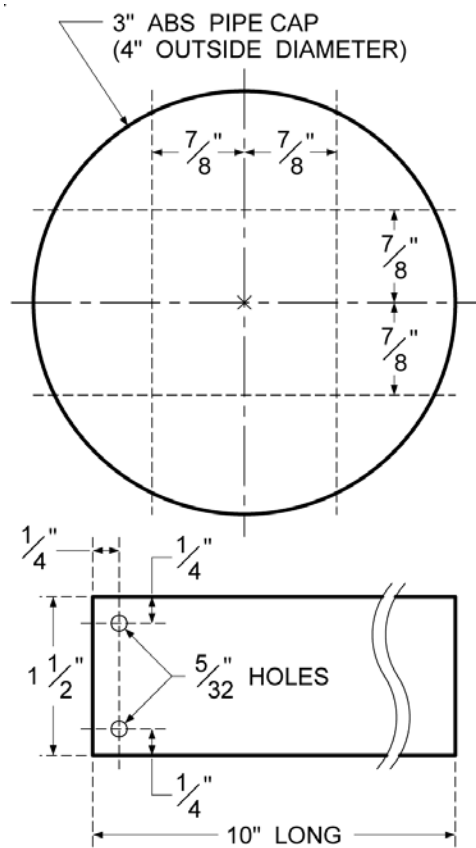


Build this UHF omni Satcom Antenna: Part 2

In our March issue we discussed some basic criteria for UHF Satcom reception, the ideas that shaped the design of our MT Omni X-wing Antenna and provided a parts list. This issue will focus on assembly of the Satcom Antenna and options for obtaining best reception.

Let's start construction by cutting four lengths of 1 1/2" wide aluminum flat stock to exactly 10" long, being careful to make the ends square. Mark one end of each element with the hole pattern in Figure 1 then drill to 5/32" diameter. I recommend starting all holes with a 1/16" dia drill bit and working up to the final size in increments. Also gently deburr each hole with a countersink or larger drill bit.

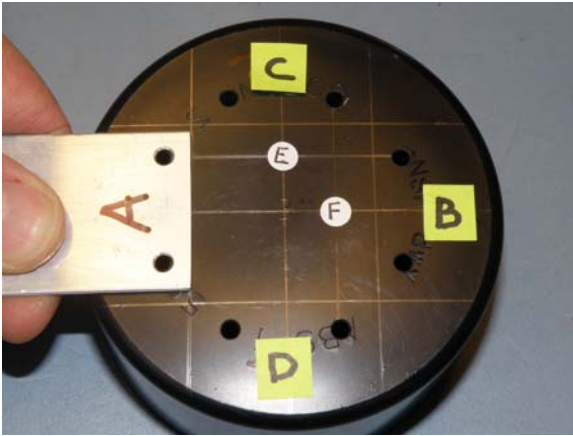
Figure 1:



Instead of drawing a complex pattern on the pipe cap for every hole, we'll draw the simple grid shown in Figure 1 and use the elements as a template. A pencil works nicely for marking on the pipe cap. Label the 4 elements with A, B, C and D, which will be needed for reference later on.

Place the drilled edge of each element against the edge of the grid of squares and center the element between the parallel lines extending to the edge of the cap as shown in the

picture below. Using the element as a template, mark the location of each set of holes with a pencil. Label each set of hole patterns on the pipe cap with an A, B, C and D to match the element that was used as the template.



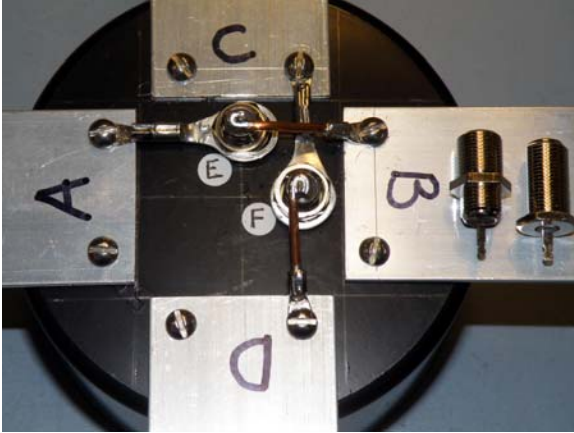
To mark locations for the F type chassis connectors, orient the pipe cap in front of you as shown in the above picture. Using a straight edge, draw a pencil line from the center of the top hole for element A to the center of the top hole for element B. Where this line intersects with the vertical center line is the location of connector hole E.

