FLUKE networks

AxTalk Analyzer™

Users Manual

July 2006

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Chapter 1: Getting Started

Introduction

The development of new standards and supporting guidelines for 10 Gig Ethernet cabling has created additional requirements for testing alien crosstalk, a critical test parameter for certifying that installed twisted pair cabling meets IEEE 802.3 10GBASE-T requirements. Alien crosstalk is noise, or crosstalk, between from adjacent data cables within a cable bundle.

AxTalk Analyzer™ software, along with the DTX-1800 CableAnalyzer, is an effective tool for testing the impact of both near-end and far-end alien crosstalk on disturbed links and for testing and identifying disturber links within a cable bundle. It supports a range of IEEE 802.3 10GBASE-T and Augmented Category 6 cabling test standards and supporting guidelines. AxTalk Analyzer calculates and presents in graphical format the power sum impact of alien crosstalk from multiple disturber links on the disturbed link. From AxTalk Analyzer, users can also generate test reports and save test data.

Registering AxTalk Analyzer

Registering your product with Fluke Networks gives you access to valuable information on product updates, troubleshooting tips, and other support services. To register, fill out the online registration form on the Fluke Networks website at **www.flukenetworks.com/registration.**

Contacting Fluke Networks

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- Hong Kong: 852 2721-3228
- Japan: 03-3434-0510
- Korea: 82 2 539-6311
- Singapore: 65-6799-5566
- Taiwan: (886) 2-227-83199

Visit our website for a complete list of phone numbers.

Additional Resources

For more information about using LinkWare and the DTX-1800 CableAnalyzer, see:

- *LinkWare Getting Started Guide* and help.
- *DTX Series CableAnalyzer Users Manua*l

For additional information about 10 Gig Ethernet technology and testing, see the Fluke Networks website: **www.flukenetworks.com**.

Safety Information

For important safety information regarding the use of the DTX-1800 CableAnalyzer, see the *DTX Series CableAnalyzer Users Manual.*

Features

AxTalk Analyzer is a powerful tool for verifying that installed twisted pair cabling meets the requirements for IEEE 802.3 10GBASE-T specifications. Key features include:

- Ability to import LinkWare link test records that include data up to 500 MHz that can be used for alien crosstalk computations and analysis.
- Test limit support for IEEE 802.3 10GBASE-T standard requirements and TIA TSB-155 and ISO TR 24750 supporting guidelines, as well as requirements for Augmented Category 6 cabling in Addendum#10 for TIA-568-B2 and ISO/IEC 11801, 1st amendment to 2nd revision.
- Software control of DTX-1800 to conduct power sum near end alien crosstalk (PS ANEXT) and power sum attenuated alien crosstalk - far end (PS AACR-F) tests.
- Graphical view of power sum alien crosstalk impact of disturber links, by individual wire-pair and overall averages, on a disturbed link. Useful for identifying cables that provide the most significant sources of alien crosstalk.
- PASS/FAIL assessments on alien crosstalk tests. Assessments include alien crosstalk average margin calculations.
- Ability to save test data in the compressed data .alien file format.
- Printable reports.
- Interface language and documentation available in English, French, German, Spanish, and Japanese.

System Requirements

Hardware Requirements

The DTX-1800 CableAnalyzer with its accessories, including a USB cord and contents of the DTX-1800 AxTalk Analyzer Kit are required for alien crosstalk testing.

The DTX-1800 AxTalk Analyzer Kit includes:

- AxTalk Analyzer software CD
- Installation Guide
- 2 DTX-AXTK1 Alien Crosstalk Modules for communication between main and remote DTX units during testing
- 2 DTX-PLA002 Cat 6A / Class E_A Permanent Link adapters
- 2 DTX-CHA001A Cat 6 / Class E Channel adapters
- 4 terminated plugs
- 4 Universal Adapters

In addition, two Ethernet patch cords are required to connect the main and remote DTX units during alien crosstalk testing.

For information about available accessories, see "Options and Accessories" on page 4-6.

PC Requirements

PC hardware requirements for AxTalk Analyzer include:

- 1 GHz Pentium® microprocessor system
- 256 MB of RAM
- Windows® 98, 2000, ME, or XP
- Monitor with 1024x768 resolution (16 bit color or higher recommended)
- USB port for connectivity with the DTX-1800 CableAnalyzer

A laptop computer is suggested for portability at the test site.

Software Requirements

Software requirements for alien crosstalk testing include:

- LinkWare version 2.5 or later installed on PC
- DTX-1800 software version 1.31 or later
- AxTalk Analyzer version 2.0 or later

Installing and Updating Software

To prepare for alien crosstalk testing, first update LinkWare software. Then install DTX software updates from the LinkWare program. You can download LinkWare, DTX-1800, AxTalk Analyzer software updates from the Fluke Networks website Technical Support area.

www.flukenetworks.com

Updating LinkWare

Before installing AxTalk Analyzer, update LinkWare software to version 2.5 or later. Download LinkWare release versions from the Fluke Networks website Technical Support area.

Updating DTX Software

To update DTX software:

1. Connect the DTX main and remote units using the channel adapters connected by a patch cable or other suitable link.
2. Connect the DTX to the PC using its USB cord.
3. Download updated DTX firmware from the Fluke Networks website Technical Support area and install this using LinkWare software.
4. Open LinkWare and check the DTX software version by selecting **Utilities > DTX CableAnalyzer > Software Version**.

Installing AxTalk Analyzer

To install AxTalk Analyzer:

1. Install the AxTalk Analyzer CD in your computer's CD drive.
2. When the setup window is displayed, click **Next** to begin installation.
3. Follow the steps to install the software.

Check the Fluke Networks website Technical Support area for software version updates.

Conducting Link Tests

To conduct alien crosstalk tests, you must first use the DTX-1800 to conduct link tests on all cables in the bundle under test. The link test certifies that individual links can support the data rates needed for IEEE 802.3 10GBASE-T communication. It also provides the Insertion Loss data required to properly calculate the Pass/Fail limits for PS ANEXT and PS AACR-F.

Link tests include the following measurements:

- Wire Map
- Resistance
- Length
- Propagation Delay
- Delay Skew
- Insertion Loss
- Return Loss
- NEXT
- PSNEXT
- ELFEXT
- PSELFEXT

When conducting link tests for alien crosstalk testing, select a test limit option that includes measured data up to 500 MHz. Link test options and their compatible test limit options in AxTalk Analyzer are listed in Table 1-1. (For the latest revisions of test limits, see the Fluke Networks website: **www.flukenetworks.com**.)

- Match tests for internal channel performance with alien crosstalk testing using a channel test requirement.
- Match tests for internal permanent link performance with alien crosstalk testing using a permanent link test requirement.

Also keep in mind that the names you assign for tested links are used in AxTalk Analyzer.

To perform link tests:

1. Connect the main and remote DTX-1800 units to opposite ends of a cable in the bundle under test. Use permanent link adapters when connecting directly to patch panel or wall outlets and use channel adapters when connecting to patch cables.
2. On the main unit, under SETUP, select Twisted Pair and select a test limit that supports a frequency up to 500 MHz (such as TSB-155, TR 24750, TIA Augmented Cat 6, or ISO Augmented Class E).
3. Under SETUP, select Instrument Settings and set the Store Plot Data to either Standard or Extended.
4. Turn the rotary switch to AUTO TEST and press TEST.
5. Save the test.
6. Perform AUTOTESTS on all links in the installation, and save the tests in the DTX-1800. After completing all link tests, these tests are uploaded to the PC using LinkWare software.

For more information about using the DTX, see the *DTX Series CableAnalyzer Users Manual*.

