FLUKE networks

# DTX Series

CableAnalyzer™

## Technical Reference Handbook

April 2004

**LIMITED WARRANTY AND LIMITATION OF LIABILITY**

Each Fluke Networks product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is one year and begins on the date of purchase. Parts, accessories, product repairs and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke Networks authorized reseller, and does not apply to disposable batteries, cable connector tabs, cable insulation-displacement connectors, or to any product which, in Fluke Networks' opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke Networks warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke Networks does not warrant that software will be error free or operate without interruption.

Fluke Networks authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke Networks. Warranty support is available only if product is purchased through a Fluke Networks authorized sales outlet or Buyer has paid the applicable international price. Fluke Networks reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke Networks' warranty obligation is limited, at Fluke Networks' option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke Networks authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke Networks authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke Networks assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke Networks determines that failure was caused by neglect, misuse, contamination, alteration, accident or abnormal condition of operation or handling, or normal wear and tear of mechanical components, Fluke Networks will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE NETWORKS SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

6/01

Fluke Networks
PO Box 777
Everett, WA 98206-0777
USA

# *Table of Contents*

# *List of Tables*

# *List of Figures*

# Chapter 1
# Getting Acquainted

## Overview of Features

The DTX Series CableAnalyzers are rugged, hand-held instruments used to certify, troubleshoot, and document twisted pair and fiber cabling installations. The testers feature the following:

- The DTX-1800 certifies twisted pair cabling to Class F limits (600 MHz) in less than 45 seconds and Category 6 cabling in less than 12 seconds. Meets Level III and proposed Level IV accuracy requirements.
- The DTX-1200 certifies Category 6 twisted pair cabling in less than 12 seconds. The DTX-LT certifies Category 6 in less than 30 seconds. Both meet Level III and proposed Level IV accuracy requirements.
- Color display clearly indicates PASS/FAIL results.
- Automatic diagnostics report distance to and likely causes of common faults.
- Toner feature helps you locate jacks and automatically starts an Autotest upon tone detection.
- Optional fiber modules let you certify multimode and singlemode fiber optic cabling.
- Stores up to 250 Cat 6 Autotest results, including graphical data, in internal memory.
- The DTX-1800 and DTX-1200 store up to 500 Cat 6 Autotest results, including graphical data, on a 16 MB removable memory card.

- Runs for at least 12 hours on the rechargeable lithium ion battery pack.
- Smart remote with optional fiber module can be used with Fluke Networks OF-500 OptiFiber™ Certifying OTDR for loss/length certification.
- LinkWare™ software lets you upload test results to a PC to create professional-quality test reports. The LinkWare Stats option generates browsable, graphical reports of cable test statistics.

## Registration

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

*Note*

*If you contact Fluke Networks about your tester, have the tester's software and hardware version numbers available if possible.*

**www.flukenetworks.com**

**support@flukenetworks.com**

+1-425-446-4519

- Australia: 61 (2) 8850-3333 or 61 (3) 9329 0244
- Beijing: 86 (10) 6512-3435
- Brazil: 11 3044 1277
- Canada: 1-800-363-5853
- Europe: +44 1923 281 300
- Hong Kong: 852 2721-3228
- Japan: +81-3-3434-0181
- Korea: 82 2 539-6311
- Singapore: +65-6738-5655
- Taiwan: (886) 2-227-83199
- USA: 1-800-283-5853

Visit our website for a complete list of phone numbers.

## Additional Resources for Cable Testing Information

The Fluke Networks Knowledge Base answers common questions about Fluke Networks products and provides articles on cable testing techniques and technology.

To access the Knowledge Base, log on to **www.flukenetworks.com**, then click **knowledge base** at the top of the page.

The website **cabletesting.com** answers common questions about cable testing and provides articles on testing, documentation, and standards, and other reference information.

## Unpacking

The DTX Series CableAnalyzers and optional DTX-MFM and DTX-SFM fiber modules come with the accessories listed below. If something is damaged or missing, contact the place of purchase immediately.

### DTX-1800

- DTX-1800 CableAnalyzer with lithium-ion battery pack
- DTX-1800 Smart Remote with lithium-ion battery pack
- Two Cat 6/Class E permanent link adapters with personality modules
- Two Cat 6/Class E channel adapters
- Two headsets
- Carrying case
- Carrying strap
- 16 MB memory card
- USB cable for PC communications
- DTX RS-232 serial cable for PC communications
- Two ac adapters
- DTX Series CableAnalyzer Users Manual
- DTX Series CableAnalyzer Product CD
- LinkWare Software CD

### *DTX-1200*

- DTX-1200 CableAnalyzer with lithium-ion battery pack
- DTX-1200 Smart Remote with lithium-ion battery pack
- Two Cat 6/Class E permanent link adapters with personality modules
- Two Cat 6/Class E channel adapters
- Two headsets
- Carrying case
- Carrying strap
- USB cable for PC communications
- Two ac adapters
- DTX Series CableAnalyzer Users Manual
- DTX Series CableAnalyzer Product CD
- LinkWare Software CD

### *DTX-LT*

- DTX-LT CableAnalyzer with lithium-ion battery pack
- DTX-LT SmartRemote with lithium-ion battery pack
- Two Cat 6/Class E permanent link adapters with personality modules
- One Cat 6/Class E channel adapter
- Carrying strap
- USB cable for PC communications
- Two ac adapters
- DTX Series CableAnalyzer Users Manual
- DTX Series CableAnalyzer Product CD
- LinkWare Software CD

### *DTX-MFM Multimode Fiber Modules (optional)*

- Two DTX-MFM Fiber Modules for testing at 850 nm and 1300 nm
- Two SC/SC adapters
- Four 62.5 /125 μm multimode patch cords, 2 m, SC/SC
- Two 62.5 /125 μm multimode patch cords, 0.3 m, SC/SC
- Two gray mandrels for 62.5 /125 μm fiber with 3 mm jackets
- *DTX-MFM/SFM Fiber Modules Users Manual*
- DTX CableAnalyzer Product CD
- LinkWare Software CD

### *DTX-SFM Singlemode Fiber Modules (optional)*

- Two DTX-SFM Fiber Modules for testing at 1310 nm and 1550 nm.
- Two SC/SC adapters
- Four 9/125 μm singlemode patch cords, 2 m, SC/SC
- Two 9/125 μm singlemode patch cords, 0.3 m, SC/SC
- *DTX-MFM/SFM Fiber Modules Users Manual*
- DTX CableAnalyzer Product CD
- LinkWare Software CD

*Note*

*The patch cords provided are suitable for testing SC-terminated links. Other patch cords are required for other connector types or 50 /125 μm fiber. Many are available as accessories from Fluke Networks.*

# *Safety Information*

Table 1-1 shows the international electrical symbols used on the tester or in this manual.

**Table 1-1. International Electrical Symbols**

| | |
|---|---|
|  | Warning: Risk of fire, electric shock, or personal injury. |
|  | Warning or Caution: Risk of damage or destruction to equipment or software. See explanations in the manuals. |
|  | Do not connect this equipment to public communications networks, such as telephone systems. |
|  | Warning: Class 1 laser (OUTPUT port). Risk of eye damage from hazardous radiation.<br>Class 2 laser (VFL port). Do not stare into beam. |

**⚠⚠Warning**

**To avoid possible fire, electric shock, or personal injury:**

- **Do not open the case; no user-serviceable parts are inside.**
- **Do not modify the tester.**
- **Use only ac adapters approved by Fluke Networks for use with the DTX tester to charge the battery or power the tester.**
- **When servicing the tester, use only specified replacement parts.**
- **Do not use the tester if it is damaged. Inspect the tester before use.**
- **If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**
- **Never connect the tester to any telephony inputs, systems, or equipment, including ISDN. Doing so is a misapplication of this product, which can result in damage to the tester and create a potential shock hazard to the user.**

- **Always turn on the tester before connecting it to a cable. Turning the tester on activates the tool's input protection circuitry.**
- **Do not use the tester if it operates abnormally. Protection may be impaired.**

### ⚠Caution

**To avoid disrupting network operation, to avoid damaging the tester or cables under test, to avoid data loss, and to ensure maximum accuracy of test results:**

- **Never connect the tester to an active network. Doing so may disrupt network operation.**
- **Never attempt to insert any connector other than an 8-pin modular (RJ45) connector into an adapter's jack. Inserting other connectors, such as RJ11 (telephone) connectors, can permanently damage the jack.**
- **Never operate portable transmitting devices, such as walkie-talkies and cell phones, during a cable test. Doing so might cause erroneous test results.**
- **To ensure maximum accuracy of copper cable test results, perform the reference procedure as described under "Setting the Reference" every 30 days.**
- **The permanent link interface adapters may not perform properly or may be damaged if they are handled improperly. See pages 1-18 and 1-19 for important handling information.**
- **Turn off the tester before attaching or removing modules.**
- **Leave the module bay covers in place when the fiber modules are not installed. See page 1-10.**
- **Never remove the memory card while the memory card's LED is on. Doing so can corrupt the data on the card.**

### ⚠⚠ Warning: Class 1 and Class 2 Laser Products

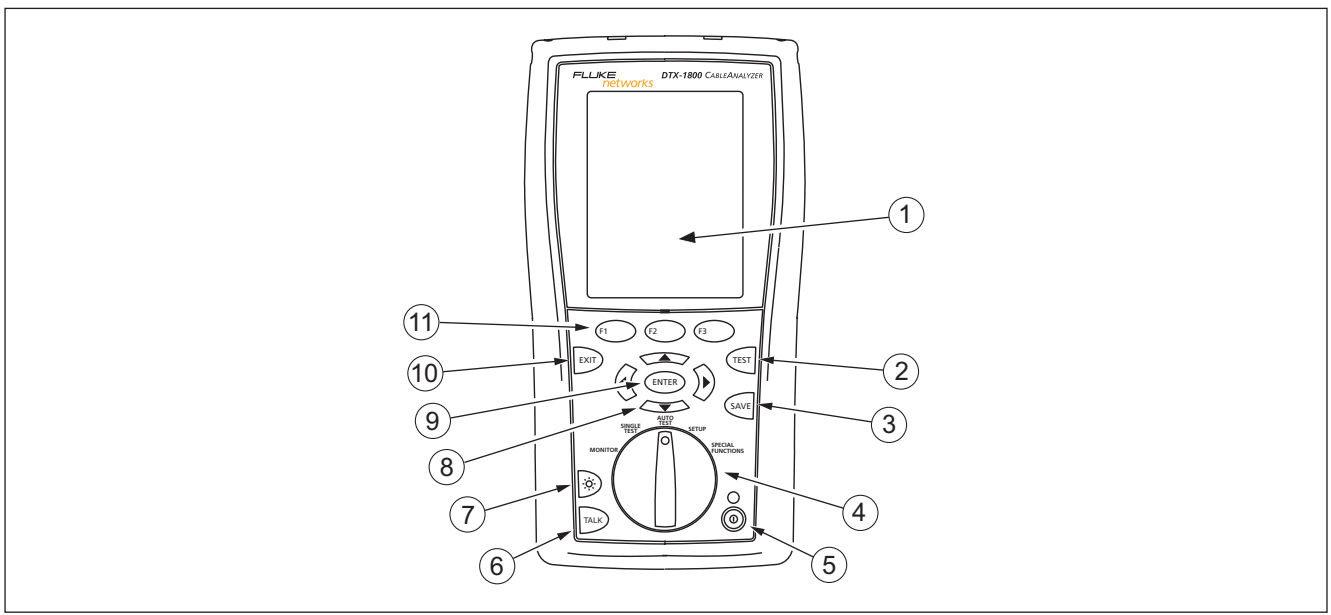
**To avoid possible eye damage caused by hazardous radiation, when using the fiber modules follow the safety guidelines given in Chapter 5 of this manual.**

# Basic Features

The following sections introduce the tester's basic features.

## Physical Features

Figures 1-1 and 1-2 describe the tester's features. Figure 1-3 describes the smart remote's features.




amd29f.eps

**Figure 1-1. Tester Front Panel Features**

① LCD display with backlight and adjustable brightness.

② TEST: Starts the currently selected test. Activates the tone generator for twisted pair cabling if no smart remote is detected. The test starts when both testers are connected.

③ SAVE: Saves Autotest results in memory.

④ Rotary switch selects the tester's modes.

⑤ ⏻: On/off key.

⑥ TALK: Press to use the headset to talk to the person at the other end of the link.

⑦ ☼: Press to turn the display backlight on or off. Hold for 1 second to adjust the display contrast.

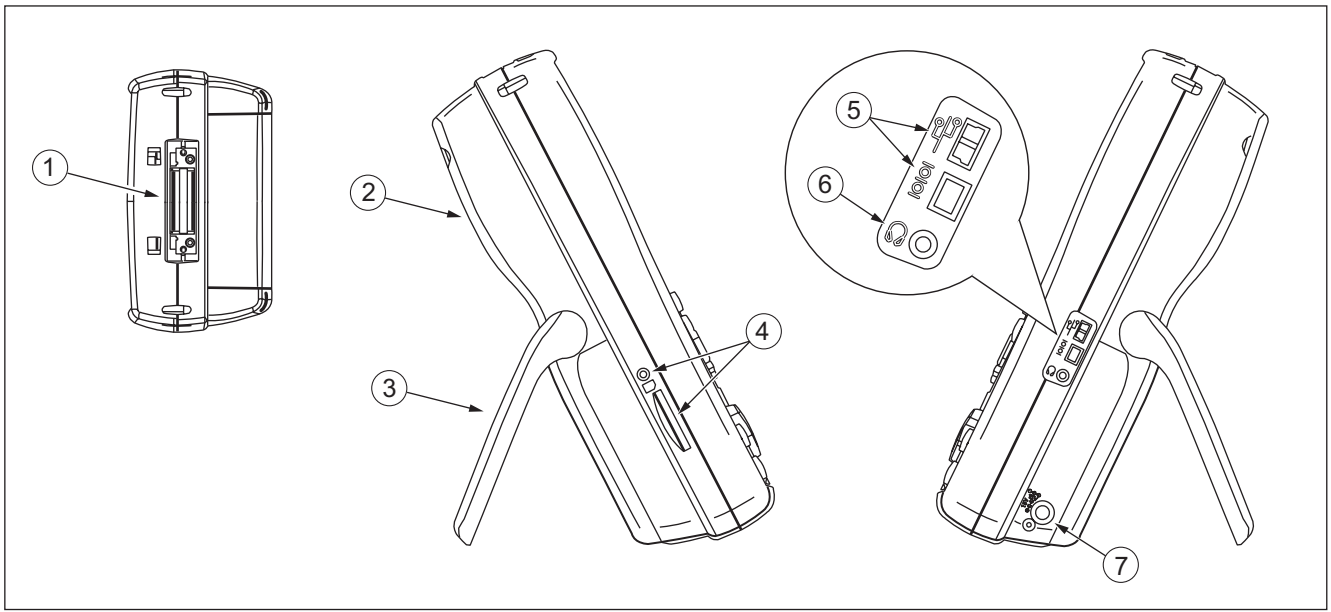
⑧ ◀ ▶ ▲ ▼: Arrow keys for navigating through screens and incrementing or decrementing alphanumeric values.

⑨ ENTER: Enter key selects the highlighted item from a menu.

⑩ EXIT: Exits the current screen without saving changes.

⑪ F1 F2 F3: The softkeys provide functions related to the current screen. The functions are shown on the screen above the keys.

**Figure 1-1. Tester Front Panel Features (cont.)**




amd33f.eps

**Figure 1-2. Tester Side and Top Panel Features**

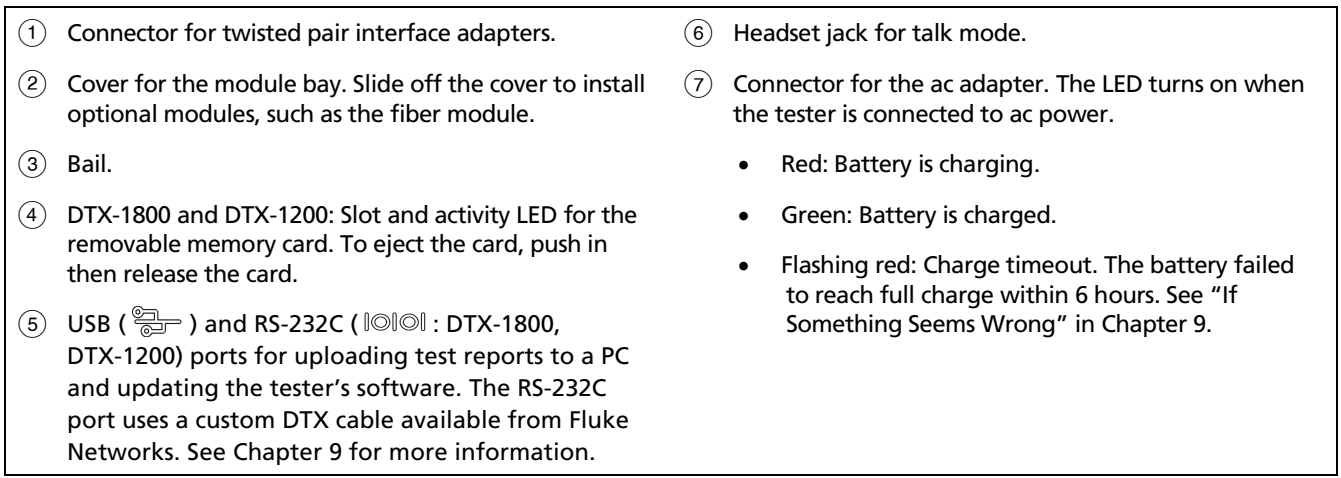
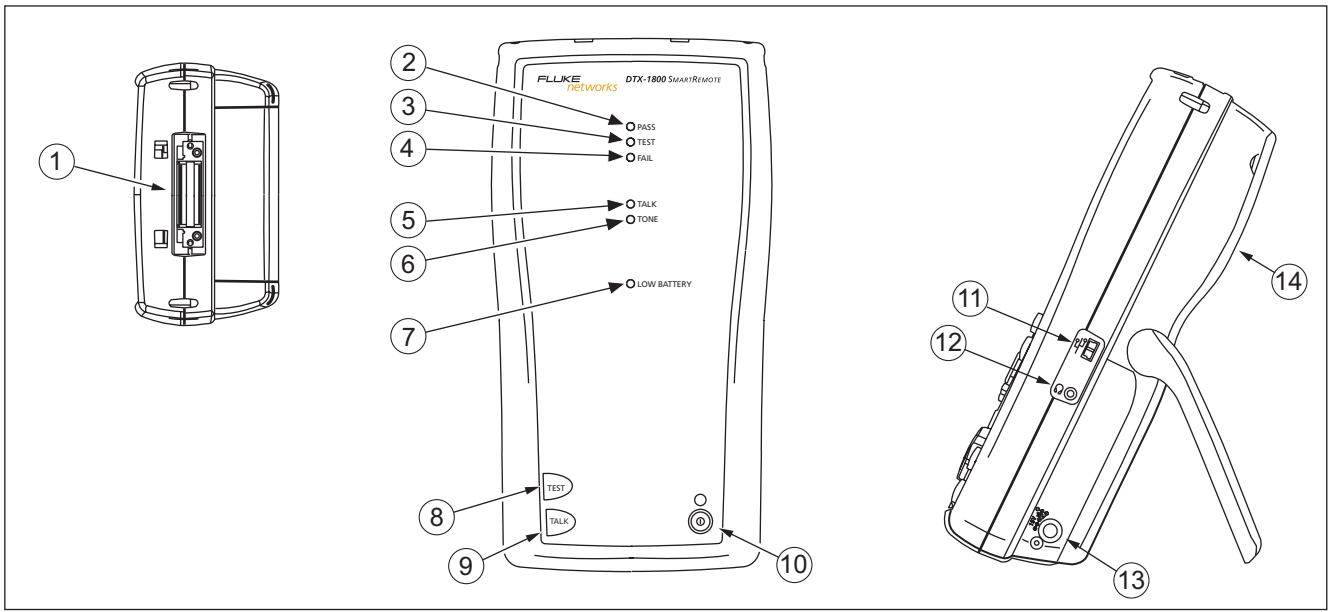



**Figure 1-2. Tester Side and Top Panel Features (cont.)**




amd30f.eps

**Figure 1-3. Smart Remote Features**

### Caution

**All the LEDs flash if the smart remote detects excessive voltage on the cable. Unplug the cable immediately if this occurs.**

*Note*

*The LEDs also act as a battery gauge. See Figure 1-5 on page 1-17.*

① Connector for twisted pair interface adapters.

② Pass LED lights when a test passes.

③ Test LED lights during cable tests.

④ Fail LED lights when a test fails.

⑤ Talk LED lights when the smart remote is in talk mode. Press TALK to adjust the volume.

⑥ Tone LED lights and the tone generator turns on when you press TEST, but the main tester is not connected.

⑦ Low battery LED lights when the battery is low.

⑧ TEST: Starts the test currently selected on the main unit. Activates the tone generator for twisted pair cabling if no main tester is detected. The test starts when both testers are connected.

⑨ TALK: Press to use the headset to talk to the person at the other end of the link. Press again to adjust the volume. Press and hold to exit talk mode.

⑩ ⏻: On/off key.

⑪ USB port for updating the tester's software with a PC.

⑫ Headset jack for talk mode.

⑬ Connector for the ac adapter, as described in Figure 1-2.

⑭ Cover for the module bay. Slide off the cover to install optional modules, such as the fiber module.

**Figure 1-3. Smart Remote Features (cont.)**

## *Changing the Language*

To change the tester's language:

1 Turn the rotary switch to **SETUP**.

2 Use ◁▽▷ to highlight **Instrument Settings** at the bottom of the list; then press ENTER.

3 Use ▷ and ◁▽▷ to find and highlight **Language** on tab **2** at the bottom of the list; then press ENTER.

4 Use ◁▽▷ to highlight the desired language; then press ENTER.

## *Powering the Tester*

**⚠Warning**

**Read the safety information at the beginning of Chapter 2 before using the tester.**

You can power the tester with the ac adapter included or with the removable lithium ion battery pack.

If the tester does not turn on, refer to "If Something Seems Wrong" in Chapter 9.

### Charging the Battery

- To charge the battery, connect the ac adapter to the battery pack, as shown in Figure 1-4.
- You may charge the battery when it is attached or detached from the tester. Figure 1-4 shows how to remove the battery.
- The battery charges fully in about 4 hours with the tester off. A fully-charged battery lasts for at least 12 hours of typical use.

  *Note*

  *The battery will not charge at temperatures outside of 0 °C to 45 °C (32 °F to 113 °F). The battery charges at a reduced rate between 40 °C and 45 °C (104 °F and 113 °F).*

- If the battery LED flashes red or the tester will not turn on, see "If Something Seems Wrong" in Chapter 9.