Using the same technique, draw a vertical line from the center of the right most hole for element C down to the right most hole for element D. Where this line intersects with the horizontal center line is the location of connector hole F.

There are two types of chassis mount F connectors that are suitable for this project, the Radio Shack type shown on the left side of element B in the picture below and the longer barrel type shown to its right. For the Radio Shack connectors drill a $23/64$ " hole at location E and F, and if using the longer barrel type, drill $3/8$ " holes.

Temporarily mount the elements using 6-32 hardware placing the screw through the element and pipe cap with nuts on the backside of the cap. There should be enough play in the screw holes so you can line up the opposing elements parallel with each other.

I found the Radio Shack #6 and $3/8$ " lugs for element ground connections will be at the correct spacing if you remove their plastic insulation and butt them against each other as shown in the picture below. Solder together two sets of these using a short piece of #14 wire between the lugs.



For Radio Shack connectors, gently countersink hole E and F from the inside of the cap to about half the thickness of the cap material. A 1/2" drill bit works ok for this if you take it slow. Do not countersink for the long barrel connectors!

The Radio Shack connectors will be force threaded, female side first into holes E and F from the top side of the cap. Start threading by hand then finish with a wrench or deep socket taking care not to strip the new threads.

For the long barrel connectors place the 3/8" ground lug assemblies over hole E and F then insert the female side of the connector through the lugs and secure the connectors with nuts from inside the cap. For Radio Shack connectors the lugs will go over the exposed threads on the top of the cap. In either case the ground lug assembly for connector E will attach to element A and connector F to element D as shown in the above picture.

Connect element B and D to the center contacts of connector E and F using a short length of bare #14 wire and #6 lugs as shown in the picture above taking care not to short the wires to the connector ground. Now is the time to make sure all the hardware is tight on the cap assembly.

To make the phasing harness you will cut one length of RG-6 cable to exactly 13 1/2" and another length to exactly 3 1/2". Using a sharp knife or razor blade, carefully remove 1/2" of outer insulation from each end of both cables being careful not to cut into the braid or foil.

Next measure 1/4" from both ends of each cable and carefully cut through the braid, foil and foam dielectric without nicking the center conductor. Twist and remove the foil/dielectric lumps from both cables leaving 1/4" of exposed center conductor. Carefully install the F connectors on both cables until the dielectric is absolutely flush with the inside bottom face of the connector.

Assemble the two cables on the Tee connector with the longer cable on the center part of the Tee and the shorter cable and F to N adapter (or SO-239, BNC, etc.) on the opposing connectors. The picture below shows the phasing harness attached to the chassis

connectors inside the pipe cap. The longer cable goes to connector E and the short cable to connector F. If you get this backwards, the antenna will have Left Hand circular polarization and will not work.



The elements will be spaced 20" above the ground screen using an 18" length of 3" diameter ABS pipe. The ground screen can be wire hardware cloth, chicken wire, a car hood, etc. The screen material should be 48" square or round with gaps no larger than about 1" and it can be stapled to a wooden frame, plywood sheet, or simply set on the ground. The lower pipe cap will screw to your wooden frame or a separate piece of flat wood for support.

If there is clearance below your ground screen you can bring the coax feedline through a hole in the bottom pipe cap as in the picture below, or exit through a hole in the lower side of the ABS support pipe as shown in part 1 of this article. Either way you should consider a drain hole for accumulated water.



Place your new antenna on a flat level surface. Connect antenna to receiver using the shortest practical length of low loss feedline. For feeding long cables there is plenty of room inside the support pipe for a dedicated UHF preamp or a remote TV antenna preamp.

US listeners will want a clear view of the southern sky to the west horizon for west coast use and east coast listeners to the east horizon. For users just north of the equator like Hawaii, tilt the south facing side of the antenna and ground screen upwards to improve reception. Listeners just south of the equator should tilt the north facing side up. Users in Alaska might tilt the north facing side up to improve reception.

We hope you enjoy building and using your new MT Omni X-Wing antenna and snag some rare Satcom traffic. Until next time, stay tuned!