

ITC55x00 UIS Tester Series
Application Note 2.0
Understanding Kelvin Tests and Failures

The ITC55100 provides full Kelvin checking on all three DUT connections: Gate, Source and Drain. Kelvin failures are always identified when they occur and the ITC55100 will stop at the point where the Kelvin failure can be identified by using a DMM and making simple voltage measurements.

The ITC55100 makes Kelvin measurements by passing a small DC current between two connections and then measuring the voltage difference between those two points. The Drain and Source Kelvin current is about 2mA, while the Gate Kelvin current is about 7mA. If the voltage between the two Kelvin connections ever rises above 1V, a Kelvin failure will result. At this point, the voltage on the identified Kelvin connections can be measured to determine why the Kelvin failure has occurred. If the Kelvin connections are left unconnected, the Kelvin connections for the Drain or Source will rise to about 1.4V and the Gate connections will rise to about 2.2V when a test is performed on that test port. Note the Gate Kelvin voltage is higher because of the higher Kelvin current flowing in the Gate Kelvin circuit.

Furthermore, by using the Utilities >> Sidepanel >> “Kelvin 1” (Test Port 1) or “Kelvin 2” (Test Port 2) commands will set the selected test port in the Kelvin test conditions so Kelvin voltages can be measured.

Tester Update Notes: ITC55100 testers made after the middle of 2005 have had the Kelvin circuitry updated to be more rugged. Therefore, if an ITC55100 is failing Kelvin, be sure the tester has been updated first and then check the remaining wiring and test fixture associated with the failing test port. In regard to the tester upgrades, an additional 150ohm resistor has been added in series with the Kelvin sensing optoisolator which is connected in parallel with the Kelvin connections. This resistor will raise the Kelvin voltage by about 0.3 to 0.9 voltages. The purpose of the resistor is to limit the maximum current that could flow through the optoisolator, especially during a fault condition. Special Kelvin upgrade assemblies are available from ITC which simply plug into the existing optocouplers.

Kelvin Testing Notes: It is possible to further isolate Kelvin faults by using the “Kelvin Loopback Technique”. The concept is to connect the two (2) Gate connections from the tester to each other, with a single BNC cable. Then make the same connection with the Drain/Source connections using a single cable. Test both Test Ports and see if the Kelvin failure is isolated to just one Test Port or both Test Ports.

The same “Kelvin Loopback Technique” can be made inside the tester to determine if the Kelvin problem is located on the Side panel or the Main Control Board. The Gate Kelvin connections are Pins #2 and #4 of J3. Connect them together on the cable that plugs into J3 to see if the Gate Kelvin on the Main Control Board is working properly. The Drain/Source Kelvin uses J1. Simply connect Pins #1 and #3 together on the cable that plugs into J1 of the Side panel to check for Drain Kelvin. For the Source Kelvin connect Pins #6 and #8 together on the cable that plugs into J1 of the Side panel.