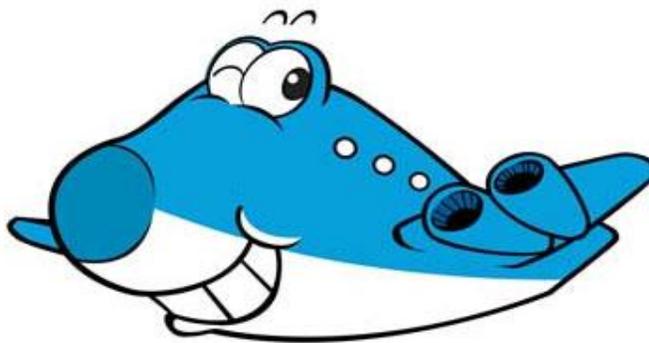
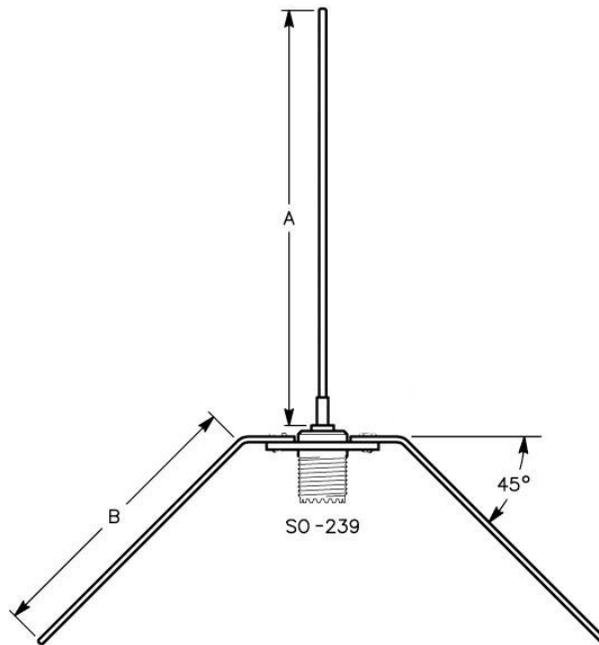


MY FIRST ADS-B ANTENNA



We will be constructing a quarter wave ground plane antenna for ADS-B. The frequency for ADS-B is 1090 MHz. If we go to our calculators we find that the full wavelength at this frequency is about 10.3 inches. As the antenna name indicates, we are interested in $\frac{1}{4}$ of this length, or 2.575 inches. Remember this number as it will become important later on.

First let's look at a diagram for our project;



Dimensions A and B are both that magic number 2.575 inches. The base of the antenna is made from an SO-239 connector available at your local Radio Shack, or electronics supply store.

Before we get started though, here are the usual DOs and DO NOTs.

DO wear safety goggles.

DO NOT use an open flame around gasoline, gun powder, atomic weapons, or other flammable objects.

DO use common sense. Temperatures hot enough to melt solder are also hot enough to severely burn skin. Burnt skin hurts.

DO NOT build this project in bare feet or open toe high heels. Falling solder will always land on your feet if you give it a chance.

DO use the proper tools. You may cause damage to yourself, others, or property if you don't.

DO NOT build this without the supervision of an adult.

DO supervise your children and teach them lots of new things if you are an adult.

DO NOT build this project on your wife's new kitchen table. Just remember how mad she gets when you forget to use a coaster.

DO make changes to this project and experiment. I'm not saying this design is perfect or the best out there, but it works. If you have other designs that perform better, let's see them.

DO keep a fire extinguisher handy. Just in case.

Tools and parts needed;

1 SO-239 connector

1 scrap length of 12/2 romex about 18 inches long.

1 pair of safety goggles

1 roll of rosin core solder

1 pair of wire cutters

1 ruler

1 pair of pliers

1 high wattage soldering iron, or low temperature torch

1 vise, or a secure place to hold your work as you solder

Let's get started.



Above is all the parts you'll need. 1 SO-239 connector (RS part # 278-0201), and a scrap length of 12/2 romex.



Strip the outer sleeve from the romex and you'll have an unshielded ground wire, and white and black insulated wires. Strip these so that you end up with three bare copper wires.



Cut 9 pieces of wire about 3 1/2 inches long, and straighten them as much as you can. The exact length isn't important, and they don't have to be perfectly straight.

