




How to Make a Dipole FM Transmitter Antenna

Materials

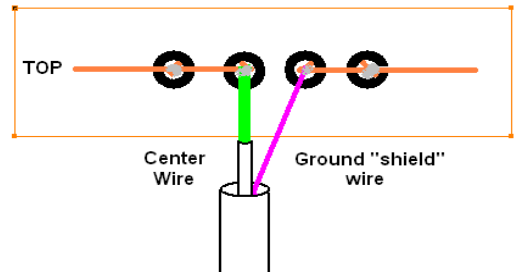
- 1 - 6' length steel cable. (Romex cable or other stiff copper wire also works)
- 1 - 8' length 1" PVC pipe
- 1 - PVC 1" T- connector
- 2 - PVC 1" end caps
- 1 - PVC 1" 90-degree corner connector
- 2 - 8" zip ties
- 2 - 1" diameter washers (same diameter as PVC pipe. The hole in the washer must be smaller than the locking end of a zip tie yet large enough for the flat zip tie to fit through.
- Television coax extension cable (with connectors) in the length you'll need from your transmitter to the antenna.
- Optional: 2-3" of shrink tubing
- Optional: 2 pipe clamps (to fit around the PVC pipe)
- Optional: choke core balun to fit the coax cable
- Optional: PVC cement

Step-by-step directions

1. If you're using steel cable, skip to step #2. If using Romex cable cut a piece of 3-conductor Romex cable about 6' long. Romex cable is the kind of wire used by home builders when installing the electrical wiring in a home. Any gauge is fine. Strip the ground wire out – it's the only wire you need.
2. Make a small loop in each end, about ½" across. Either solder the loop wires together or tightly twist the wire so it will not come apart. 
3. Measure and cut the wire exactly in half so you have two identical lengths.
4. Decide on the frequency of your FM station. Then use the following formula to determine the length of one of the half pieces in inches: $2803/\text{frequency in mhz}$. Example: suppose your station will be transmitting on 87.9mhz: $2803/87.9 = 31.888$ inches (31-7/8" is close enough).
5. Don't cut, but mark this length on each half using a Sharpie measuring from the loop end. This is the ideal radiating element length for your chosen frequency. Make a 90 degree bend in both wires at exactly that point.
6. On a small piece of perf board that's narrow enough to fit through the PVC pipe, drill a row of four small holes just large enough for the wire to fit through, and place them close together – no more than ¼" apart. 
7. Insert the bent wires into the inside holes and bend them back out through the other holes on each side. 
8. Solder the wires together where the ends come out and cross; clip off the excess wire.
9. Clip off one of the end connectors from the TV coax cable, strip down the insulation and separate the

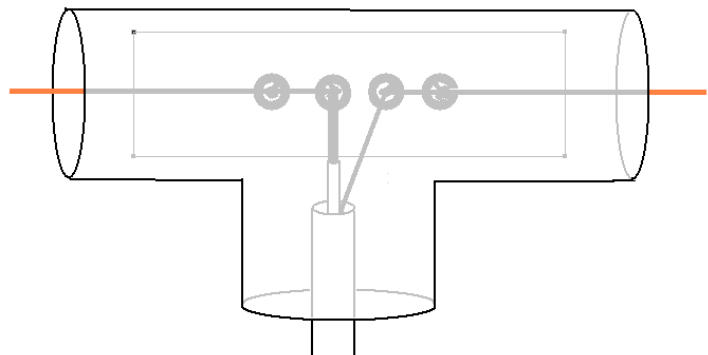
center wire from the outer “ground shield” wire. Make sure the shield wire does not touch the center wire.

10. Solder the center coax wire to one of the wires and the ground “shield” wire to the other. It doesn’t matter which is which, although the side that connects to the center wire will be the “top” of the antenna if the antenna is mounted vertically. Note: to prevent against accidental shorts, you may want to use shrink-tubing to insulate the center wire from the shield wire.



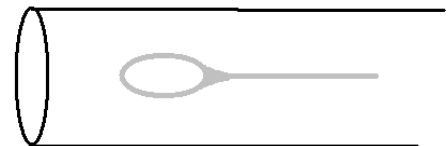
11. Extend the wires from the center junction and adjust them so they’re straight. Just eyeball it – no need to make them exact. At this point, you actually have a working antenna, but you’ll want to finish it off.

