

Grounding in the Shack:

You know, over the last nearly six decades of being a ham operator, I've had lots of experience at putting both effective and not so effective grounding systems in. Everything from a wire going to a water pipe that was 35' away to putting a full mesh of copper under a new lawn. I have put pieces of copper pipe at the back of an operating desk and 1/4" copper tubing along the desktop connected to radiators and just electrical water pipe grounds 15 feet away. They all worked to some degree, except the 35' piece of wire going to the water pipe. I had blisters forming on my lips for weeks before I finally figured that one out. Nobody could accuse me of having sensitive lips nor of having any kind of love life with greasy salve all over my lips because I simply couldn't figure out where the problem was coming from. We just kept buying more salve whenever they formed.

Then I got into the marine electronics business installing equipment on fish boats on the "Wet" coast in the 70's. I laid down what seemed like miles of copper flashing along the bulkheads of fish boats from the wheelhouse where the radios were usually located down to the keel ground plate. If you have ever crawled around in the bilge of a fish boat, you know why it seemed like miles and not just feet. As I remember it was about 2-inch-wide pure copper flashing and everything was attached to it in the wheelhouse. Reception and transmission were excellent and it all worked very well indeed.

Let's talk about the 35' piece of wire for a moment. What's a quarter wave at 40M? Remember the formula $234/fmHz$? That's how you find the length of wire to use for a quarter wave antenna, right? So if you divide 234 by 7.0 mHz you get about 33.5 feet or a quarter wave at 40M. Guess what? I was part of the antenna and, yes, it was really electrically grounded but in terms of RF I was at the top of the antenna at the high voltage point. Ouch! No wonder my lips were being burned whenever I got too close to the microphone. I had always wondered why my XYL thought I glowed in the dark whenever I was on the radio late at night. They didn't call us Sparkers for nothing while in the Navy, I guess. We moved shortly after that, and the problem went away.

So, this week I looked at my grounding system in the shack and, although there was no problem with sparking, the ground rod was the water pipe which is 15 feet from the copper tubing I grounded to on the back of the desk. I had soldered each ground connection to the pipe which is another story in itself. Here we go again. What's the natural resonant frequency of 15 feet? Just do it by transposing some terms in the equation. In this case $234/Length = 15.6 \text{ Mhz}$ at its quarter wave frequency. Once again, we were close to another ham band, 20M, 14.0 to 14.350. Oops!

I have been putting off driving a ground rod just outside the shack window because I'm just plain lazy, but finally bought a beautiful 10' long copper clad steel ground rod and cut it in half and drove it in with a 4 lb short handle sledgehammer. I'm going to drive the other half close to it later today, (my arms are still hurting) and get it all finished off. From the new ground rod, I attached a 2-metre-long piece of copper tubing through the feedthrough box in the window and down to a new thing I made yesterday afternoon called a single point ground plate. I cut out a 15 x 2-inch piece of 0.125 aluminum plate and bent it up in the vice to form a U shape. Then I marked out 18 points staggered and drilled 13/64 holes and tapped them for 10-32 x 1/2-inch machine screws. I attached the flattened tubing to the centre and using both copper straps and #10 stranded wire with soldered lugs on each end connected every piece of equipment I have to this new ground plate. There is still lots of room to move the equipment in and out from its place on the desk even with the ground line attached.



As you can see, I just mounted the plate at each end with some Robertson wood screws to the brace on my back of the shelves and everything leads off from that. I disconnected everything from the tubing that was on the desktop and now it is all connected to a single point ground instead. I haven't finished testing everything to see the difference, but the one thing I'm sure of is that the noise level is just as low or lower than it was before. We will see whether the other ground rod makes any difference and report back on it to you. I'm going to make one change and it is only because whoever invented the flat head screwdriver should be rolled in tar and burned at the stake. I'll be hunting for at least 4 of those bloody machine screws under equipment on the bench and the floor because at arms length it is hard to get them into the tapped holes over a 34" desktop. I'm going to go get some "Robertson" head 10-32 bolts from Bolt Supply later today. (That's because I'm a dedicated Canadian and

we only use Robertson's.). <https://www.familyhandyman.com/article/diy-dictionary-what-is-a-robertson-screw/>.

What a neat and simple project for the week. I did another one but will report on it next week instead. Don't want to overload you all at once.

73

Tom VE6ARG

Grounding in the Shack: Follow up

Last weeks blurb had some information on how I did the grounding in my shack. I have had quite a pile of email looking for more information on where I got the parts and some suggestions too. One suggestion was from Kevin VE6KVV and I include his quote here, "Grounding is so important. I noticed you are using copper to aluminum connections and I'm wondering if you have considered using an oxide inhibitor compound such as Penetrox A13 between your ground lug connectors and the bar? In my years of Equipment Installation with TELUS, its use was mandatory on connections between dissimilar metals to help create the lowest possible resistance to ground and prevent galvanic corrosion." Now that is a great suggestion. Thanks Kevin.

Another question was identifying that a new ham had his AC power ground on the other side of his basement. He was wondering if he should run a 35' piece of wire to that ground and bond them all together. The AC ground in your house goes throughout the house and uses a single point ground for the panel. The type of grounding we are trying to achieve is an RF ground and should be as short as possible and usually consists of a couple of ground rods just outside your shack. That keeps the cabling short and thus eliminates any problems with resonant circuitry. The AC ground being 35' away could still be bonded to the same ground however the grounding to the power supply through the house wiring is a safety ground and should be sufficient. It is still recommended that you bond your tower and other equipment to your RF ground as well as any other RF grounds you may have.

73

Tom VE6ARG