

## Ham 63 – Making an Attic Antenna Perform

Dr. Marc & Rosemary © 220906

1. Why do some antennas perform and another ham using the same device cannot make it work? It's the tricks, that are really engineering decisions.
2. Let's start with the experience of one local ham, David N5DMK: "Yes! Moving the antenna element a few feet around the attic can make a big difference on reception to different repeaters. I moved it probably 10 times before I found its final spot where I got the best reception on all repeaters. I had a hard time hitting W5DRZ (146.910) at first but I get full scale now. It was fun troubleshooting. I'd like to check out one of those antenna you guys talk about so much, Compactenna. Seems interesting."
3. Why would moving the antenna make such a difference? Obstructions to radio waves. Any metal will disrupt the waves. Think about it. How large is an A/C duct or piping when compared to the small size of an antenna? So, the metal wins the contest for the signal and you receive or transmit noise.
4. Rule: Avoid metal in the vicinity; move away, up, down. Just get away.
5. Rule: Avoid electrical devices and wiring, especially HVAC motors and controls which are notoriously noisy. The NEC requires at least 4" separation from other electrical wiring.
6. Rule: Go as high as you can, but never violate the first two rules. Use metal EMT for a post to prevent summer sag.
7. Rule: If sheathing or roof is metal clad, drop down close to the joists. This allows the radio waves to 'sneak' out under the edge of the roof.
8. Rule: Do not allow the antenna to touch anything. Radials touching some surfaces cause SWR to deteriorate.
9. A counterpoise can make a big difference. Properly designed, it provides a 3 dB gain for the antenna.
10. A Quarter-Wave vertical on a counterpoise is often adequate. Article "Ham 54 – Counterpoise and Dual-Band Antenna, Ham Brew" is a how to make a very decent workable antenna for about \$10.
11. A Not-Line-Of-Sight (NLOS) can work when others do not, since it does not depend on a clear path. In our area, there is no such thing as line of sight because of terrain, vegetation, and structures. Simply remove the Quarter-Wave, change adapter and screw-on the NLOS to the counterpoise. The Compactenna 9" is the most effective we have found. Using the ham-brew counterpoise, the NLOS is within a few bucks of most commercial antennas.
12. The antenna is only half of getting the radio wave through the air. The other half is the earth. To bond all the radio frequency (RF) energy to earth has specific needs. Follow *National Electrical Code* "Article 810".
  - a. Although we have discussed this before, some confusion remains.
  - b. Create a Single-Point Ground bus bar of copper or stainless. For an attic antenna, locate before going through walls or into the air-conditioned space. This reduces the length and bends to the ground rod.
  - c. Run #10 AWG copper Protective Bond from the single point to the structure's Intersystem Bonding Termination, if available. If not drive an 8' copper clad ground rod and bond to that. Keep distances short. Avoid right angle bends.
  - d. Run #6 AWG solid copper from the RF ground rod to the Power ground rod and bond together.
  - e. Install an antenna discharge unit (ADU, lightning protector) on the coax and bond to the single-point.
  - f. If a metal mast, bond to the single-point.
  - g. Bond #14 AWG Operational Bond from each piece of equipment to the single point.
  - h. This is an RF ground and not the Power safety ground. The importance of the ground system cannot be stressed enough.
13. Coax gets the signal from the antenna to the radio. Minimize the loss (attenuation) in the coax by selecting the correct size. For overall distance less than 25', it is OK to use RG-8X. Over 25 feet should use RG-213/U.
  - a. Run Coax from the antenna to the grounded antenna discharge unit inlet.
  - b. Run Coax from ADU out to radio.
  - c. RG-213/U is stiff. So, use a 3' RG-8X and a barrel connector for hookup to the radio.
14. For RF noise reduction, place 4 – 5 Mix-31 ferrite snap-on beads on the coax near the antenna connection. Use electrical tape or zip-ties to hold in place.
15. If everything is bonded properly, the radio is safe to use during inclement weather. Nevertheless, if local lightning, I prefer to leave it on receive, but prefer not to touch the metal radio., just in case something is loose.
16. Life is good. Enjoy.