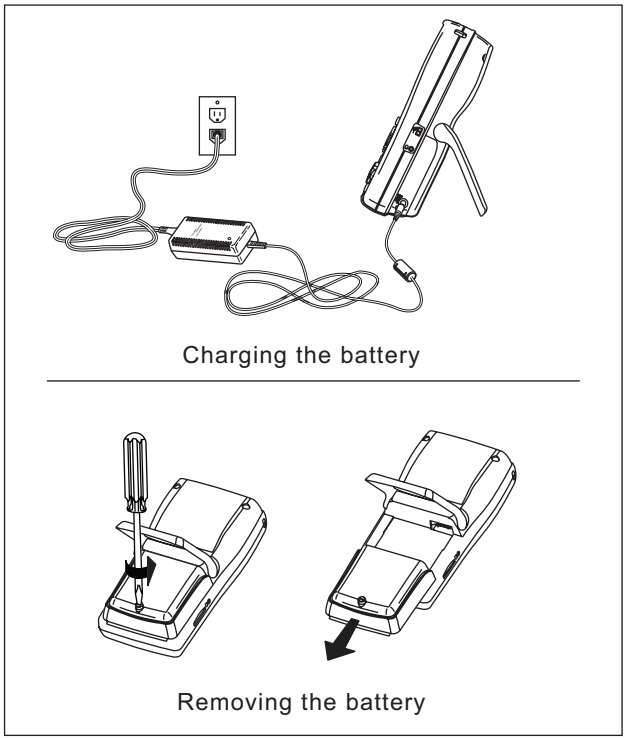



**Figure 1-4. Charging and Removing the Battery**

## Checking the Battery Status

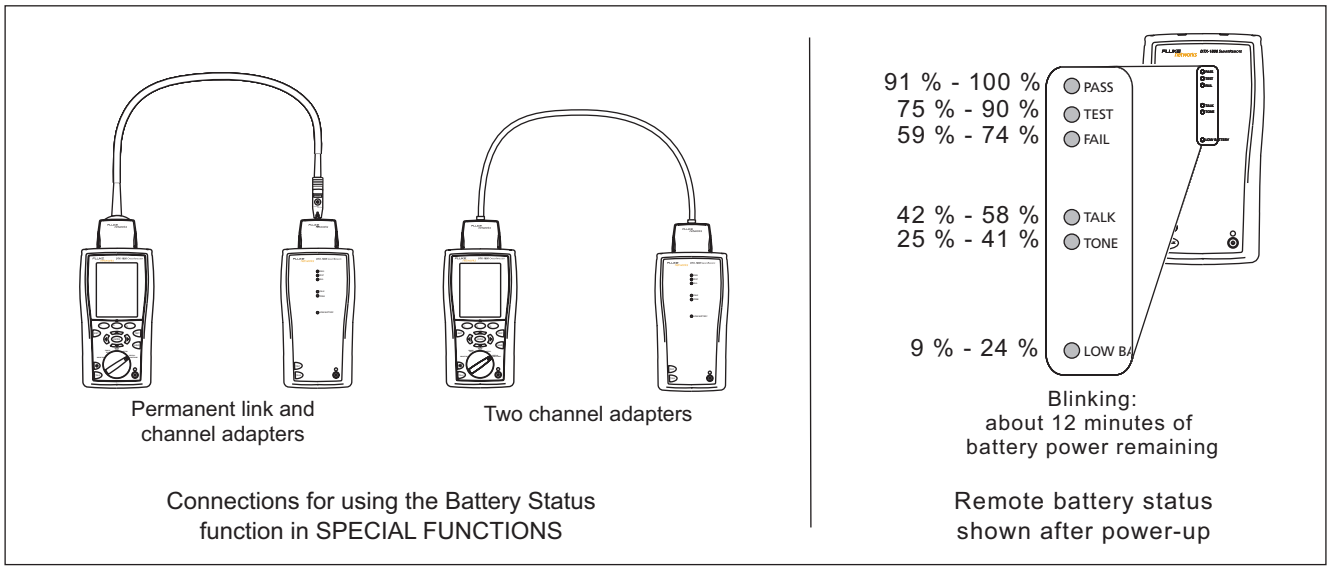
The battery status icon ( ) near the upper-right corner of the tester's main screens shows the battery's charge level. The smart remote's LEDs show the smart remote's battery status at the end of the power-up cycle, as shown in Figure 1-5.

To see more information about battery status:

1. On the main Autotest screen, verify that the media type is set to **Twisted Pair**. Press F1 **Change Media** to change it if necessary.
2. Connect the tester and smart remote as shown in Figure 1-5. You may also connect the testers through a link.
3. Turn the rotary switch to **SPECIAL FUNCTIONS**.
4. Use ▼ to highlight **Battery Status**; then press ENTER.

   The **Time Remaining** value tells you approximately how long the main tester's battery will last based on the last 3 minutes of use.

The accuracy of the battery gauge may drift over time. If the battery status information seems incorrect, reset the battery gauge as described in Chapter 9.




amd102f.eps

**Figure 1-5. Checking the Battery Status**

## *About Link Interface Adapters and Modules*

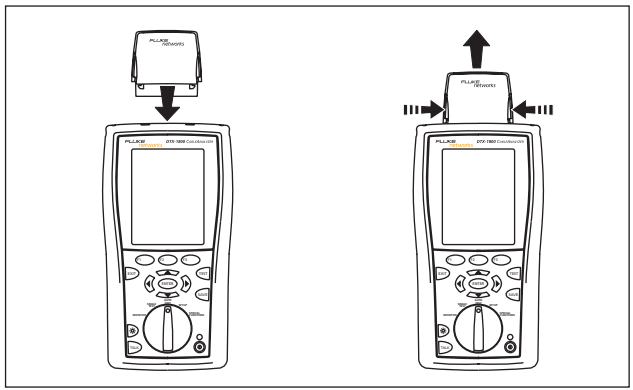
Link interface adapters provide the correct jacks and interface circuitry for testing different types of twisted pair LAN cabling. The channel and permanent link interface adapters provided are suitable for testing cabling up to Cat 6. For information on other adapter types, contact Fluke Networks or visit the Fluke Networks website.

Figure 1-6 shows how to attach and remove adapters.

**⚠Caution**

**To avoid damaging the permanent link adapter and to ensure maximum accuracy of test results, never pinch, kink, or crush the adapter's cable. Follow the handling guidelines given in Figure 1-7.**

Modules provide optional testing capabilities. For example, the DTX-MFM and DTX-SFM modules let you certify fiber optic cabling. See Chapter 5 for details on fiber modules.



amd35f.eps

**Figure 1-6. Attaching and Removing Adapters**

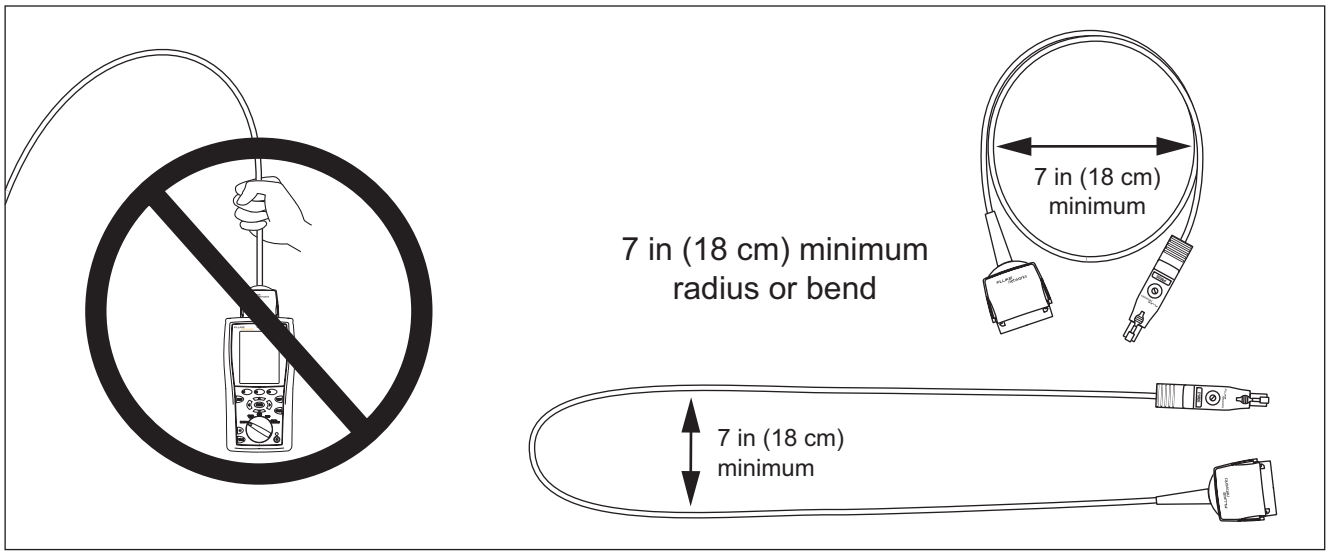



**Figure 1-7. Handling Guidelines for Permanent Link Adapters**

The DTX-PLA001 universal permanent link adapter has a removable personality module. These may be changed to customize the adapter for different jack configurations.

To change the personality module (refer to Figure 1-8):

**1** Ground yourself by touching a grounded, conductive surface.

**2** Remove the link interface adapter from the tester.

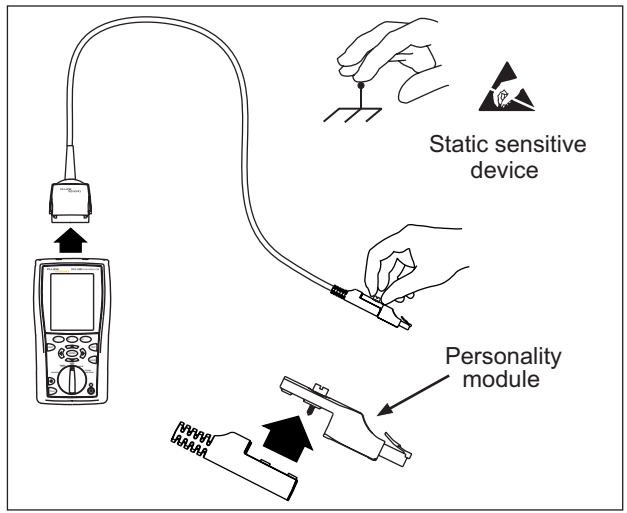
**3** Use your fingers to unscrew the screw on the personality module. If necessary, you may use a flat-blade screwdriver to loosen the screw.

**4** Store the module in its original, static protection bag.

**5** Put the new module in place and tighten the screw with your fingers.

**⚠Caution**

**Tighten the screw snugly with your fingers only. Do not overtighten. Doing so can damage the module or the end of the cable.**




amd74f.eps

**Figure 1-8. Changing the Personality Module**

## *Verifying Operation*

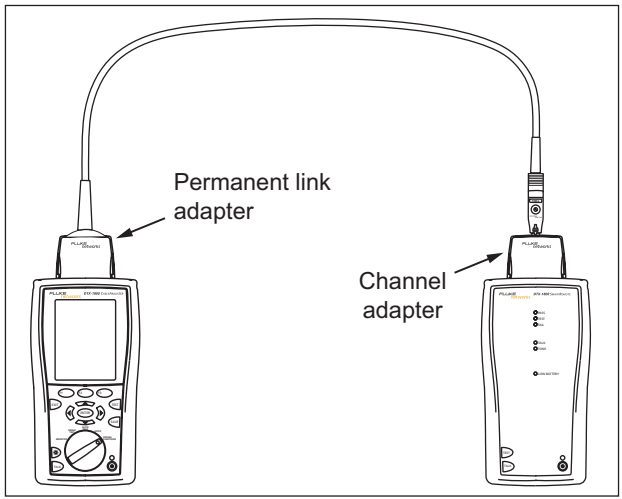
The tester performs a basic self test when you turn it on. To run a more thorough self test for an acceptance test or as part of a routine equipment check:

1 Connect the main and remote testers as shown in Figure 1-9.

2 Turn the rotary switch to **SPECIAL FUNCTIONS**.

3 Use  to highlight **Self Test**; then press ENTER.

If the tester reports an error, refer to "If Something Seems Wrong" in Chapter 9.




amd41f.eps

**Figure 1-9. Self Test Connection**

## Checking the Hardware and Software Versions

To see version information for the tester's hardware and software:

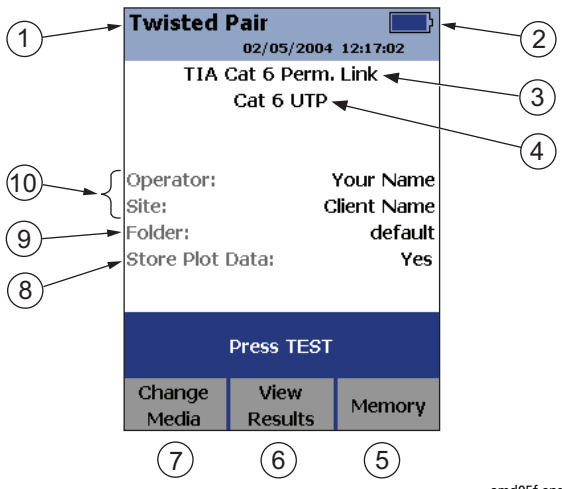
1. Connect the tester and smart remote through adapters, as in Figure 1-9.
2. Turn the rotary switch to **SPECIAL FUNCTIONS**.
3. Use ▼ to highlight **Version Information**; then press ENTER.
4. Use F1 and F2 to switch between the tester and remote's information, and between information for the main unit and the adapters.

To determine if your tester needs a software update, visit the Fluke Networks website to see if an update is available.

## The Main Autotest Screen

The Autotest automatically runs all the tests necessary to certify that cabling meets the requirements of the selected test limit. You will probably use the Autotest more than any other of the tester's functions.

When you first turn the rotary switch to **AUTOTEST**, the main Autotest screen shows settings you should check before you start testing. Figure 1-10 describes this screen. You can change these settings in **SETUP**, as described in Chapters 2, 3, and 5.




1. The media type selected for testing. Press F1 to change media.
2. Battery status icon.
3. **Test Limit**: The tester compares test results to the selected limit to determine the PASS/FAIL result.
4. **Cable Type**: The type of cable to be tested.
5. Press F3 to check the memory status.
6. Press F2 to view the results of the previous test.
7. Press F1 to change the type of media you will test.
8. **Store Plot Data**: **Yes**: the tester saves graphical plot data for twisted pair tests with frequency-based results. This lets you include plots on the test reports you create in LinkWare software. **No**: plot data is not saved. Only the worst value and worst margin results are saved.
9. **Folder**: The folder where results will be saved.
10. **Operator, Site**: The person using the tester. **Site**: The job site name. These are stored with saved results.

**Figure 1-10. The Main Autotest Screen (for Twisted Pair Media)**

# Setting User Preferences

The following sections describe how to change settings you may want to adjust when you first start using the tester.

## Changing the Date, Time, and Date/Time Formats

1 Turn the rotary switch to **SETUP**, use ▼ to highlight **Instrument Settings**; then press ENTER.

2 Press ▶ to go to the tab with the **Date** and **Time** selections.

3 Use ▼ to highlight the setting you want to change; then press ENTER.

4 To change numbers in the date or time on the **Date** or **Time** screen, use ◀ ▶ to highlight the number; then use ▲ ▼ to change the number.

Press SAVE when you are done.

5 To change the date or time format, press F1 **Change Format** on the **Date** or **Time** screen. Use ▼ to highlight the format you want; then press ENTER.

## Changing the Length Units

1 Turn the rotary switch to **SETUP**, use ▼ to highlight **Instrument Settings**; then press ENTER.

2 Press ▶ to go to the tab with the **Length Units** selection.

3 Use ▼ to highlight **Length Units**; then press ENTER.

4 Use ▼ to highlight the setting you want; then press ENTER.

## Adjusting the Display Contrast

1 Press and hold ☼.

2 Use ◀ ▶ for coarse adjustments and F2 **Fine** F3 **Fine** for fine adjustments.

F1 **Default Setting** sets the contrast to the default level.

3 Press ENTER when you are done.

The setting is retained when you turn the tester off. The contrast setting does not affect the battery life.

## *Setting the Power Down Timer*

The power down timer turns off the tester after a selected period of inactivity. The timer starts when the backlight timer times out. If the backlight timer is disabled, the power down timer starts whenever the tester is not being used.

The smart remote turns off after 30 minutes of inactivity. This setting is not adjustable.

*Note*

*The power down timer is inactive when the ac adapter is connected or when the USB or RS-232 serial port is active.*

To set the power down timer:

1 Turn the rotary switch to **SETUP**, use ▽ to highlight **Instrument Settings**; then press ENTER.

2 Press ▷ to go to the tab with the **Power Down Time-Out** setting; then press ENTER.

3 Use ▽ to highlight the setting you want; then press ENTER.

## *Setting the Backlight Timer*

The backlight timer turns off the backlight after a selected period of inactivity. Using the timer to turn off the backlight helps conserve battery power.

To set the backlight timer;

1 Turn the rotary switch to **SETUP**, use ▽ to highlight **Instrument Settings**; then press ENTER.

2 Press ▷ to go to the tab with the **Backlight Time-Out** setting. Use ▽ to highlight **Backlight Time-Out**; then press ENTER.

3 Use ▽ to highlight the setting you want; then press ENTER.

### *Enabling or Disabling the Beeper*

To enable or disable the tones for key presses and testing progress:

1 Turn the rotary switch to **SETUP**, use ▼ to highlight **Instrument Settings**; then press ENTER.

2 Press ▶ to go to the tab with the **Audible Tone** setting. Use ▼ to highlight **Audible Tone**; then press ENTER.

3 Use ▼ to highlight the setting you want; then press ENTER.

## *Overview of Memory Features*

All DTX testers have internal memory that can store at least 250 Autotest results, including graphical data. The maximum capacity of internal memory depends on the space taken by the tester's software.

The DTX-1800 and DTX-1200 testers can also store up to 500 Cat 6 Autotest results, including graphical data, on a 16 MB card. The testers can also use cards with higher capacity and secure digital (SD) memory cards.

### *Formatting the Memory Card (DTX-1800 and DTX-1200)*

To format the memory card:

1 Insert an MMC or SD memory card into the tester, as shown in Figure 1-11.

2 Turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Memory Status**.

3 Press F2 **Format**; then press F3 **Yes.**

### *Creating Folders*

You can organize your test results by saving them in folders.

To create a folder:

1 DTX-1800, DTX-1200: Insert a memory card into the tester.

2 Turn the rotary switch to **SETUP**.

3 Use ▼ to highlight **Instrument Settings**; then press ENTER.

4 Press ▼ to highlight **Current Folder**; then press ENTER.

5 DTX-1800, DTX-1200: Press F1 if necessary if you want to create the folder on the memory card.

6 Press F3 **Create Folder**.

7 Use F1 F2 F3, ◄ ►, ▲, ▼, and ENTER to enter a folder name. Press SAVE when you are done.

8 Use ▲ ▼ to highlight the new folder in the list of folders; then press ENTER.

### *Setting the Storage Location (DTX-1800 and DTX-1200)*

To set the destination for saved results on a DTX-1800 or DTX-1200 tester:

1 Turn the rotary switch to **SETUP**, use ▼ to highlight **Instrument Settings**; then press ENTER.

2 Use ▼ to highlight **Result Storage Location**; then press ENTER.

4 Use ▼ to highlight **Internal Memory** or **Memory Card (if present)**; then press ENTER.

*Note*

*If you change storage location, and the selected **Current Folder** does not exist in the new location, the tester creates a new folder with the current folder's name in the new location.*

See Chapter 8 for more information on memory features.

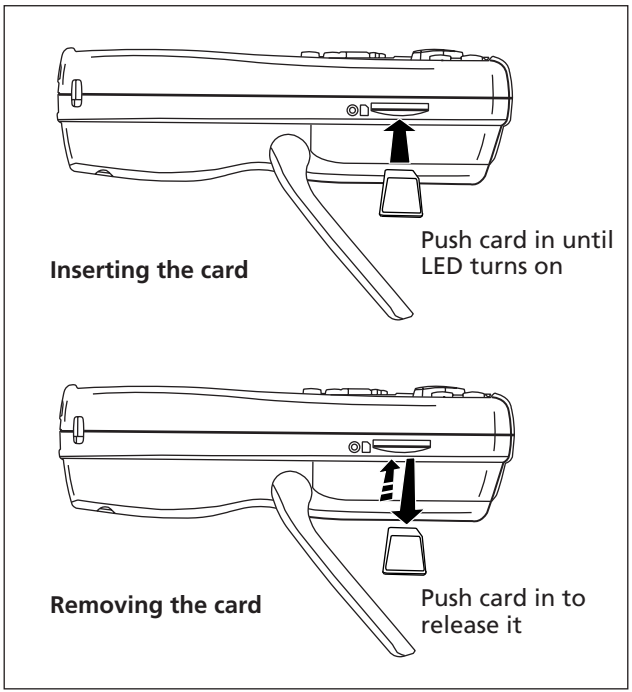



**Figure 1-11. Inserting and Removing the Memory Card**

## *Options for Entering Cable IDs*

When you save a test, you enter a name for the test. At a job site, you usually name each test with the identification code assigned to the link tested. You can enter this ID character by character, or by selecting the ID from a pre-generated list.

To select a method for entering cable IDs:

1 Turn the rotary switch to **SETUP**.

2 Use ▼ to highlight **Instrument Settings**, then press ENTER.

3 Press ENTER to select **Cable ID Source.**

4 Use ▼ to highlight an ID source, then press ENTER.

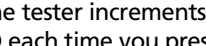
The tester offers the following methods for entering cable IDs:

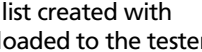
- **Auto Increment**: You enter an ID for the first test you save. After that, the tester increments the last character of the ID each time you press SAVE. See Chapter 2 for details.
- **List:** Lets you select IDs from a list created with LinkWare software and downloaded to the tester. See the LinkWare online help for details. The ID list can be sequential or random.
- **Auto Sequence:** Lets you select IDs from a list of sequential IDs generated from a template in **SETUP**. The horizontal, backbone, and campus templates follow the ID formats specified in the ANSI/TIA/EIA-606-A standard. The **Free Form** template lets you create your own pattern. See Chapter 2 for details.
- **None:** Lets you create an ID each time you press SAVE.

After you press SAVE, you can also edit an existing ID before using it for saving results.

To create a list of sequential IDs:

**1** On the **Auto Sequence** screen, select a template.

**2** On the **Auto Sequence** screen, select **Start ID**. Use the softkeys,  , and ENTER to enter the first ID in the sequential list. Press SAVE when you are finished.

