inch) to make measuring consistent during assembly.

40 M Step A2 – Drilling Cross Tee



Using the $\frac{1}{4}$ Inch drill bit drill a hole centered in one side of the $\frac{1}{2}$ Inch 90 Deg Cross Tee. Make two of these pieces.

40 M Step A3 – Adaptor Modification



Cut the $\frac{1}{2}$ Inch male end off the $\frac{1}{2}$ to $\frac{3}{4}$ Male Adaptor without damaging or cutting into the face. File or sand to produce a flat finished surface. Make two of these pieces.

40 M Step B1 – Cross Tee & Adaptor Assembly



Layout the 1/2 Inch 90 Deg Cross Tee next to the 1/2 to 3/4 Male Adaptor and 1/4-20 hardware for assembly. A finished assembly is shown at the left.

40 M Step B2 – Cross Tee & Adaptor Assembly



Place the 1/4 x 1 Fender Washer in the 1/2 to 3/4 Male Adaptor then insert the 1/4-20 x 1 Inch Hex Head Bolt. Next place the protruding bolt into the hole in the 1/2 Inch 90 Deg Cross Tee. Keep everything face down for now.

40 M Step B3 – Cross Tee & Adaptor Assembly



Slowly turn the Adaptor and Cross Tee horizontal keeping it together. Using needle nose pliers add the ; 1/4 Flat Washer, 1/4 Split Washer and 1/4-20 Hex Nut.

40 M Step B4 – Cross Tee & Adaptor Assembly



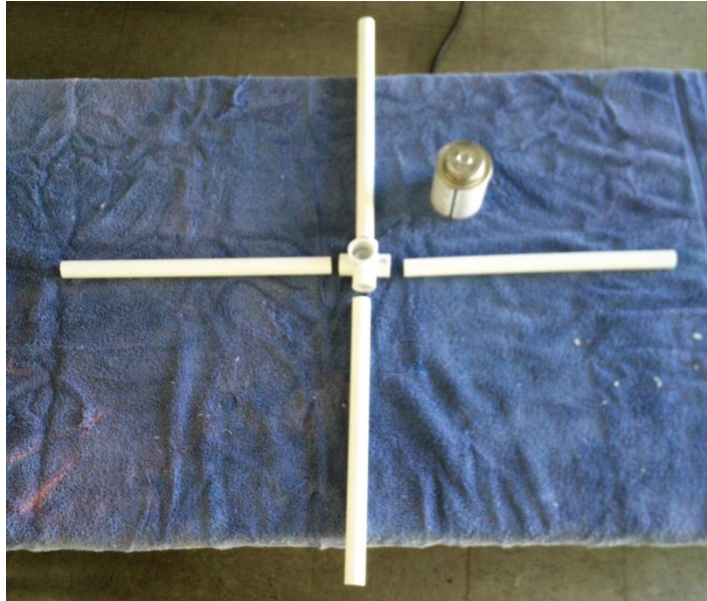
Turning the hex bolt while holding the nut with your needle nose pliers your assembly should look like this one. Now firmly tighten by hand beyond the point the split washer is fully compressed. You should NOT be able to turn the Cross Tee by hand when holding the Adaptor.

40 M Step B5 – Cross Tee & Adaptor Assembly



Your finished Cross Tee & Adaptor Assembly should look like this one. Make two of these assemblies.

40 M Step C1 – PVC Frame Assembly



Layout the Cross Tee & Adaptor Assembly, 4 $\frac{1}{2}$ PVC Pipes and PVC Cement ready for assembly.

