

Hi, everyone! Over time, I've spoken to a lot of people who have been having reception problems with their radios at home. A common "base station" or fixed station is a mobile radio hooked up to a power supply with an external antenna. Well, I've got a doozie of a homemade antenna that most people could build in an afternoon for less than 10-20 bucks (in most cases) and will last years. In the amateur radio community, this antenna is also quite common and most people who build one give rave reviews.

This post is written to be aimed at those of you who may not be technically inclined but have always wanted to learn. With a little patience and perseverance, you can have yourself an antenna for your home station, whether a mobile radio or even a portable! This antenna will increase your reception and transmit distance and although it won't provide "gain" like some, you will notice a drastic difference in signal transmit and reception versus using an indoor or rubber duck antenna.

The antenna is called a "Ground Plane", which means it gets its ground from radials and directly from the radio. The basics of it are one transmitting element, four grounding elements, and a connector. The beauty of its construction is that the whole antenna is centered around an SO-239 connector, which can be found at radio shack for about 5 bucks or less. Here is what the completed antenna looks like:



Below is what an SO-239 looks like:



An SO-239 is simply the "female jack" of a PL-259 connector, which is shown next:



Okay, so do you want to build one? You will need:

1. SO-239 connector
2. Coaxial cable (50 ohms) of your size preference. DO NOT use Cable TV coax as this is 75 ohms and not the right stuff for radio without modification.
3. Connector and/or adapter to your specific radio
4. Household wire like 14-16 gauge copper wire, clothes hangers, welding rod, or anything else metal.
5. Hot glue gun or RTV sealant.
6. Some 3/4" PVC pipe or other mounting tube.
7. Soldering iron and solder.
8. 4 #4-40 bolts and nuts. Don't get these too long or they'll interfere with the connector. 1/4" inch or less will do.

Okay, you're probably looking at this list like "what the???". Don't worry.

First, scour your house or neighbor's houses for parts. You'd be surprised who has PVC pipes or other pipes lying around. If you can find a pipe that is 3/4", you're in business. It can be metal or PVC, but PVC works better because the antenna won't transmit its signal into the pipe. So, long story short, find some PVC pipe. If you don't have any or can't find any, go to (enter your favorite hardware store or big box store here) and pick some up. PVC pipe is pretty cheap and you can price out the size you want. While you're at the hardware store, buy (4) 4-40 size nuts and bolts. They are really small. You'll want to get them in stainless steel if at all possible. I got mine from Menards. Total cost: \$1.20. If you don't own a soldering iron, get one. Make sure you have solder too...rosin core lead free solder is the best, not the stuff one uses to solder copper pipes. Also, some RTV silicone or hot glue too.

If you haven't gotten to the hardware store yet and looking around at home, find some metal wire. It can be stretched "romex" or 14 gauge household electrical wire (solid) or welding rods. I used 1/8" copper clad carbon steel welding rods. You can use brass, copper, or anything of the like since most SO-239 connectors are clad in nickel, which protects it from dissimilar metals. Dissimilar metals (copper and steel, for example) react with each other and corrode quickly. One of your

neighbors or a friendly LAG person may have some to give you 😊
If you don't have any of these, metal coat hangers can work too! More or less anything metal in wire-form will work! Just make sure it is solid wire so it holds strength. I've seen these things build with hobby copper tubes and out of bicycle spokes. Use your imagination, it's part of the fun!

Okay, for the rest of the parts. SO-239 connectors can be harvested from the back of old broken CB radios or purchased new at a Radio Shack. And yes, most of the attendants in those places know where and what they are. In the case they do not, go to the back of the store and they usually have sliding drawers of connectors. The front of one of the drawers will say Connectors and show SO-239. If you can't find one or they don't have one, there are other places that sell these. But I'd bet dollars to donuts that most Radio Shacks still carry these. Buy one or a couple.

Okay, you have your SO-239, coax, wires, nuts, bolts, and soldering iron. Cool. Let's build.