**3** Select **Stop ID**. Use the softkeys,  , and ENTER to enter the last ID in the sequential list. Press SAVE when you are finished

**4** Press F3 **Sample List** to see what the list will look like.

When you use an ID from a list, the ID is marked with a "$".

See Chapter 2 for more information on the **Auto Sequence** feature.

## Using the Talk Mode

The talk mode lets you talk to the person at the other end of a twisted pair or fiber link. Two-way communication over twisted pair requires one good wire pair. Two-way communication over fiber requires fiber modules and two fibers.

*Note*

*The talk mode is disabled during cable tests.*

1 Connect the tester and smart remote to the cabling.

2 Plug headsets into the headset jacks on the testers.

3 Press TALK on either the tester or smart remote, then speak into the headset's microphone.

To adjust the volume at the main unit use ▲ ▼.

At the smart remote, use TALK to cycle through the volume settings.

4 To exit the talk mode at the main tester, press EXIT, turn the rotary switch to a new position, or start a test. At the smart remote, hold down TALK for two seconds.

## About LinkWare and LinkWare Stats Software

The LinkWare™ Cable Test Management software included with your tester lets you do the following:

- Upload DTX test results to PC. See Chapter 8.
- View test results.
- Add ANSI/TIA/EIA-606-A administration information to records.
- Organize, customize, and print professional-quality test reports.
- Update the tester's software.

Details about using LinkWare software are provided in the LinkWare Getting Started Guide and the online help available under Help on the LinkWare menu.

Updates to LinkWare software are available on the Fluke Networks website.

The LinkWare Stats Statistical Report option for LinkWare software provides statistical analysis of cable test reports and generates browsable, graphical reports.

LinkWare software includes a demo version of LinkWare Stats. Contact Fluke Networks or visit the Fluke Networks website for more information on LinkWare Stats.

# Chapter 2
# Tutorials on Setup and Test Procedure

The tutorials in this chapter guide you through setting up the tester, checking the tester's status, testing twisted pair and fiber cabling, and setting up cable ID lists.

## Preparing to Save Tests

### Step 1: Checking the Memory Space Available

**1-1** DTX-1800, DTX-1200: Insert a memory card into the tester.

**1-2** Turn the rotary switch to **SPECIAL FUNCTIONS**.

**1-3** Use  to highlight **Memory Status**; then press ENTER.

**1-4** DTX-1800, DTX-1200: Press F1 **Int. Memory** to switch between memory card and internal memory status.

## *Step 2: Entering Job Information*

Job information includes the operator name, name of the job site, and the customer's company name. These settings are stored with results you save.

To enter job information:

**2-1** Turn the rotary switch to **SETUP**.

**2-2** Use ▼ to highlight **Instrument Settings**; then press ENTER.

**2-3** Press ▶ to go to the tab with the **Operator Name** setting. Press ENTER to select **Operator Name**.

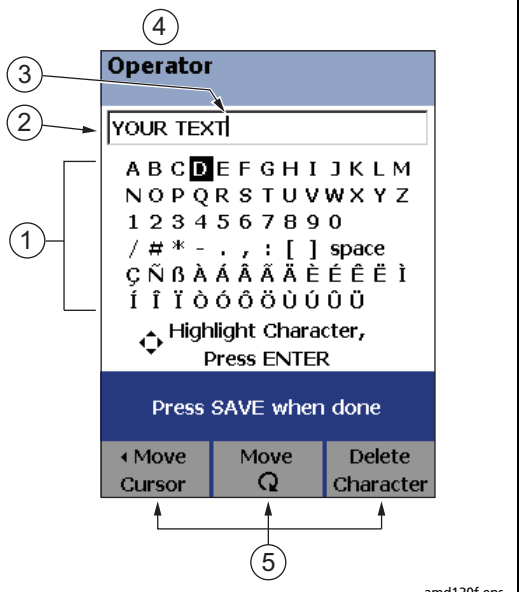
**2-4** Use F1 F2 F3, ◀ ▶ ▲ ▼, and ENTER to enter your name in the box. Press SAVE when you are done.

**2-5** Figure 2-1 describes the text editing screen.

**2-6** Use ▼ to highlight **Site**; then press ENTER.

**2-7** Use F1 F2 F3, ◀ ▶ ▲ ▼, and ENTER to enter the job site name in the box. Press SAVE when you are done.

**2-8** Repeat steps 2-6 and 2-7 to enter the customer's **Company** name.




① The characters available for use.

To select a character to enter in the text box, use ↑ ↓ ← → to highlight the character; then press ENTER. The character is entered to the left of the cursor.

② The text you are entering.

③ The cursor. Use F1 and F2 to move the cursor.

④ The item you are editing.

⑤ Use F1 F2 F3 to move the cursor and delete characters.

**Figure 2-1. Using the Text Editing Screen**

## *Step 3: Setting Up a Job Folder*

You can organize test results by saving them in a folder named for the job.

To set up a job folder:

**3-1** DTX-1800, DTX-1200: Insert a memory card into the tester.

**3-2** Turn the rotary switch to **SETUP**.

**3-3** Use ▼ to highlight **Instrument Settings**; then press ENTER.

**3-4** Press ▼ to highlight **Current Folder**; then press ENTER.

**3-5** DTX-1800, DTX-1200: Press F1 if necessary to select the memory card. Typically, you should save results on a memory card rather than in internal memory.

**3-6** Press F3 **Create Folder**.

**3-7** Use F1 F2 F3, ◄►▲▼, and ENTER to enter a folder name. Press SAVE when you are done.

**3-8** Use ▲▼ to highlight the new folder in the list of folders; then press ENTER.

## *Step 4: Setting the Storage Location (DTX-1800 and DTX-1200)*

To set the destination for saved results on a DTX-1800 or DTX-1200 tester:

**4-1** Turn the rotary switch to **SETUP**, use ▼ to highlight **Instrument Settings**; then press ENTER.

**4-2** Use ▼ to highlight **Result Storage Location**; then press ENTER.

**4-3** Use ▼ to highlight **Internal Memory** or **Memory Card (if present)**; then press ENTER.

*Note*

*If you change storage location, and the selected **Current Folder** does not exist in the new location, the tester creates a new folder with the current folder's name in the new location.*

### *Step 5: Selecting a Cable ID Source*

Cable IDs are names you enter for tests you save. You can select IDs from a pre-generated list, or enter them manually after each test. For this tutorial, you will enter IDs manually.

To select a cable ID source:

**5-1** Turn the rotary switch to **SETUP**.

**5-2** Use ▼ to highlight **Instrument Settings**; then press ENTER.

**5-3** Press ENTER to select **Cable ID Source**.

**5-4** Use ▼ to highlight **None**; then press ENTER.

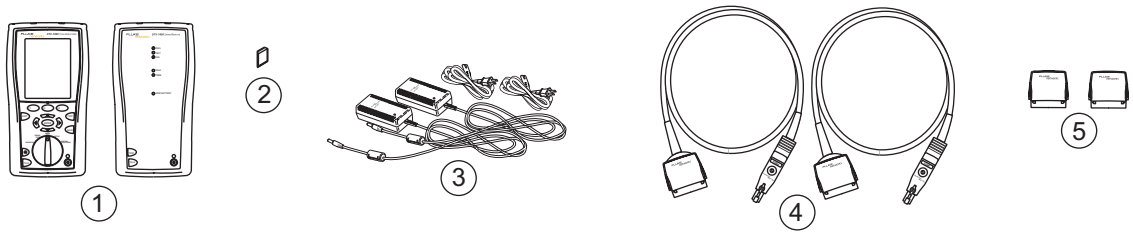
## *Certifying Twisted Pair Cabling*

This tutorial familiarizes you with testing twisted pair cabling by guiding you through the following tasks:

- Attaching twisted pair adapters
- Checking the battery status and verifying operation with twisted pair adapters
- Running an Autotest
- Viewing the Autotest results
- Saving the results

## *Required Equipment*

Figure 2-2 shows the equipment for testing twisted pair cabling.




1. Tester and smart remote with battery packs
2. Memory card (optional)
3. Two ac adapters with line cords (optional)
4. For testing permanent links: two permanent link adapters
5. For testing channels: two channel adapters

*Note*

*To run an Autotest without connecting to cabling, you may connect the tester and remote together with a permanent link and a channel adapter or two channel adapters and a patch cord.*

**Figure 2-2. Equipment for Certifying Twisted Pair Cabling**

## *Step 1: Checking the Battery Status and Verifying Operation with Twisted Pair Adapters*

You should check the tester and smart remote's battery status and verify all equipment is in good working order before going to the job site.

**1-1** Connect the tester and smart remote together as shown in Figure 2-3.

**1-2** Turn the rotary switch to **SPECIAL FUNCTIONS**.

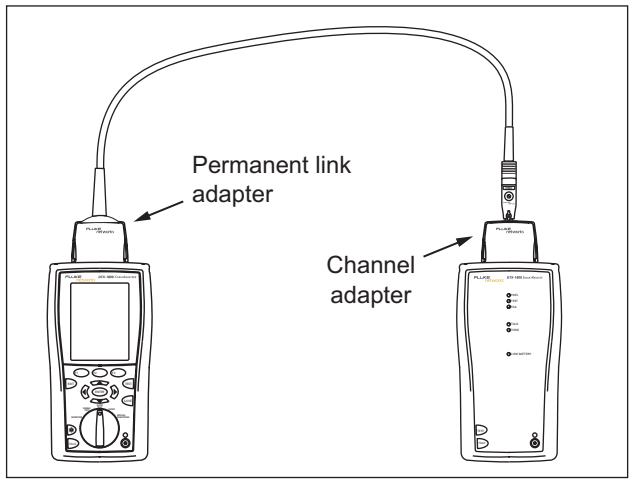
**1-3** Use ⟨▼⟩ to highlight **Battery Status**; then press ENTER. Press EXIT when you are done.

**1-4** Use ⟨▼⟩ to highlight **Self Test**; then press ENTER.

**1-5** Press TEST to start the self test.

*Note*

*You can also check the battery status by connecting channel adapters with a patch cord, or by connecting the tester and smart remote through a link.*




amd117f.eps

**Figure 2-3. Battery Status and Self Test Connections for Twisted Pair Adapters**

### *Step 2: Selecting a Cable Type and Test Limit*

Select the cable type and test limit specified for the job.

**2-1** Turn the rotary switch to **SETUP**; then press ENTER to select **Twisted Pair**.

**2-2** On the **Twisted Pair** menu press ENTER to select **Cable Type**. Cables are organized in groups:

**UTP**: Unshielded twisted pair cable

**FTP**: Foil screened twisted pair cable

**SSTP**: Screened/shielded twisted pair cable

**Manufacturer**: Specific brands of twisted pair cable

**2-3** Use ▼ to highlight the group for the cable type you will test; then press ENTER.

**2-4** Use ▼ to highlight the cable type you will test; then press ENTER.

**2-5** On the **Twisted Pair** menu, use ▼ to highlight **Test Limit**; then press ENTER.

**2-6** The first **Test Limit** screen shows the most recently-used limits. To see the list of test limit groups, press F1 **More**.

**2-7** Use ▼ and ENTER to select a different limit group, if necessary, and to select the test limit required for the job.

If you are connecting the permanent link and channel adapters together just to try an Autotest, select a Cat 6 Channel or equivalent limit.

### *Step 3: Running the Autotest*

**3-1** Attach the correct adapters to the tester and smart remote.

**3-2** Turn on the tester and smart remote; then connect them to the cabling. Figures 2-4 and 2-5 show connections for permanent link and channel installations.

To run an Autotest without connecting to installed cabling, connect the tester and remote as shown in Figure 2-3 on page 2-7, or connect using two channel adapters and a patch cord.

**3-3** Turn the rotary switch to **AUTOTEST**. Verify that the media type is set to **Twisted Pair**. Press F1 **Change Media** to change it if necessary.

**3-4** Press TEST on the tester or smart remote.

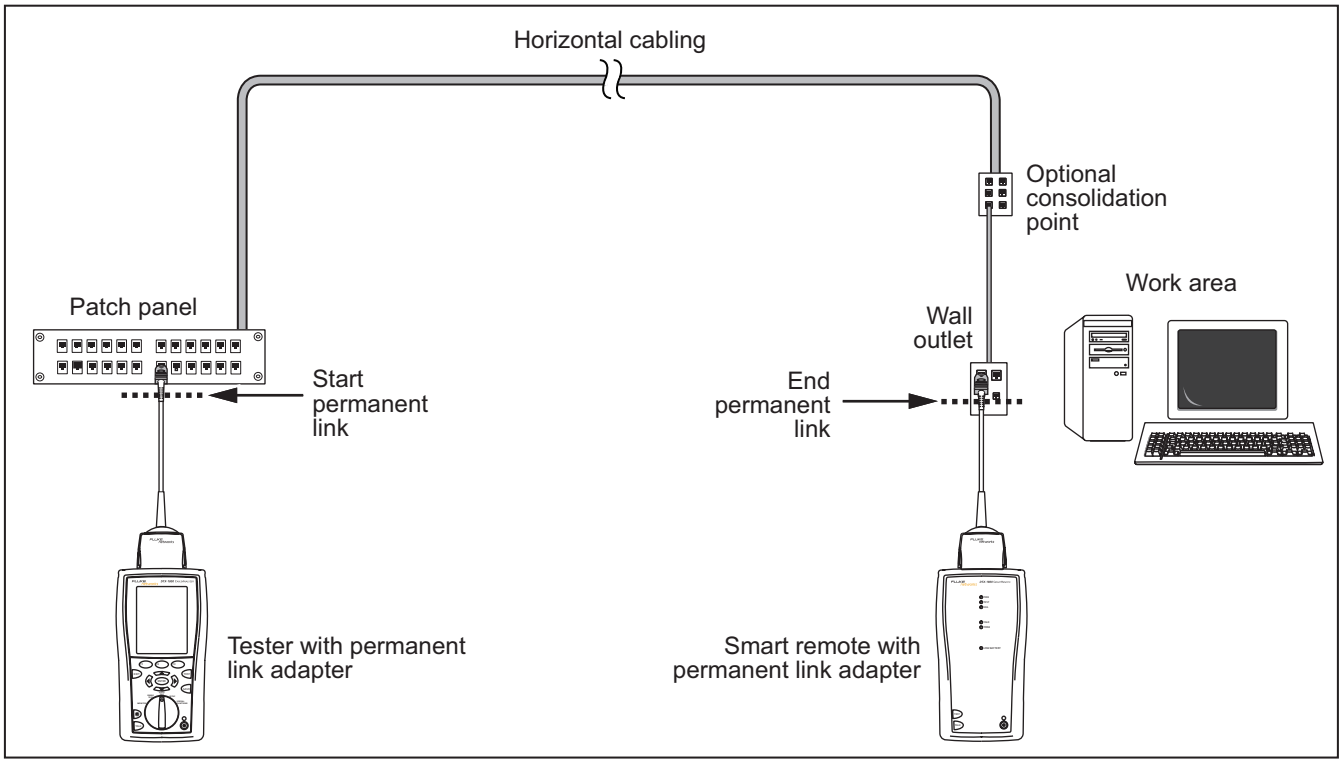



**Figure 2-4. Permanent Link Test Connections**

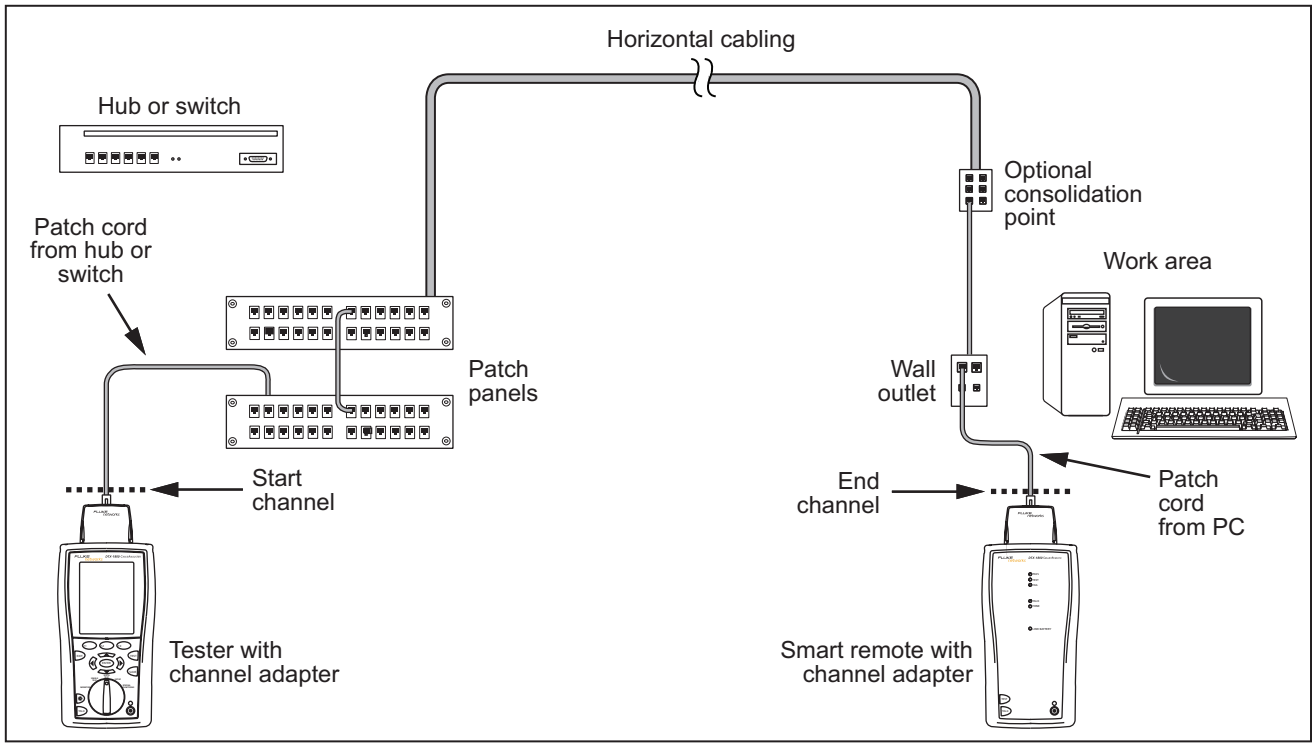



**Figure 2-5. Channel Test Connections**

### *Step 4: Viewing the Autotest Results*

The **Summary** screen, shown in Figure 2-6, tells you if the test results met the selected test limit. This screen also shows a status for each measurement:

✔: PASS

✘: FAIL

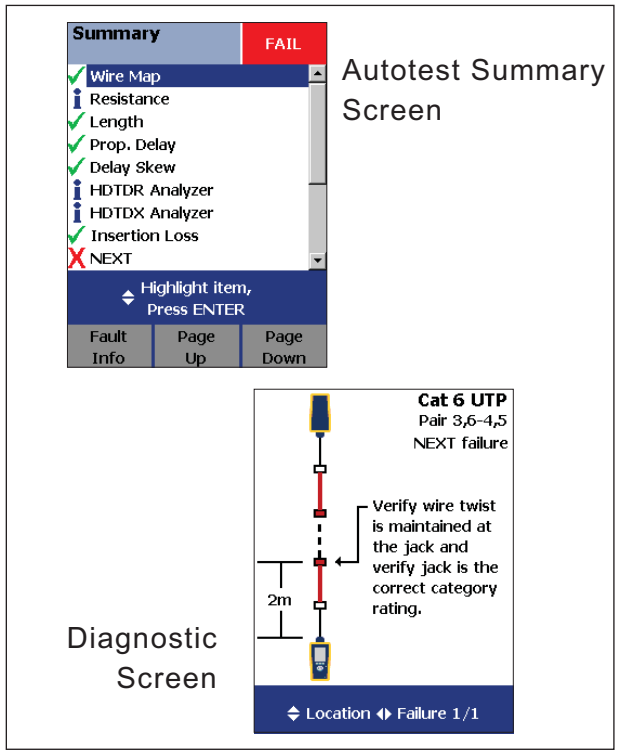
ℹ: The results are for informational purposes only. The measurement is not required by the selected test limit.

✱: The measurement is within the tester's accuracy uncertainty range. See Chapter 3 for details.

To see the results for an individual measurement, use ◇ to highlight the test; then press (ENTER).

If the test failed, press (F1) **Fault Info**. for a diagnosis of the fault. Figure 2-6 shows a typical diagnostic screen. The **Next Fault** softkey is available if the tester detected more than one fault. See Chapter 4 for more information on diagnosing faults.

See Chapter 3 for details on twisted pair test results.




amd119f.eps

**Figure 2-6. Autotest Summary and Diagnostic Screens**

### *Step 5: Saving the Results*

**5-1** Press SAVE.

**5-2** Use the text editing screen to enter a name for the results. See Figure 2-1 on page 2-3 for details on editing text.

**5-3** Press SAVE when you are done.

This concludes the tutorial on testing twisted pair cabling. For more information on testing twisted pair cabling, see Chapter 3.

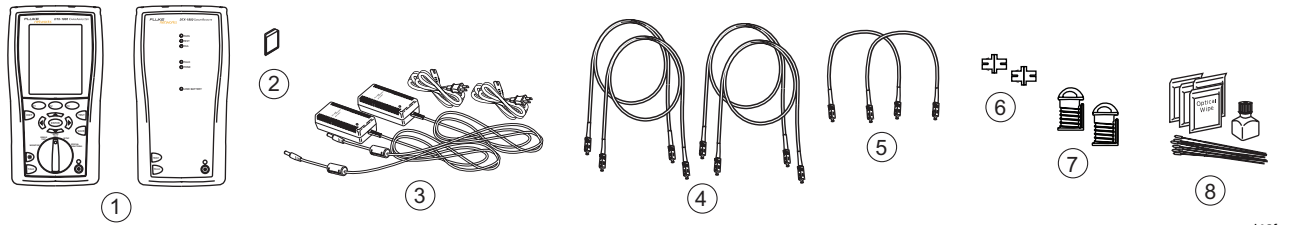
## *Certifying Fiber Cabling*

This section familiarizes you with the optional DTX-MFM and DTX-SFM fiber modules by guiding you through the following tasks:

- Installing fiber modules
- Checking the battery status and verifying operation with the fiber modules
- Setting a reference in Smart Remote mode
- Running an Autotest in Smart Remote mode
- Viewing the Autotest results
- Saving the results

### *Required Equipment*

Figure 2-7 shows the equipment for testing fiber cabling in Smart Remote mode.