Table 1-1. Corresponding Test Options for DTX Internal Parameters and AxTalk Analyzer

Type	DTX Twisted Pair Test Limit	Compatible AxTalk Analyzer Test Options
Standard	10GBASE-T Ch Cl E 0-55m	IEEE802.3 10GBASE-T Ch TIA TSB-155 Ch dr 4.0 ISO TR 24750 Ch 25N1182 TIA Cat 6A Ch dr 4.0 ISO Class Ea Ch 25N1173
	10GBASE-T Ch Cl E 55-100m	
	10GBASE-T Ch Cl F 0-100m	
Guideline	TIA TSB-155 Ch dr 4.0 0-55m	
	TIA TSB-155 Ch dr 4.0 55-100m	
	ISO TR 24750 Ch 25N1182 0-55m	
	ISO TR 24750 Ch 25N1182 55-100m	
	TIA TSB-155 PL dr 4.0 0-45m	These standards do not contain power sum alien crosstalk limits.
	TIA TSB-155 PL dr 4.0 45-90m	
	ISO TR 24750 PL 25N1182 0-55m	
	ISO TR 24750 PL 25N1182 55-100m	
Standard	TIA AugCat 6 Ch dr 4.0	IEEE802.3 10GBASE-T Ch TIA TSB-155 Ch dr 4.0 ISO TR 24750 Ch 25N1182 TIA Cat 6A Ch dr 4.0 ISO Class Ea Ch 25N1173
	ISO Class Ea Channel	
	ISO11801 Channel Class F	
Standard	TIA AugCat 6 PL dr 4.0	TIA AugCat 6 PL dr 4.0

Saving Test Results in LinkWare

Once you have completed in-channel link testing on all cables in the bundle, open the LinkWare program, import the test results, and save these in an .flw file. For information about merging test records from separate .flw files, see the LinkWare help.

To create an .flw file of link test results:

1 Connect the DTX-1800 main unit to the PC using the USB cord.

2 Open LinkWare.

3 Select **File** > **Import from** > **DTX CableAnalyzer**.

4 Select records to import or click **Import All Records**.

5 Select **File** > **Save** or **Save As** and save the LinkWare file

6 Exit LinkWare.

Chapter 2: Measuring Power Sum Alien Crosstalk

Once you have gathered link data on cables in the bundle under test and saved these in a LinkWare Database (.flw) file, you can use the AxTalk Analyzer program to measure power sum alien crosstalk on a selected disturbed link.

Power sum alien crosstalk is the combined impact of the alien crosstalk of cables in the bundle (disturber links) upon the cable under test (the disturbed or "victim" link).

Planning Alien Crosstalk Testing

The following steps are recommended to prepare for alien crosstalk testing:

1 Refer to a quality plan agreed on by the cabling installer and user on what the exact alien crosstalk measurement requirements are or use guidelines provided by cabling standards committees (see Table 2-1). Use LinkWare results to identify disturbed links.

2 For each selected disturbed link, determine which links are in the same cable bundle or have adjacent connection positions on the patch panels used by the disturbed link. Include all links that meet these criteria in an alien crosstalk measurement.

3 Review any unusual cabling routing, such as cable bundles splitting apart and then recombining with other cables.

4 Measure from the location of the disturbed link where most cables terminate in one place. Usually this is the patch panel in the floor distributor or the equipment room. Measuring in the opposite direction accounts for another alien crosstalk test (another of the 6 or 10 disturber links to be selected).

For a disturbed link, each data record may contain:

- The PS ANEXT as measured from End 1.
- The PS AACR-F as measured from End 1.
- The PS ANEXT as measured from End 2.
- The PS AACR-F as measured from End 2.

5 Verify that no other cables are in contact with the selected disturbed cable over a significant distance. If you are unsure whether contact between two cables contributes significant alien crosstalk, from the AxTalk Analyzer user interface, you can observe whether all, some, or no wire pair combinations have significant alien crosstalk. You can also observe the degradation of the alien crosstalk average test margin after adding the alien crosstalk of the disturber links. For more information, see "Viewing Significance Details" on page 3-4.

6 Repeat measurements for each selected disturbed link beginning at Step 2.

Names of the tested links are used in AxTalk Analyzer.

Table 2-1. Minimum Alien Crosstalk Test Recommendations

Standard Body	Minimum Test Recommendation
TIA	At least 6 links with the highest insertion loss.
IEC	At least 10 links with the highest insertion loss.

Selecting a Disturbed Link

In AxTalk Analyzer, you use a LinkWare Database file as the basis for selecting disturbed links and conducting PS ANEXT and PS AACR-F disturber tests on these links. For tips on selecting disturbed links, see "Planning Alien Crosstalk Testing" on page 2-1.

To select a disturbed link from a LinkWare Database file:

1 Open AxTalk Analyzer. From the Windows **Start** menu, select **Fluke Networks > AxTalk Analyzer**.

2 Select **File > New**. Click **OK**.

3 In the Open Reference LinkWare Project dialog, select a LinkWare Database (.flw) project file.

4 In the dialog, select a disturbed link.

5 In the User Settings dialog, enter the company and operator name and click **OK**.

6 At the prompt to search for previous disturber data for the ID, for first time use, click **No**. If you have run tests with the selected link as a disturbed and want to access these, select **Yes**. For more information on performing a search, see "Searching for Disturbers" on page 2-10.

The disturbed link is displayed in AxTalk Analyzer and its name is shown above the Disturber list. You can now select a test limit type and begin running PS ANEXT or PS AACR-F disturber tests on the disturbed link.

Specifying a Test Limit Type

When you create a new disturbed link, you need to specify a test limit.

To specify a test limit, in AxTalk Analyzer, from the **Test Limit** menu select the test limit used to perform initial internal link parameter tests. Table 2-2 lists the available test limits. For information about how these relate to link tests, see Table 1-1 on page 1-6. (For the latest revisions of test limits, see the Fluke Networks website: **www.flukenetworks.com**.)

Table 2-2. Test Limits

Type	Description
IEEE802.3 10GBASE-T Ch	IEEE 802.3an committee standard to provide 10 Gigabit per second communication over twisted pair cables.
TIA TSB-155 Ch dr 4.0	TIA draft guideline to enable existing twisted pair cabling to be verified to run IEEE 802.3 10GBASE-T.
ISO TR 24750 Ch 25N1182	ISO draft guideline to enable existing twisted pair cabling to be verified to run IEEE 802.3 10GBASE-T.
TIA Cat 6A Ch dr 4.0	TIA draft standard for Augmented Category 6 twisted pair cabling meeting specifications defined in TIA 586.B2.1 draft amendment 10, for use in new installations.
ISO Class Ea Ch 25N1173	ISO draft standard for Augmented Class Ea twisted pair cabling for use in new installations.
TIA Cat 6A PL dr 4.0	TIA draft standard for Augmented Category 6 twisted pair cabling meeting specifications defined in TIA 586.B2.1 draft amendment 10, for use in new installations.

Setting up the DTX-1800

To prepare the DTX-1800 for alien crosstalk testing:

1. Remove the plastic enclosure (or any existing modules) from the module bay of the DTX-1800 main and remote units. Insert one Alien Crosstalk Module adapter in the module bay of the DTX main unit and the other adapter in the module bay of the DTX remote unit.

2. Connect the DTX main unit to the PC's USB port using the USB cable.

3. Connect the Alien Crosstalk Module ports of the DTX main and remote units using a standard patch cable. For specific test setup, see "Running the PS ANEXT Disturber Test" on page 2-4 and "Running the PS AACR-F Disturber Test" on page 2-6.

Setting the Termination Check Type

When you run a disturber test, the DTX-1800 checks for the presence of a termination at the far ends of the disturbed and disturber links.

To set the termination check option, select **Options > Termination Check** and select:

- **Resistance** to perform a d.c. loop resistance measurement. In most cases, leave this default setting.
- **Return Loss** only if a.c. coupling is used in the link (and no d.c. path exists), such as when a mid-span power supply is used in Power Over Ethernet applications.

Running the PS ANEXT Disturber Test

The PS ANEXT disturber test is a measure of the unwanted signal coupling from a near-end transmitter into a wire-pair in another cable measured at the same end. All 16 wire-pair combinations for alien NEXT between two cabling links are measured over the frequency range from 1 through 500 MHz.

Figure 2-1 shows the PS ANEXT test setup.