For the next part you'll need to make sure your iron is hot. Very hot. The SO-239 is a pretty big piece of metal, and will want to steal all that heat you are using to melt your solder. It helps to first tin the surface with a layer of solder. It doesn't have to be perfect, and it doesn't have to be pretty.

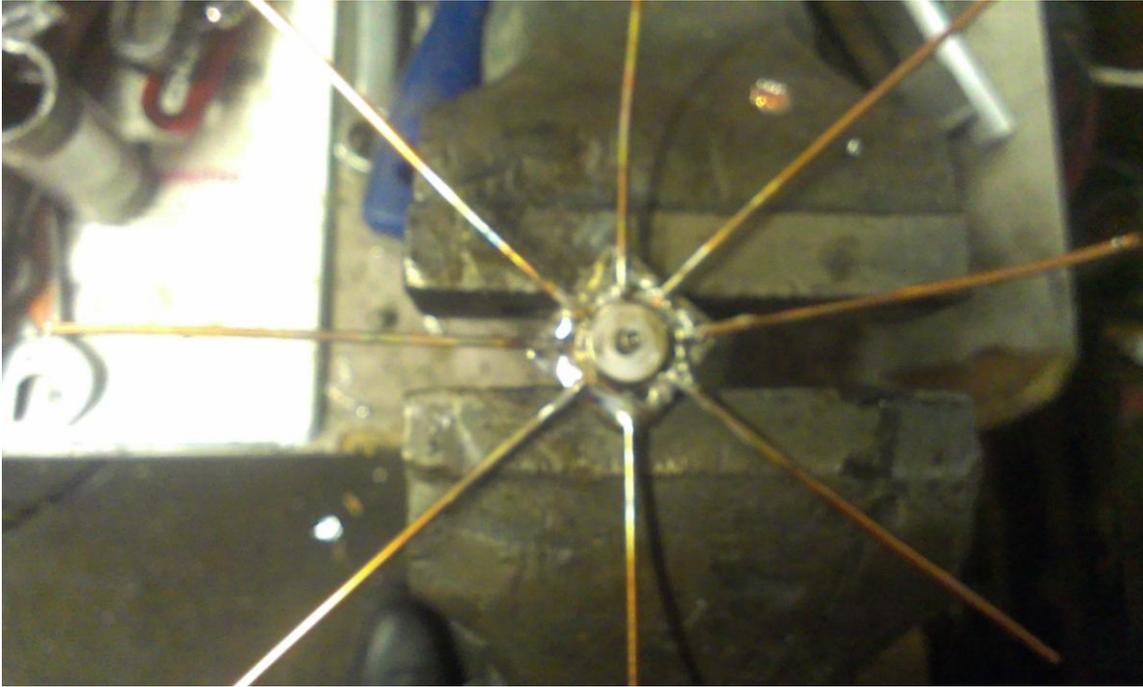


Next apply some solder to one end of each of the lengths of wire. **WARNING:** use the pliers to hold the wire while doing this. Copper is an extremely good conductor of heat, and you will burn yourself if you don't.

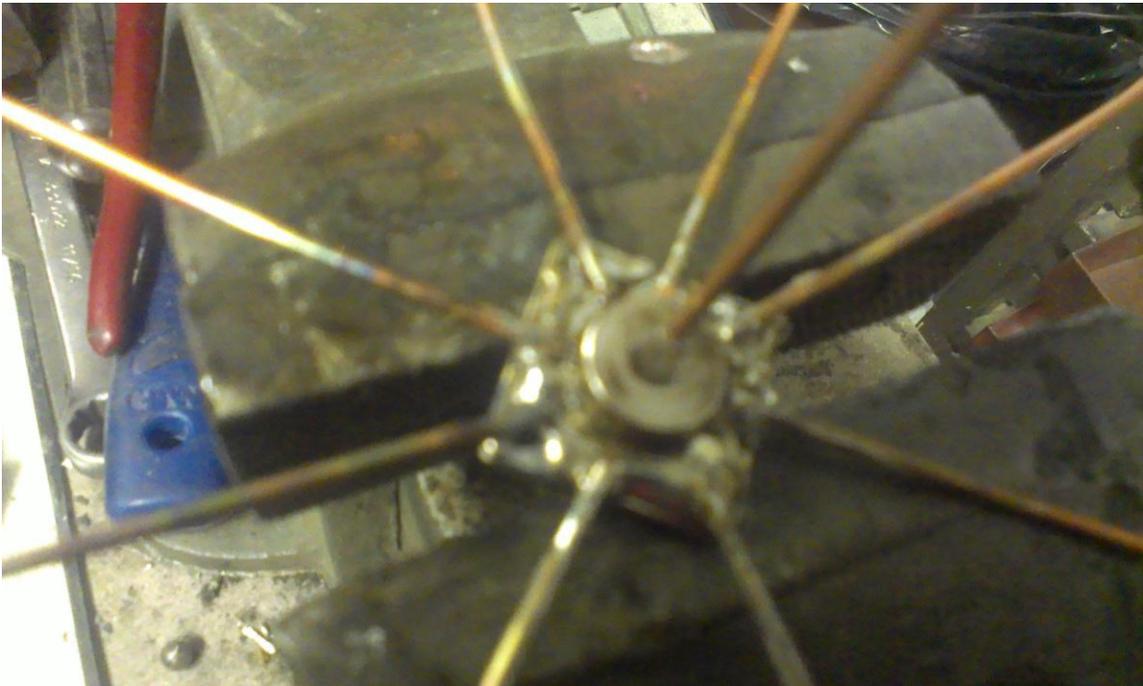
Sorry, no pic for that.