1. Tester and smart remote with fiber modules. Use DTX-MFM modules for testing multimode fiber. Use DTX-SFM modules for testing singlemode fiber.
2. Memory card (optional)
3. Two ac adapters with line cords (optional)
4. Four patch cords (match fiber and connectors to be tested, SC at tester end)
5. Two short patch cords (match fiber and connectors to be tested)
6. Two adapters of the appropriate type
7. Mandrels. Recommended when testing multimode fiber. See Chapter 5.
8. Fiber cleaning supplies

*Note*

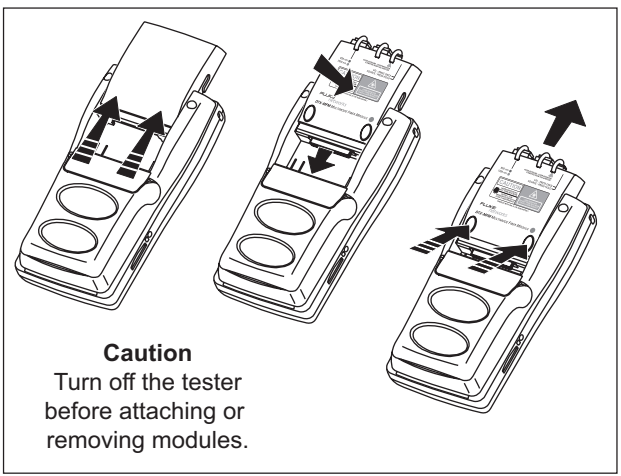
*To run an Autotest without connecting to cabling, you may connect the tester and remote together with two SC/SC patch cords.*

**Figure 2-7. Equipment for Testing in Smart Remote Mode**

## *Step 1: Installing the Fiber Modules*

**1-1** Turn off the tester and smart remote.

**1-2** Remove the cover from the back of each unit and install a DTX-MFM or DTX-SMF module in each unit, as shown in Figure 2-8.




amd34af.eps

**Figure 2-8. Installing and Removing Fiber Modules**

### Caution

**Leave the module bay covers in place when the fiber modules are not installed.**

## *Step 2: Checking the Battery Status and Verifying Operation with Fiber Modules*

**2-1** Clean the tester's connectors and the connectors on two SC/SC patch cords. See Chapter 5 for details on cleaning.

**2-2** Connect the tester and smart remote together, as shown in Figure 2-9.

**2-3** Turn the rotary switch to **SPECIAL FUNCTIONS**.

**2-4** Use ▼ to highlight **Battery Status**; then press ENTER. Press EXIT when you are done.

**2-5** Use ▼ to highlight **Self Test**; then press ENTER.

**2-6** Press TEST to start the self test.

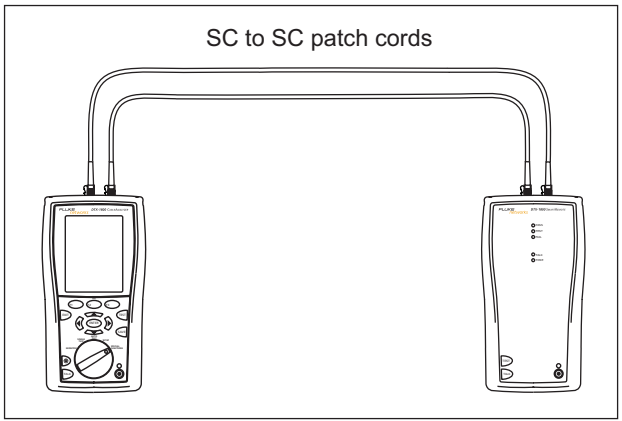



**Figure 2-9. Self Test Connections for Fiber Modules**

## *Step 3: Selecting a Fiber Type and Test Limit*

Select the cable type and test limit specified for the job.

**3-1** Turn the rotary switch to **SETUP**.

**3-2** Use ▼ to highlight **Fiber**; then press ENTER.

**3-3** On the **Fiber** menu press ENTER to select **Fiber Type**. Fiber types are organized in groups:

**Generic**: Generic types of fiber

**Manufacturer**: Specific brands of fiber cable

**3-4** Use ▼ to highlight a group for the fiber type you will test; then press ENTER.

**3-5** Use ▼ to highlight the fiber type you will test; then press ENTER.

**3-6** On the **Fiber** menu, use ▼ to highlight **Test Limit**; then press ENTER.

**3-7** The first **Test Limit** screen shows the most recently-used limits. To see the list of test limit groups, press F1 **More**.

**3-8** Use ▼ and ENTER to select a different limit group, if necessary, and to select the test limit required for the job.

### *Step 4: Configuring the Fiber Test*

**4-1** Turn the rotary switch to **SETUP**.

**4-2** Use ▼ to highlight **Fiber**; then press ENTER.

**4-3** Use ▼ to highlight **Remote End Setup**; then press ENTER.

**4-4** Use ▼ ▲ to highlight **Smart Remote**; then press ENTER.

**4-5** Use ▼ and ENTER to enter the settings listed below. Use ▶ to find settings on other tabs.

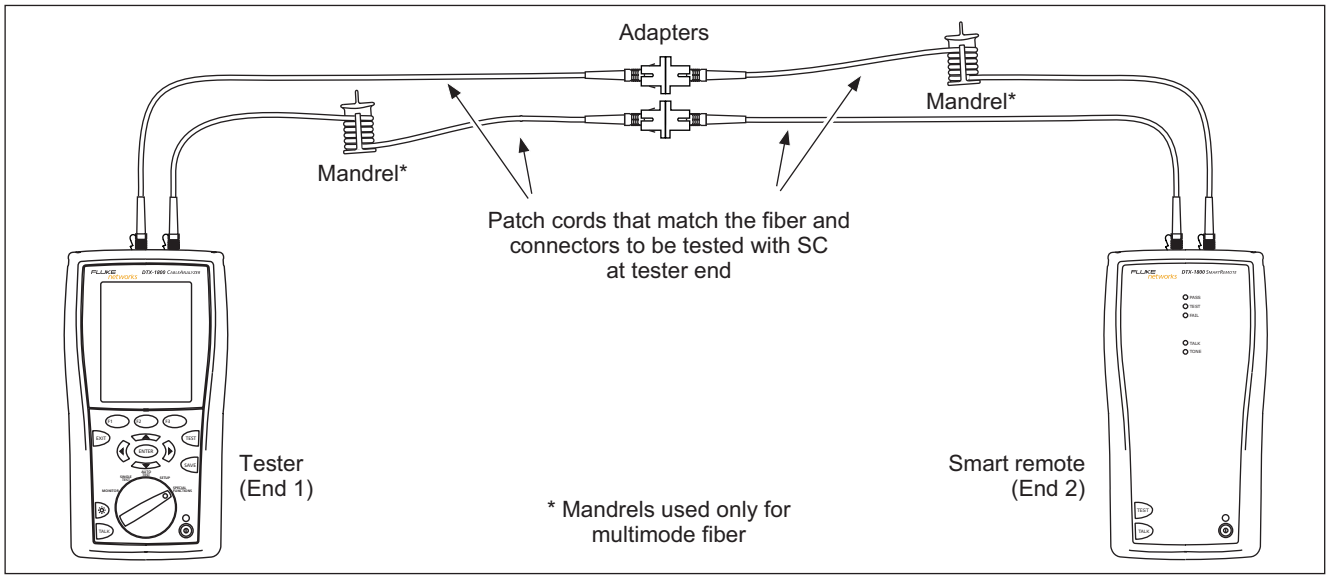
- **Bi-Directional**: **No**
- **Number of Adapters**: Enter the number of adapters used in the cabling you will test. For example, if the cabling has one connector at each end, enter 2.
- **Number of Splices**: Enter the number of splices in the cabling you will test.
- **Connector Type**: Select the type of connector used in the cabling you will test.
- **Test Method**: **Method B**

### *Step 5: Setting the Reference*

**5-1** Clean the connectors on the tester and the four patch cords.

**5-2** Turn the rotary switch to **SPECIAL FUNCTIONS**. Press ENTER to select **Set Reference**. If both a fiber module and twisted pair adapter are attached, select **Fiber Module** next.

**5-3** Connect the tester and smart remote as shown in Figure 2-10; then press TEST.




amd122f.eps

**Figure 2-10. Smart Remote Mode Reference Connections**

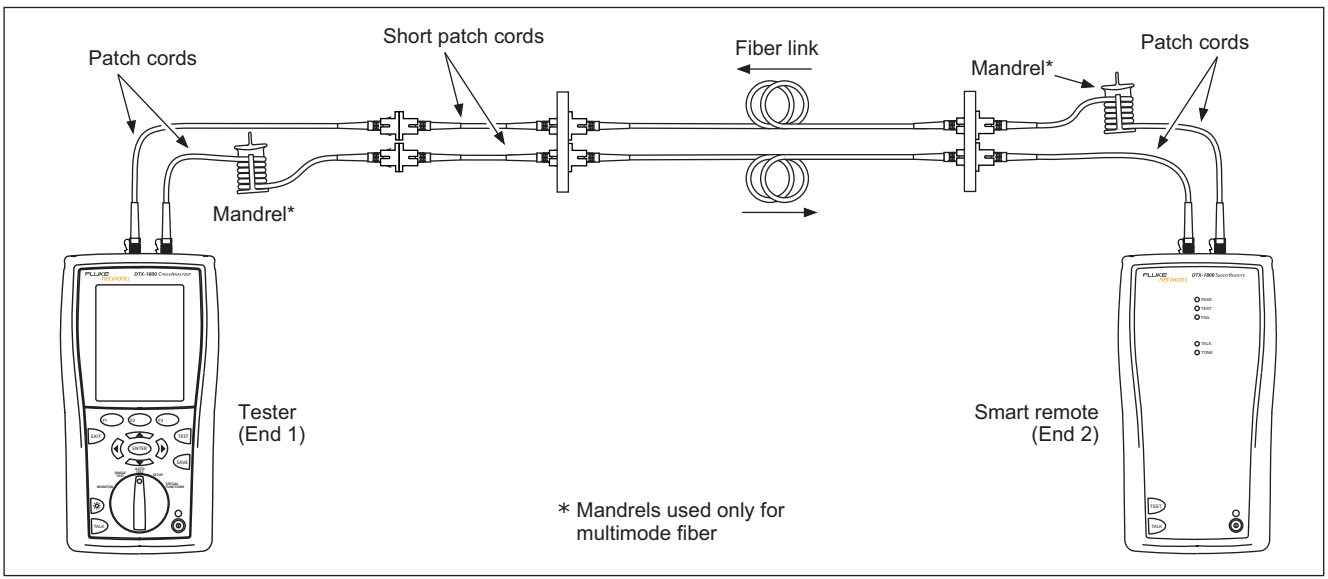
## *Step 6: Running the Test*

**6-1** Clean the connectors on the cabling to be tested.

**6-2** Make the connections as shown in Figure 2-11.

**6-3** Turn the rotary switch to **AUTOTEST**. Verify that the media type is set to **Fiber**. Press F1 **Change Media** to change it if necessary.

**6-4** Press TEST.




amd123f.eps

**Figure 2-11. Smart Remote Mode Test Connections**

### *Step 7: Viewing the Results*

The **Summary** screen, shown in Figure 2-12, tells you if the test results met the selected test limit. This screen also shows a status for each measurement:

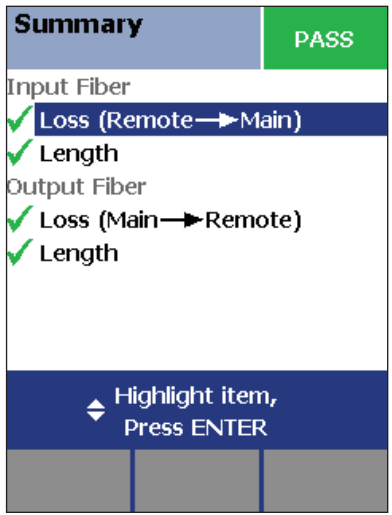
✔: PASS

✘: FAIL

**i**: The results are for informational purposes only. The measurement is not required by the selected test limit.

To see the results for an individual measurement, use ◡ to highlight the test; then press (ENTER).

See Chapter 5 for details on fiber test results.




amd121f.eps

**Figure 2-12. Summary Results Screen for an Autotest on Fiber**

### *Step 8: Saving the Results*

**8-1** Press SAVE.

**8-2** Use the text editing screen to enter a name for the results. See Figure 2-1 on page 2-3 for details on editing text.

**8-3** Press SAVE when you are done.

This concludes the tutorial on testing fiber cabling. For more information on testing fiber cabling, see Chapter 5.

## *Using the Auto Increment and Sequential Cable ID Features*

The auto increment and sequential ID features generate cable IDs automatically. This frees you from having to enter IDs manually after each test.

These features are useful when you test installations with sequentially-numbered links.

When you use an ID from a list, the ID is marked with a "$".

*Note*

*The* **List** *feature lets you select IDs from a list created with LinkWare software and downloaded to the tester. See the LinkWare documentation for details.*

### *Using the Auto Increment Feature*

The auto increment feature increments the last character in the fiber ID you enter.

For example, if you save a test with the ID "A0", the tester increments the ID as follows:

**A0, A1, A2…A9, A10, A11…A99, A100, A101…**

Consecutive digits increment from right to left, but other characters do not.

Letters increment through the alphabet shown on the text editing screen:

**1A, 1B, 1C…1Y, 1Z, 1Ç…1Û, 1Ü, 1A**

To use the sequential ID feature:

1 Turn the rotary switch to **SETUP**.

2 Use ▼ to highlight **Instrument Settings**; then press ENTER.

3 Press ENTER to select **Cable ID Source**.

4 Press ENTER to select **Auto Increment**.

5 Run a test; then press SAVE.

6 Enter an ID in the **ID:** box.

7 Press SAVE again.

The next time you run a test and press SAVE, the incremented cable ID appears in the ID box. Press SAVE again to use the ID.

## *Creating a List of Sequential IDs*

The tester includes templates for creating a list of sequential IDs. Three of these templates meet the ANSI/TIA/EIA-606-A standard for documenting cabling installations, as summarized in the next section. A fourth template lets you create your own ID pattern.

Letters and numbers in sequential IDs increment from right to left. The following characters are not incremented:

- Special characters: / # * - . , : [ ] space
- Characters that match between the start and stop IDs. For example if the start and stop IDs were ROOM1 and ROOM25, the characters "ROOM" would not increment.

For example, the following start and stop IDs could be used for testing the cabling in two rooms where each room has three cable drops:

Start ID: ROOM A DROP#1
Stop ID: ROOM B DROP#3

These IDs produce the following ID list:

ROOM A DROP#1
ROOM A DROP#2
ROOM A DROP#3
ROOM B DROP#1
ROOM B DROP#2
ROOM B DROP#3

The steps below guide you through creating a sequential ID list for the following scenario:

- You will test 12 cables in two patch panels: cables 1 through 6 in panel A and cables 1 through 6 in panel B.
- Both panels are located in telecommunications closet A on the third floor of the building.

Your IDs will follow the ANSI/TIA/EIA-606-A standard for horizontal links. See "About ANSI/TIA/EIA-606-A Cable IDs" on page 2-24 for details.

**1** Turn the rotary switch to **SETUP**.

**2** Use ▼ to highlight **Instrument Settings**, then press ENTER.

**3** Press ENTER to select **Cable ID Source**.

**4** Use ▼ to highlight **Auto Sequence**, then press ENTER.

**5** Use ▼ to highlight **Template**, then press ENTER.

**6** Use ▲ ▼ to highlight **Horizontal**, then press ENTER.

**7** On the **Auto Sequence** screen, press F1 **Default** to transfer the default pattern into the **START ID** and **STOP ID**.

**8** Use ▲ to highlight **Start ID**; then press ENTER.

**9** Use F1 F2 F3, ◀ ▶ ▲ ▼, and ENTER to change the default ID to **03A-A01**.

Press SAVE when you are done.

**10** Use ▼ to highlight **Stop ID**; then press ENTER.

**11** Use F1 F2 F3, ◀ ▶ ▲ ▼, and ENTER to change the default ID to **03A-B06**.

Press SAVE when you are done.

**12** Press F3 **Sample List**. You should see a list of 12 sequential fiber IDs: **03A-A01** through **03A-B06**. If the tester beeps instead of showing the list, see "Solving Problems with ID Lists" on page 2-25.

**13** Press EXIT to leave the sample list.

If the tester shows a error message, check your **Start** and **Stop** IDs for the problems listed below.

**14** Press SAVE when you are done setting up the list. The list is saved in the tester's internal memory.

If the ID sequence is invalid, check the following:

- Verify that the types of characters in each position match between the start and stop IDs. For example, using the letter "O" as the third character in the **Start ID** and the number "0" as the third character in the **Stop ID** is not allowed.
- Verify that you are not using the characters / # * - . , : [ ] space or accented characters as incrementing characters. You may use these characters in IDs, but they must match between the **Start** and **Stop** IDs.
- Verify that the **Start** and **Stop** IDs have the same numbers of characters.
- Verify that the **Stop ID** is not sequentially greater than the **Start ID**. For example, using 25 as the **Start ID** and 10 as the **Stop ID** is not allowed.
- Verify that the **Start** and **Stop** IDs do not generate a sequence with more than 3000 IDs.

To use an ID from the list:

**1** Run a test; then press SAVE.

**2** Select an ID from the ID list; then press SAVE again.

## *About ANSI/TIA/EIA-606-A Cable IDs*

The following sections give basic examples of the 606-A IDs. For detailed information, including ID formats for other elements in cabling installations, contact the TIA to purchase a copy of the 606-A standard.

The examples use the following abbreviations:

- f=floor number
- t=telecom room letter
- pp=patch panel letter
- p=port number
- c=backbone cable letter or number
- n=copper pair or fiber strand in backbone cable
- b=building

### Horizontal Link Identifier

Horizontal links run between telecommunications closets and work areas.

Format: [f][t]-[pp][p]

Example: 11C-D32

The link tested was on floor 11 in telecom room C, patch panel D, port 32.

### Backbone Cable Identifier

Backbone cables run between telecommunication closets, usually on different floors.

Format: [f1][t1]/[f2][t2]-[c].[nn]

Example: 01B/5C-D.10

The cable tested is in the backbone cable that runs between floor 1, telecom room B and floor 5, telecom room C. The backbone cable is cable D. The cable or fiber tested is fiber 10 in backbone cable D.

### Campus Cable Identifier

Campus cables are backbone cables that run between buildings.

Format: [b1]-[f 1][t1]/[b2]-[f2][t2]-[c].[n]

Example: LBRY-01A/AUD-01A-5.16

The cable tested is in the backbone cable that runs between the library (LBRY), floor 1, telecom room A and the auditorium (AUD), floor 1, telecom room A. The backbone cable is cable 5. The cable or fiber tested is number 16 in backbone cable 5.

# Chapter 3
# Certifying Twisted Pair Cabling

## Setting the Reference

The reference procedure sets a baseline for insertion loss, ELFEXT, and dc resistance measurements.

Run the tester's reference procedure at the following times:

- When you want to use the tester with a different smart remote. You can reference the tester to two different smart remotes.
- Every 30 days. Doing so ensures maximum accuracy of test results.

You do not need to set the reference after changing link interface adapters.

*Note*

*Turn on the tester and smart remote and let them sit for 1 minute before setting the reference. Set the reference only after the testers have reached an ambient temperature between 10 ℃ and 40 ℃ (50 ℉ and 104 ℉).*

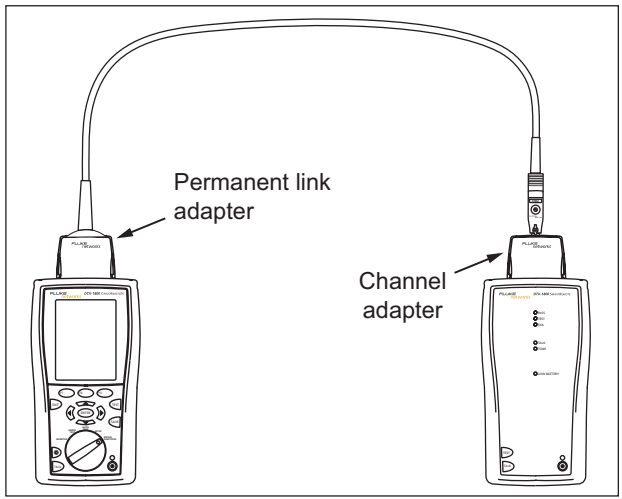
To set the reference:

**1** Attach permanent link and channel adapters and make the connections shown in Figure 3-1.

**2** Turn the rotary switch to **SPECIAL FUNCTIONS** and turn on the smart remote.

**3** Highlight **Set Reference**; then press ENTER. If both a fiber module and copper adapter are attached, select **Link Interface Adapter** next.

**4** Press TEST.




amd41f.eps

**Figure 3-1. Twisted Pair Reference Connections**

## *Twisted Pair Test Settings*

Table 3-1 describes the settings that apply to twisted pair cabling tests.

To access the settings, turn the rotary switch to **SETUP**, use ◁▽▷ to highlight **Twisted Pair**; then press (ENTER).

**Table 3-1. Twisted Pair Test Settings**

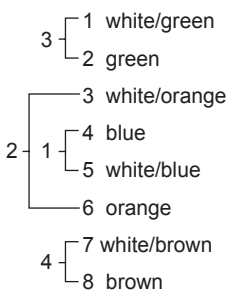
| Setting | Description |
|---|---|
| **SETUP > Twisted Pair > Cable Type** | Select a cable type appropriate for the type you will test. The cable types are organized by type and manufacturer. |
| **SETUP > Twisted Pair > Test Limit** | Select the appropriate test limit for the job. |
| **SETUP > Twisted Pair > NVP** | Nominal velocity of propagation, which is used with the measured propagation delay to determine cable length. The default value defined by the selected cable type represents the typical NVP for that cable type. You may enter a different value if necessary. To determine the actual value, change the NVP until the measured length matches the known length of a cable. Use a cable at least 15 m (50 ft) long. The recommended length is 30 m (100 ft).<br><br>Increasing the NVP increases measured length. |

-continued-

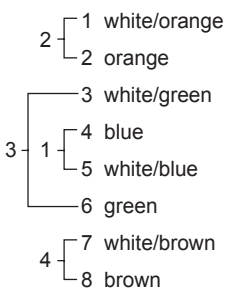
**Table 3-1. Twisted Pair Test Settings (cont.)**

| Setting | Description |
|---|---|
| **SETUP > Twisted Pair > Outlet Configuration** | The **Outlet Configuration** setting determines which cable pairs are tested and which pair numbers are assigned to the pairs. |

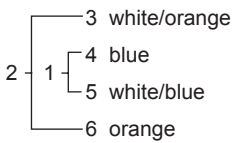
**T568A**



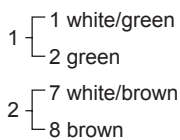

**T568B**



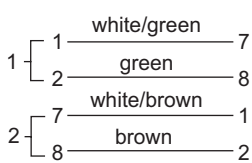

**USOC (1 or 2 Pair) Token Ring**



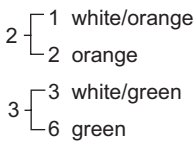

**ATM/TP-PMD Straight**




**ATM/TP-PMD Crossed**




**Ethernet**



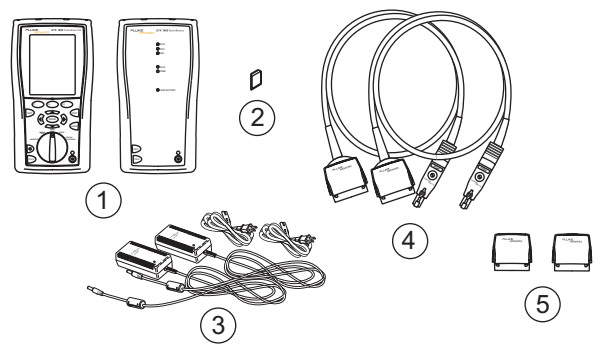

-continued-

**Table 3-1. Twisted Pair Test Settings (cont.)**

| Setting | Description |
|---|---|
| **SETUP > Instrument Settings > Store Plot Data** | **Yes**: the tester displays and saves plot data for frequency-based tests such as NEXT, return loss, and insertion loss. This lets you include plots on test reports created in LinkWare software.<br>**No**: plot data is not displayed or saved, which lets you save more results. |
| **SPECIAL FUNCTIONS > Set Reference** | The tester must be referenced to the smart remote the first time the two units are used together. You should also set the reference every 30 days. See "Setting the Reference" on page 3-1. |
| **SETUP > Instrument Settings**<br>Settings for saving tests | **Cable ID Source**, **Current Folder**, **Result Storage Location** (DTX-1800, DTX-1200), **Operator**, **Site**, and **Company**. See "Preparing to Save Tests" in Chapter 2. |

## *Equipment for Certifying Twisted Pair Cabling*

Figure 3-2 shows the equipment needed for certifying twisted pair cabling.




