

Editorial – Ground types

When discussing grounds and grounding, we often find the need to distinguish between different kinds of grounds, because they are not all the same, or have the same purpose. Still, there is some overlapping usage between them, adding to the confusion. Among those most applicable to amateur radio are signal ground, chassis ground, RF ground, safety ground, earth ground, and lightning ground.

Signal Ground

Each electrical and electronic circuit contains conductive points whose signal levels can be measured in relation to a reference point known as *signal ground*. Furthermore, a circuit can contain multiple local signal ground reference points that are isolated from each other by function or by components, to maintain signal integrity or improve noise immunity, for example.

Chassis ground

Many devices contain circuit boards that are mounted on a metal frame or enclosed in a metal box, often called a *chassis ground*, because it's conductive and typically used for safety, as well as for an electrical reference.



RF ground

We amateurs tend to use two types of *RF ground*, one is a conductive path for completing an RF (radio frequency) signal circuit, and the other is a conductive plane for providing a reflective surface for radio waves. In the first type, one of the two transmission line conductors is thought of as a “return path” for electrical RF energy. The second provides a *ground plane* or *counterpoise* off which radio waves can reflect in place of an earth ground.

Safety ground

Any ground connection that is used to protect humans from harm and sensitive electronics from damage is known as *safety ground*. One type of safety



ground is built into the equipment, such that its chassis, shield, or enclosure is bonded to a common grounding point to either equalize hazardous electrical potential or provide a grounded pathway for such energy. Another is the kind that an operator attaches or implements at the time of use, such as a wrist strap or anti-static mat.

Earth ground

An *earth ground* is any conductor that is directly connected to outdoor earthen soil. For amateur purposes, an earth ground is often achieved by one or more conductive rods driven into the dirt. In the US, they are also bonded with the electric service enclosure, which uses its own earth ground.

Lightning ground

A *lightning ground* is no more than a low-impedance electrical connection to a safety ground or an earth ground, and whose primary function is for safety. The ground connection protects equipment and structures by directing much of the lightning current to Earth.

Finally

A circuit signal ground can be the chassis ground, the safety ground can share conductors with the RF ground, and lightning ground and earth ground can be one and the same. This illustrates how grounds by different names can serve common purposes, but can also contribute to the confusion when attempting to distinguish between them. Hopefully, this discussion can help clarify the meanings when people do not agree on the implementation of a ground.

Anything to add? Email editor@utaharc.org