40 M Step C2 – PVC Frame Assembly



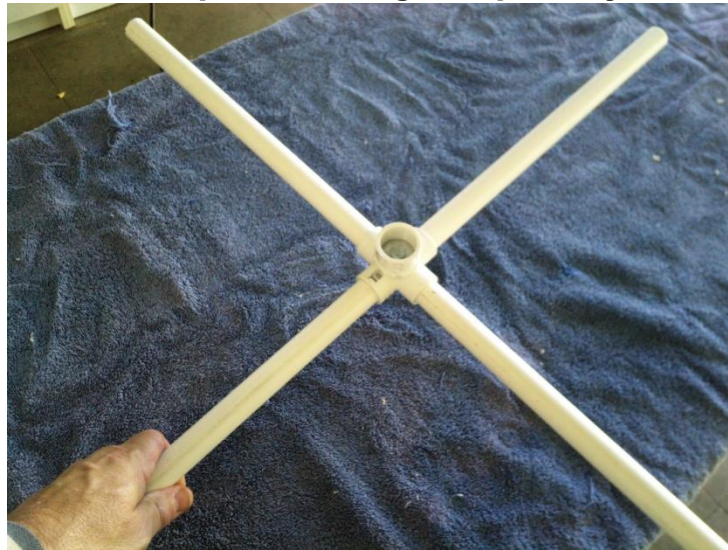
Using PVC cement attach the Cross Tee to the 4 $\frac{1}{2}$ PVC Pipes. Be sure to fully seat each pipe. Make two of these assemblies. **Put away the PVC Cement it is no longer needed to complete the antenna.**

40 M Step D1 – Marking the Spiral Layout



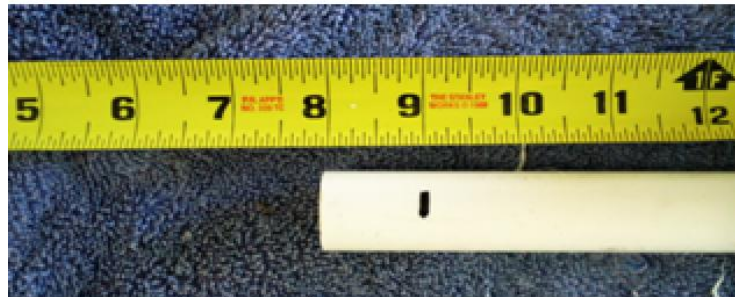
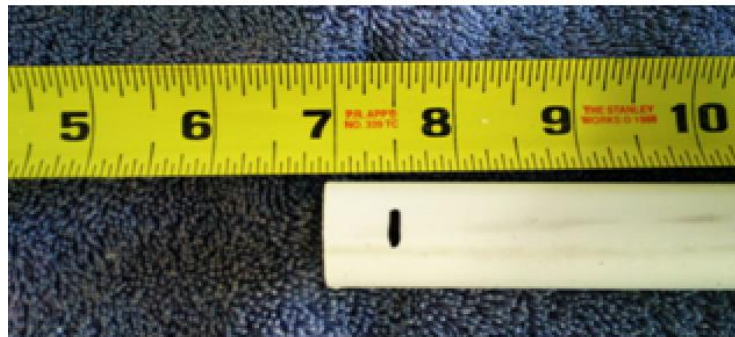
Layout the tape measure next to the 2 X 9 Inch Scrap Cardboard and felt tipped marker. Using the marker make the left side with an arrow to shown the starting point. Mark vertical lines at the 2, 4, 6 and 8 Inch positions left to right as shown.