① Tester and smart remote with battery packs

② Memory card (optional)

③ Two ac adapters with line cords (optional)

④ For testing permanent links: two permanent link adapters

⑤ For testing channels: two channel adapters

**Figure 3-2. Equipment for Certifying Twisted Pair Cabling**

## *Autotest on Twisted Pair Cabling*

**1** Verify that the settings listed in Table 3-1 are appropriate.

**2** Attach adapters appropriate for the job to the tester and the smart remote.

**3** Turn the rotary switch to **AUTOTEST** and turn on the smart remote. Connect to the cabling, as shown in Figure 3-3 for a permanent link or Figure 3-4 for a channel.

**4** Press TEST on the tester or smart remote. To stop the test at any time, press EXIT.

**5** The tester shows the Autotest **Summary** screen when the test is complete (see Figure 3-5 on page 3-10).

To view results for a specific parameter, use ▲ ▼ to highlight the parameter; then press ENTER.

If the Autotest failed, press F1 **Fault Info** for possible causes of the failure.

**6** To save the results, press SAVE. Select or create a cable ID; then press SAVE again.

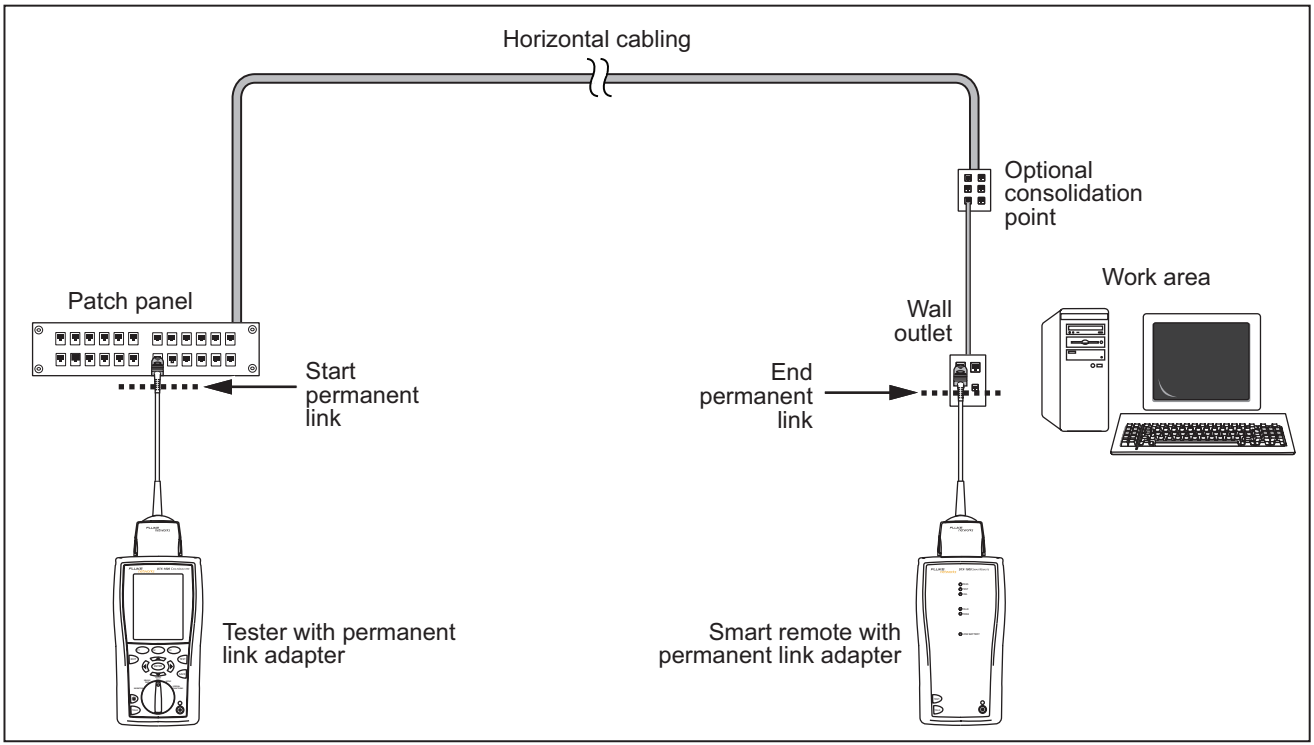



**Figure 3-3. Permanent Link Test Connections**

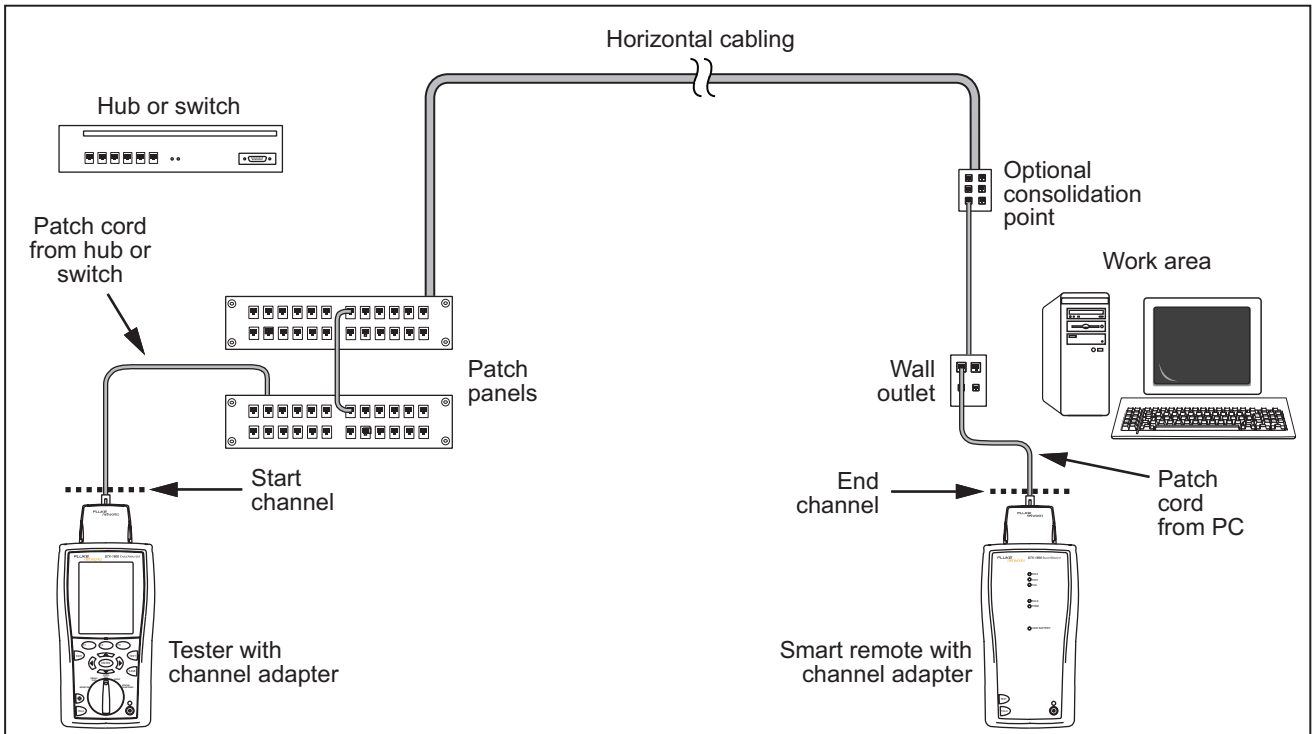



**Figure 3-4. Channel Test Connections**

## *Twisted Pair Autotest Results*

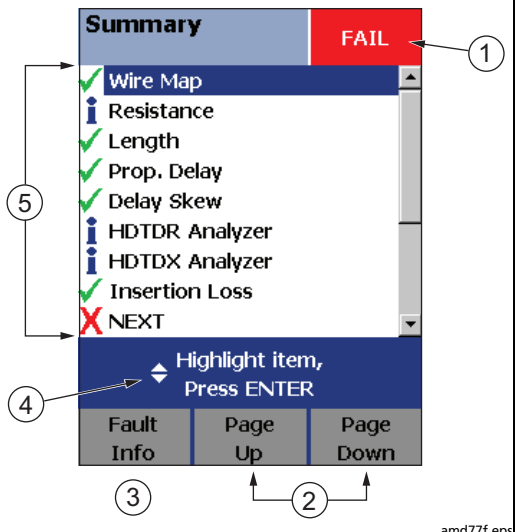
The tests listed below apply to twisted pair cabling.

*Note*

*The Autotest runs some or all of the tests listed below, depending on the selected test limit.*

- Wire map
- Resistance
- Characteristic impedance
- Length
- Propagation delay
- Delay skew
- Insertion loss (attenuation)
- NEXT (near-end crosstalk) and NEXT at the smart remote
- Return loss
- ACR (attenuation to crosstalk ratio) and ACR at the smart remote
- PSACR (power-sum attenuation to crosstalk ratio) and PSACR at the smart remote
- ELFEXT (equal level far-end crosstalk)
- PSELFEXT (power-sum equal level far-end crosstalk)

Figure 3-5 describes the Autotest **Summary** screen.




1. **PASS:** All parameters are within limits.

   **FAIL:** One or more parameters exceeds the limit.

   **PASS*/FAIL***: One or more parameters are within the tester's accuracy uncertainty range, and the "*" notation is required by the selected test standard. See "PASS*/FAIL* Results" on page 3-12
2. Press F2 or F3 to scroll the screen.
3. If the test failed, press F1 for diagnostic information.
4. Action prompt for the screen. Use ▼ ▲ to highlight a parameter; then press ENTER.
5. ✔: The measurement was within limits.

   **i**: The parameter was measured, but has no PASS/FAIL limit in the selected test limit. The results are for informational purposes only.

   **X**: The measurement exceeds the limit.

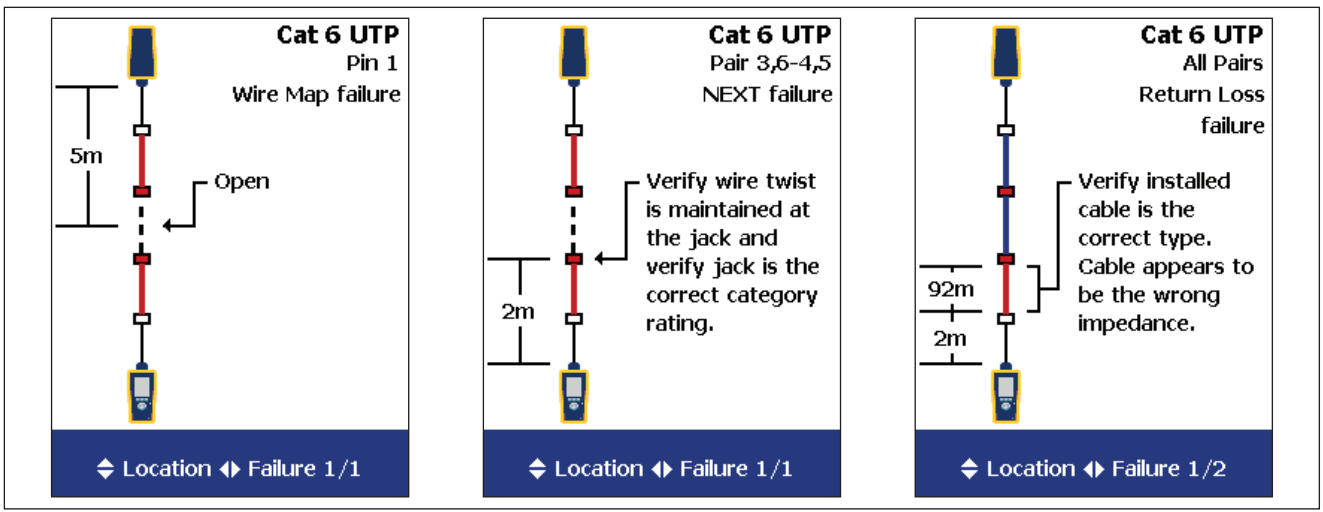
   ✱: See "PASS*/FAIL* Results" on page 3-12.

**Figure 3-5. Autotest Summary Screen for Twisted Pair Cabling**

## *Automatic Diagnostics*

If an Autotest fails, press F1 **Fault Info** for diagnostic information about the failure. The diagnostic screens show likely causes of the failure and suggest actions you can take to solve the problem. A failed test may produce more than one diagnostic screen. In this case, press F2 to see additional screens.

Figure 3-6 shows examples of diagnostic screens.




amd75f.eps

**Figure 3-6. Examples of Automatic Diagnostic Screens**

## *PASS*/FAIL* Results*

A result marked with an asterisk means that measurements are in the tester's accuracy uncertainty range (Figure 3-7) and the "*" notation is required by the selected test standard. These results are considered marginal. Marginal passing and failing results are marked with blue and red asterisks, respectively.

For a **PASS*** result you should look for ways to improve the cabling installation to eliminate the marginal performance.

A **FAIL*** result should be considered a failure.

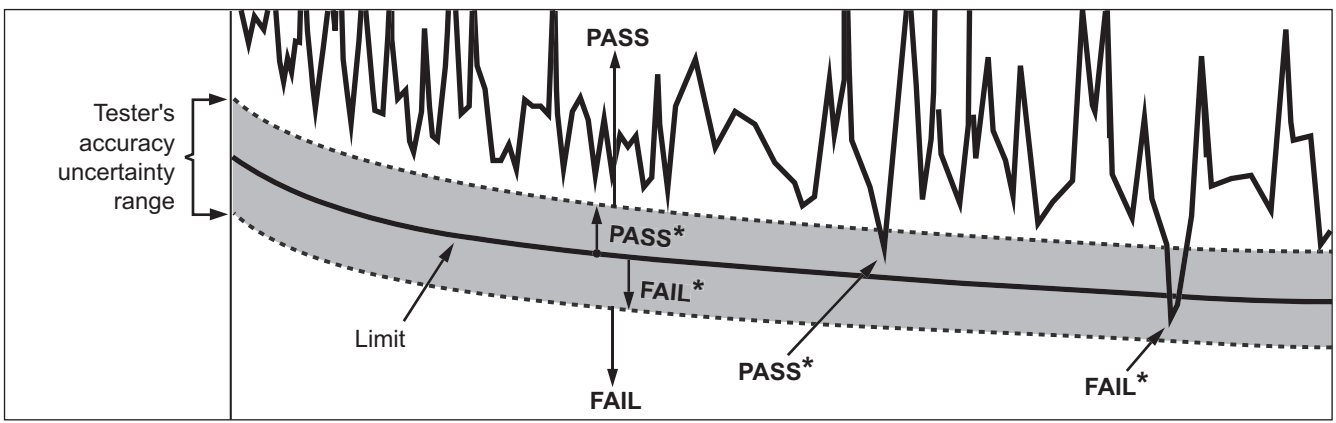



**Figure 3-7. PASS* and FAIL* Results**

## *Wire Map*

Wire map results show the connections between the near and far ends of the cabling. The tester checks the cable pairs required by the selected test limit.

If the wire map test fails, the Autotest stops and the tester displays the wire map. You may continue the test by pressing (F3) **Yes**.

Figure 3-8 describes examples of wire map screens.

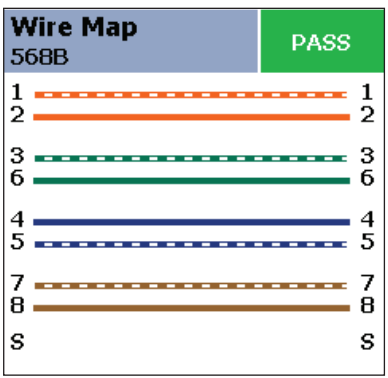
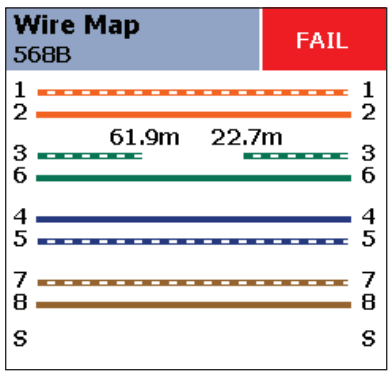
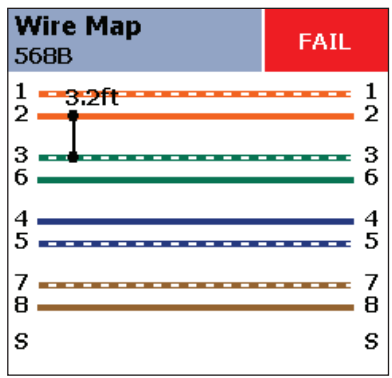
| | | |
|---|---|---|
|  |  |  |
| **Correct wiring (568B)** | **Open** | **Short** |
| Shield continuity is shown if a shielded (FTP or SSTP) cable type is selected in SETUP. | Wire 3 is open 61.9 m from the tester and 22.7 m from the smart remote. | Wires 2 and 3 are shorted 3.2 ft from the tester. |

**Figure 3-8. Wire Map Examples**

-continued-

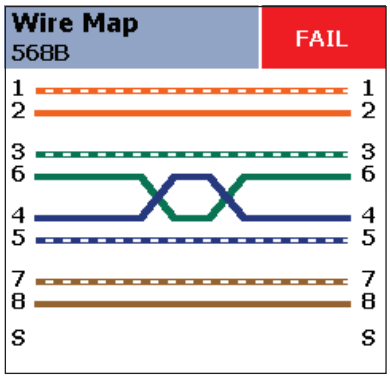
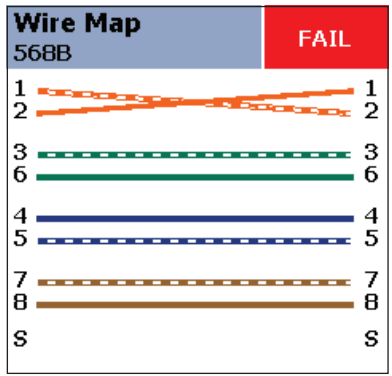
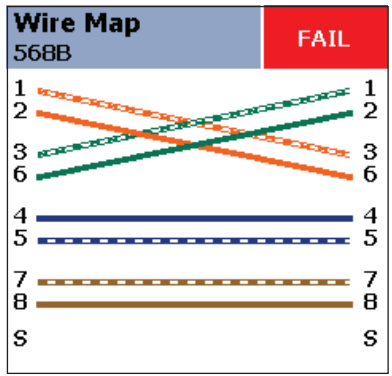
| | | |
|---|---|---|
|  |  |  |
| **Split pair** | **Reversed pair** | **Crossed pairs** |
| A wire in the 3, 6 pair is crossed with a wire in the 4, 5 pair. | Wires 1 and 2 are crossed. | Pairs 1, 2 and 3, 6 are crossed. |

**Figure 3-8. Wire Map Examples (cont.)**

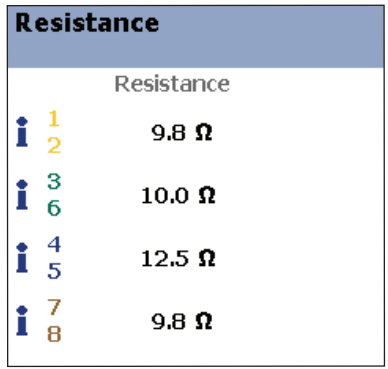
## *Resistance*

Resistance results show the dc loop resistance for each cable pair. The smart remote shorts the end of each pair to create the loops. A pair's resistance depends on the integrity of the contacts in the connector, the length of the pair, and its wire gauge.

Resistance problems always affect other tests. For example:

- A link that is too long has higher-than-normal resistance and will fail the length test.
- High-resistance connections reflect signals that cause the return loss test to fail. The tester's HDTDR test tells you the distance to the bad connection.

Most standards do not have a limit for resistance. The tester shows an **i** when no limit is available. Figure 3-9 shows the resistance results screen.




amd85f.eps

**Figure 3-9. Resistance Results**

## *Characteristic Impedance*

*Note*

*Most test limits do not require the characteristic impedance measurement. Characteristic impedance is not displayed for these limits.*

*Impedance measurements require a cable at least 5 m (16 ft) long. Cables shorter than this length will always pass the impedance test.*

Characteristic impedance results show approximate characteristic impedance of each cable pair.

Characteristic impedance is the impedance a cable would have if the cable were infinitely long. Proper network operation depends on constant characteristic impedance throughout the system's cables and connectors. Abrupt changes in characteristic impedance, called anomalies, cause signal reflections that can cause network faults.

## Length

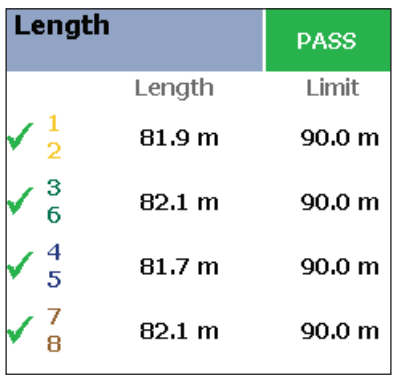
Length results show the length of each cable pair. The **PASS/FAIL** result is assigned based on the shortest measured length. A 2 % to 5 % difference in measured length among cable pairs is normal because of the following:

- Signals travel at slightly different speeds in each cable pair, but the tester uses the same speed to calculate the length of each pair.
- The twist rate varies slightly among cable pairs. If you untwisted and straightened all the pairs, they would have slightly different lengths.