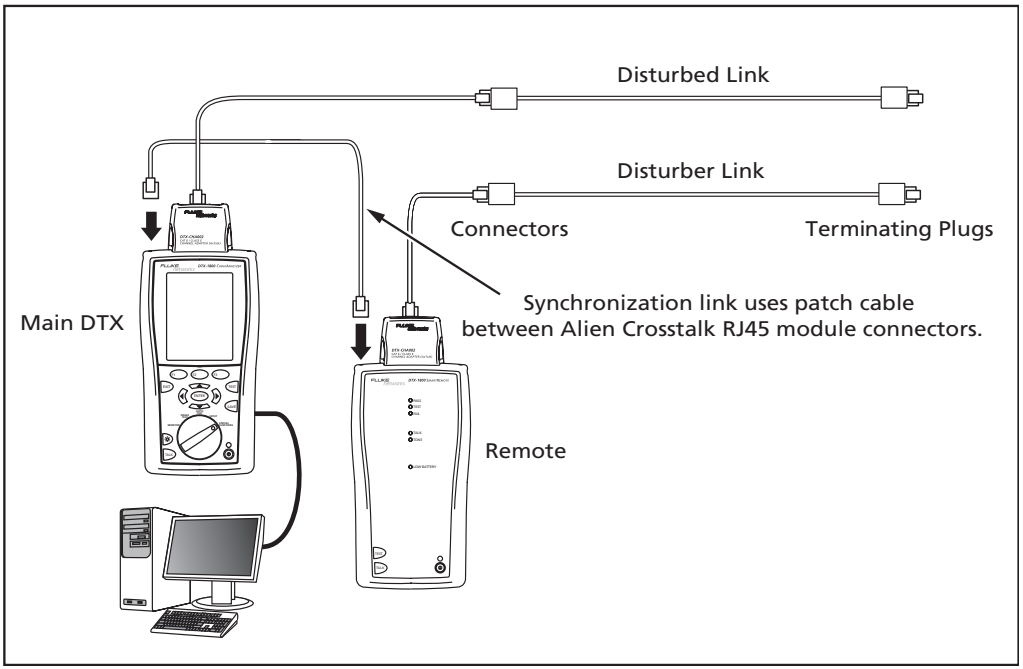

Figure 2-1. PS ANEXT Test Setup

To run a PS ANEXT disturber test on a selected disturbed link:

1 From the AxTalk Analyzer user interface, select **PS ANEXT**.

2 Select **End 1** or **End 2**. End 1 is typically assigned to the location of the patch panel in the floor distributor or the equipment room.

3 Click **Run Disturber Test**.

4 On your first use of AxTalk Analyzer and once daily afterward, you are prompted to manually synchronize testers by running a Set Reference test on the DTX-1800 CableAnalyzer. Connect the DTX main and remote units using the Permanent Link adapter. On the main unit, turn the rotary switch to SPECIAL FUNCTIONS and select Set Reference. For more information, see the *DTX Series CableAnalyzer Users Manual*.

5 Once the units are synchronized, click **OK**.

6 In the PS ANEXT Disturber Link Test dialog, select any disturber from the list of possible disturbers within the cable bundle and links that have positions on patch panels that are adjacent to the position of the disturbed link. Click **Next**. The Run Disturber Test window is displayed (see Figure 2-2).

7 Set up the DTX for alien crosstalk testing (see Figure 2-1):

   a Connect the DTX main unit to the disturbed link and the remote unit to the disturber link using channel or permanent link adapters.

   b Connect the Alien Crosstalk Module ports on the main and remote DTX units using a patch cable.

   c Terminate the far ends of the disturbed and disturber link with terminating plugs included in the DTX-1800 AxTalk Analyzer Kit.

   d Connect the DTX main unit to the PC's USB port using the USB cable.

8 In the Run Disturber Test window, click **Next**. The measurement begins. By default, the DTX performs a d.c. loop resistance measurement to check remote terminations. (see "Setting the Termination Check Type" on page 2-4). If you have connectivity problems, see "Troubleshooting Connectivity" on page 2-10.

   The newly acquired pair-to-pair alien crosstalk data is added to any previously accumulated power sum alien crosstalk data. The Disturber List displays the disturber link name and a marked check box. To exclude the results of this disturber from the overall power sum result, clear its box. To delete the disturber, select it and right-click. Select **Delete Disturber Test**.

9 To add a second disturber link, click **Run Disturber Test** again. At the prompt, connect the remote unit to another disturber link and select **Next**. If you select a previously measured disturber, data is overwritten.

Repeat this process until you have measured all disturbers that you want to include in an overall power sum result for this disturbed link.

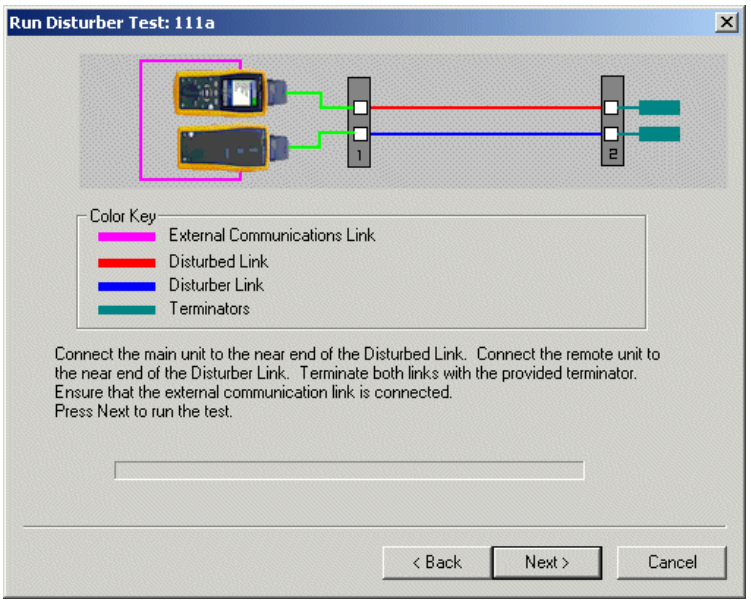

Figure 2-2. Run PS ANEXT Disturber Test

Running the PS AACR-F Disturber Test

The PS AACR-F test is a measure of the unwanted signal coupling from a transmitter at the near-end into a neighboring cable measured at the far-end. All 16 wire-pair combinations for attenuated far end alien crosstalk between two cabling links are measured over the frequency range from 1 through 500 MHz.

To run a PS AACR-F disturber test on a selected disturbed link:

1 From the AxTalk Analyzer user interface, select **PS AACR-F**.

2 Select **End 1** or **End 2**. End 1 is typically assigned to the location of the patch panel in the floor distributor or the equipment room.

3 Click **Run Disturber Test**.

4 On your first use of AxTalk Analyzer and once daily afterward, you are prompted to manually synchronize testers by running a Set Reference test on the DTX-1800 CableAnalyzer. Connect the DTX main and remote units using the Permanent Link adapter. On the main unit, turn the rotary switch to SPECIAL FUNCTIONS and select Set Reference. For more information, see the *DTX Series CableAnalyzer Users Manual*.

5 Once the units are synchronized, click **OK**.

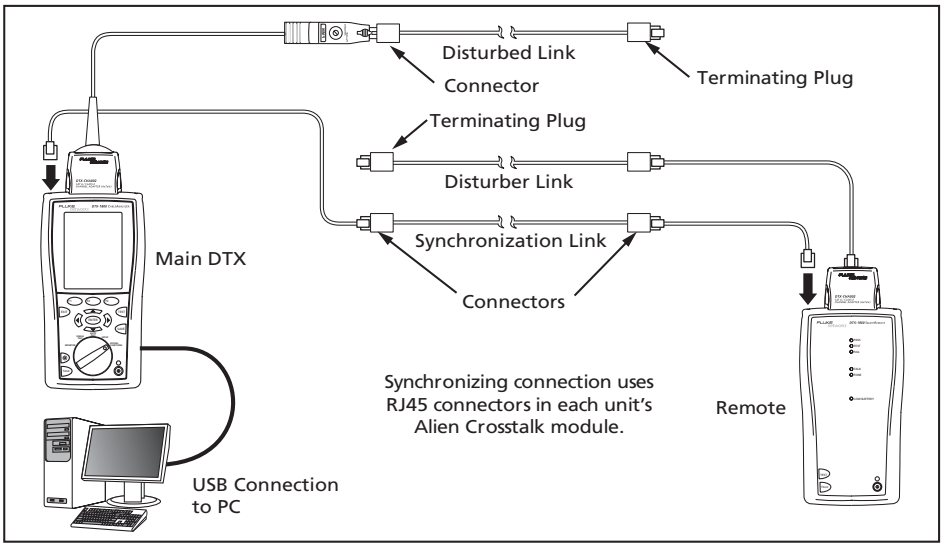

Figure 2-3. PS AACR-F Test Setup Using Separate Communication Link—Channel or Permanent Link