40 M Step D2 – Marking the Spiral Layout



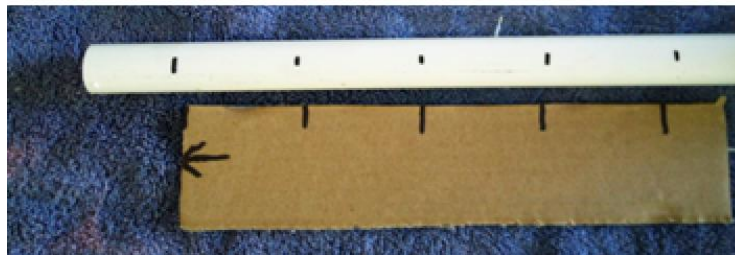
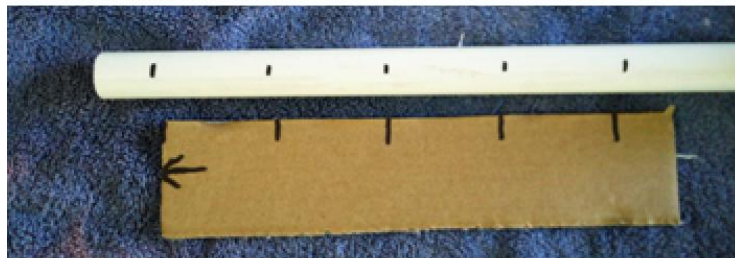
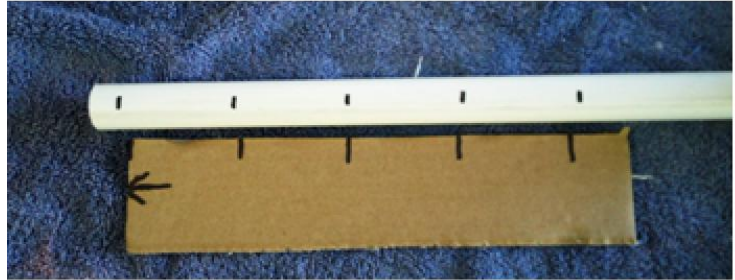
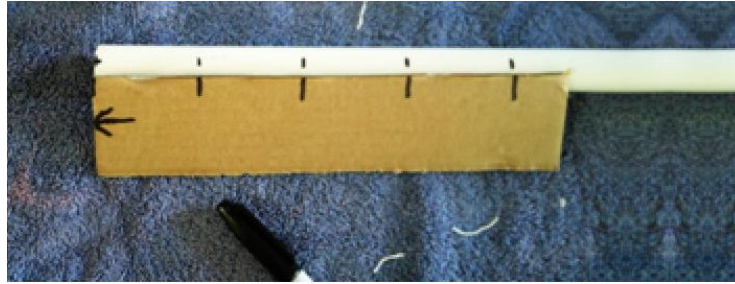
Place one of the Cross Tee Assemblies with the $\frac{3}{4}$ Inch Adaptor end up on your work bench aligned with the spokes at the 12 O'clock, 3, 6 and 9 positions. These clock references will be used to identify the correct spoke during the spiral marking steps. Just remember to think of a clock face. If you might be interrupted it is a good idea to write the time references on the spokes before proceeding to the next step.

40 M Step D3 – Marking the Spiral Layout



Shown from top to bottom spoke positions are 12, 3, 6 and 9 PM. Starting at the 12 PM spoke mark the outer end with the felt tipped marker. On the 3 PM spoke make a mark $\frac{1}{2}$ Inch from the outer end. On the 6 PM spoke make a mark 1 Inch from the outer end. On the 9 PM spoke make a mark $1\frac{1}{2}$ Inch from the outer end. Place the marked Cross Tee in a safe place until they are needed again. Repeat steps D2 and D3 from the other Cross Tee. Place the marked Cross Tee in a safe place until they are needed again.

40 M Step D4 – Marking the Spiral Layout



Shown from top to bottom spoke positions are 12, 3, 6 and 9 PM. Starting at the 12 PM spoke align the cardboard (arrow end) at the outer end mark and then mark the 2, 4, 6 and 8 Inch positions with the felt tipped marker as left to right as shown in the top picture. On the 3 PM spoke align the cardboard (arrow end) at the mark $\frac{1}{2}$ Inch from the outer end and then mark the 2, 4, 6 and 8 Inch positions with the felt tipped marker. On the 6 PM spoke align the cardboard (arrow end) at the mark 1 Inch from the outer end and then mark the 2, 4, 6 and 8 Inch positions with the felt tipped marker. On the 9 PM spoke align the cardboard (arrow end) at the mark $1\frac{1}{2}$ Inch from the outer end and then mark the 2, 4, 6 and 8 Inch positions with the felt tipped marker. Place the marked Cross Tee in a safe place until they are needed again. Repeat this step using the other Cross Tee. Place the marked Cross Tee in a safe place until they are needed again.

40 M Step E1 – PVC Frame Assembly



Layout the 7/64 Drill, #6 screw, screwdriver and felt tipped marker for the PVC frame assembly.

40 M Step E2 – PVC Frame Assembly



Drill one 7/64 Drill hole 1/4 Inch from the top of the adaptor.

40 M Step E3 – PVC Frame Assembly



Install the and fully seat one #6 screw. When complete invert the $\frac{3}{4}$ Inch PVC Pipe so the cross that was in the air is now resting on your work bench. Now drill and install the screw for the cross on your bench. Your PVC should now be one piece and secure. Repeat steps H1 to H4 for the second Cross Tee Assembly. The two end spirals should be located as MIRROR images (the spirals are in opposite directions and the 12 PM spokes are 180 Degrees apart) Proceed to the next step.