Next, one at a time, attach eight of the wires to the SO-239. work fast and apply the heat to the wire near the solder end, not the SO-239. Otherwise you will be transmitting too much heat, and the wires next to the one you are soldering will fall off. If this happens, do not attempt to catch it. Just wait a second for everything to cool off and try again. After a few attempts you should get a feel on how much heat to apply.

Once all eight radials are attached (they are officially now radials, and not just copper wire), let everything cool until it can be handled comfortably.



Finally take the last wire and solder it into the center piece of the SO-239.



Next with your ruler and wire cutters, measure and cut each piece to 2.575 inches. You don't have to be exact. It may be easier to mark them all with a sharpie as you measure, and then cut them after.



Now bend the radials to approximately 45 degrees. You can bend each leg until the antenna stands up straight to get them all even. Again, close is good enough. The antenna doesn't have to be perfect to function properly.

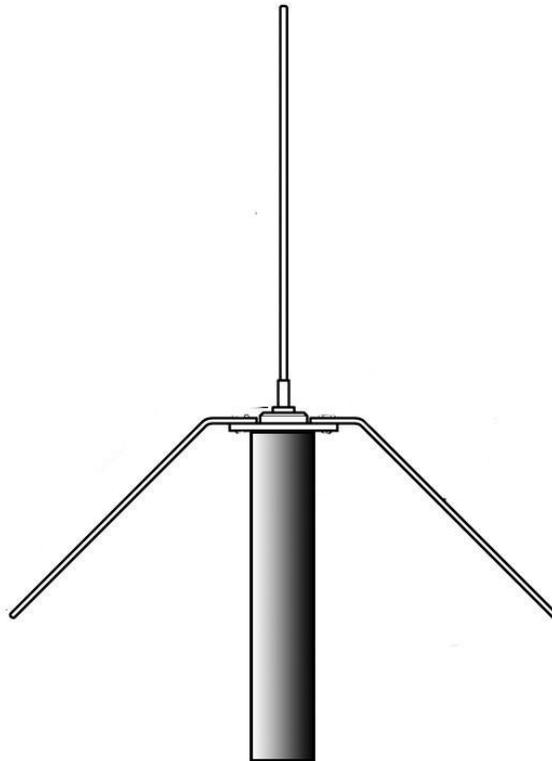


When you are finished, you have an antenna that is less than 4 ½ inches tall that when mounted outside on a roof should easily be able to extend your ADS-B reception. Typical reception for this antenna mounted at 25 feet is capture of signals 100 miles away with excellent reception within 60 miles. Occasional signals of up to 200 miles away is not unusual. Actual performance may depend on terrain, surrounding buildings, and cable length and type. RG-59 (75 ohm) is a good choice for this because of the availability of both PL-239 and BNC connectors.

Some dongles with PAL connectors can be easily adapted with off the shelf parts at Radio shack to accept BNC connections. The MCX connector found on some other dongles is a bit trickier. You may want to cut this wire and attach a BNC connector as close to the dongle as practical.