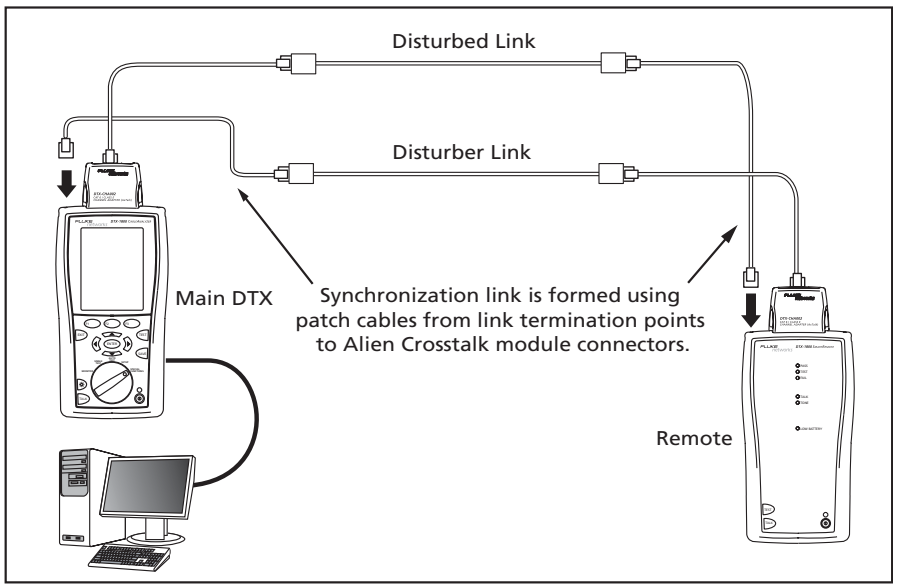

Figure 2-4. PS AACR-F Test Setup Without Separate Communication Link—Channel Only

6 In the PS AACR-F Disturber Link Test dialog, select any disturber from the list of possible disturbers within the cable bundle and links that have positions on patch panels that are adjacent to the position of the disturbed link. Click **Next**. The Run Disturber Test window is displayed (see Figure 2-5).

7 Two test setups are possible:

To set up the PS AACR-F with a separate synchronization link, for permanent link or channel adapters (see Figure 2-3):

a Connect the DTX main unit to one end of the disturbed link using a permanent link adapter or, if you are using a channel adapter, a patch cable.

b Connect the remote unit to the opposite end of a disturber link in the same bundle.

c Connect a termination plug at the far end of each cable under test.

d Use a separate link in the bundle as a synchronization path between the DTX units. Connect the units using the RJ-45 ports in the Alien Crosstalk modules.

To set up the PS AACR-F without a separate synchronization link, for channel adapters only (see Figure 2-4):

a Connect the DTX main unit to one end of the disturbed link using a patch cable. At the far end of the link, connect a patch cable from the disturbed link to the remote unit's Alien Crosstalk module.

b Connect the remote unit to the opposite end of a disturber link in the same bundle. At the far end of the disturber link, connect a patch cable from the link to the main unit's Alien Crosstalk module.

c Select **Options > Termination Check > Return Loss**.

8 In the Run Disturber Test window, click **Next**. The measurement begins. The DTX performs a remote termination check (see "Setting the Termination Check Type" on page 2-4). If you have connectivity problems, see "Troubleshooting Connectivity" on page 2-10.

The newly acquired pair-to-pair alien crosstalk data is added to any previously accumulated power sum alien crosstalk data. The Disturber List displays the disturber link name and a marked check box. To exclude the results of this disturber from the overall power sum result, clear its box. To delete the disturber, select it and right-click. Select **Delete Disturber Test**.

9 To add a second disturber link, click **Run Disturber Test** again. At the prompt, connect the remote unit to another disturber link and select **Next**. If you select a previously measured disturber, data is overwritten.

Repeat this process until you have measured all disturbers that you want to include in an overall power sum result for this disturber link.

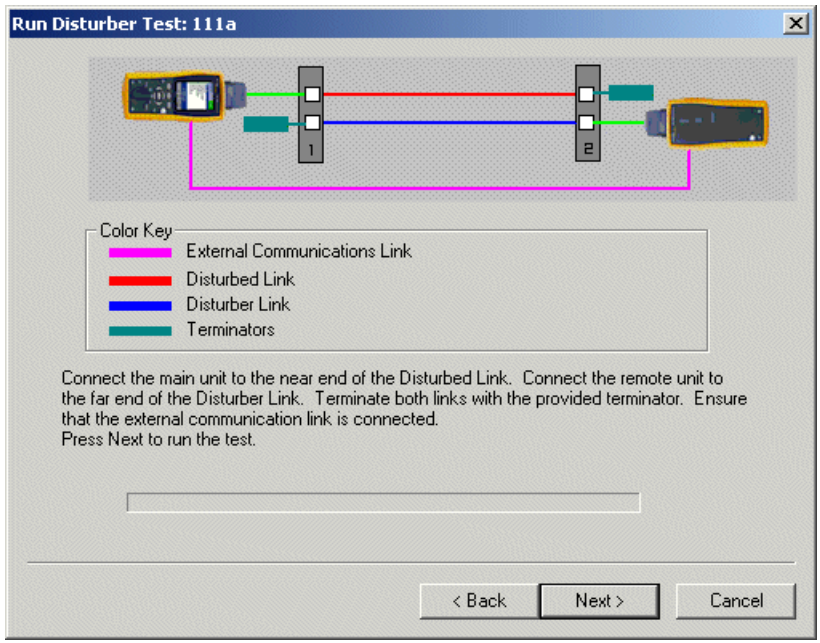

Figure 2-5. Run PS AACR-F Disturber Test

Troubleshooting Connectivity

AxTalk Analyzer provides warning messages when connectivity problems occur and the DTX-1800 main unit may show additional information to help you diagnose problems.

Common problems that can block measurement include:

- A termination error. On the DTX main unit, select SINGLE TEST and then DC resistance or Return loss and press TEST. The display provides information on the connectivity that was found. Disregard any Pass/Fail indication on the DTX-1800. The measured d.c. resistance must be between 75 Ω and 125 Ω. The return loss at 10 MHz must be greater than 15 dB.
- The terminating plugs are not connected properly or are placed on wrong outlets. Apply the plugs based on your PS ANEXT or PS AACR-F test scenario.
- The main unit is not referenced properly to the remote unit. Perform a Set Reference test.
- The connection between main and remote units' Alien Crosstalk Module ports was not established or a wrong adapter may be connected to the DTX. Make sure that the units are connected according to PS ANEXT or PS AACR-F test setup requirements.
- The USB interface is not ready. Disconnect and re-connect the USB cable to the DTX main unit and the PC, and make sure that the DTX beeps.

Searching for Disturbers

You can find existing disturber alien crosstalk results that may have been previously accumulated.

Performing a search for existing disturbers can eliminate the need to retest links previously tested. After having conducted a full suite of alien crosstalk tests for one disturbed link in a bundle, when testing the next disturbed link you can use the search feature to find existing link tests that apply to the link under test.

For example, the PS ANEXT results of disturbed link #0 include the impact of disturber link #1 from End 1. When you select link #1 as the disturbed link from the same End 1, you can find the pair-to-pair ANEXT data from link #0 as the disturber from the previous measurements.

To search for disturbers:

1 Select **Data > Search for Disturbers**.

2 From the Browse for Folder dialog, select a folder which contains data files pertaining to other disturbed links in the same LinkWare Database (.flw) file.

   - For PS ANEXT tests, search for pair-to-pair ANEXT data taken from the same end.
   - For PS AACR-F tests, search for pair-to-pair AFEXT data taken from the opposite end.

Chapter 3: Viewing and Managing Tests

Once you have run the power sum alien crosstalk tests on disturbers, you can analyze individual and power sum alien crosstalk impact on disturbed links.

View Alien Crosstalk Test Data

The AxTalk Analyzer user interface includes important information about the alien crosstalk tests run and a number of options for viewing graph data (see Figure 3-1).

