Grounding

Introduction

After antennas, station grounding is probably the most discussed subject in amateur radio and it is also the one replete with the most misconceptions. The first thing to know is that there are three functions served by grounding in ham shacks: 1. Electrical Safety 2. Stray RF Suppression (or simply RF Grounding) 3. Lightning Protection. Each has it's own set of requirements, but not all station setups need every kind of ground. In fact, some setups don't use a ground at all! The articles on this page will help clear up some of the myths and mystery surrounding this popular topic.

Grounding FAQ

1. How important is a ground? Most people say that grounding is all- important, but I have had a few people tell me that grounds aren't necessary.

Grounds fulfill three distinct functions. The best ground for one function isn't necessarily the best for another. The three are:

a. **Safety ground**. This protects you from a shock hazard if one of the mains or high voltage power supply wires contacts the chassis due to some kind of fault. The requirements for this ground are spelled out in your state's electrical code. I believe that most states adopt the National Electrical Code (NEC). The safety ground conductor in your wall sockets should be connected to ground according to this code, and your rig's chassis should be connected to the safety ground.

b. **Lightning ground**. The requirements for a ground for lightning protection are much more stringent than for a safety ground as a lot of energy must be safely dissipated. See the TIS Page on **Lightning Protection**.

c. **RF ground**. This is required only for some antennas-- ones which require current flow to ground to complete the antenna circuit. A quarter-wave vertica is a popular example. One wire of the feedline connects to the base of the antenna, and the other connects to ground. The connection to ground has to have a low RF resistance, or you'll expend too much of your power heating the ground. A few radial wires will provide a moderately low loss connection. A ground rod will help a little, but the RF resistance will be high, resulting in quite a bit of loss. Chapter 8 of the ARRL Antenna Book shows the approximate trade between resistance and number of radials. If your antenna is much shorter than ¼ wavelength, you'll need many, many radials to get reasonable efficiency. If it's longer, you can get by with fewer. A ½ wavelength base-fed vertical needs only a very modest ground, and a ground rod is adequate. The requirements for various other end-fed antennas depend on their length. If you use a "complete" antenna like a dipole or a ground plane (that is, one that doesn't require your feedline to connect to ground), you don't need a RF ground, as long as you keep common-mode currents off your feedline. A "current" or "choke" balun is most commonly used for this.

2. How do mobile HF operators get RF grounds? For obvious reasons, the 8-foot buried pole won't work.

In a typical HF setup, the car is capacitively coupled to the ground, so the antenna is something sort of like a cross between a lopsided vertical dipole (with the whip being one side and the car the other) and a vertical with elevated radial system.

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Articles

- Lab Notes - Different Grounds for Different Shacks
  QST April 1996, pp. 80-81
- Assorted Hints & Kinks

Web Links

- Power and Grounding for Audio and Audio/Video Systems - A White Paper for the Real World by Jim Brown, K9YC. While written for sound and video contractors, the fundamentals also apply to hams.
- Tom Rauch W8JI has excellent pages on station grounding.
- *Ilkka Yrjölä* OH5IY has lots of useful information on grounding, bonding, and transient protection.
- Rudy Severns N6LF has done an extensive study on ground radials for vertical antennas.
- According to OSHA, safety is not improved by grounding portable generators for Field Day. Visit our Electrical Safety page for a fact sheet and explanation or use these links.

Technology >> Radio Technology Topics >> Safety >> Grounding

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