Certifying a Category 5 Cable Link

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Lab Summary

This lab uses a cable analyzer to certify a Cat 5 cable link.

Lab Goal

The goal of this lab is to use a cable analyzer and identify some of its features. The knowledge gained in performance of these test can also be applied to the testing of other cable types

Learning Objectives

1. Set up and use a cable analyzer to perform basic tests on a Cat 5 cable link. .
2. Print out a basic test report for a Cat 5 cable link.

Grading Criteria: This is left up to the instructor.

Time Required: 1 hour

Lab Preparation

- Read the WRE Wiring and Cabling Narrative Module.
- Read this document completely before you start on this experiment.
- Print out the laboratory experiment procedure that follows.
- Read the document: The Specification of Field Test Requirements for a Balanced Twisted-Pair Cabling System (Cat5e_Field_Test_Req.pdf)

Equipment and Materials

Each team of students will need the parts specified below.

Equipment	Quantity
Fluke Networks DSP-4000 Cable Analyzer	1
Fluke Networks DSP-4000SR Smart Remote	1
Fluke Networks DSP-LIA011 Basic Link Adapter for Cat 5e	2
Cat5e_Field_Test_Req.pdf file	1
ROOM108C14.pdf file	1
ROOM108C14.txt file	1
Windows XP computer with Fluke's LinkWare software installed	1
Cable link (an RJ45 wall connector which is routed to a patch panel)	1
Cable (9 pin, Female-to-Female)	1

Introduction

The Fluke DSP-4000 is a hand-held instrument used to certify, test, and troubleshoot coaxial and twisted pair cabling in local area network (LAN) installations. The DSP-4000 runs all critical tests automatically and contains diagnostic routines which helps identify and locate faults. This particular model stores at least 500 text-based test reports which can be sent to a host computer or directly to a serial printer. It includes an up-gradable stored library of common test standards and cable types. Custom configuration of test standards is also possible. The DSP-4000 also incorporates a "talk" feature which allows 2-way communication between the main and remote units over twisted pair cable or over fiber when using a Fiber Test Adapter.

The DSP-4000 Cable Analyzer works in conjunction with the DSP-4000SR Smart Remote. Both the analyzer and remote must use an adapter suited for the application. The interface adapters provide the correct connectors and interface circuitry for testing different types of LAN cables. The DSP-LIA011 Basic Link Adapter for Cat 5e is for primarily testing permanent cabling installed between the closet and the first wall outlet in the work area. The basic link may consists of up to 90 meters of cable, one connector at each end, and two test equipment patch cables of no more than 2 meters each. The DSP-LIA012 Channel Adapter for Cat 6 / Class E is for testing a channel which includes transition connectors and equipment patch cables added to a basic link segment. The channel is tested from end to end to verify the performance of all the components. A channel is defined as a basic link plus one extra transition connector at each end and up to 10 meters of equipment patch cables.

A channel with just one connector at each end is basically a link; however, the channel test standard should be used if the network equipment's patch cables are used to connect the test tool.

The DSP-4000 Cable Analyzer is able to monitor Ethernet traffic for collisions, jabber, peak traffic, and percentage of network utilization when used with the DSP-LIA013 adapter.

Take Some Pre-Cautions

To avoid disrupting network operation and to ensure maximum accuracy of test results:

- Never connect the test tool to an active network unless using the DSP-LIA013 adapter
- Never attempt to send data from a PC to the test tool while running a cable test
- Never operate portable transmitting devices during a cable test

Test List

The following is a list of tests commonly performed. The tests performed will vary according to the test standard selected.

- Headroom: Reports the worst-case margin for a parameter determined by the selected test standard
- Wire Map: Tests for opens, shorts, crossed pairs, reversed wires, and split pairs
- Resistance: Measures the loop resistance of each cable pair
- Length: Measures the length of un-terminated cables
- Propagation Delay: Measures the times taken for a signal to travel the length of each cable pair
- Delay Skew: Calculates the differences in propagation delays between the cable pairs
- Impedance: Measures the impedance of each cable pair

- NEXT and ELFEXT (Near-End and Equal Level Far-End Crosstalk): Tests twisted pair cabling for near-end crosstalk and equal level far-end crosstalk
- Attenuation: Measures the attenuation of each cable pair
- ACR (Attenuation to Crosstalk Ratio): Calculates the ratio of attenuation to crosstalk for all combinations of cable pairs
- RL (Return Loss): Measures signal loss due to signal reflections in the cabling
- PSNEXT (Power Sum NEXT): For each cable pair, PSNEXT is calculated as the sum of the NEXT from all other pairs
- PSELFEXT (Power Sum ELFEXT): For each cable pair, PSELFEXT is calculated using the sum of the FEXT from the other pairs
- PSACR (Power Sum ACR): For each cable pair, PSACR is calculated using the sum of the NEXT from the other pairs
- HDTDX (High-Definition Time Domain Crosstalk): Displays the locations where crosstalk occurs on the cabling under test
- HDTDR (High-Definition Time Domain Reflectometry): Reports the locations of signal reflections caused by impedance anomalies

The SINGLE TEST mode provides access to the individual tests defined by the selected test standard. This mode also allows access to the HDTDR and HDTDX analyzer tests.