Figure 3-10 shows a length results screen, along with propagation delay and delay skew results for comparison.

*Notes*

*Differences between measured and actual length values can be caused by variations in the cable's NVP value. NVP values can vary among cable types, lots, and manufacturers. In most cases, these differences are minor and may be disregarded.*




amd87f.eps

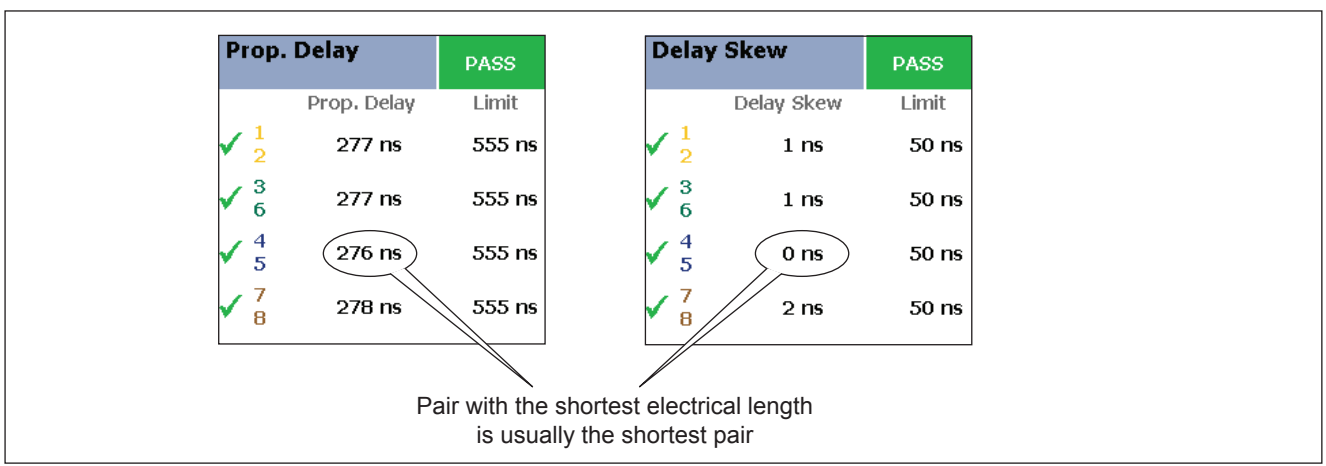
**Figure 3-10. Length Results**

## *Propagation Delay and Delay Skew*

Propagation delay is the time taken for a test pulse to travel the length of a cable pair. The delay is measured in nanoseconds. Propagation delays vary slightly among pairs because of small differences in electrical characteristics and length.

Delay skews are the differences in propagation delays between the shortest delay and the delays of the other cable pairs. The shortest delay is shown as "0 ns" in the delay skew results.

The propagation delay and delay skew results show a limit if the measurements required by the selected test limit. Otherwise, the results always show **PASS**. Figure 3-11 shows the propagation delay and delay skew results screens.




amd88f.eps

**Figure 3-11. Propagation Delay and Delay Skew Results**

## Insertion Loss

*Note*

*Insertion loss is also known as attenuation.*

Insertion loss is the loss of signal strength over the cabling, as shown in Figure 3-12. Insertion loss is caused by the resistance of the copper wire and connecting hardware and by leakage of electrical energy through the cable's insulation.

At higher frequencies, signals tend to travel only near the surface of a conductor. This "skin effect", along with the cabling's inductance and capacitance, cause insertion loss to increase with frequency.

Figure 3-13 describes the insertion loss plot.

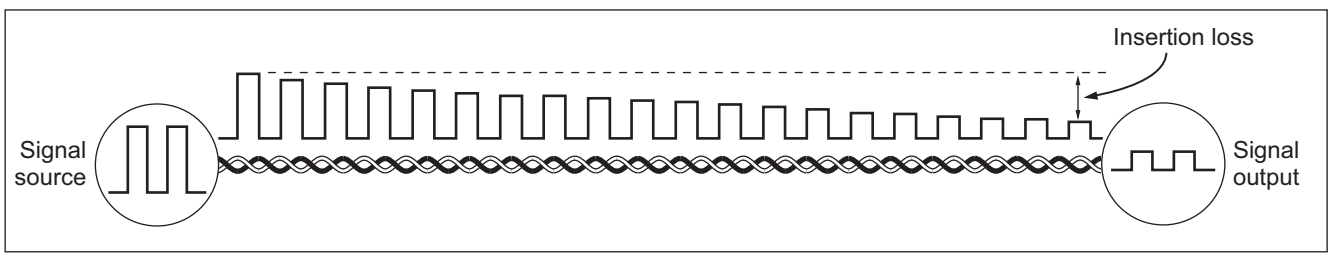
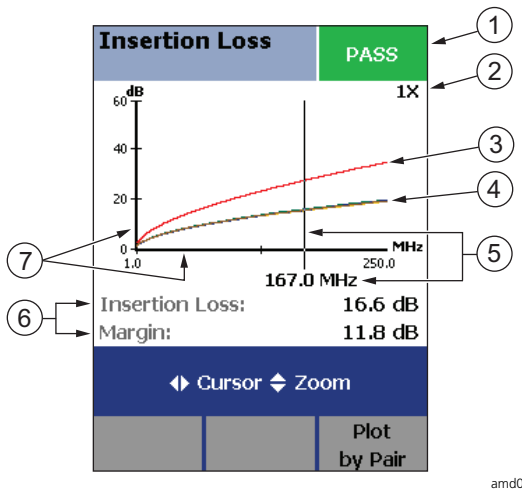



**Figure 3-12. Insertion Loss is a Decrease in Signal Strength**




1. The overall insertion loss result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.
2. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.
3. The limit line (in red) for insertion loss. The lower the measurements fall below the limit line, the better the cabling performance. Press F3 to see plots of individual pairs.
4. Measured insertion loss for the cable pairs. Lower insertion loss means better cabling performance.
5. The cursor and its location on the frequency scale. When you first view the plot, the cursor is placed at the worst margin. Use ◀ ▶ to move the cursor.
6. The measured insertion loss and margin at the cursor's position. Margin is the difference between the measured value and the limit. Margin is negative if the pair failed.
7. The horizontal scale is the frequency range in megahertz. The vertical scale is the insertion loss range in decibels.

**Figure 3-13. Insertion Loss Plot**

## *NEXT (Near-End Crosstalk)*

NEXT results show the crosstalk attenuation between cable pairs. NEXT is the difference in amplitude (in dB) between a transmitted signal and the crosstalk received on other cable pairs at the same end of the cabling. Higher NEXT values correspond to better cabling performance.

Because of insertion loss, crosstalk signals occurring farther from the signal source are weaker and cause less trouble than crosstalk nearer the source (Figure 3-14). For this reason, NEXT is measured from both ends of the cabling.

For NEXT failures, the testers diagnostic screens (F1 **Fault Info**) may show more than one possible cause for the failure. In this case, you can use the HDTDX analyzer results to further diagnose the problem. See Chapter 4 for details.

Figure 3-15 describes the NEXT plot.

*Note*

*For ISO/IEC 11801-2002 and EN50173:2002 standards, NEXT is not evaluated where insertion loss at the same frequency is less than 4 dB.*

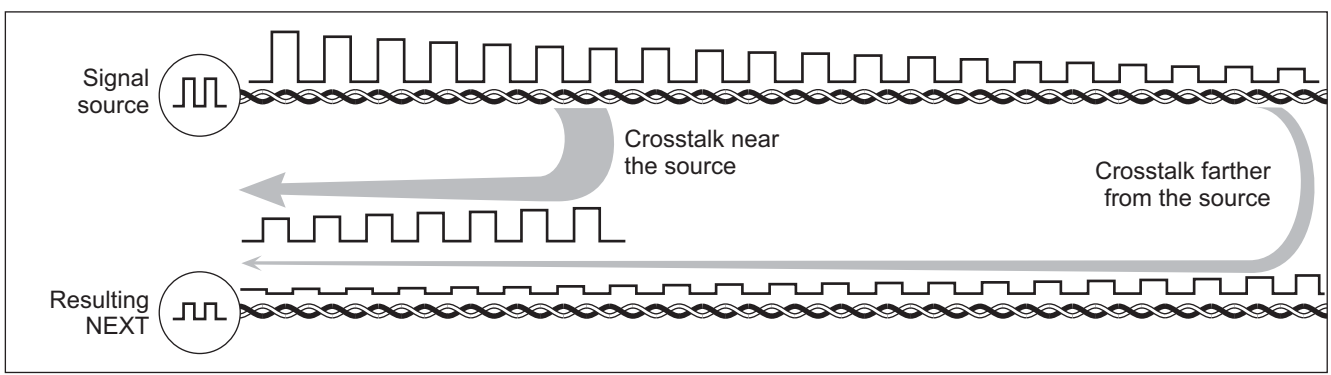
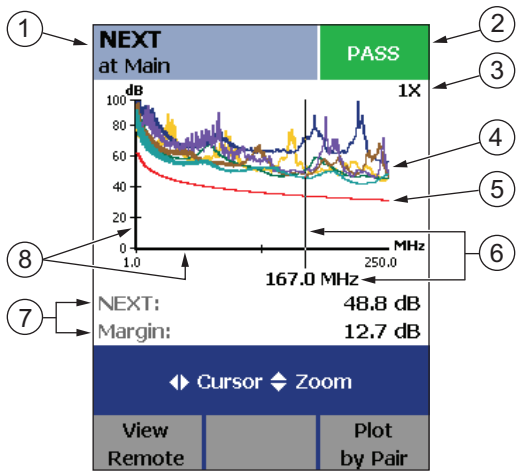



**Figure 3-14. Near-End Crosstalk (NEXT)**



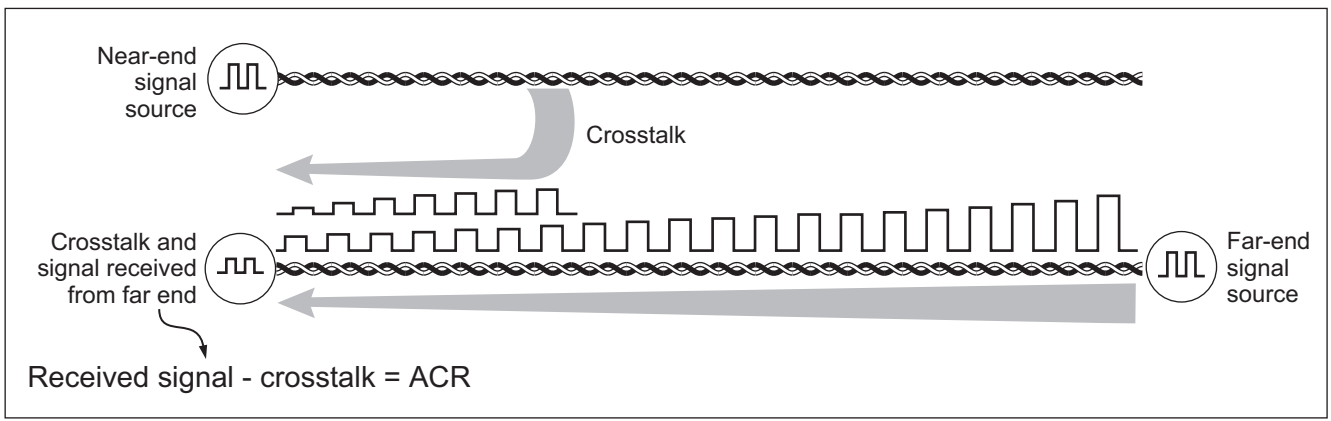

1. The location of the NEXT results. Press F1 to switch between the tester and smart remote.
2. The overall NEXT result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.
3. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.
4. Measured NEXT for the cable pairs. Higher NEXT means better cabling performance.
5. The limit line (in red) for NEXT. The higher the measurements rise above the limit line, the better the cabling performance. Press F3 to see plots of individual pairs.
6. The cursor and its location on the frequency scale. When you first view the plot, the cursor is placed at the worst margin. Use ◀ ▶ to move the cursor.
7. The measured NEXT and margin at the cursor's position. Margin is the difference between the measured value and the limit. Margin is negative if the pair failed.
8. The horizontal scale is the frequency range in megahertz. The vertical scale is the NEXT range in decibels.

**Figure 3-15. NEXT Plot**

## *ACR (Attenuation to Crosstalk Ratio)*

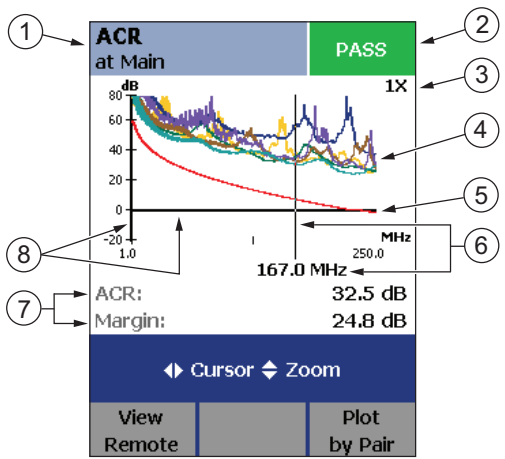
ACR is like a signal-to-noise ratio. ACR values indicate how the amplitude of signals received from a far-end transmitter compares to the amplitude of crosstalk produced by near-end transmissions, as shown in Figure 3-16. The tester calculates ACR as the difference (in dB) between NEXT and attenuation (insertion loss). Higher ACR values mean received signals are much larger than crosstalk signals. Higher ACR values correspond to better cabling performance.

Figure 3-17 describes the ACR plot.




amd91f.eps

**Figure 3-16. Attenuation to Crosstalk Ratio (ACR)**




1. The location of the ACR results. Press F1 to switch between the tester and smart remote.
2. The overall ACR result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.
3. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.
4. Measured ACR for the cable pairs. Higher ACR means better cabling performance.
5. The limit line (in red) for ACR. The higher the measurements rise above the limit line, the better the cabling performance. Press F3 to see plots of individual pairs.
6. The cursor and its location on the frequency scale. When you first view the plot, the cursor is placed at the worst margin. Use ◀ ▶ to move the cursor.
7. The measured ACR and margin at the cursor's position. Margin is the difference between the measured value and the limit. Margin is negative if the pair failed.
8. The horizontal scale is the frequency range in megahertz. The vertical scale is the ACR range in decibels.

**Figure 3-17. ACR Plot**

## *Return Loss*

Return loss is the difference between the power of a transmitted signal and the power of the signals reflected back. The signal reflections are caused by variations in the cable's impedance. Figure 3-18 shows some common sources of reflections that create return loss.

High return loss means the cabling reflects very little of the transmitted signal back to the source. High return loss is especially important for high-speed systems, such as Gigabit Ethernet. The bi-directional (full-duplex) transceivers used in these systems use directional couplers to distinguish between incoming and outgoing signals. The couplers may interpret strong reflected signals as incoming data, resulting in data errors.

A return loss plot indicates how well a cable's impedance matches its rated impedance over a range of frequencies. Figure 3-19 describes the return loss plot.

For return loss failures, the testers diagnostic screens (F1 **Fault Info**) may show more than one possible cause for the failure. In this case, you can use the HDTDR analyzer results to further diagnose the problem. See Chapter 4 for details.

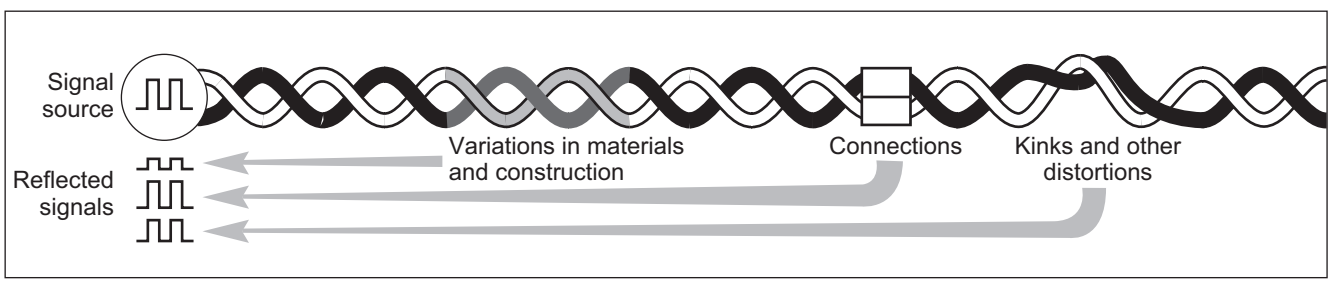
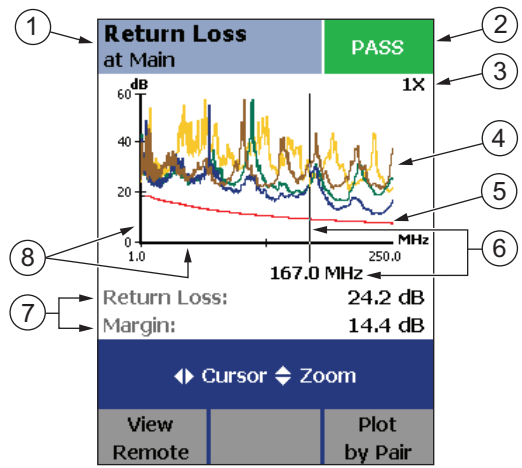



**Figure 3-18. Sources of Return Loss**




1. The location of the return loss results. Press F1 to switch between the tester and smart remote.
2. The overall return loss result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.
3. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.
4. Measured return loss for the cable pairs. Higher return loss means better cabling performance.
5. The limit line (in red) for return loss. The higher the measurements rise above the limit line, the better the cabling performance. Press F3 to see plots of individual pairs.
6. The cursor and its location on the frequency scale. When you first view the plot, the cursor is placed at the worst margin. Use ◀ ▶ to move the cursor.
7. The measured return loss and margin at the cursor's position. Margin is the difference between the measured value and the limit. Margin is negative if the pair failed.
8. The horizontal scale is the frequency range in megahertz. The vertical scale is the return loss range in decibels.

**Figure 3-19. Return Loss Plot**

### *PSNEXT (Power Sum Near End Crosstalk) Test*

PSNEXT results show how much each cable pair is affected by the combined crosstalk from the other pairs. PSNEXT is the difference (in dB) between the test signal and the crosstalk from the other pairs received at the same end of the cabling. The tester uses the NEXT values to calculate PSNEXT. Higher PSNEXT values correspond to better cabling performance.

PSNEXT results are typically a few dB lower (worse) than worst-case NEXT results.

### *PSACR (Power Sum Attenuation to Crosstalk Ratio) Test*

PSACR values indicate how the amplitude of signals received from a far-end transmitter compares to the combined amplitudes of crosstalk produced by near-end transmissions on the other cable pairs. PSACR is the difference (in dB) between PSNEXT and attenuation (insertion loss). The tester uses the PSNEXT and attenuation results to calculate PSACR values. Higher PSACR values mean received signals are much larger than the crosstalk from all the other cable pairs. Higher PSACR values correspond to better cabling performance.

PSACR is the difference (in dB) between each wire pair's attenuation (insertion loss) and the combined crosstalk received from the other pairs. The tester uses the PSNEXT and attenuation values to calculate PSACR values.

PSACR results are typically a few dB lower (worse) than worst-case ACR results.

### *ELFEXT (Equal Level Far-End Crosstalk) Test*

While NEXT is measured at the same end as the signal source, FEXT (far-end crosstalk) is measured at the far end. Because all far-end crosstalk signals travel the same distance, they experience the same amount of attenuation, as shown in Figure 3-20. This means that all crosstalk signals contribute equally to noise at the far end. This is different from near-end crosstalk. At the near end, crosstalk occurring closer to the source contributes more to noise than crosstalk occurring farther from the source. (Figure 3-14).

Because of attenuation, FEXT on longer cables is less than FEXT on shorter cables of the same type. Subtracting the effects of attenuation normalizes the results for length and produces ELFEXT (equal level far end crosstalk) values. Since ELFEXT does not depend on length, it is used instead of FEXT to evaluate cable performance.

Because all far-end crosstalk signals travel the same distance, they tend to add up in phase. Therefore, high ELFEXT is critical when two or more wire-pairs carry signals in the same direction. 1000BASE-T carries bi-

directional signals on all four wire pairs, so ELFEXT is a critical parameter for 1000BASE-T certification.

Like ACR, ELFEXT represents a signal-to-noise ratio for the cabling. Higher ELFEXT values mean that data signals received at the far end of the cabling are much larger than crosstalk signals received at the far end. Higher ELFEXT values correspond to better cabling performance.

NEXT and ELFEXT performance tends to be similar in cable, but may differ greatly in connecting hardware. Some connectors achieve good NEXT performance by balancing the inductive and capacitive currents that cause crosstalk. Since these currents are 180° out of phase at the near-end of the cabling, they cancel out, which eliminates crosstalk at the near end. However, currents that cancel at the near end add up at the far end, causing far-end crosstalk and poor ELFEXT performance.

Figure 3-21 describes the ELFEXT plot.

