Ground Bond, Ground Continuity and Earth Continuity

Ground tests on electrical devices are mandated by product safety standards to protect anyone coming in contact with the product from electrical shock. Common sense tells us that the product should be properly grounded so that it retains no residual charge. How do these ground tests verify safety, and how are they different?

Ground Continuity

A Ground Continuity (GC) test verifies a connection between exposed conductive parts and the ground of the power cord on the product being tested. GC testing is required on all corded products. A Ground Continuity test measures resistance using either a DC or AC signal and is performed at a current typically under 1A to check that there is a connection. If an AC signal is used, the test is identical to a ground bond or an earth continuity test with the exception that the testing is at a low current level (typically less than 1 Amp). The DC test can be performed with an ohmmeter, battery, and light /buzzer or milliohmmeter. Such a test ensures a connection between ground and any exposed metal. This does **not** verify ground integrity in a fault condition in which ground connections must handle 20 or 30 amps until a fuse blows.

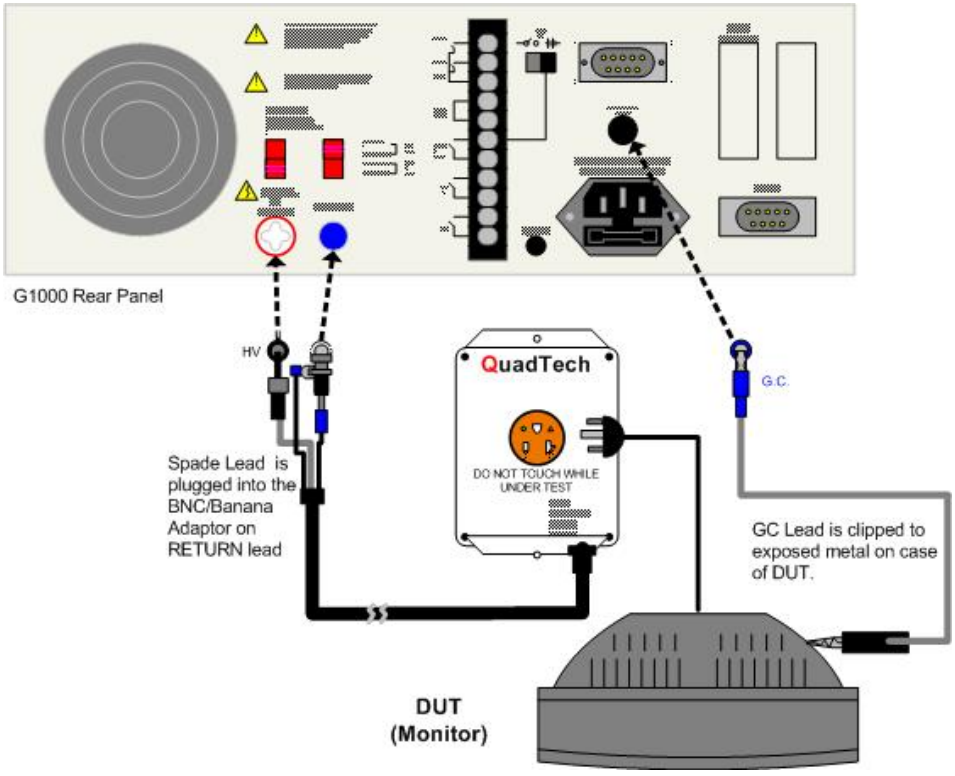

Figure 1: Ground Continuity Test Connection to DUT

Ground Bond and Earth Continuity

Ground Bond and Earth Continuity tests verify the integrity of the ground connection between exposed metal and the ground blade of the power cord under **high** current conditions. The test is performed using an AC test signal as follows:

- Line frequency 50 or 60Hz
- Less than 12V
- Current levels of 10A, 25A or 30A.

The measured resistance on a good product is typically less than 1Ω, therefore it is important to account for resistance in test fixtures and test leads. To determine the amount of lead resistance present, short the test leads and measure the resistance. Lead resistance is then subtracted from subsequent measurements. An offset feature is available on most ground bond testers that automatically subtracts lead resistance from the measurements.

High current provides a better simulation of how the ground on the device would perform under **actual** conditions if the motor or wiring were to short to ground. This verifies that the grounds in the device can handle 25 or 30 amps until a circuit breaker trips or fuse blows. Standards such as TÜV, IEC, VDE, BABT and CSA require this type of testing.

