Simple Ground Plane Antenna for Two Meter Band

This is a simple and inexpensive antenna for use on the two meter band. The antenna is relatively easy to build and effective. It also has the merit of being inexpensive.

Materials:

Quantity of 5 brazing rod 3/32” diameter approximately 20” in length. Available from American Welding and Gas (AW&G) in Kalispell. Price is $15/pound, which is about 14 36-inch long rods. AW&G only sells brazing rod in full pound quantities, so you may want to split the order with someone. 1/16” diameter would also work, but it was not available at the time I was purchasing the materials.

Quantity 4 of 6-32 x 1/2” brass machine screws, washers, and nuts. Home Depot or Ace Hardware. Home Depot sells bagged quantities while Ace usually has the hardware in open stock allowing you to pick the quantity you want. The screws and nuts from Home Depot cost a total of $4.14.

Quantity of 1 SO-239 four-hole chassis connector. I just ordered a quantity of 10 from EBay for a little under $20 including shipping. Note that high-quality connectors, such as Amphenol brand, will be much more expensive, but the cheap connectors should be adequate for this application.

One 10-12 American wire gauge (AWG) butt splice, uninsulated.

1-1/2” schedule 40 PVC pipe and end cap.

Procedure:

Select four pieces of brazing rod and bend a loop in one end of each rod. The loop should be just large enough to accommodate one of the 6-32 machine screws. About one inch from the looped end, bend each rod to 135° to allow it to hang downward as shown in the picture below.

Solder one rod into the center conductor pin of the SO-239 connector. Use care not to overheat the pin and melt the plastic insulation. This is where a high-quality Teflon insulated connector would be nice to have, but it would be more expensive. You will likely need to file the end of the rod to a smaller diameter to fit in the connector. Slide the butt splice over the end of the rod and crimp in place over the connector and the rod. Depending on the style of butt splice, you may need to remove the detent in the middle of the splice to allow it to slide over the rod. The only purpose of the butt splice is for

mechanical reinforcement. Solder the butt splice in place, but use caution not to melt the plastic insulator in the SO-239 connector.

Attach the four ground plane rods to the SO-239 connector using 6-32 screws as shown in the picture above.

Trim the rods to 19-5/8" length. If you have an antenna analyzer, you may want to shorten the elements a little at a time to obtain the best SWR for the operating frequency you desire to use. It is not necessary to do this since the antenna will provide a reasonable match over the entire two meter band if it is optimized for 146 MHz.

Drill a 5/8" diameter hole in the center of the PVC pipe cap and insert the threaded SO-239 connector in the cap.

If the antenna is to be permanently mounted outdoors, you may want to seal the connections with RTV or liquid electrical tape to prevent moisture ingress.

The math:

The elements need to be 1/4 wavelength long at the operating frequency. To determine the wavelength divide the velocity of light in a vacuum by the frequency.

$$300{,}000{,}000\frac{meters}{second} \div \frac{146{,}000{,}000\ cycles}{second} = 2.05\ meters$$

Since we want a quarter wavelength, divide by 4 to get 0.514 meters. Convert to inches by multiplying by 39.37 inches/meter.

$$(0.514\ meters)\left(39.37\frac{inches}{meter}\right) = 20.2\ inches$$

20.2 inches is a bit longer than the 19-5/8 inches in the instructions. This is because the velocity of the electromagnetic wave in a vacuum is greater than in the bronze brazing rod. An antenna element will always be a little shorter than the calculation of wavelength in a vacuum indicates.