40 M Step E4 – PVC Frame Assembly



Using a felt tipped marker carefully draw a very straight vertical alignment line on the $\frac{3}{4}$ Inch PVC Pipe and Adaptor above the screw head as shown. When complete invert the $\frac{3}{4}$ Inch PVC Pipe so the cross that was in the air is now resting on your work bench. Proceed to the next step.

40 M Step E5 – PVC Frame Assembly



Using a different color felt tipped marker carefully draw a very straight vertical alignment line on the $\frac{3}{4}$ Inch PVC Pipe and Adaptor above the screw head as shown. Proceed to the next step.

40 M Step F1 – Preparing the Wire Elements



Starting with this step the top and bottom cross tees will have unique steps. Begin the top Cross Tee wire element. Uncoil about 50 Ft of 14 AWG THHN Copper wire to remove the set and straighten the wire. Measure and cut 40 Ft 2 In of THHN wire. Now coil the cut wire clockwise in a 12 In diameter without kinking. Double check to see you have the correct Cross Tee before proceeding to the next step.

40 M Step F2 – Preparing the Wire Elements



Prepare the bottom Cross Tee wire element. Uncoil about 30 Ft of 14 AWG THHN Copper wire to remove the set and straighten the wire. Measure and cut 26 Ft 10 In of THHN wire. Now coil the cut wire clockwise in a 12 In diameter without kinking. Proceed to the next step.

40 M Step G1 – Attaching Top Spiral



Place the top Cross Tee Assemblies with the $\frac{3}{4}$ Inch Adaptor end up on your work bench aligned with the spokes at the 12 O'clock, 3, 6 and 9 positions. The 12 PM spoke is shown at the top in the photograph above. Place the 40 Ft 2 In coil of THHN wire on top of the Cross Tee with the coil clockwise and place the outer end at the 12 PM spoke as shown. Proceed to the next step.

40 M Step G2 – Attaching Top Spiral



Using hot glue is the easiest method I have found to attach the spirals. The wire will take longer to set on the first wrap as the coil is hard to work. . Each turn becomes less difficult as the natural coil of the wire tracks with the spiral. The Hi Temp hot glue sets in less than ten seconds so it is not too boring. The glue does not heat the wire so you can position and hold the wire with bare fingers Better bonding occurs if you place a $\frac{3}{8}$ Inch diameter pool of glue on the PVC Pipe first, pressure wire into the hot glue immediately and put a $\frac{1}{4}$ Inch pool on top of the wire all in one quick step. I found placing the Cross Tee on a small round table and walking around the table to glue each spiral is better than turning the Cross Tee. Proceed to the next step.

40 M Step G3 – Attaching Top Spiral



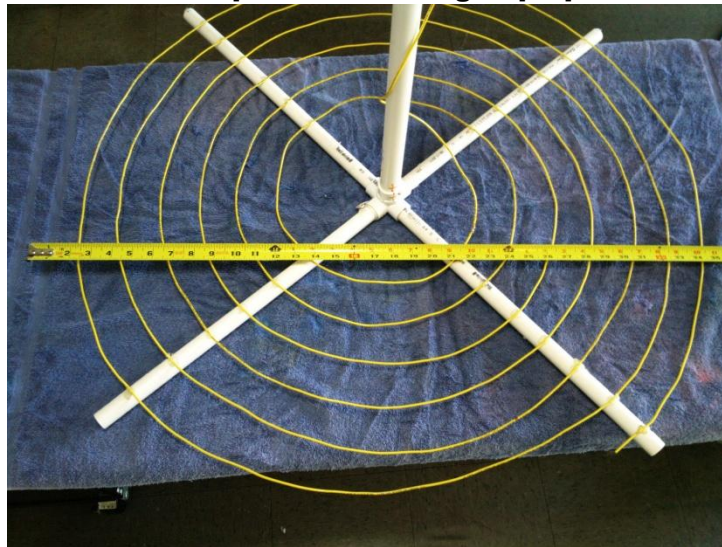
The 6 PM position is shown above glued on the mark. Work slowly around the first spiral gluing the 40 Ft 2 In Wire to the spoke positions in a clockwise order 3, 6, and 9 PM. It is important to form a uniform arc (circle) on the first spiral for spacing reference on the inner spirals. Proceed to the next step.

