FLUKE®
Calibration

5730A/LP
Multifunction Calibrator

Addendum

Introduction

The 5730A/LP (the Product) is the same as a standard 5730A except that the front-panel display assembly has been replaced with a blank panel, and the Product is configured for rear output.

Current Guard Use

The rear panel current guard is required when the Product is supplying low-level ac current through a long cable, such as in a system. For that reason, a current guard terminal is supplied on the rear panel to make system applications more convenient.

The current guard is active only when the Product is in the ac current function. The guard is voltage driven and is in phase with the Product output current to the level of compliance voltage at the OUTPUT HI terminal. Compliance voltage is the sum of the Unit Under Test (UUT) burden voltage and the additional burdens of contact resistances and cable losses. When connected to the inner shield of a triaxial cable, the current guard blocks a potentially significant leakage path by surrounding the output current with an in-phase voltage at the same potential. Current leakage still occurs, but only between the guard voltage on the inner cable shield and the grounded outer cable shield.

An example where current guarding is desirable is when the Product sources 100 µA at 1 kHz through a 3-meter coaxial cable into a UUT with a burden voltage of 1 V. At 100 pF per meter of length, the cable places an additional 300 pF load across the Product output. The amount of current leakage through the cable capacitance is:

$I = V(2\pi fC)$

Where,

$V = 1V$

$f = 1\ kHz = 1 \times 10^{3}\ Hz$

$C = 300\ pF = 300 \times 10^{-12}\ F$

Therefore, the total leakage is:

$I = (1)(2)(\pi)(10^{3})(300)(10^{-12}) = 1.9\ \mu A$

This will add in quadrature to the current through a resistive load causing an error of:

$\sqrt{100^2 + 1.9^2} - 100 = 0.018\ \mu A$

At 100 µA, the Product's 90-day uncertainty is specified to be ±140 ppm + 20 nA, or ±0.034 µA. The current leakage here is over half the Product's uncertainty. The error caused by this leakage can be minimized by using the current guard.

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