1. Take that wire (whatever you used) and cut off one piece at about 6" and four at about 6.25". You could actually make 5 pieces at 6" but add a little to the ends of four of them for later. You'll see. Make sure all the wires are as straight as possible. Welding rods work great because of their solidity.
2. If you're using coat hangers or other steel-type metals, sand 'em down quick, especially at the ends. Remember, steel rusts in the weather so getting a metal such as copper or stainless is better. Yes, copper will discolor over time but it isn't rust!
3. Plug in your soldering iron and let it heat up. If you have a soldering gun with a trigger, you're ok.
4. Take the four wires you cut at 6.25" and make a small eyelet on one end with a set of needle nose pliers. This little eyelet will be where the bolts go through.
5. By the time you're done with this, your soldering iron should be hot. Take the one wire you didn't put an eyelet in and put it into the long shaft of the SO-239. Don't put it in the part where the threads are, put it in the other side. The threaded hole/part is where your coaxial connector is going to go!
6. Once it is secure, touch your soldering iron to the side of the shaft and wire. Be careful not to make it too hot as the little white plastic inside the SO-239 connector could melt. That would be bad. Try touching the solder to the connector and when it is hot enough, it should melt the solder and suck it in around the antenna wire and the SO-239 shaft. Solder it good enough to make it solid. After you're in, let it cool! If you did it right, you've just learned a skill you can use all over the house! If you used something that doesn't quit fit snugly in the SO-239 shaft (1/8" wire works well) you'll have to flow a bunch of solder into the shaft FIRST and put the wire in it while its molten and hold it for a moment until it dries. This is a skill, for sure. Another trick is to make a small bend at the bottom to hold itself upright when it goes down into the shaft. Don't put metal or other things in there to "shim" it. A small bend at the end of the wire will give it the temporary strength it needs until you flow solder and it hardens around the wire.
7. Once the solder is cool, take your four elements and feed one 4-40 bolt through the eyelet you made in the end of each of them. Take the eyelet element with the 4-40 bolts and feed the bolt into the top of the little holes on the SO-239 connector. Put your 4-40 nuts onto the bottom of the connector under the plate and tighten them down. It is good practice to put the bolt and element on the TOP side of the SO-239 and the nut (and lock washer if you want) on the bottom. You'll see why in a minute.
8. Once you've tightened and adjusted all the nuts and bolts, grasp each element and bend them down AT THE EDGE of the connector to an angle of about 45 degrees. It doesn't have to be perfect.
9. Once you've done this and it's pretty solid, you've got an antenna! Take a moment to use your hot glue gun or RTV and seal the top shaft of the SO-239 where the vertical element comes out of. This will keep water out. I sealed mine and used an old mobile antenna rubber gasket.

The next parts are up to you. If you take your coax cable and connect the PL-259 to the bottom of the SO-239, it's pretty much done! You can hang it in the kitchen from the ceiling by string around the vertical element or mount it to a PVC pipe. Best thing to do is get the antenna outside or in the attic. At GMRS frequencies, **height is everything!**

If you go outside, you need to mount it and seal the PL-259. This is where the 3/4" PVC comes into play. 3/4" PVC is the perfect size to hold the antenna in place when it is screwed into a PL-259. Feed the PL-259 down a piece of PVC to where it comes out the other end. Screw the PL-259 onto the SO-239 and it sets beautifully on top of the PVC. At this point, you can seal it by glue, RTV, or something a bit more robust like hose clamps or screws or nuts and bolts. Wind can beat this thing up so make it secure in there. Some people have drilled holes and put nuts and bolts in place to make a holder. Others glued theirs. Some use hose clamps. Try whatever you have around.

Mount the PVC to whatever you want wherever you want. I actually have mine outside in 10' of PVC attached to the deck with some leftover wire. The whole unit is so light that I didn't need to do much.

I drilled a little hole above a joint of 2 5' pieces of PVC to feed the coax out of and into the house. Some have used little brackets to hold the PVC onto the side of their house. Others have something else so do what works for you!

In the end, you'll have a cheap antenna made for GMRS that will work for years. And it is realistically portable and will last for a long time. Trial and error work best and don't give up. If you have any comments or questions, post them in this thread. If you build one, share a picture or what you did differently. There are a few ways to do these and no one way is better than another. The fact of the matter is you'll have an inexpensive and effective antenna that won't cost you an arm and a leg!





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