

## Preventing Damage to Your Electrical Safety Tester Due to Improper Test Station Setup

*Associated Research, Inc.*

### Introduction

One of the most frequent causes of damage to Associated Research electrical safety compliance testers occurs due to improper test station setup. Our technicians have determined that in many instances test operators mistakenly allow high fault currents to feedback through the return input of their test instruments, which causes damage to sensitive components and PCB traces. Oftentimes this type of damage results in out-of-warranty repair costs. Fortunately, it is very easy to prevent this type of damage to your instrument by taking some simple considerations into account prior to testing. This paper will discuss how the instrument is damaged and how to avoid the conditions that lead to this damage. For those that are unfamiliar with safety testing and the types of tests that are performed, please refer to the whitepaper entitled "Electrical Safety Testing Primer" which can be found on AR's website.

### Associated Research Hipot Tester Design

Most AR electrical safety testers that are capable of performing an AC or DC hipot test incorporate our patented SmartGFI protection circuit. The circuit automatically detects if the DUT is isolated from ground and prevents the test operator from being shocked in case of accidental contact with the DUT during testing (see Figure 1 below). AR technicians recommend that the test operator always isolate the DUT from ground so the SmartGFI circuit is enabled and provides the highest level of protection against injury.

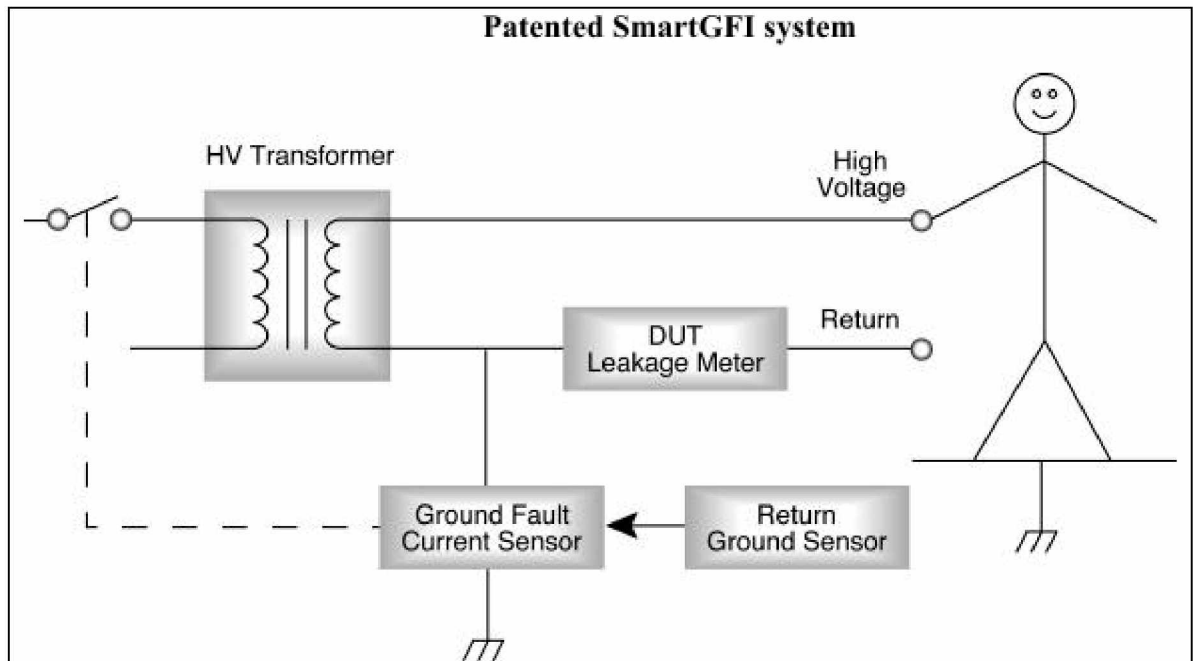


Figure 1: SmartGFI Circuit

SmartGFI requires sensitive measurement circuits in order to function correctly which can be damaged if fault currents are fed into the return of the instrument. This damage usually occurs when the test operator leaves the Return and/or Cont. Check leads connected to the DUT during line leakage or functional run testing. If the test leads remain connected and the DUT is faulty or stray leakage current finds its way back through one of the leads the instrument the SmartGFI circuitry is often the first to suffer the effects.