40 M Step G4 – Attaching Top Spiral



Continue gluing the wire to the spokes to form the inner spirals. Maintain two Inch spacing as shown above. Proceed to the next step.

40 M Step G5 – Attaching Top Spiral



Continue gluing the wire to the spokes to form the inner spirals. STOP gluing when 24 Inches remain free at inner end of the 40 Ft 2 In Wire. Even with perfectly spaced gluing the wire will not LOOK even. Without damaging the glue take a few minutes to hand bend the wire spacing to a uniform spiral as shown in the next step. Place the Cross Tee in a safe place until it is needed again. Leave the Cross Tee on your work bench and proceed to the next step. Place the top Cross Tee in a safe place until it is needed again.

40 M Step H1 – Attaching Bottom Spiral



The bottom spiral has a different spacing procedure. Place the bottom Cross Tee Assembly with the $\frac{3}{4}$ Inch Adaptor end up on your work bench aligned with the spokes at the 12 O'clock, 3, 6 and 9 positions. The 12 PM spoke is shown at the top in the photograph above. Place the 26 Ft 10 In coil of THHN wire on top of the Cross Tee with the coil clockwise and place the outer end at the 12 PM spoke as shown. **The bottom Cross Tee has four inch spacing. Double check to see you have the correct Cross Tee before proceeding to the next step.**

40 M Step H2 – Attaching Bottom Spiral



Using hot glue is the easiest method I have found to attach the spirals. The wire will take longer to set on the first wrap as the coil is hard to work. . Each turn becomes less difficult as the natural coil of the wire tracks with the spiral. The Hi Temp hot glue sets in less than ten seconds so it is not too boring. The glue does not heat the wire so you can position and hold the wire with bare fingers Better bonding occurs if you place a 3/8 Inch diameter pool of glue on the PVC Pipe first, pressure wire into the hot glue immediately and put a 1/4 Inch pool on top of the wire all in one quick step. I found placing the Cross Tee on a small round table and walking around the table to glue each spiral is better than turning the Cross Tee. Proceed to the next step.

40 M Step H3 – Attaching Bottom Spiral



The 6 PM position is shown above glued on the mark. Work slowly around the first spiral gluing the 26 Ft 10 In Wire to the spoke positions in a clockwise order 3, 6, 9 and **again at 12 PM** (2 Inches inside the first 12 PM). It is important to form a uniform arc (circle). Proceed to the next step.

40 M Step H4 – Attaching Bottom Spiral



Read this step carefully and study the photograph before proceeding to glue the bottom Cross Tee. The inner 3 PM position is shown above glued on the SECOND mark. Work slowly around the SECOND spiral gluing the 26 Ft 10 In Wire to the spoke positions in a clockwise order 3, 6 and 9 PM (4 Inches inside the first spiral). Continue gluing the wire to the spokes to form the inner spirals. STOP gluing when 24 Inches remain free at inner end of the 26 Ft 10 In Wire. Even with perfectly spaced gluing the wire will not LOOK even. Without damaging the glue take a few minutes to hand bend the wire spacing to a uniform spiral as shown in the next step. Place the Cross Tee in a safe place until it is needed again. Leave the Cross Tee on your work bench and proceed to the next step.

40 M Step I1 – Final Frame Assembly



You are now ready to install the $\frac{3}{4}$ Inch PVC Pipe into the top and bottom Cross Tee Assemblies as shown in the picture above. If you plan on disabling the antenna for transport or storage lightly sand or file the first inch of the 36 Inch $\frac{3}{4}$ PVC Pipe on both ends. Proceed to the next step.

