

Summary of Accuracy Data for the DSP-4000 Series

Overview

Accuracy of measurement is a key decision-maker when purchasing any test equipment. Most potential buyers do not have a \$50,000 Laboratory Network Analyzer to carry out such accuracy comparisons, so they are unable to verify manufacturer claims. When laboratory equipment is available, the ability to produce both accurate and repeatable measurements is often a challenge. This is particularly true for Category 6 and Class E where the measurements extend to 250 MHz.

Fluke Networks invited UL (Underwriters Laboratories) to verify the accuracy of the DSP-4000 Series against the latest draft standard for Category 6 (Draft 9) in May 2001. The accuracy requirements for field testers have not changed since then. Accuracy requirements for Category 6 are comparable to that of Class E found in IEC 61935-1.



Findings

The DSP-4000 Series was tested and found to exceed Level III accuracy limits as specified for Cat 6 cable certification. UL randomly selected instruments from the DSP-4000 Series production line. The testing included the evaluation of Category 6 baseline performance, permanent link performance, and channel performance. The performance with the DSP-LIA101S Permanent Link Adapter significantly exceeded even baseline performance requirements.

This document contains a summary of all of the data collected during the testing with UL. In order to represent the extensive data set in an easily understood format, each data point on the graphs is from the pair that performed worst at each frequency and length. Thus the graphs are really the "worst of the worst" – in other words, 'typical' performance is even better.

As you will see by the enclosed data, the requirements for field testers are extensive.



For further information on the DSP-4000 Series, or a copy of the verification letter from UL, visit www.flukenetworks.com.

Terms

Level III Accuracy	Tester accuracy limits specified for Category 6 at the end of the tester's adapter.
Permanent Link	Category 6 accuracy limits for the Permanent Link test configuration, i.e., a configuration that excludes any error contribution by the tester patch cords (adapter cables or test leads). The reference or start point for the comparison is at the end of the tester patch cords, but before the RJ-45 plug. This means that the test lead material must be of sufficient quality and durability in order to not impact accuracy. The impressive accuracy documented here is achieved by the DSP-4000 Series using its non-twisted-pair designed test lead.
Channel	Category 6 accuracy limits for the Channel test configuration, i.e., a configuration that includes the network user's actual patch cords that will be used with the link in the network. Since the connection to the tester must be of an RJ-45 style, performance degradation is inevitable. However, using Digital Signal Processing techniques, it is possible to eliminate the effect of this connection. The recent introduction of Fluke Network's RC ² ™ (Remote Connector Compensation) technology improves the accuracy even further, especially for shorter links where the remote adapter becomes a noticable source of noise. (The graphs here are without RC ²).
Baseline	Tester accuracy limits specified for Category 6 at the tester's measurement system interface, i.e., with no adapters or patch cords connected. This is not a practical specification for field use. Installers or end-users should refer to the accuracy for Permanent Link and Channel configurations.
Return Loss	For Return Loss, each DSP-4000 Series Permanent Link Adapter contains one-port calibration data, which eliminates the effect of the connection to the adapter, as required by the standards. This technique is the same used for calibrating Laboratory Network Analyzers before each measurement. It is a proven technique, as the following graphs show.
Worst Case Conditions	A line representing a worst case specification based on the actual data collected for the DSP-4000 Series Cable Analyzers.
Fluke Networks Data	Actual DSP-4000 Series measurement accuracy data collected by Fluke Networks, independent of the UL data.

