#### Proper Test Sequence Setup

In order to prevent damage to AR electrical safety testers the hipot test should always be performed *before* the line leakage and functional run tests. The hipot test is an invaluable test in that it helps to determine if there are any manufacturing defects in the DUT that could cause excessive leakage currents to be present on the chassis. If the DUT fails the hipot test, the test operator should *never* perform the line leakage or functional

run test until the DUT has been repaired. In addition, the line leakage and functional run tests should never be performed before the hipot test for similar reasons. The test operator needs to verify that DUT has been manufactured correctly with proper insulation before performing the other two tests.

### Proper Test Setup with Multiple Test Instruments

Customers that utilize multiple pieces of test equipment to perform their compliance testing must take specific precautions to prevent damage to their AR hipot tester. The test operator should *always* disconnect the hipot tester's HV, Return, and Cont. Check test leads before the line leakage test and the run test are performed (see Figure 2 below).

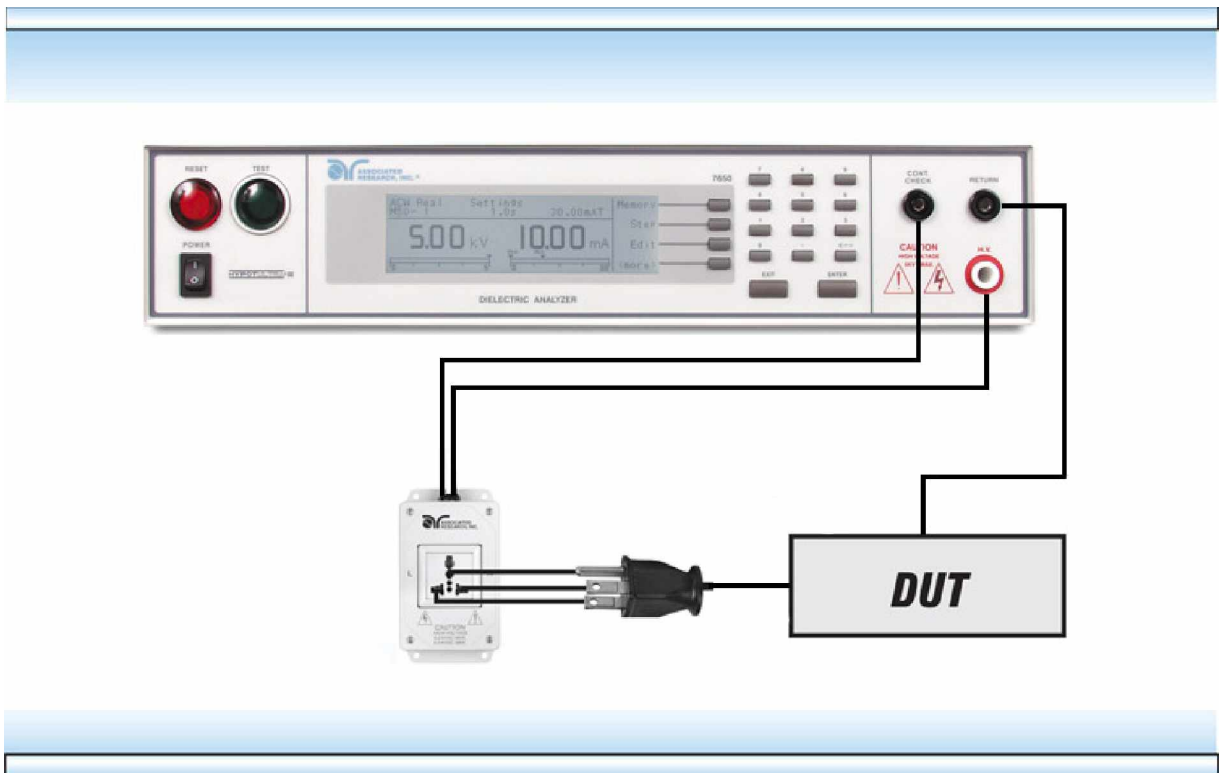


Figure 2: HypotULTRA 3 Test Lead Connections

Removing the hipot tester's leads from the DUT prior to performing the line leakage and run tests will prevent any leakage or fault currents from feeding back to the hipot tester's return and damaging the instrument.