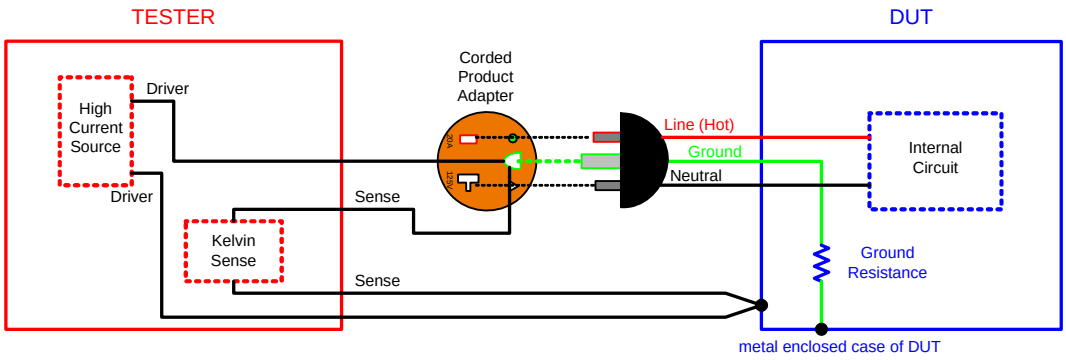

Figure 2: Ground Bond 3-wire 120V IT Equipment

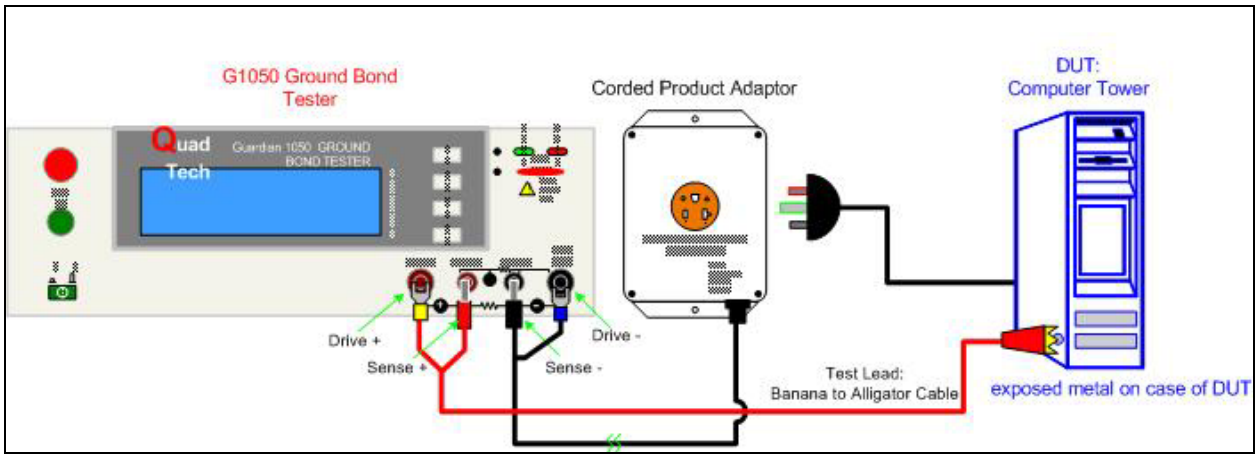

Figure 3: Ground Bond Test Connection to DUT

Table 1 lists QuadTech electrical safety testers that can perform ground continuity or ground bond measurements.

Table 1: QuadTech Electrical Safety Testers

Guardian 1050 Ground Bond Tester

Ground Bond Measurement:

Provides up to 45A for high current testing
Source Voltage from 1.0 V to 8.0 V rms

Guardian 1050 can be used alone or connected to the Guardian 1010, 1030 or 1030S Hipot Testers for complete product electrical safety testing with the push of a button.

Guardian 1000 Series AC/DC/IR Hipot Testers

Ground Continuity Check:

All of the Guardian 1000 Series units have a ground continuity check feature to determine that the resistance, between the ground blade of the power cord and any exposed metal on the product, is less than 1 ohm.

Guardian 6100 Plus Electrical Safety Analyzer

Twin Port—Simultaneous Ground Bond & Hipot:

Ground Bond Output Current: 1A – 30A AC
Output Voltage: 5kV to 6kV AC
Resistance Measurement: 0.1mΩ – 510.0mΩ

Sentry Plus AC/DC/IR Hipot Testers

Programmable Ground Continuity: 0.1Ω-5Ω±0.2Ω

Current: 0.1A or OFF

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