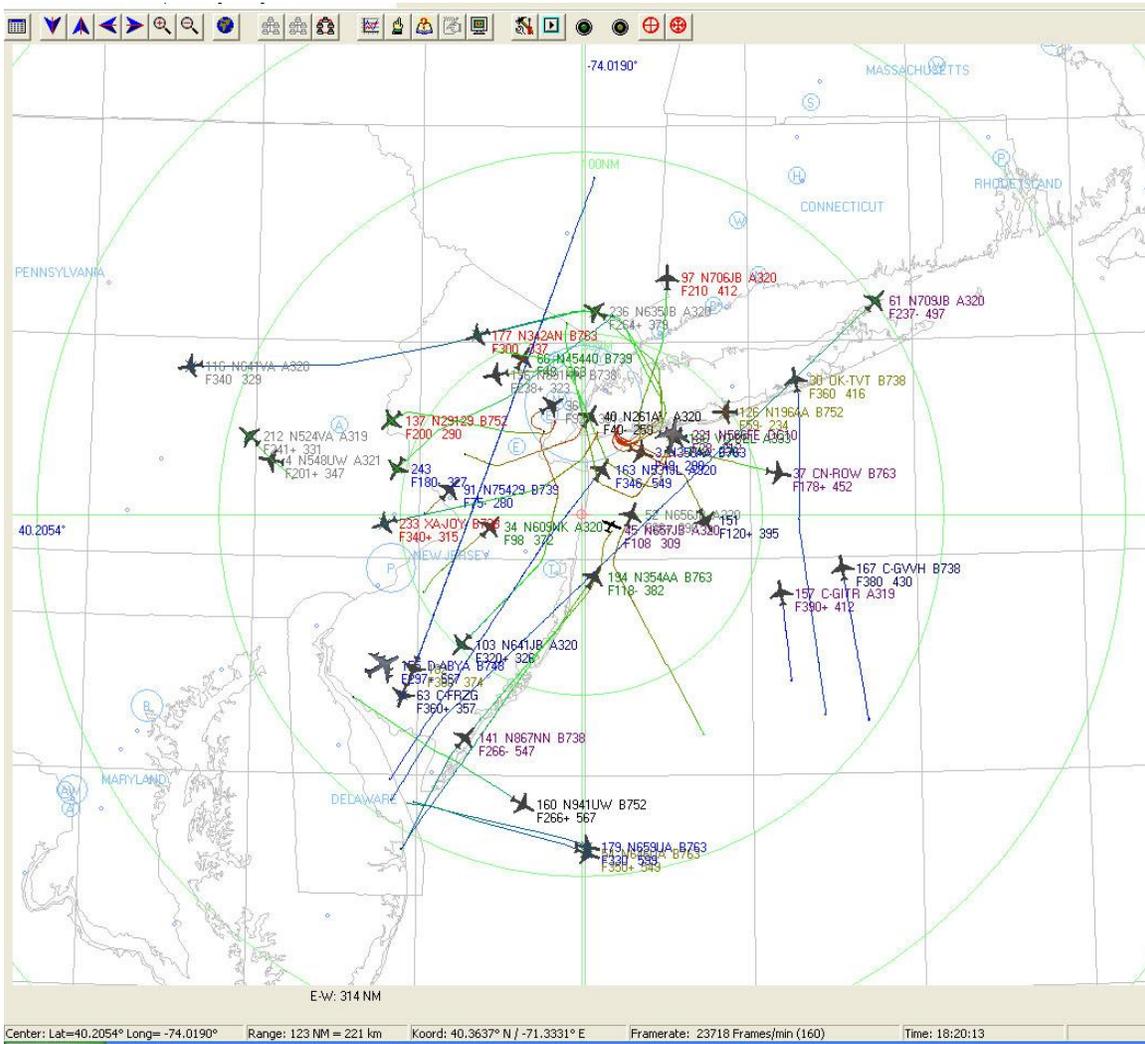


Mounting the antenna can be as simple as using a length of 1" PVC, and running the cable down the middle with the antenna resting at the top.



KID-SAFE ALTERNATIVE

For teachers, or parents of young children that may not want to use torches or high wattage irons, the ground plane radials may be attached to the SO-239 using 4-40 or 6-32 screws, washers, and nuts depending on the size of the 4 mounting holes on your SO-239. You can always go back and solder them on for a more permanent connection later without removing the attachment hardware.



The above map was made using ADSBScope using the actual antenna assembled in this document. The antenna is mounted on a PVC pipe 25 feet in the air, and connected using a length of RG-59 with a PL-239 plug at the antenna end, and a BNC connector at the dongle end.