### Proper Test Setup with an Electrical Safety Compliance Analyzer

Many customers choose to purchase AR's OMNIA 4- 5- and 6-in-1 electrical safety compliance analyzers in order to increase productivity and shorten test time. These testers allow customers to setup and perform multiple tests in sequence with a single button push (see Figure 3 below).

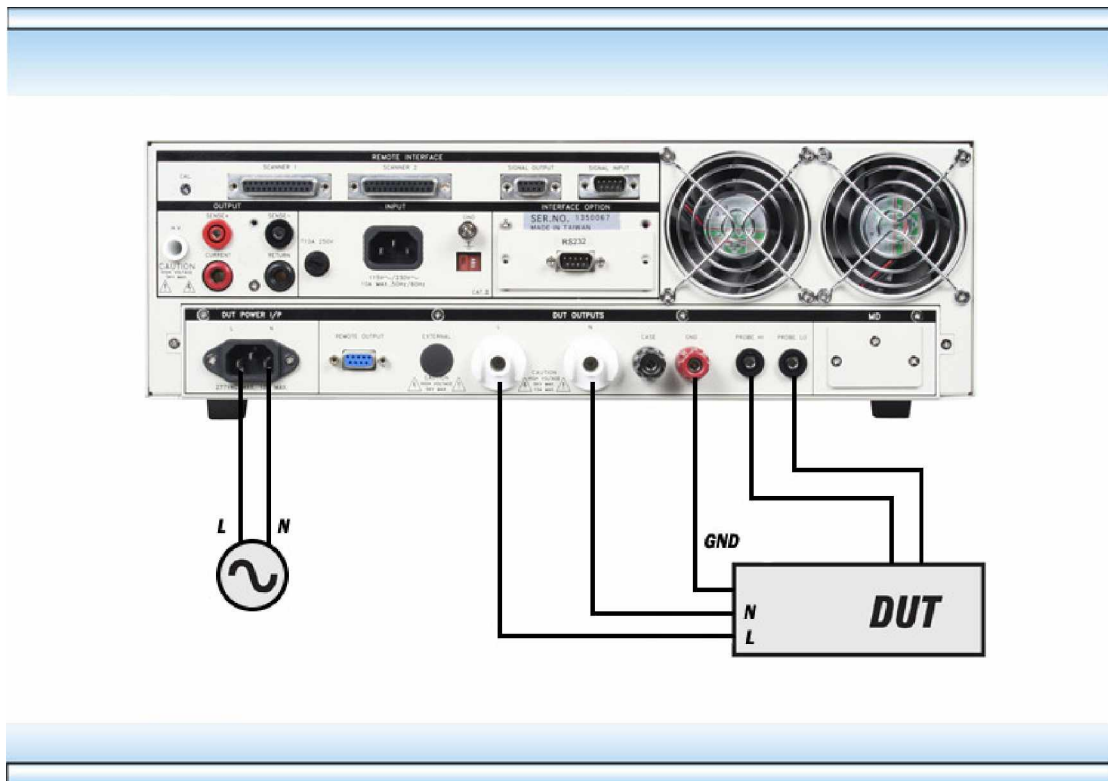


Figure 3: OMNIA-DUT Connection Diagram

For test operators with these models, the HV, Return, and Cont. Check leads need not be disconnected from one test to another because the instrument automatically isolates these leads. However, special attention should be made to the order of the tests (see above) as well as utilizing the Fail-Stop feature. This feature will cause the test sequence to stop if a failure is detected. Fail-Stop should *a/ways* be enabled by customers performing hipot tests as well as line leakage and functional run tests. In the case that the hipot test fails, the tester will automatically shutdown the test and refrain from performing additional tests in the sequence, thereby preventing damage to the tester itself.

#### Conclusion

Improper test station setup can cause traumatic damage to a customer's AR hipot tester, often leading to out-of-warranty repair costs. By configuring tests in the proper order, and paying close attention to the way in which the test leads are connected, test operators can easily prevent any fault currents from flowing into the hipot tester's return and damaging the instrument. Whether multiple test instruments or a one-box solution are involved in compliance testing, test operators can avoid non-warranty repair costs with a few simple test considerations.