



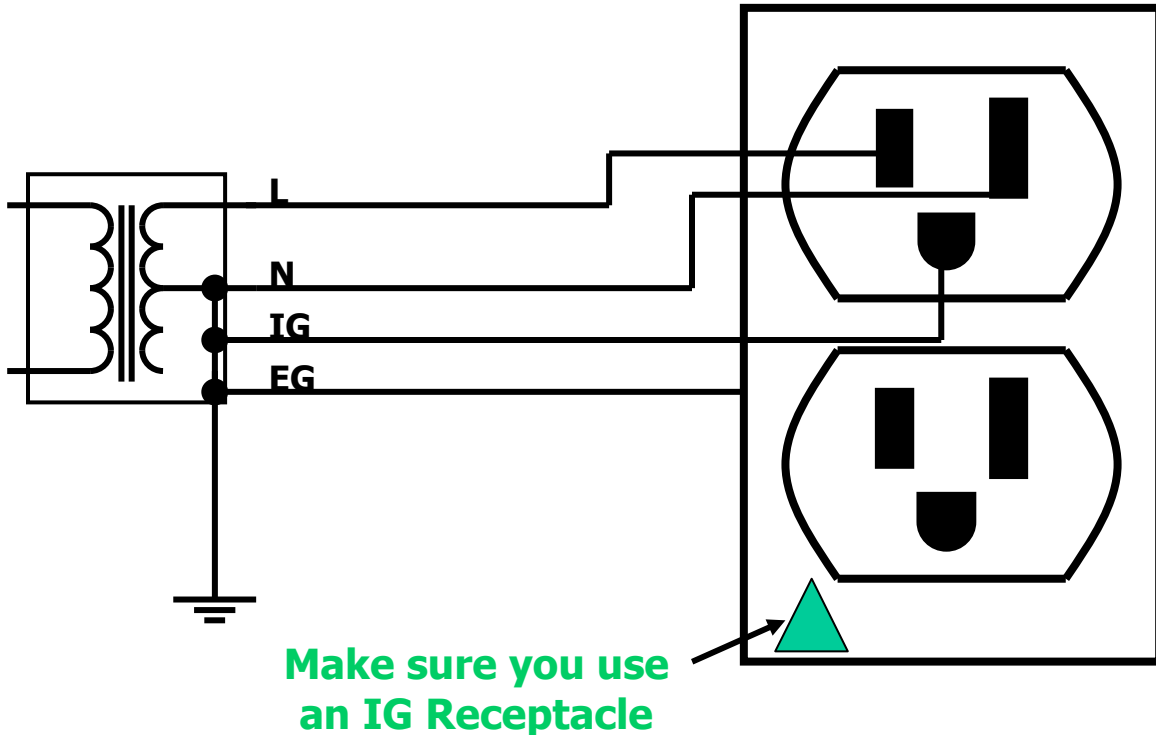
## **Isolated Ground Circuits**

By: Dan Maxcy 1/06/03

With respect to Power Quality Grounding Issues we are going to take a look at the term "Isolated Ground". Quite often when doing an initial walk through of a facility that is having power quality problems I hear the following; "This equipment shouldn't be having any problems because it is on an Isolated Ground Circuit". First let us review just exactly what an isolated circuit is, how it works, and the associated problems with relying on one by itself to provide power quality.

The following figure illustrates a proper isolated circuit. The individual parts are labeled as; L which equals the Line or "Hot" wire. N which is the circuit Neutral. IG which stands for Isolated Ground and EG is the Equipment Ground.

In theory, by separating the equipment ground from the isolated ground we have provided a "Clean Ground" for our circuit. This "clean ground" is not connected to any other equipment ground from the initial neutral to ground bond all the way to our connected equipment at the receptacle. This is illustrated below:



In theory, by not interconnecting this isolated ground to the equipment ground we can isolate stray currents and therefore voltages on the isolated ground. Remember IEEE deals not only with theory but actual application. When we look at what the IEEE has to say about isolated ground systems we get a better picture of their effectiveness.

As defined by IEEE standards IEEE 1100-1999 section **8.5.3.2** an isolated ground circuit is a:

**...grounding configuration (that) is only intended to be used for reducing common-mode electrical noise on the electronic load equipment circuit...**

This definition is very straight forward. Nothing is said about an isolated ground providing power quality for under voltages, over voltages, sags, swells, or voltage transients, however, as I stated at the beginning of this article many people are under the impression an isolated ground circuit will solve all power quality problems.

IEEE 1100-1999 section **8.5.3.2** goes further to say:



**It (an isolated ground circuit) has no other purpose and its effects are variable and controversial. Results from the use of the isolated ground method range from no observable effects, the desired effects, or worse noise conditions than when standard equipment grounding configurations are used to serve electronic load equipment.**

This indictment of an isolated ground system is partially due the inherent problem of establishing one. As shown in the above figure, once the IG and the EG leave the neutral to ground bond they can no longer touch. This isolation is VERY difficult to perform due to the fact that many manufactures do not keep this IG/EG isolation internal to their equipment. The more equipment and receptacles that are on the isolated circuit can lead to many other places where an IG/EG bond will degrade the isolated ground circuit. Quite often while performing a power quality survey I have found what was supposed to be an isolated circuit to be degraded by both standard receptacles and multiple equipment IG/EG bonds. *(Remember standard receptacles do not have the IG separated from the EG. Special isolated ground receptacles must be provided.)*

Isolated Ground Circuits can help provide some electrical noise attenuation, however, for complete power quality they must be properly installed along with quality surge suppression, noise suppression, harmonic cancellation, voltage regulation, and uninterruptible power supplies if protection from under voltages, over voltages, sags, swells, and voltage transients is needed.