Ground Bond or Ground Continuity?
Taking Your Customer's Safety to the Next Level

Introduction

Most manufacturers familiar with safety testing are well aware that a verification of the ground circuit on electrical products is necessary for safety agency compliance. In fact, verifying that the ground circuit of an electrical product is intact is required by most safety agencies as a 100% production line test (a test that must be performed on all manufactured units prior to shipment). What most manufacturers don't know, however, is that there is more than one way to test a product's ground circuit. While the Ground Continuity test has found a home in the majority of safety testing routines, more test engineers and technicians are discovering the benefits of the Ground Bond test.

For years, the only means by which to test the continuity of a product's earth ground conductor was the Ground Continuity test. This low voltage, low current test usually consists of a small DC voltage source, a simple measuring circuit, and an indicating device. The test instrument can be as simple as a battery-operated clip and buzzer, or as advanced as an automated electrical safety tester. Yet the concept remains the same: apply a small voltage across the ground wire of a product, measure the current through it, and make sure the resistance is within an acceptable level. Ensuring that the safety ground wire is continuous meets most safety agency standards, but as we will discuss, that may not be good enough.

Ground Continuity Shortcomings

An undeniable shortcoming of the Ground Continuity test is that it fails to verify the *integrity* of the earth ground conductor. Why is this important? The earth ground conductor is tied directly to the chassis of a Class I product (a product with a metallic or other conductive enclosure) in order to direct any fault current back to ground in case of an insulation failure. Determining that there is continuity between the ground plug and the metal chassis of the electrical product is desirable because it indicates that there is a path for fault current to return to ground; however, continuity alone doesn't justify whether or not the wire is capable of handling the current it is meant to conduct.

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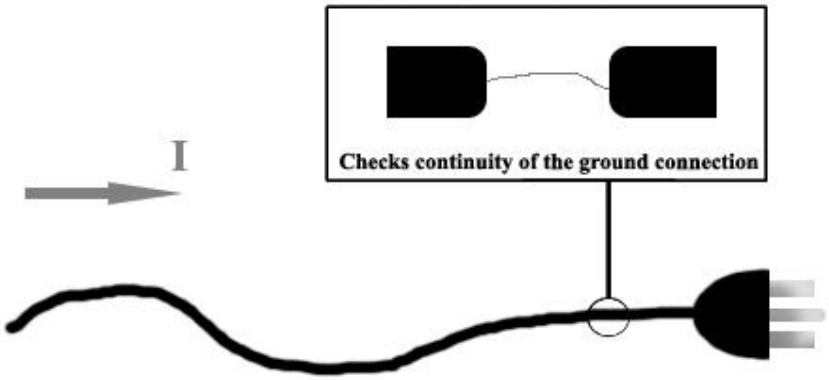

Figure 1.0: Ground Continuity Test Theory

Since the Ground Continuity test is a low current test, it will only indicate if there is a connection between a product's enclosure and its ground plug (see Figure 1.0). This connection could consist of one strand of wire or one-thousand stands of wire – as long as the measured resistance is below the specified preset value, the test will indicate a PASS condition. Yet how will this single strand or bundle of conductors handle the fault current likely to be imposed on it? Many household time-delay fuses and/or circuit breakers can handle a 200% current overload condition for up to two minutes; it is only logical that the earth ground conductor on any product operating under utility power is capable of handling the same condition. Yet the Ground Continuity test will not yield this important piece of information.

A Better Way to Test

In today's on-demand world, electrical products are ever-present. The Ground Bond test provides the high current levels needed in order to ensure that the earth ground conductor of a product can handle any fault current likely to be imposed on it (see Figure 2.0). In fact, most Ground Bond tests are specified to be performed at two times the rating of a product's fuse or branch circuit for up to two minutes. Testing under these conditions not only verifies the *presence* of a continuous earth ground conductor, but also verifies the *integrity* of that conductor.

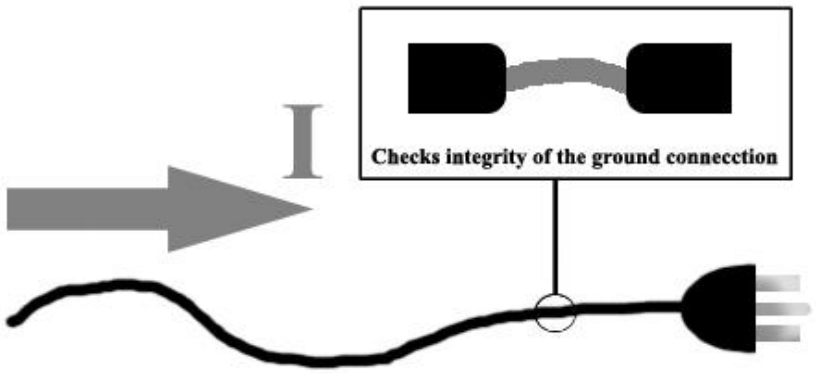

Figure 2.0: Ground Bond Test Theory

The SCI Model 264 is a 30 amp Ground Bond tester with multiple Memory Locations and Auto-offset capability (see Figure 3.0). Features like these make it easy on manufacturers of multiple products to test quickly and easily in a production environment. With multiple programmable Memory Locations, a test operator can set up, store, and recall parameters for different devices under test (DUT's). For example, say a manufacturer sells toaster ovens domestically in the U.S. and overseas into the European Union. With an SCI 264 the test operator can set Memory Location 1 to test at 60 Hz, 30 amps, and 60 seconds. Meanwhile, the operator can also set Memory Location 2 to test at 50 Hz, 25 amps, and 120 seconds. Recalling and toggling between Memory Locations is as easy as pressing a button, allowing the test engineer to quickly and efficiently test products to both countries' specifications.

Figure 3.0: **SCI Model 264**

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Many manufacturers are concerned about offsetting test lead resistance when performing a Ground Bond test. After all, one of the most important pieces of information which a Ground Bond verifies is the resistance measurement – it is crucial that this measurement be accurate. Instruments like the SCI Model 264 compensate for this issue by incorporating an "Auto-offset" feature. With this feature, the test operator can intentionally subtract (hence the term "offset") the resistance of the test leads and any other fixturing during a Ground Bond test, making the final resistance measurement of the DUT's earth ground conductor more accurate. This feature assures that a good test is being performed.

Summary

The Ground Bond test presents manufacturers with the ability to perform a better, safer method of testing an electrical product's earth ground conductor. Routine Ground Bond testing will help to ensure that all products shipped from the factory meet the highest safety standards, giving customers and manufacturers piece of mind, while preventing frivolous injury lawsuits. For manufacturers considering making the switch to Ground Bond testers, the principle of the Ground Bond test and the operation of the tester itself are not unlike that of the Ground Continuity test. Thus the transition from one instrument to the other is seamless. As of this writing, Ground Bond testing is usually done as a type or design test – a rigorous test performed in a laboratory environment. Yet more and more manufacturers are starting to rely on the Ground Bond test in the production environment as well. The simple fact is that the Ground Bond test is a *better* test, and a better test yields a safer product.

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