- **Limit**: Directly beneath the Fluke Networks logo, the test limit type selected from the Test Limit menu is displayed. For more information, see "Specifying a Test Limit Type" on page 2-3
- **IL @ 250 MHz**: The measured average value of the insertion loss (IL) of all wire pairs of the disturbed link at 250 MHz is shown in decibels.
- **Limit** (checkbox): The limit applicable to individual wire pairs is displayed by default. The limit is indicated by a red line in the graph.
- **Average Limit**: The limit applicable to the average of all wire pairs is displayed by default. This is stricter than the individual wire-pair limit. The average limit is indicated by a gray line in the graph.
- **Pairs**: Select to view test results for the individual disturbed wire pairs 12, 36, 45, and 78.
- **Average**: Select to view the average test result for all wire pairs. The pair average is indicated by a purple line in the graph.
- **Overall Status PASS/FAIL indicator**: Overall status of the alien crosstalk tests on the disturbed link, including alien crosstalk average margin tests.This may not appear until both PS ANEXT and PS AACR-F data are available for the disturbed link.
- **Test Type PASS/FAIL indicator**: Status of the selected test type, PS ANEXT or PS AACR-F.
- **End**: End 1 and End 2 are used to identify opposite ends of the same link. End 1 is typically assigned to the location of the patch panel in the floor distributor or the equipment room.
- **Cable ID**: The name of the disturbed link.
- **Significance Detail**: Find out whether a newly selected disturber adds a significant amount of alien crosstalk to the overall result. See "Viewing Significance Details" on page 4.
- **Graph coordinates indicator**: Use the mouse to locate specific points of interest on the graph and view the magnitude and frequency coordinates.

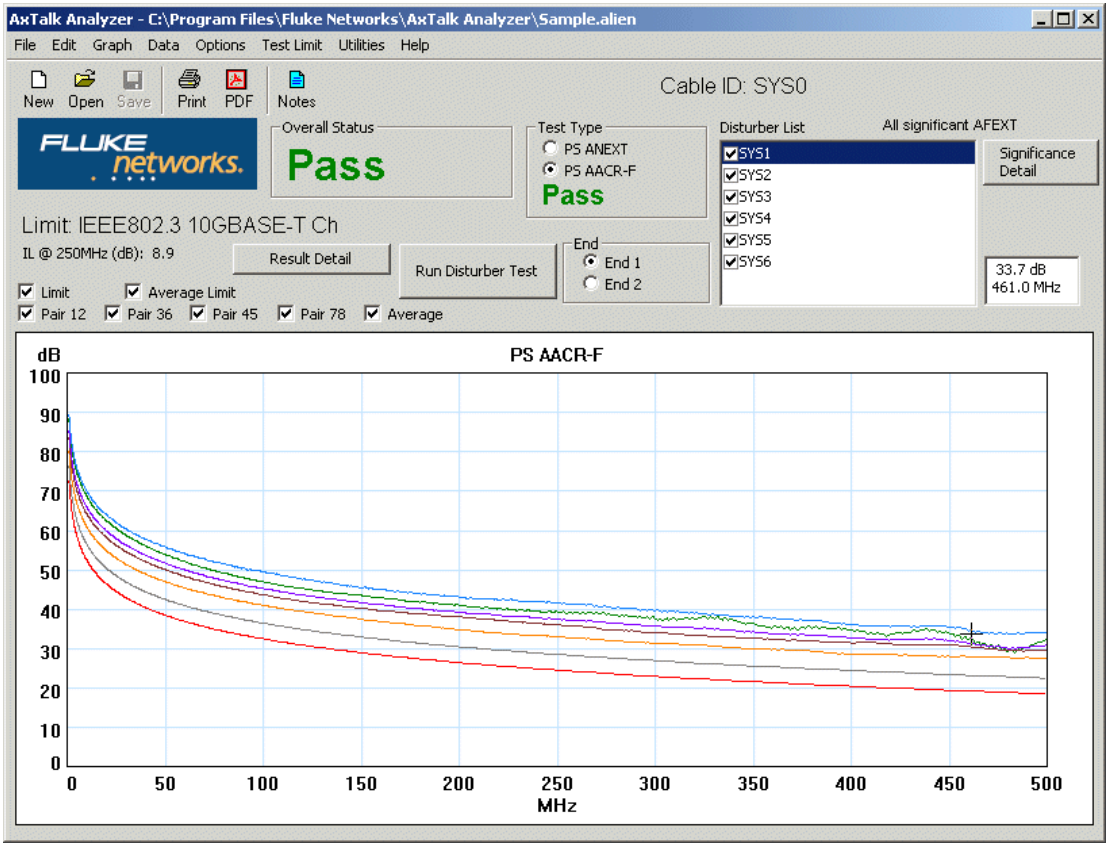

Figure 3-1. AxTalk Analyzer Interface—Disturbed Link Selected

Viewing Overall Result Details

From AxTalk Analyzer, click **Result Detail** to access a report of all pass/fail conditions for each wire pair for both PS ANEXT and PS AACR-F tests and the overall test status.

For each wire pair (and the overall average), the insertion loss, constant, value, limit, and alien crosstalk average margin are given in decibels. Frequency is given in MHz, and the status is displayed as Pass or Fail. The overall status is displayed in the lower right along with company and operator name (entered in User Settings), limit, link type, and date and time.

For IEEE 802.3 10GBASE-T, TIA TSB-155, and ISO TR 24750 test limit types, limits are calculated from the measured insertion loss of the disturbed link. The evaluation contains three sets of pass/fail conditions:

- PS ANEXT for all four wire pairs and the average of the wire pairs.
- PS AACR-F for all four wire pairs and the average of the wire pairs.
- The alien crosstalk average margin for all four wire pairs and the average of wire pairs.

For these test limit types, alien crosstalk average margin computations may cause overall alien crosstalk measurements to pass, even if a particular PS ANEXT or PS AACR-F test or set of tests fail. Note the following:

- If PS ANEXT and PS AACR-F pass, then the alien crosstalk average margin will always pass. If either PS ANEXT or PS AACR-F fail but the alien crosstalk average margin result passes, the overall result is a PASS.
- It is easier to pass the alien crosstalk average margin condition (where the combination of PS ANEXT and PS AFEXT is evaluated rather than a separate evaluation of PS ANEXT and PS AACR-F).

For Augmented Category 6 cabling standards, alien crosstalk average margin calculations are not displayed. Any failure of PS ANEXT or PS AACR-F tests will result in an overall failure.

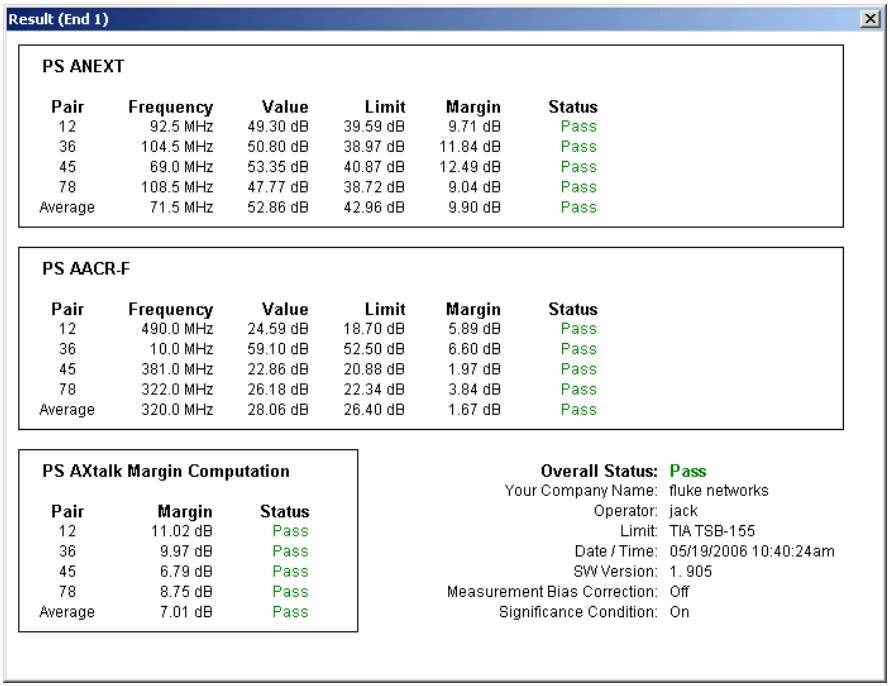

Figure 3-2. Result Details

Viewing Significance Details

From the AxTalk Analyzer user interface, you can quickly assess the impact an individual disturber has on the overall power sum alien crosstalk result.