AUTOTEST performs all of the tests necessary to qualify the cabling under test.

Test Results

The test results are listed with the overall result for each test. A more detailed test result is also available by selecting the results for a particular test. When an Autotest is complete, the display shows the overall result (pass or fail) and the headroom value. Headroom is the smallest difference found between the NEXT measurements and their limits. This number serves as a figure of merit that reflects the overall performance of the link. Larger headroom values correspond to better cabling performance.

Worst margin and worst value results are shown for frequency-dependent tests such as NEXT, RL, ELFEXT, and ACR. Worst margin results are measurements that came closest to the limit, or that exceeded the limit by the greatest amount. Worst value results are the lowest measurements found which may not necessarily come closest to the limit.

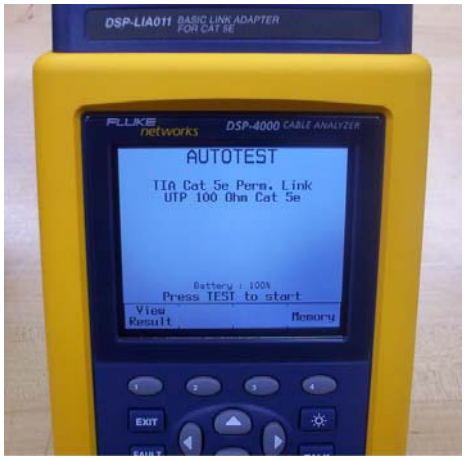
Lab Procedure

1. Attach a DSP-LIA011 Basic Link Adapter to the DSP-4000 Cable Analyzer and another DSP-LIA011 Basic Link Adapter to the DSP-4000SR Smart Remote.

2. Turn the Smart Remote "on" and connect it to the wall connector. See the following picture.

3. Turn the rotary switch on the Cable Analyzer to AUTOTEST.

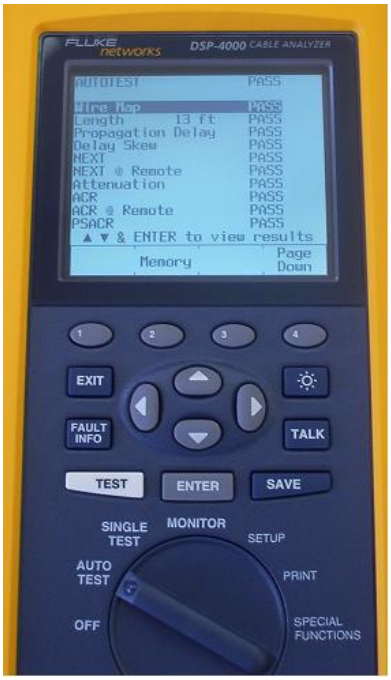
4. Verify that the settings displayed are correct. It should read: TIA Cat 5e Permanent Link. See the following picture. If a change is needed, use the SETUP mode.



5. Connect the Cable Analyzer to other end of the link, which in the following picture is a patch panel.

6. Press the TEST button to start the Autotest. If the attached link interface adapter does not support the requested test/s, an incompatibility message will be displayed on the cable analyzer.

7. When an Autotest is complete, the overall results will be displayed. See the following picture to the left. Detailed results and plots can be viewed by highlighting the desired test and pressing the ENTER button. See the pictures to the right side.



8. If a cable link fails any of the tests, the fault should be corrected and the link retested.

9. When an Autotest is complete, save the results by pressing the SAVE button. Use the alphanumeric display to enter a cable identification for the report; then press SAVE again. In the sample test, the results were saved as ROOM108/C14.

10. Connect the Cable Analyzer to the Windows XP computer using the 9-pin female-to-female RS232 cable.

11. Run the LinkWare software and import the date contained in the file you named in Step 9. With LinkWare, you can upload reports to the PC for viewing and printing. The overall result printed on a report can be a pass or fail, or warning.
    a. A failure of any test required by the selected test standard produces a fail result on the report summary.
    b. If required by the selected standard, a warning appears on reports for twisted pair cabling if a length, impedance, propagation delay, or delay skew test produced a warning. The warning means that the measurement exceeds its limit, but the test standard does not fail the cabling based on that measurement.

12. Save your report as a PDF or TXT file using LinkWare. Also, print your report and submit it to your instructor. A sample report can be viewed by opening either ROOM108C14.pdf or ROOM108C14.txt .