12. Insert the coax cable through an end of the PVC “T” connector and then out through the middle opening. Then push one end of the antenna wire all the way through the “T” connector and out the other side. Carefully pull the coax cable out the middle until the center junction fits into the center of the “T” connector so that antenna wires come out each end and the coax cable comes out the middle. Your result may not look exactly like this example, but it should give you a good idea of what the end result should be like. It’s perfectly okay if the center connector sticks out a bit from the “T” connector.

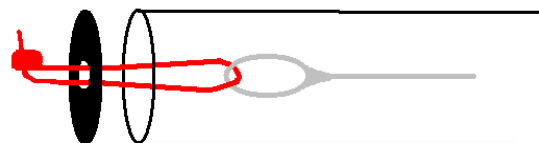


13. Mark the outside of the “T” connector with a pen or tape to tell which is the “TOP” end.

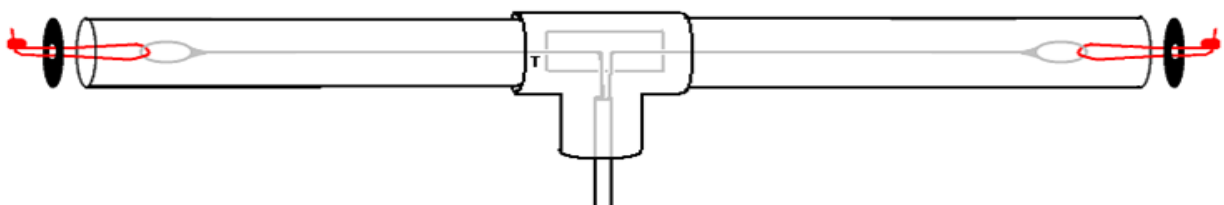
14. Measure a length of PVC pipe so that after being inserted over one of the looped antenna ends and into the “T” connector, it’s about 1” to 2” longer than the end of the wire. Do the same with the other end.



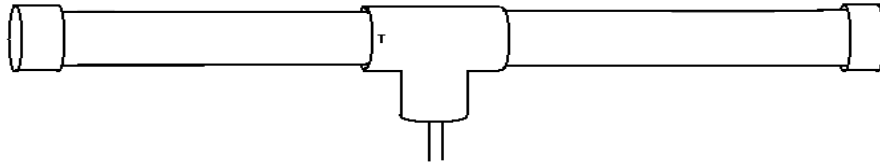
15. Loop the zip tie through the hole in the washer, down into the pipe, through the loop in the cable and back out through the washer. Then loosely tighten the zip tie so there’s some play. Do the same with the other end.



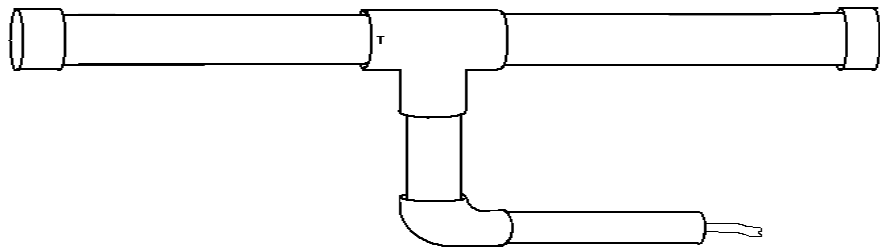
16. You should have something that looks like the picture below. Now tighten each zip tie so that the center junction remains inside the “T” connector. When you’re done, the inside antenna wire should be taut -- not touching anything -- and held securely at each end with the washers flush against the ends of the PVC pipe.



17. Slip a PVC end cap onto each end of the pipe. This will cover the washers and make the antenna virtually waterproof. Your antenna will look something like this:



18. With the remaining PVC pipe, cut two lengths about 6" long and push each into an end of the 90-degree PVC corner piece. This will become the antenna mounting post. Then slip the coax wire through it and push it into the open middle of the "T" connector. When done, your antenna will look similar to this picture:



19. Note the marking you placed on the "T" connector for the "TOP" and how the post points downward. You can mount the two pipe clamps onto a wall in your garage or side of the house and slide the mount down into them.
20. You may be able to increase the efficiency of your dipole antenna by affixing a choke core balun around the coax cable. You should place it as close as possible to the center junction and it will fit quite nicely inside the short PVC pipe that comes out of the "T" connector.
21. After you test your antenna, if you plan to put the antenna outdoors, you may wish to use PVC cement to make joints permanent. Alternately, you may use just a small bit of silicone glue around the joints to make the antenna truly waterproof yet easy to dismantle.