If you have few disturbers included in the overall power sum alien crosstalk result, adding another disturber has a noticeable impact on the power sum alien crosstalk. If you have a large number of disturbers, the added alien crosstalk from another disturber may not be noticeable.

Select a disturber from the Disturber List to view its significance assessment. One of three messages is displayed:

- **Green**: "No significant ANEXT" or "No significant AFEXT." None of the selected pair's average data was below the significance condition. All data was considered random signals.
- **Blue**: "Some significant ANEXT" or "Some significant AFEXT." Some of the selected pair's average data was below the significance condition and included in the power sum calculation. Some of the data was considered random signal.
- **Black**: "All significant ANEXT" or "All significant AFEXT." All of the selected pair's average data was below the significance condition and included in the power sum calculation.

Click **Significance Detail** to view more information about the significance condition for the disturber link (see Figure 3-3). The significance threshold is 91.0 dB. For more information, see "Pass/Fail Limits and Margin Calculations" on page 4-1.

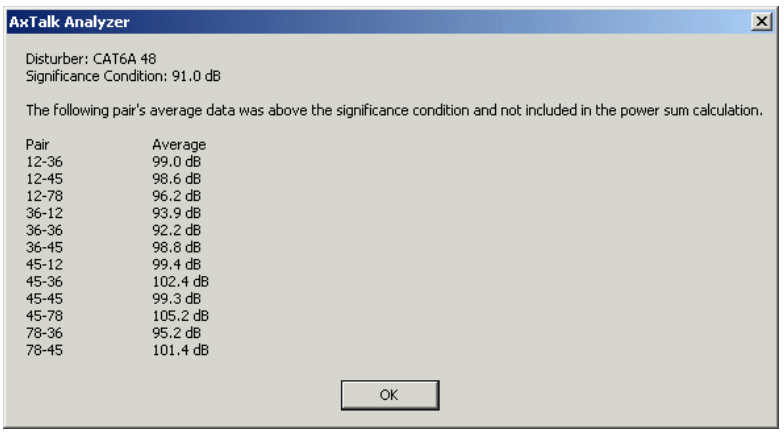

Figure 3-3. Result for No Significant ANEXT

Modifying Graph Views

You can modify the magnitude and frequency range displayed in the AxTalk Analyzer graph and specify color settings for wire-pairs.

Setting the Magnitude Range

The magnitude range is displayed in decibels in the vertical axis of the AxTalk Analyzer graph.

To set the magnitude, select **Graph > Range**. Options are: **60 dB**, **80 dB**, **100 dB**, **120 dB** or **140 dB**. The default is **100 dB**.

Setting the Maximum Frequency

The maximum frequency is displayed in megahertz (MHz) in the horizontal axis of the AxTalk Analyzer graph.

To set the maximum frequency, select **Graph > Max. Frequency**. Options are: **500 MHz** (the default setting) or **800 MHz**.

Viewing by Log Frequency

By default, frequency is displayed on a linear scale up to the maximum frequency (500 or 800 MHz) on the graph's horizontal axis. You can also view the results graph with the frequency displayed on a log scale.

To view the graph based on logarithmic frequency, select **Graph > Log Frequency**.

Viewing by Negative dB

By default, signal magnitude is displayed on a positive scale on the graph's vertical axis.

To view magnitude by a negative decibel range, select **Graph > Negative dB**.

Specifying Wire Pair Colors

You can specify the color code used for displaying individual wire pair responses in the AxTalk Analyzer graph. The color of the line on the results graph will correspond to the color of the wire pair based on the selected pair assignment.

To specify the pair assignment color code, select **Graph > Color Code**. Options are **T568A** (the default setting) or **T568B**. For details, see Table 3-1.

Table 3-1. Color Options

Color	WP 12	WP 36	WP 45	WP 78
T568A	Green (pair 3)	Orange (pair 2)	Blue (pair 1)	Brown (pair 4)
T568B	Orange (pair 2)	Green (pair 3)	Blue (pair 1)	Brown (pair 4)

Customizing the User Interface Display

You can customize how information is displayed in the AxTalk Analyzer user interface and the language settings for the interface, documentation, and reports.

Specifying Display Options

You can specify the date, time, and number formats displayed in the AxTalk Analyzer user interface, Result Details window, and in reports.

To set display options, select **Options** > **Display Options**.

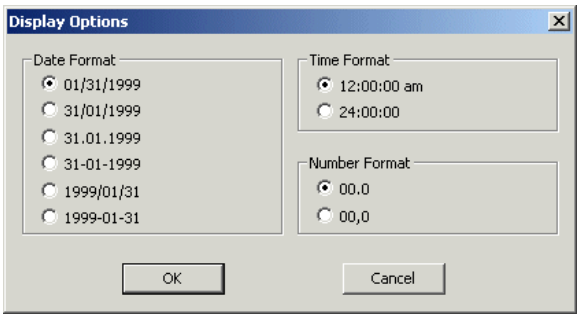

Figure 3-4. Display Options

Specifying the Language

You can change the language displayed in the AxTalk Analyzer user interface, reports, and user documentation.

To select the language, select **Options** > **Language**. Options include **English**, **French**, **German**, **Spanish**, and **Japanese**.

Using Measurement Bias Correction

By default, the measurement bias correction is active on test results in AxTalk Analyzer. In most cases, these settings will accurately indicate the impact of the level of random noise on the disturbed link. Under certain extreme test conditions, however, you may consider updating the measurement bias correction setting. For more information, see "Updating the Measurement Bias Correction" on page 4-2.

Managing Test Information

You can apply user setting information, add notes to a test, and edit the test name.

Applying User Settings

You can apply user settings, which include the company and operator name, that will be stored with the Alien Test Data (*.alien) file.

To specify user settings, select **Options > User Settings**.

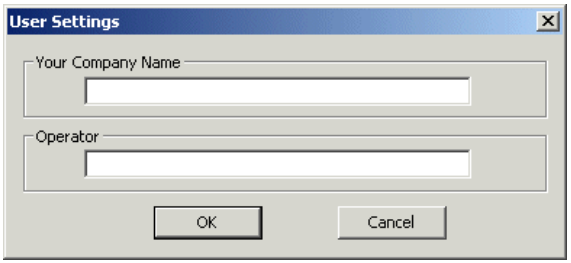

Figure 3-5. User Settings

Adding Notes to a Test

To add notes to an open test file, select **Edit > Notes** or click the **Notes** tool button.

Editing a Tested Link ID

To change the name of a disturbed link, select **Edit > Edit ID of Tested Link**.

Deleting a Disturber Test

To delete a disturber test from the Disturber List, select the disturber and click **Delete Disturber Test**. Click **OK**.

Saving Alien Crosstalk Test Results

When you have measured all disturbers that you want to include in an overall power sum result for the disturbed link, you can save the results as an .alien file. All data, including the raw pair-to-pair alien crosstalk data, is saved in this highly compressed format. Alien crosstalk data for each disturbed link has its own data file.

Note

Save alien crosstalk data regularly while adding new data to a disturbed link.

To save test results using the default file name, select **File > Save**. AxTalk Analyzer checks for previously obtained power sum alien crosstalk data when the power sum alien crosstalk to a different disturbed link is measured. You can always add additional alien crosstalk data to previously saved disturbed results by opening the applicable disturbed file.

To save test results using a new file name, select **File > Save As**.

Exporting Test Data

From AxTalk Analyzer, you can export test data to Excel, save to .csv and .pdf formats, print the graph directly, and generate a summary report of all or selected power sum alien crosstalk tests.

Export functions are useful for analyzing the complex alien crosstalk data in detail.

Exporting Disturbed Insertion Loss Data to Excel

You can export insertion loss data on the disturbed link to Microsoft Excel by selecting **Data > Disturbed IL to Excel**.

