

Touch 1 Ultra Tech-note

8 September 2006

External HV Ground Fault, GFI Protection, and Grounded Return Operation

This tech-note describes the GFI feature of the Touch 1 Ultra as it relates to an External HV Ground Fault and other safety concerns relating to AC testing.

When using AC voltage, it is possible to have an External HV Ground Fault even though the device under test has been confirmed to not be grounded or may not even be connected to the analyzer.

Rationale

The Touch 1 Ultra has a protection circuit built into the external HV supply that monitors the HV current to earth ground. This is known as GFI or ground fault interrupt. Leakage current greater than 450 μ A will cause the GFI circuit to engage which will shut off the HV current in less than 1 ms and display the External HV Ground Fault error. The shut off point varies from tester to tester, which can be less than the stated 450 μ A.

Several factors can contribute to this error.

1. The internal capacitance of the relay matrix contributes to the leakage threshold, making a failure mode more likely.
2. A device under test in close proximity to earth ground, as well as fixturing, can create capacitive coupling, contributing to the leakage threshold.
3. Higher AC voltages create higher AC currents for all sources of capacitive coupling to ground.

It is possible, with no device under test attached, for this error to occur at higher voltage levels.

Solution

The Touch 1 Ultra can be operated in a “grounded return” mode. This mode ties earth ground to the HV return inside the tester. By grounding the return, the GFI circuit is disabled. When the analyzer is operating in grounded return mode, the external HV supply will shut down when the current exceeds the AC Real current limit.

WARNING

Operating the Touch 1 Ultra in grounded return mode is more hazardous than when the GFI is enabled since a grounded operator touching a live connection will receive a shock at the real current setting rather than the 450 μ A GFI current setting. Cirris strongly recommends the use of a proper safety interlock to protect against accidental electrical shock in every case where the GFI is turned off.

Application

The grounded return mode can be activated in a Touch 1 Ultra wirelist by turning off the External GFI Safety option. When the External GFI Safety option is enabled, the GFI circuitry is enabled. When the External GFI Safety option is disabled, the analyzer is operating in grounded return mode. When operating in grounded return mode, AC tests will include the AC current consumed by the scanner assembly (test points) in the measurements.

This wirelist option can only be modified in a text editor.

1. Save the wirelist to a floppy disk or onto the network if available.
2. Modify the wirelist to include a parameter line either
 - a. External GFI Safety on
 - b. External GFI Safety off
3. Save the wirelist on the Touch 1 Ultra.

The final wirelist will look like the following:

```
...
Parameter Settings:
CONNECTION RESIS 10.0 ohm
LV INSULATION RESIS 100 K ohm
EXTERNAL GFI SAFETY ON ←
EXTERNAL DW VOLTAGE 1000 Vac
EXTERNAL DW MAX TOTAL CURRENT 2 mA
EXTERNAL DW RAMP UP .1 SEC
EXTERNAL DW RAMP DOWN 0 SEC
EXTERNAL DW DWELL .4 SEC
...
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