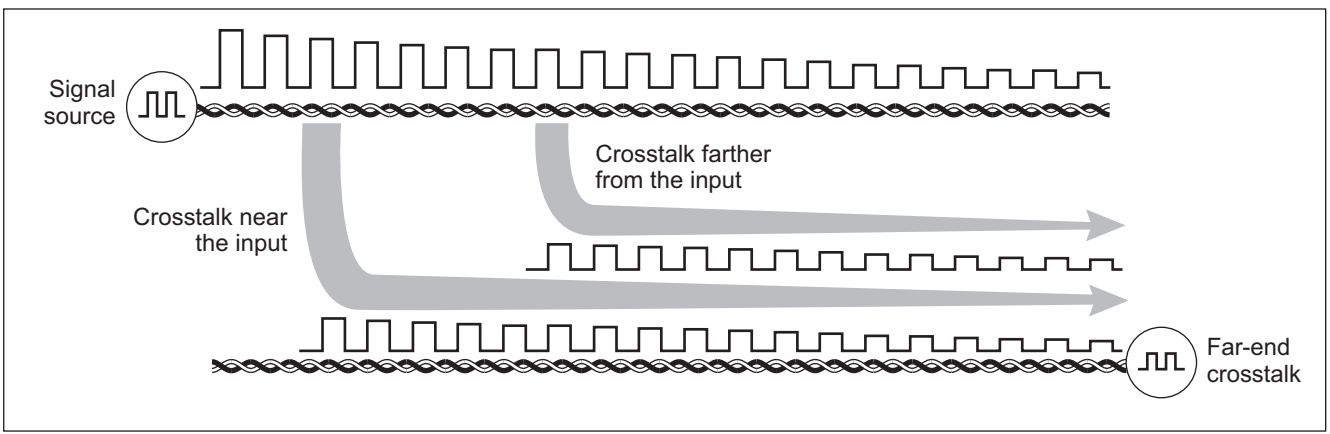
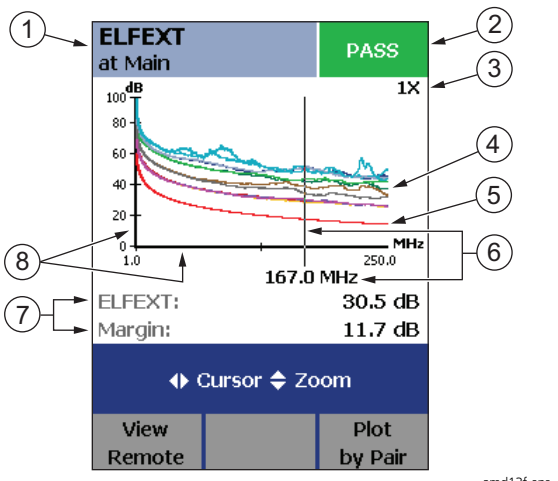



**Figure 3-20. Far-End Crosstalk (FEXT)**




1. The location of the ELFEXT results. Press F1 to switch between the tester and smart remote.
2. The overall ELFEXT result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.
3. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.
4. Measured ELFEXT for the cable pairs. Higher ELFEXT means better cabling performance.
5. The limit line (in red) for ELFEXT. The higher the measurements rise above the limit line, the better the cabling performance. Press F3 to see plots of individual pairs.
6. The cursor and its location on the frequency scale. When you first view the plot, the cursor is placed at the worst margin. Use ◀ ▶ to move the cursor.
7. The measured ELFEXT and margin at the cursor's position. Margin is the difference between the measured value and the limit. Margin is negative if the pair failed.
8. The horizontal scale is the frequency range in megahertz. The vertical scale is the ELFEXT range in decibels.

**Figure 3-21. ELFEXT Plot**

### *PSELFEXT Test*

PSELFEXT results show how much the far end of each cable pair is affected by the combined far-end crosstalk from the other pairs. PSELFEXT is the difference (in dB) between the test signal and the crosstalk from the other pairs received at the far end of the cabling. The tester uses the ELFEXT values to calculate PSELFEXT. Higher PSELFEXT values correspond to better cabling performance.

PSELFEXT results are typically a few dB lower than worst-case FEXT results.

## *Running Single Tests*

The tester's single test mode (**SINGLE TEST** on the rotary switch) lets you run individual tests for isolating cabling failures and quickly testing repairs. You can run some single tests without a remote. Table 3-2 shows which tests require a smart remote.

Single tests use the selected test limit to produce a PASS/FAIL result for the test. Each single test also produces results for other measurements. For example, the wire map test also produces resistance, propagation delay, and delay skew results. To see these results, press EXIT when the single test is finished; then press F2 **View Results**.

To save a single test, press SAVE, select or create a cable ID; then press SAVE again.

**Table 3-2. Smart Remote Requirements for Single Tests**

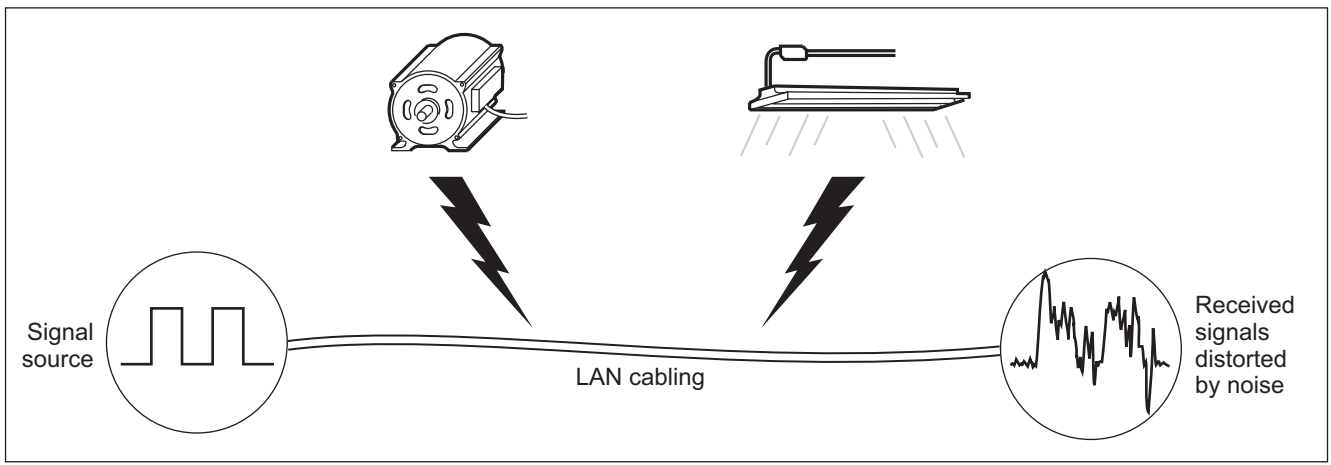
| Test | Smart Remote Requirements* |
|---|---|
| HDTDX analyzer | Recommended. Without a smart remote, results for short cables may be unreliable. |
| HDTDR analyzer | Optional. Without a smart remote, the plot shows large reflections at the end of the cabling. |
| Wire Map | Recommended. Without a remote some faults, such as split pairs and opens at the far-end connector, cannot be detected. |
| Length | Optional. |
| Propagation Delay | Optional. |
| Delay Skew | Optional. |
| Insertion Loss | Required. |
| NEXT/PSNEXT | Recommended. The NEXT test fails unless the end of the cabling is properly terminated with a remote or resistors. |
| ELFEXT/PSELFEXT | Required. |
| ACR/PSACR | Required. |
| Return Loss | Recommended. The return loss test fails unless the end of the cabling is properly terminated with a remote or resistors. |
| * Note: If a remote is not required for a test, the test runs without activating the toner when no remote is detected. | |

## *Monitoring Impulse Noise*

Impulse noise is electrical noise generated by fluorescent lights, electric motors, electric heaters and air conditioners, photocopiers, refrigerators, microwave ovens, and other electric devices. Active links in the same pathway can also cause noise.

Noise distorts the shape of digital signals, as shown in Figure 3-22. Too much noise can cause transmission errors, resulting in poor network performance.

The impulse noise test lets you monitor noise on inactive twisted pair cabling to determine if the noise may affect network operation.




amd95f.eps

**Figure 3-22. Causes and Effects of Noise**

The test takes noise voltage samples every second on pair 3, 6. The test produces a PASS/FAIL result if the selected standard specifies a noise limit.

*Notes*

*To extend battery life, connect the ac adapter when monitoring impulse noise for extended periods. The tester's power down timer is disabled during the impulse noise test.*

*Monitoring impulse noise without a smart remote may produce unreliable test results.*

To monitor impulse noise:

**1** Attach twisted pair link interface adapters to the tester and smart remote.

**2** Turn the rotary switch to **MONITOR** and turn on the smart remote; then connect to the testers to the ends of the cabling.

**3** Press TEST.

To adjust the noise threshold, press F3 **Stop**; then use ▲ ▼ to change the value. Press TEST to resume testing.

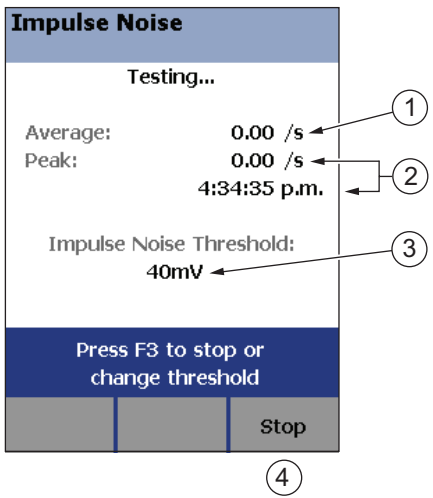
**Tip:** Fluke Networks recommends a noise threshold of 30 mV with an average pulse rate below 0.01/sec for testing 1000BASE-T (Gigabit Ethernet) cabling.

To stop the test at any time, press EXIT.

*Note*

*If you disconnect the tester and smart remote during the impulse noise test, it takes several minutes for the remote to stop testing.*

Figure 3-23 describes the impulse noise test results.




① The average number of noise hits per second.

② The highest number of noise hits per second since the start of the test. The time shows when the peak was recorded.

③ The minimum level of noise considered to be a noise hit. To change the threshold, press F3 **Stop**; then use ▲ ▼.

To stop the test, press F3 **Stop**.

If the 10BASE-T standard is selected, the screen also shows a PASS/FAIL result. PASS means than no 10-second interval included more than two noise hits. FAIL means than more than two noise hits were detected during a 10-second interval.

**Figure 3-23. Impulse Noise Test Results**

## Using the Tone Generator

The tone generator on the tester and smart remote produces a distinct signal for locating cables and jacks with a tone probe such as a Fluke Networks IntelliTone™ probe. The tone probe converts the toner's signal to audible tones that get louder as you get closer to the cable or jack transmitting the signal.

The tone generator also activates a sleeping or powered-down tester or smart remote connected to the other end of the cabling.

*Note*

*The tone generator does not generate the IntelliTone signal.*

To use the tone generator:

1. Attach a twisted pair adapter to the tester or smart remote.
2. Connect the tester or smart remote to the cabling as shown in Figure 3-24.
3. To turn on the tester's toner, turn the rotary switch to **AUTOTEST** or **SINGLE TEST**; then press TEST.

   To turn on the smart remote's toner, press TEST.
4. Use a tone probe to locate the cable or jack transmitting the tone.

   *Notes*

   *The toner's signal may not be detectable along shielded cable, but can be detected at a patch panel or outlet.*
5. To start the test selected on the tester, connect the far-end unit to the cabling.

   To turn off the tester's toner, press EXIT.

   To turn off the smart remote's toner, press TEST.

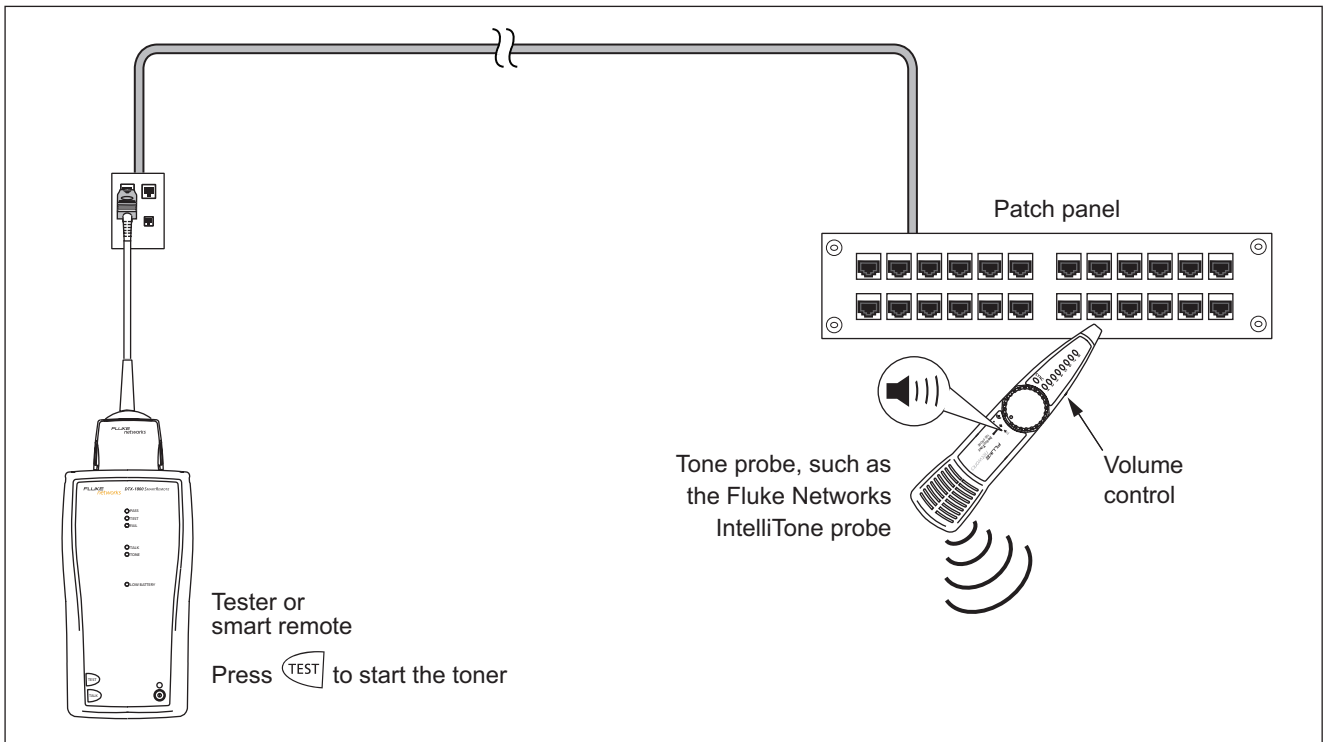



**Figure 3-24. Using the Tone Generator**

# Chapter 4
# Diagnosing Twisted Pair Cabling Faults

## Using the Automatic Diagnostics

The DTX Series testers helps you isolate cabling faults by automatically diagnosing Autotest failures. Press F1 **Fault Info** after a failed Autotest to see information about the location and likely cause of the fault.

## Avoiding Tester-Induced Failures

Some test failures can be avoided if the tester is properly maintained and configured. To keep your tester in top condition, follow these guidelines:

- Keep the tester's software current. The latest software is available on the Fluke Networks website. See Chapter 9 for details on installing updates.
- Set the reference for the twisted pair adapters every 30 days. See Chapter 3 for details.
- Run the self test before going to the job site. See Chapter 1 for details.
- Be sure to select the correct test standard and cable type for the job.
- Send the testers to a Fluke Networks service center every 12 months for factory calibration.

## *Common Causes of Twisted Pair Test Failures*

Table 4-1 describes common causes of test failures on twisted pair cabling.

**Table 4-1. Diagnosing Twisted Pair Test Failures**

| **Wire Map: open** |
| --- |
| • Wires connected to wrong pins at connector or punchdown blocks<br>• Faulty connections<br>• Damaged connector<br>• Damaged cable<br>• Wrong **Outlet Configuration** selected in setup<br>• Wrong application for cable |
| **Wire Map: split pair or reversed pair** |
| Wires connected to wrong pins at connector or punchdown block. |

-continued-

**Table 4-1. Diagnosing Twisted Pair Test Failures (cont.)**

| **Wire Map: crossed wires** |
|---|
| • Wires connected to wrong pins at connector or punchdown block.<br>• Mix of 568A and 568B wiring standards (12 and 36 crossed).<br>• Crossover cables used where not needed (12 and 36 crossed). |
| **Wire Map: short** |
| • Damaged connector<br>• Damaged cable<br>• Conductive material stuck between pins at connector.<br>• Improper connector termination<br>• Wrong application for cable |
| **"Bad patch cord" message appears (indicates excessive crosstalk over the first 2 m of the cabling)** |
| • Poor quality patch cord used for channel<br>• Cable on permanent link interface adapter is badly distorted or damaged<br>• Wrong test standard selected |

-continued-

**Table 4-1. Diagnosing Twisted Pair Test Failures (cont.)**

| **NEXT, PSNEXT, ELFEXT, PSELFEXT gives FAIL, FAIL*, or PASS* result** |
|---|
| *Note*<br>*Fixing NEXT problems usually corrects ELFEXT problems.*<br>• Excessive untwisting of pairs at connector<br>• Poor quality patch cords<br>• Poor quality connectors<br>• Poor quality cable<br>• Poorly matched plug and jack (Cat 6/Class E applications)<br>• Incorrect link interface adapter<br>• Cable compression (tight cable ties, pinches, kinks, etc.)<br>• Inappropriate use of couplers<br>• Excessive noise source near cabling under test. Use the impulse noise test to check for noise.<br>• Wrong test standard selected |

-continued-

**Table 4-1. Diagnosing Twisted Pair Test Failures (cont.)**

| |
|---|
| **NEXT passes, but the plot shows that measurements exceed the limit** |
| For ISO/IEC standards, NEXT is not evaluated where insertion loss is less than 4 dB (the 4 dB rule). |
| **Return passes, but the plot shows that measurements exceed the limit** |
| Return loss is not evaluated where insertion loss is less than 3 dB (the 3 dB rule). |
| **Return loss gives FAIL, FAIL*, or PASS* result** |
| • Patch cord or cable impedance not 100 Ω<br>• Patch cord handling causing changes in impedance<br>• Excessive amount of cable jammed into outlet box<br>• Tight service loops in telecommunications closet<br>• Excessive untwisting of pairs at connector<br>• Poor quality connectors<br>• Cable impedance not uniform (poor quality cable) |

-continued-

**Table 4-1. Diagnosing Twisted Pair Test Failures (cont.)**

| **Return loss gives FAIL, FAIL*, or PASS* result (cont.)** |
|---|
| • Mismatches in cable construction (such as cable from different manufacturers)<br>• Cable compression (tight cable ties, pinches, kinks, etc.)<br>• Poorly matched plug and jack (Cat 6/Class E applications)<br>• Wrong test standard selected<br>• Defective link interface adapter |
| **Insertion loss gives FAIL, FAIL*, or PASS* result** |
| • Cabling is too long<br>• Poor quality patch cord<br>• Bad connection<br>• Wrong cable type in installation<br>• Wrong test standard selected |

-continued-

**Table 4-1. Diagnosing Twisted Pair Test Failures (cont.)**

| **Characteristic impedance exceeds the limit or an anomaly is detected** |
|---|
| • Bad connection<br>• Cable compression (tight cable ties, pinches, kinks, etc.)<br>• Mismatch of cable types<br>• Excessive loading at coaxial cable tap<br>• Incorrect terminator value (coaxial cable) |
| **Resistance gives FAIL, FAIL*, or PASS* result** |
| • Cabling is too long<br>• Bad connection due to oxidized or loose contacts<br>• Wire gauge is too thin<br>• Wrong patch cord type used |
| **Length gives FAIL result** |
| • Cable is too long (may need to remove coiled service loops)<br>• NVP is set incorrectly |

-continued-

**Table 4-1. Diagnosing Twisted Pair Test Failures (cont.)**

| **Propagation delay or delay skew gives FAIL result** |
|---|
| • Cable is too long (may need to remove coiled service loops)<br>• Cable uses different insulation materials on different pairs |
| **Impulse noise is detected** |
| • Electrical devices near the cabling are generating noise pulses.<br>• There is an active link in the same bundle as the cabling under test.<br>• Verify that the tester and smart remote are operating correctly. Connect the units together and run an Autotest. |

# The HDTDX Analyzer

The HDTDX™ (High-Definition Time Domain Crosstalk) analyzer plots the locations and magnitudes of crosstalk on the cabling under test. The analyzer, along with the tester's automatic diagnostics, helps you isolate the causes of NEXT and ELFEXT failures.

## Running the HDTDX Analyzer

After an Autotest, you can view HDTDX results only if the Autotest test failed.

To see HDTDX results for a failed Autotest, select **HDTDX Analyzer** on the Autotest **Summary** screen.

To run the HDTDX analyzer as a single test:

*Note*

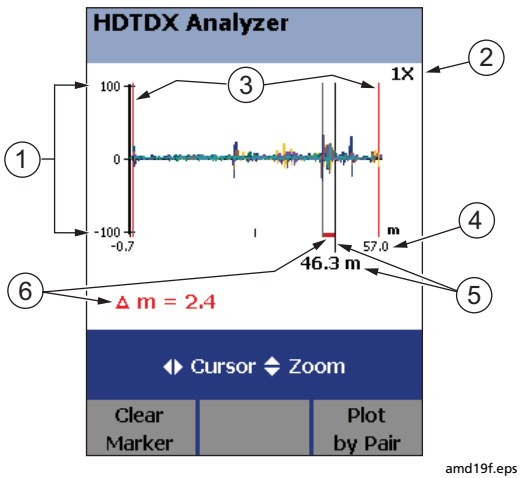
*You can run the HDTDX analyzer with or without a smart remote. Without a remote, results on short cables may be unreliable.*

1. Turn the rotary switch to **SINGLE TEST** and verify that the test limit and cable type are correct. Change them in **SETUP** if necessary.
2. Attach the appropriate interface adapters to the tester and smart remote.
3. Turn on the smart remote; then connect the tester and remote to the cabling.
4. Turn the rotary switch to **SINGLE TEST**, select **HDTDX Analyzer**; then press TEST.
5. To save the results, press SAVE. Select or create a cable ID; then press SAVE again.

*Note*

*If **Store Plot Data** is set to **No**, the HDTDX plot will not be included in saved results.*

Figure and 4-1 describe the HDTDX plot.




1. The magnitude of crosstalk on the cable pairs. Crosstalk levels shown on the plot are adjusted to compensate for insertion loss. This means that the levels represent the magnitudes of the signals as they appear at the crosstalk source.

   To see the crosstalk on just one pair, press F3 **Plot By Pair**. Press EXIT to return to the plot of all pairs.

2. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.

3. The beginning and end of the cabling under test. The plot shows 0.7 m before and after the beginning and end for a permanent link.

4. The distance to the end of the cabling.

5. The cursor and the distance to the cursor from the tester. Use ◀ ▶ to move the cursor.

6. Readouts showing the distance between the measurement cursors. To use the measurement cursors:

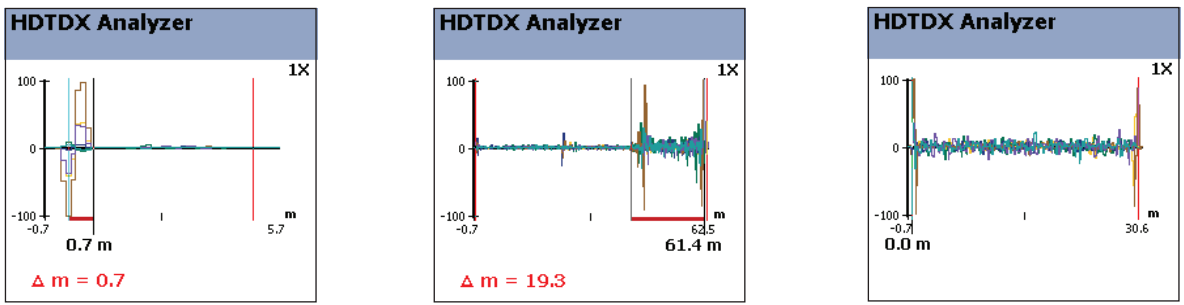
   **1** Use ◀ ▶ to move the cursor to the beginning of an area of interest. Use ▲ ▼ to zoom in on the area if desired.