The spreadsheet displays insertion loss in decibels for each wire pair and the wire-pair average for frequency levels between 1 and 500 MHz.

Exporting Alien Crosstalk Results to Excel

To export alien crosstalk test results for a selected disturber to Microsoft Excel:

1 Select a disturber from the Disturber List.

2 From the **Data** menu, select:

- **ANEXT to Exce**l if the PS ANEXT test type is selected.
- **AFEXT to Excel** if the PS AACR-F test type is selected.

The spreadsheet displays ANEXT or AFEXT in decibels for the 16 pair-to-pair combinations between the disturber and disturbed link for frequency levels between 1 and 500 MHz.

Exporting Power Sum Alien Crosstalk Results to Excel

To export power sum alien crosstalk test results to Microsoft Excel from the **Data** menu, select:

- **PS ANEXT to Excel** if the PS ANEXT test type is selected.
- **PS AACR-F to Excel** if the PS AACR-F test type is selected.

The spreadsheet displays information for the tests with the worst margin results and the average of these, including the status (PASS or FAIL), wire pair, frequency, value, limit, and margin. It also displays the PS ANEXT or PS AACR-F in decibels for the limit, the average limit, each wire pair (12, 36, 45, and 78) and the wire-pair average for frequency levels between 1 and 500 MHz.

Saving Alien Crosstalk results to CSV

You can save alien crosstalk test results to a .csv file by selecting items in the **Data** menu. Options depend on the selected test type:

- For PS ANEXT, you can save ANEXT and PS ANEXT results to .csv.
- For PS AACR-F, you can save AFEXT and PS AACR-F results to .csv.

Saving Test Results to PDF

You can save results to a .pdf file that includes the overall test status, PS ANEXT and PS AACR-F graphs and detailed pass/fail summaries, and alien crosstalk average margin computations when applicable.

To save to a .pdf file, select **File > PDF**.

Printing Test Results

Printed test results include the overall test status, PS ANEXT and PS AACR-F graphs and detailed pass/fail summaries, and alien crosstalk average margin computations when applicable.

To print test information, select **File > Print**.

To modify printer settings before printing, select **File > Print Setup**.

Generating a Summary Report

You can generate a report on all or selected alien crosstalk tests. This report includes: the cable ID, the date and time, test limit type, link type, and end 1 and end 2 status (Pass or Fail).

To create a report, select **Utilities > Summary Report**. From the Summary Report dialog, you can select tests to include, print the report directly, or open the report as a .pdf file.

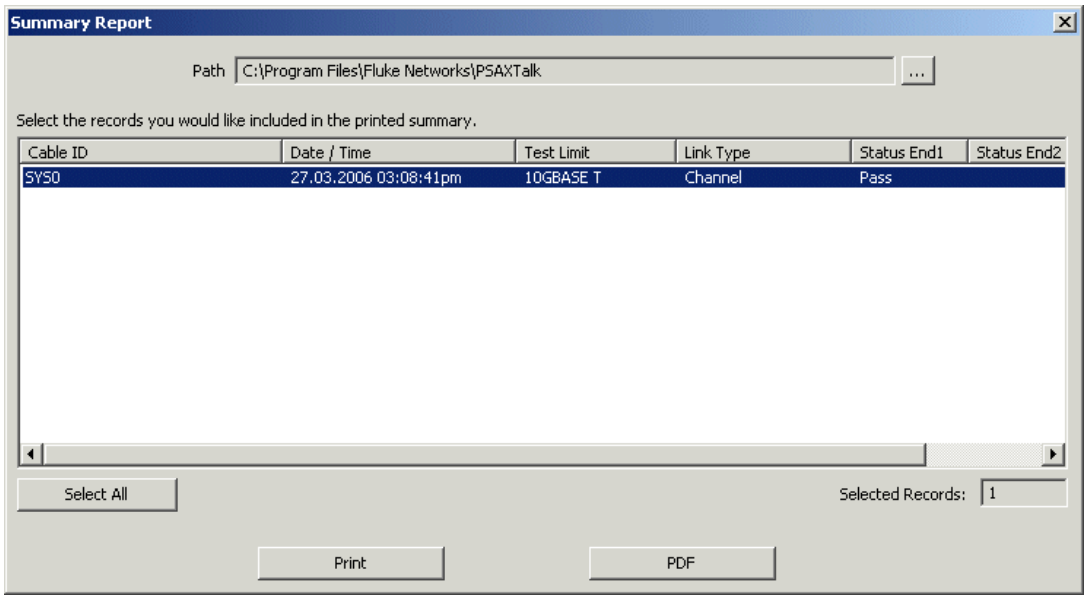

Figure 3-6. Summary Report

Chapter 4: References

This chapter includes information on pass/fail limits and alien crosstalk average margin calculations, measurement bias correction settings, alien crosstalk requirements, and options and accessories.

Pass/Fail Limits and Margin Calculations

The IEEE 802.3 10GBASE-T standard specifies:

- A limit for both PS ANEXT and PS AACR-F, which depends on the insertion loss @ 250 MHz of the disturbed link.
- A pass/fail condition, which can be used if neither the PS ANEXT or PS AACR-F condition is met. This pass/fail condition uses the combined PS ANEXT and PS AACR-F computed results and the combined pass/fail limits for PS ANEXT and PS AACR-F in addition to the insertion loss of the disturbed link (extracted from the LinkWare data file).

All pass/fail conditions for PS ANEXT, PS AACR-F, and combined PS ANEXT and PS AACR-F are applied to each wire pair and to the average value of all four wire pairs. The average PS ANEXT requirement of all wire pairs is 2.25 dB tighter than for each wire pair. The average PS AACR-F requirement of all wire pairs is 4 dB tighter than for each wire pair. These stricter requirements are also included in the combined average power sum alien crosstalk condition.

When evaluating PS ANEXT and PS AACR-F, the worst case conditions of computed PS ANEXT or PS AACR-F responses must exceed the limit. By contrast, the combined PS ANEXT and PS AACR-F evaluation uses the computation of the alien crosstalk average margin relative to the combined pass/fail limit. This average margin must be greater than 0 dB for each individual wire pair and the average of all four wire pairs to pass. Therefore, in some frequencies the combined PS ANEXT and PS AACR-F may permissibly drop below the combined PS ANEXT and PS AACR-F limit line.

PS AACR-F exhibits a continuous frequency response which is close to 20 dB/decade downward slope. PS ANEXT responses can be more erratic. Research has indicated that the “average over frequency” response is approximately 2.5 dB better than the worst case values.

Augmented cabling standards contain requirements for PS ANEXT for each wire pair and PS ANEXT for the average of all wire pairs, as well as PS AACR-F for each wire pair and PS AACR-F for the average of all wire pairs. In augmented cabling there is no provision for the alien crosstalk average margin computation.

Updating the Measurement Bias Correction

By default, measurement bias correction settings are active on test results in AxTalk Analyzer. The bias correction file contains settings to ensure maximum accuracy when large numbers of individual measurements are included in the power sums.

In most cases, the measurement bias correction settings will accurately indicate the impact of random noise on the disturbed link. In the following extreme conditions, however, you may consider updating these settings;

- the number of disturbers is 48 or more, and;
- the length of the disturbed link is 90 to 100m, and;
- the measurement floor of the testing device is near nominal.

Under such conditions, a substantial build-up of random noise may occur in a PS ANEXT or PS AACR-F result. By characterizing this noise for a large number of readings, the random noise from the measurement system can be accurately predicted for any number of disturber readings in an overall power sum result. You can maximize the rejection of random noise by creating a bias correction file customized for your DTX-1800.

To update the measurement bias:

1. Connect one terminating plug to the channel adapter of the DTX main unit and connect the other terminating plug to the channel adapter of the DTX remote unit.

2. Connect the main and remote units via their communication path.

3. Select **Utilities > Update Bias Corrections**. (See Figure 4-1.)

4. Click **Start**.

AxTalk Analyzer will collect 100 individual measurements to characterize the noise floor of the DTX-1800, and store a new custom bias correction file. To restore the original default bias correction, select **Utilities > Restore Default Bias**.