40 M Step I2 – Final Frame Assembly



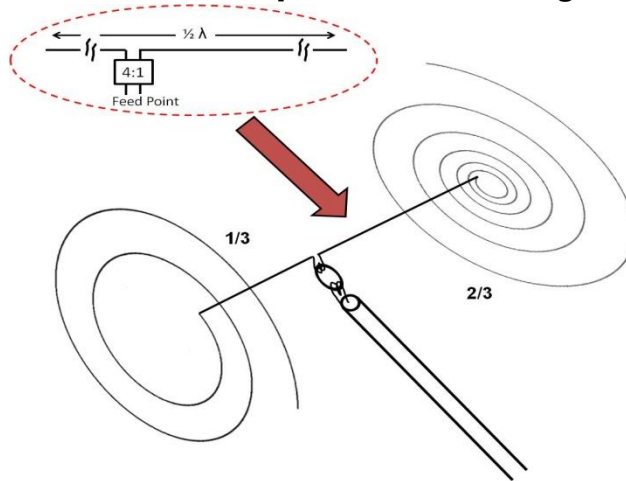
No PVC Cement is use in this assembly. Now dry fit the bottom Cross Tee into the 36 Inch $\frac{3}{4}$ PVC Pipe. Be sure to fully seat the pipe into the adaptor. Install the and fully seat one #6 screw. Your PVC should now be one piece and secure. Proceed to the next step.

40 M Step I2 – Final Frame Assembly



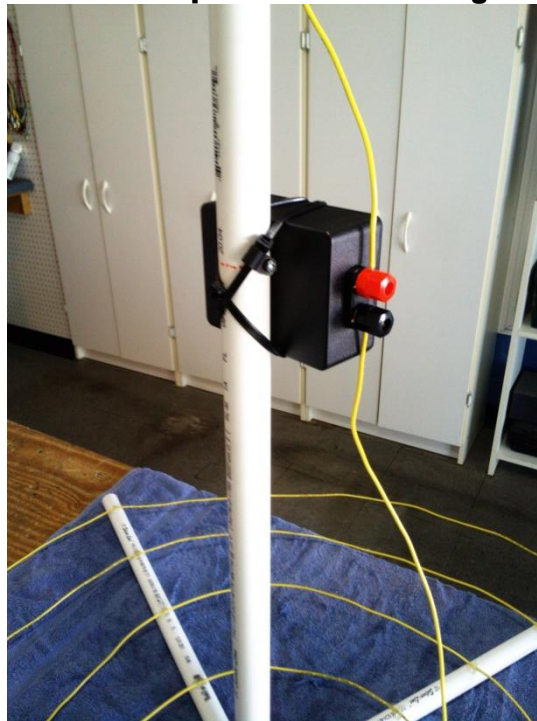
No PVC Cement is use in this assembly. With the top Cross Tee sitting on you work bench dry fit the top Cross Tee and 36 Inch $\frac{3}{4}$ PVC Pipe. Be sure to fully seat the pipe into the adaptor. Install the and fully seat one #6 screw. Your PVC should now be one piece and secure. Proceed to the next step.

40 M Step J1 – BALUN Wiring



The 60/40 Off Center Feed Dipole results in a 200 to 300 ohm the antenna interfacing to a 4:1 current BALUN to a 50 ohm coax providing impedance matching plus some isolation. The two drawings above show the mechanical and electrical configuration of the feed. Proceed to the next step.

40 M Step J2 – BALUN Wiring



Connect the top and bottom THHN wires to the 4:1 BALUN. Route the wire in the direction of their respective spiral to reach the balanced terminals of the BALUN as shown. The BALUN will require mechanical support that is non-metallic. The picture above is one possible solution using nylon cable ties to hold the BALUN and a #6 Sheet Metal Screw in the $\frac{3}{4}$ Inch PVC Pipe supporting the load at the SO-239. As each BALUN is slightly different some variation is likely and cable ties are recommended. Proceed to the next step.

40 M Step K1 – Operation



Installation and Operation - Mount at least 5 Feet above ground. Mount on a PVC pipe tee, sit on a PVC pipe or just hang from a tree. A camera tripod is a good choice for portable operations. Just like a conventional vertical dipole it does not matter which end is up. Keeping a separation of 10 Feet is best, 5 Feet will work. Do not worry about direction blockage. The pattern is not noticeably degraded by wood or concrete block fences, and shingle or tile roofs. Sorry no metal roofs or metal clad sheathing. Like all antennas consider your RF Hazard zone for Safety.

40 M Step L1 – Problems?



In Case of Difficulty (words)

- Proximity to objects and metal
- If you find high VSWR you need to