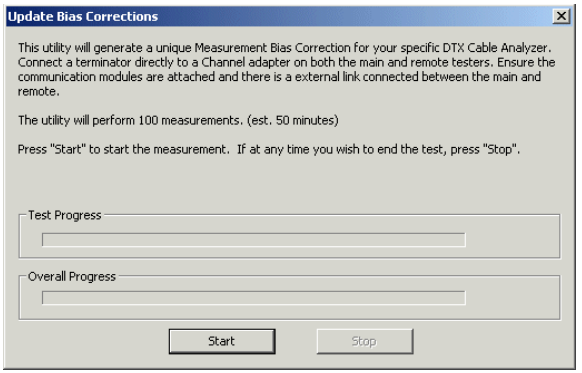

Figure 4-1. Update Bias Corrections

Alien Crosstalk Requirements

The following sections provide alien crosstalk requirements. Only sample limits are shown in this section, since computed results and limits often depend on the insertion loss properties of all links. For detailed requirements, see the applicable standards, guidelines, and documentation on the Fluke Networks web site: **www.flukenetworks.com**.

Channel Requirements at 55 Meters

Table 4-1 contains the channel alien crosstalk requirements for IEEE 802.3 10GBASE-T, TIA TSB-155, and ISO TR 24750 at 55 meters.

Table 4-1. Test Limit Requirements for PS ANEXT and PS AACR-F Testing at 55 Meters

Frequency	PS ANEXT		PS AACR-F		Avg. Margin
	Each Wire Pair (dB)	Wire Pair Avg.	Each Wire Pair (dB)	Wire Pair Avg.	Each Wire Pair and Avg. of all
1	67.0	67.0	65.7	65.7	>0 dB
4	61.0	63.2	61.6	64.6	
8	58.0	60.2	55.6	59.6	
10	57.0	59.2.	53.7	57.7	
16	55.0	57.2	49.6	53.6	
20	54.0	56.2	47.4	51.7	
25	53.0	55.3	45.7	49.7	
31.25	52.1	54.3	43.8	47.8	
62.5	49.0	51.3	37.8	41.8	
100	47.0	49.2	33.7	37.7	
200	42.5	44.7	27.7	31.7	
250	41.0	43.3	25.7	29.7	
350	38.8	41.1	22.8	26.8	
500	36.5	38.8	19.7	23.7	

1. PS ANEXT and PS AACR-F limits are dependent on the insertion loss of the disturbed channel.
2. Normalization corrections apply when disturbed and disturber links differ in length.
3. Power back-off corrections apply when disturbed and disturber links differ in length. Corrections apply to the average limits for the purpose of average alien crosstalk margin computations.

Channel Requirements at 100 Meters

Table 4-2 contains the channel alien crosstalk requirements for IEEE 802.3 10GBASE-T, TIA TSB-155, and ISO TR 24750 at 100 meters.

Table 4-2. Test Limit Requirements for In-Channel and ANEXT Testing at 100 Meters

Frequency	PS ANEXT		PS AACR-F		Avg. Margin
	Each Wire Pair (dB)	Wire Pair Avg.	Each Wire Pair (dB)	Wire Pair Avg.	Each Wire Pair and Avg. of all
1	65.7	65.7	64.7	64.7	>0 dB
4	64.6	64.6	62.8	62.8	
8	59.6	63.6	59.8	61.1	
10	57.7	61.7	57.9	60.4	
16	53.6	57.6	53.8	57.8	
20	51.7	55.7	51.9	55.7	
25	49.7	53.7	49.9	53.9	
31.25	47.8	51.8	48.0	52.0	
62.5	41.8	45.8	42.0	46.0	
100	37.7	41.7	37.9	41.9	
200	31.7	35.7	31.9	35.3	
250	29.7	33.7	29.9	30.1	
350	26.8	30.8	20.4	20.4	
500	23.7	27.7	8.1	8.1	

1. PS ANEXT and PS AACR-F limits are dependent on the insertion loss of the disturbed channel.
2. Normalization corrections apply when disturbed and disturber links differ in length.
3. Power back-off corrections apply when disturbed and disturber links differ in length. Corrections apply to the average limits for the purpose of average alien crosstalk margin computations.

Channel and Permanent Link Requirements

Table 4-3 contains the channel and permanent link alien crosstalk requirements for TIA Addendum #10 to TIA/EIA-568-B.2 (Augmented Cat 6), and ISO/IEC 11801 1st revision to 2nd amendment (Augmented Class E).

Table 4-3. Channel and Permanent Link Alien Crosstalk Requirements for Augmented Cables

Frequency	PS ANEXT		PS AACR-F	
	Each Wire Pair (dB)	Wire Pair Avg.	Each Wire Pair (dB)	Wire Pair Avg.
1	67.0	67.0	64.8	64.8
4	67.0	67.0	62.9	62.9
8	67.0	67.0	58.9	61.3
10	67.0	67.0	57.0	60.6
16	67.0	67.0	52.9	56.9
20	66.9	67.0	50.9	54.9
25	66.0	67.0	49.0	53.0
31.25	65.0	67.0	47.1	51.1
62.5	62.0	64.2	41.0	45.0
100	59.9	62.2	37.0	41.0
200	55.4	57.7	30.9	34.9
250	54.0	56.2	29.0	32.2
350	51.8	54.0	23.3	23.3
500	49.5	51.7	12.2	12.2

1. PS ANEXT and PS AACR-F limits for Augmented Cabling are not dependent on the insertion loss of the disturbed or disturbing channels. However maximum values for PS AFEXT do affect whether pass/fail criteria apply. The PS AACR-F limits shown are for 100 m long disturbed links.

2. Corresponding permanent link requirements are 1.1 dB higher for PS ANEXT and 0.7 dB higher for PS AACR-F than shown in this table.

3. Normalization corrections apply when disturbed and disturber links differ in length.

Options and Accessories

Table 4-4 lists parts and accessories for alien crosstalk testing using the AxTalk Analyzer and DTX-1800 CableAnalyzer.

Table 4-4. AxTalk Analyzer Parts and Accessories

Model Number	Description
DTX-10GKIT	DTX-1800 Alien Crosstalk Analyzer Kit
DTX-AXTK1	Alien Crosstalk Modules (set of two) with AxTalk Analyzer™ software
DTX-PLA002S	Cat 6A/Class E_A Permanent Link Adapter - set of two
DTX-CHA002S	Cat 6/Class E Permanent Link Adapters (AXTalk) - set of two
DTX-AXTERM	Alien Crosstalk Link Terminators - set of four
DTX-PLA002	Cat 6A/Class E_A Permanent Link Adapter - replacement
DTX-CHA002	Cat 6/Class E Permanent Link Adapter (AXTalk) - replacement

Glossary

10GBASE-T Ch

IEEE 802.3an committee standard to provide 10 Gigabit/second communication over balance twisted pair cables.

AACR-F

Alien attenuation-to-crosstalk ratio, far end. The measure of the unwanted signal coupling from a transmitter at the near-end into a neighboring cable measured at the far-end relative to the received signal level measured on that same link.

ACR-F

Attenuation-to-crosstalk ratio, far end.

ACR-N

Attenuation-to-crosstalk ratio, near end.

AFEXT

Alien far end crosstalk.

ANEXT

Alien near end crosstalk.

Alien Crosstalk

Crosstalk noise from adjacent data cables. Alien crosstalk is the most significant noise source for 10GbE application when using unshielded twisted pair cabling.

Disturbed Link

Cable measured for the impact of alien crosstalk signal induced in each of its wire-pairs by other cables (disturber links) in the bundle. Also referred to as "victim" link.

Disturber Link

In alien crosstalk testing, a cable that induces alien crosstalk upon a disturbed link.

PS AACR-F

Power sum alien attenuation-to-crosstalk ratio, far end. The computation of the unwanted signal coupling from multiple transmitters at the near-end into a wire pair measured at the far-end, relative to the received signal level measured on the same wire-pair.

PS ACR-F

Power sum attenuation-to-crosstalk ratio, far end.

PS ACR-N

Power sum attenuation-to-crosstalk ratio, near end.

PS ANEXT

Power sum near end alien crosstalk. The combined impact of many wire-pairs near end alien crosstalk in the bundle (disturber links) upon the wire-pair under test (of the disturbed link).

PS AXtalk

Power sum alien crosstalk.

Index

Symbols

–A–

–C–

–D–

–F–