   **2** Press F1 **Set Marker**; then use ◀ ▶ to move the second cursor to the end of the area of interest.

**Figure 4-1. HDTDX Plot**

## *Recognizing Faults on HDTDX Plots*

Figure 4-2 shows how some common faults appear on HDTDX plots.




① Bad connector ② Bad section of cable ③ Bad spool of cable

amd98f.eps

① A bad connector at the end of a patch cord near the main tester.

② Bad section of cable near the smart remote.

③ A spool of cable with poor NEXT performance. This cable produced a **FAIL** result. Note the crosstalk along the entire length of the cable.

**Figure 4-2. Interpreting HDTDX Plots**

# The HDTDR Analyzer

The HDTDR™ (High-Definition Time Domain Reflectometry) analyzer plots the locations and magnitudes of reflections caused by impedance anomalies. The analyzer, along with the tester's automatic diagnostics, helps you isolate the causes of return loss failures.

## Running the HDTDR Analyzer

After an Autotest, you can view HDTDR results only if the Autotest failed.

To see HDTDR results for failed Autotest, select **HDTDR** on the Autotest **Summary** screen.

To run the HDTDR test as a single test:

*Note*

*Though you can run the HDTDR analyzer without a smart remote, the following steps assume you are using a remote.*

1. Turn the rotary switch to **SINGLE TEST** and verify that the test limit and cable type are correct. Change them in **SETUP** if necessary.
2. Attach the appropriate interface adapters to the tester and smart remote.
3. Turn on the smart remote; then connect the tester and remote to the cabling.
4. Turn the rotary switch to **SINGLE TEST**, select **HDTDR Analyzer**; then press TEST.
5. To save the results, press SAVE. Select or create a cable ID; then press SAVE again.

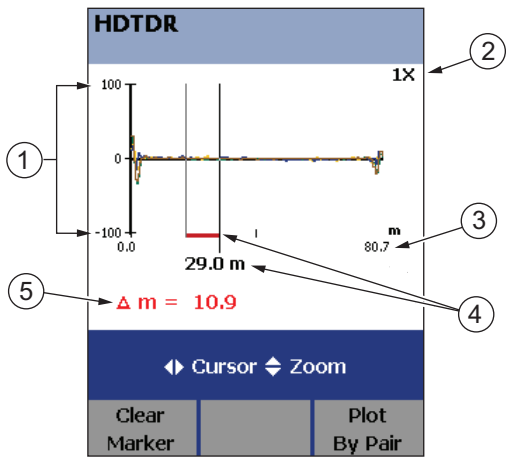
*Note*

*If **Store Plot Data** is set to **No**, the HDTDR plot will not be included in saved results.*

Figure 4-3 describes the HDTDR analyzer.

## Recognizing Faults on HDTDR Plots

Figure 4-4 shows how some common faults appear on HDTDR plots.




1. The percentage of the HDTDR test signal reflected back to the tester. See Figure 4-4 for details. Reflections shown on the plot are adjusted to compensate for insertion loss. This means that the reflections represent the magnitudes of the signals as they appear at the cause of the reflection.

   To see the reflections on just one pair, press F3 **Plot By Pair**. Press EXIT to return to the plot of all pairs.

2. Magnification level for the plot. Use ▲ ▼ to zoom in or out at the cursor's location.

3. The distance to the end of the cabling.

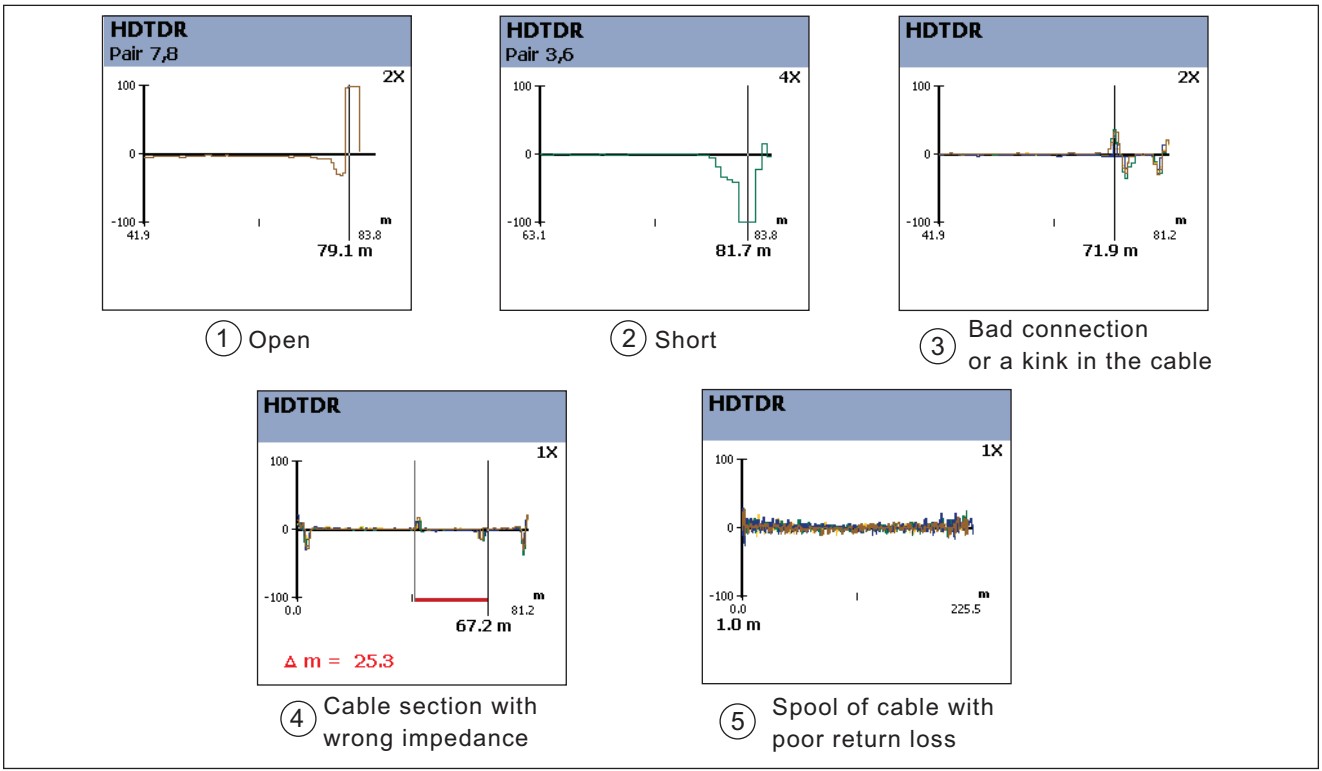
4. The cursor and the distance to the cursor from the tester. Use ◀ ▶ to move the cursor.

5. Readouts showing the distance between the measurement cursors. To use the measurement cursors:

   **1** Use ◀ ▶ to move the cursor to the beginning of an area of interest. Use ▲ ▼ to zoom in on the area if desired.

   **2** Press F1 **Set Marker**; then use ◀ ▶ to move the second cursor to the end of the area of interest.

**Figure 4-3. HDTDR Plot**




amd100f.eps

**Figure 4-4. Interpreting HDTDR Plots**

① Open on pair 7, 8 near the smart remote. A positive reflection indicates an increase in impedance. Opens are large increases in impedance and create large positive reflections

② Short on pair 3, 6 near the smart remote. A negative reflection indicates a decrease in impedance. Shorts are large decreases in impedance and create large negative reflections.

③ Bad connection or kink near the smart remote. The reflection for this example starts with a positive pulse. This indicates that the fault has higher impedance than the rest of the cable. A fault with lower impedance would start with a negative pulse.

④ Cable section with higher impedance than the rest of the cable. The bad cable section is near the smart remote. Note the positive pulse where the impedance increases at the beginning of the bad section, and the negative pulse where impedance decreases at the end of the bad section.

⑤ A spool of cable with poor return loss. This cable produced a **FAIL*** result. The cable produces reflections along its entire length.

**Figure 4-4. Interpreting HDTDR Plots (cont.)**

# Chapter 5
# Certifying Fiber Optic Cabling

## Overview of Features

The optional DTX-MFM and DTX-SFM fiber modules are used with a DTX Series CableAnalyzer to test and certify fiber optic cabling installations. The fiber modules offer the following functions and features:

- Measures optical power loss and length on dual-fiber cabling. The DTX-MFM tests multimode cabling at 850 nm and 1300 nm. The DTX-SFM tests singlemode cabling at 1310 nm and 1550 nm.
- Each module transmits both wavelengths (850 nm and 1300 nm; 1310 nm and 1550 nm).
- Provides pass/fail results based on industry-standard limits.
- Visual fault locator helps you locate breaks, bad splices, bends, and check fiber continuity and polarity.
- FindFiber™ function helps you identify and verify fiber connections.

**⚠ Warning: Class 1 and Class 2 Laser Products**

**To avoid possible eye damage caused by hazardous radiation:**

- **Never look directly into optical connectors. Some sources produce invisible radiation that can permanently damage your eyes.**

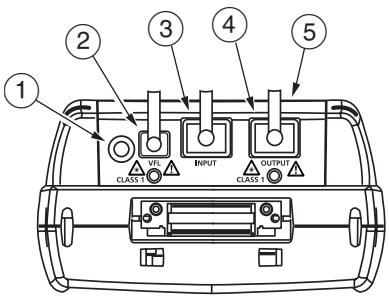
- **Keep the fiber module's OUTPUT port covered with a dust cap or keep a patch cord attached. The OUTPUT port may be active even when a test is not in progress. Covering the port reduces the risk of accidental exposure to hazardous radiation.**
- **Never start a test or activate the OUTPUT port or VFL port without first connecting a fiber to the port you will use.**
- **Never look directly into the visual fault locator output. Momentary exposure to the locator's output will not damage your eyes; however, direct, long-term exposure is potentially hazardous.**
- **Do not use magnification to view the optical outputs without proper filtering.**
- **Use of controls, adjustments, or procedures not stated herein might result in hazardous radiation exposure.**

## Caution

**To avoid damaging the tester or cables under test, to avoid data loss, and to ensure maximum accuracy of test results:**

- **Turn off the tester before attaching or removing modules.**
- **Leave the module bay covers in place when the fiber modules are not installed.**
- **When using the fiber modules, use proper cleaning procedures to clean all fiber connectors before every use. Neglecting this step or using improper procedures can cause unreliable test results and may permanently damage the connectors.**
- **Use a Fluke Networks FiberInspector Video Microscope to periodically inspect the fiber module's OUTPUT connector for scratches and other damage.**
- **Do not use a video microscope to inspect the fiber module's INPUT connector. This connector has different dimensions than the OUTPUT connector, and may be damaged by a fiber inspection probe.**

## *Physical Features*




amd64f.eps

**⚠ Warning**

**Never look directly into optical output connectors (② and ④). Some sources produce invisible radiation that can permanently damage your eyes.**

① Button for activating the visual fault locator (②) and output port (④). See "Using the Visual Fault Locator" in Chapter 6 and "Autotest in Far End Source Mode" on page 5-30.

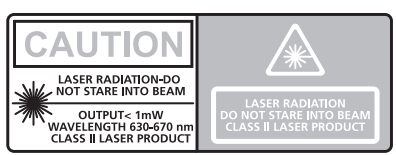
② Universal fiber connector (with dust cap) for the visual fault locator output. The connector accepts 2.5 mm ferrules. The LED below the connector indicates the locator's mode (continuous or blinking).

③ SC input connector with dust cap. Receives optical signals for loss, length, and power measurements.

④ SC output connector with dust cap. Transmits optical signals for loss and length measurements.

The LED below the connector is red when the output is active at 850 nm (DTX-MFM) or 1310 nm (DTX-SFM) and green for 1300 nm (DTX-MFM) or 1550 nm (DTX-SFM).

⑤ Laser safety label.




amd128i.eps

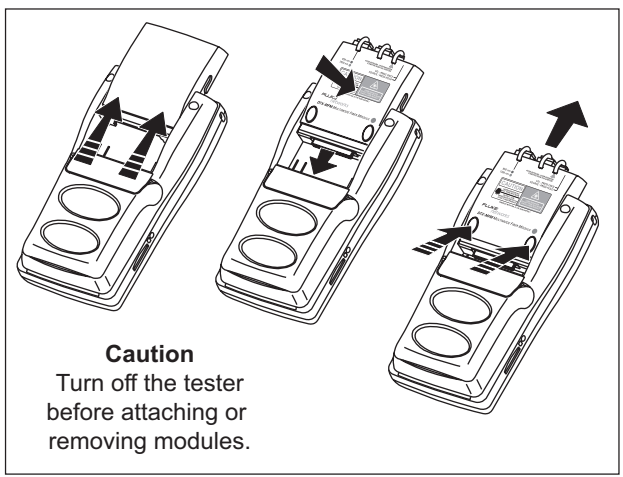
**Figure 5-1. Fiber Module Features**

## *Installing and Removing Fiber Modules*

Figure 5-2 shows how to install and remove the fiber modules.

### Caution

**Leave the module bay covers in place when the fiber modules are not installed.**

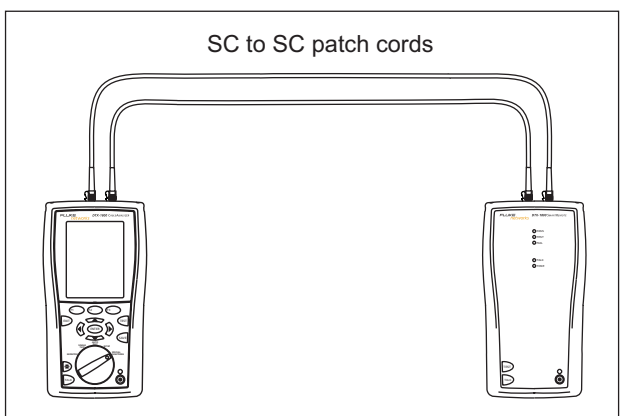



amd34af.eps

**Figure 5-2. Installing and Removing Fiber Modules**

## *Verifying Operation*

1. Clean the tester's connectors and the connectors on two SC/SC patch cords.
2. Connect the tester and smart remote together, as shown in Figure 5-1.
3. Turn the rotary switch to **SPECIAL FUNCTIONS**.
4. Use ◁▷ to highlight **Self Test**; then press ENTER.
5. Press TEST to start the self test.




amd118f.eps

**Figure 5-3. Self Test Connections for Fiber Modules**

# *Essentials for Reliable Fiber Test Results*

To get reliable fiber test results, you must follow proper cleaning and referencing procedures and, in some cases, use mandrels during testing.

## *Cleaning Connectors and Adapters*

Always clean and inspect fiber connectors before making connections. Use 99 %-pure isopropyl alcohol and optical-grade wipes or swabs to clean connectors as follows:

- Connector ends: Wipe the end of the ferrule with a swab or wipe lightly moistened with alcohol. Dry with a dry swab or wipe.

  *Note*

  *Use a 2.5 mm foam swab for cleaning the tester's optical connectors.*

- Bulkhead connectors: Dip the tip of a foam swab in alcohol; then touch the swab to a dry wipe. Touch a new, dry swab to the alcohol spot on the wipe. Push the swab into the connector; twist it around 3 to 5 times against the endface, then remove and dispose of the swab. Dry the connector with a dry swab by twisting it around in the connector 3 to 5 times.
- Inspect connectors with a fiber microscope, such as the Fluke Networks FiberInspector Video Microscope before making connections.

Periodically clean fiber adapters with a swab and alcohol. Dry adapters with a dry swab before use.

Always cover unused connectors with dust caps or plugs. Clean dust plugs periodically with a swab or wipe and alcohol.

## About Setting the Reference

The reference serves as the baseline power level for loss measurements. Regular referencing helps account for minor variations in source power and connection integrity. Also, since the reference is the baseline for measurements, the losses of the patch cords and adapters used during referencing are excluded from test results.

*Note*

*Turn on the tester and smart remote and let them sit for 5 minutes before setting the reference. Allow additional time if the modules have been stored above or below room temperature.*

You should set the reference at these times:

- At the beginning of each day using the remote end setup (Figures 5-8 through 5-16) you will use that day.
- Anytime you reconnect a patch cord to the module's output or other source.
- Anytime the tester warns you that the reference is out of date.
- Anytime you see a negative loss measurement. (See Chapter 7.)

You must set the reference at these times:

- Anytime you change the fiber module in the tester or smart remote.
- Anytime you start using a different smart remote.
- Anytime you change the **Test Method** in Setup.
- Twenty-four hours after the reference was previously set.

Reference values should not change by more than a few tenths of a dB from day to day. Larger changes may indicate a problem with the patch cords or connections.

See the sections on Smart Remote, Loopback, and Far End Source modes for details on setting the reference for each mode.

After you set the reference, you can enter the lengths of the patch cords used for reference and test connections. The lengths are included with saved results to meet TSB-140 reporting requirements for fiber test results.

## *Using Mandrels for Testing Multimode Fiber*

You should use mandrels when testing multimode fiber with the DTX-MFM fiber modules. Mandrels can improve measurement repeatability and consistency. They also allow the use of LED light sources to certify 50 µm and 62.5 µm fiber links for current and planned high bit-rate applications, such as Gigabit Ethernet and 10 Gigabit Ethernet.

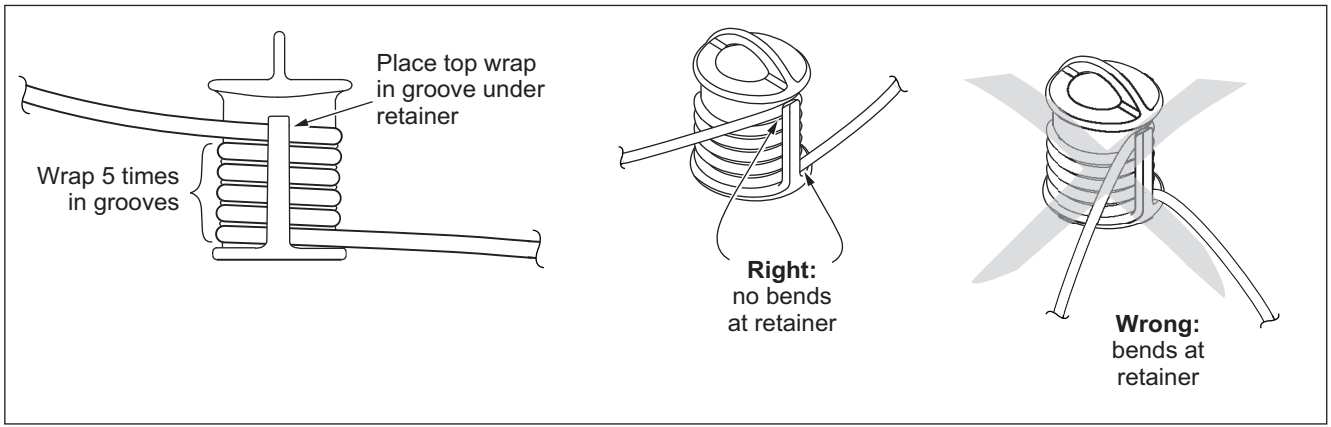
The gray mandrels included with the DTX-MFM are compliant with TIA/EIA-568-B for 62.5 µm fiber with a 3 mm jacket. Mandrels for 50 µm fiber are available from Fluke Networks. Refer to the appropriate standard for mandrel requirements if you follow other standards. Table 5-1 shows a partial list of mandrel requirements for TIA and ISO standards.

Figure 5-4 shows how to wrap the fiber around a mandrel. Place mandrels on the tester's output fibers, as shown in Figures 5-7 through 5-16.

In the reference and test connection diagrams shown on the tester, mandrels are indicated by a loop in the fiber.

**Table 5-1. TIA/EIA-568-B.1 and ISO/IEC TR 14763-3 Mandrel Requirements**

| Fiber core size | Standard | Wraps Around Mandrel | Mandrel Diameter for 250 µm Buffered Fiber | Mandrel Diameter for 3 mm (0.12 in) Jacketed Cable |
|---|---|---|---|---|
| 50 µm | TIA/EIA-568-B.1 7.1 | 5 | 25 mm (1.0 in) | 22 mm (0.9 in) |
| | ISO/IEC TR 14763-3 6.22 | 5 | 15 mm (0.6 in) | 15 mm (0.6 in) |
| 62.5 µm | TIA/EIA-568-B.1 7.1 | 5 | 20 mm (0.8 in) | 17 mm (0.7 in) |
| | ISO/IEC TR 14763-3 6.22 | 5 | 20 mm (0.8 in) | 20 mm (0.8 in) |




amd67f.eps

**Figure 5-4. Wrapping a Patch Cord Around a Mandrel**

## *Testing Your Patch Cords*

You should test your patch cords before each job. Use another set of known-good patch cords to set a reference and run an Autotest on each patch cord. Use Smart Remote mode to test two patch cords at a time, or Loopback mode to test one patch cord. For SC/SC patch cords, you can also use the method described in TIA/EIA TSB140.

## *Fiber Test Settings*

Table 5-2 describes the test settings that apply to fiber cabling.

To access the fiber test settings turn the rotary switch to **SETUP**; then select **Fiber**. Use ◀ ▶ to see different tabs.

**Table 5-2. Fiber Test Settings**

| Setting | Description |
|---|---|
| **SETUP > Fiber > Fiber Type** | Select a fiber type that is appropriate for the type you will test. |
| **SETUP > Fiber > Test Limit** | Select the appropriate test limit for the job. The tester compares the fiber test results to the selected test limit to produce **PASS** or **FAIL** results. |
| **SETUP > Fiber > Remote End Setup** | Use **Smart Remote** mode for testing dual-fiber cabling.<br>Use **Loopback** mode for testing patch cords and cable spools.<br>Use **Far End Source** mode with an optical source for testing individual fibers. |

-continued-

**Table 5-2. Fiber Test Settings (cont.)**

| Setting | Description |
|---|---|
| **SETUP > Fiber > Bi-Directional** | When enabled in Smart Remote or Loopback mode, the tester prompts you to swap the test connections halfway through the test. The tester can then make bi-directional measurements for each fiber at each wavelength (850 nm/1300 nm; 1310 nm/1550 nm). |
| **SETUP > Fiber > Number of Adapters**<br>**SETUP > Fiber > Number of Splices** | If the selected limit uses a calculated loss limit, enter the number of adapters and splices that will be added to the fiber path after the reference is set. Figure 5-5 shows an example of how to determine the **Number of Adapters** setting.<br>Only limits that use maximum values for loss per km, loss per connector, and loss per splice use a calculated limit for overall loss. For example, limits for fiber backbones use a calculated loss limit. |
| **SETUP > Fiber > Connector Type** | Select the type of connector used in the cabling. This setting affects only the diagrams shown for reference connections. If the cabling's connector type is not listed, use **General**. |

-continued-

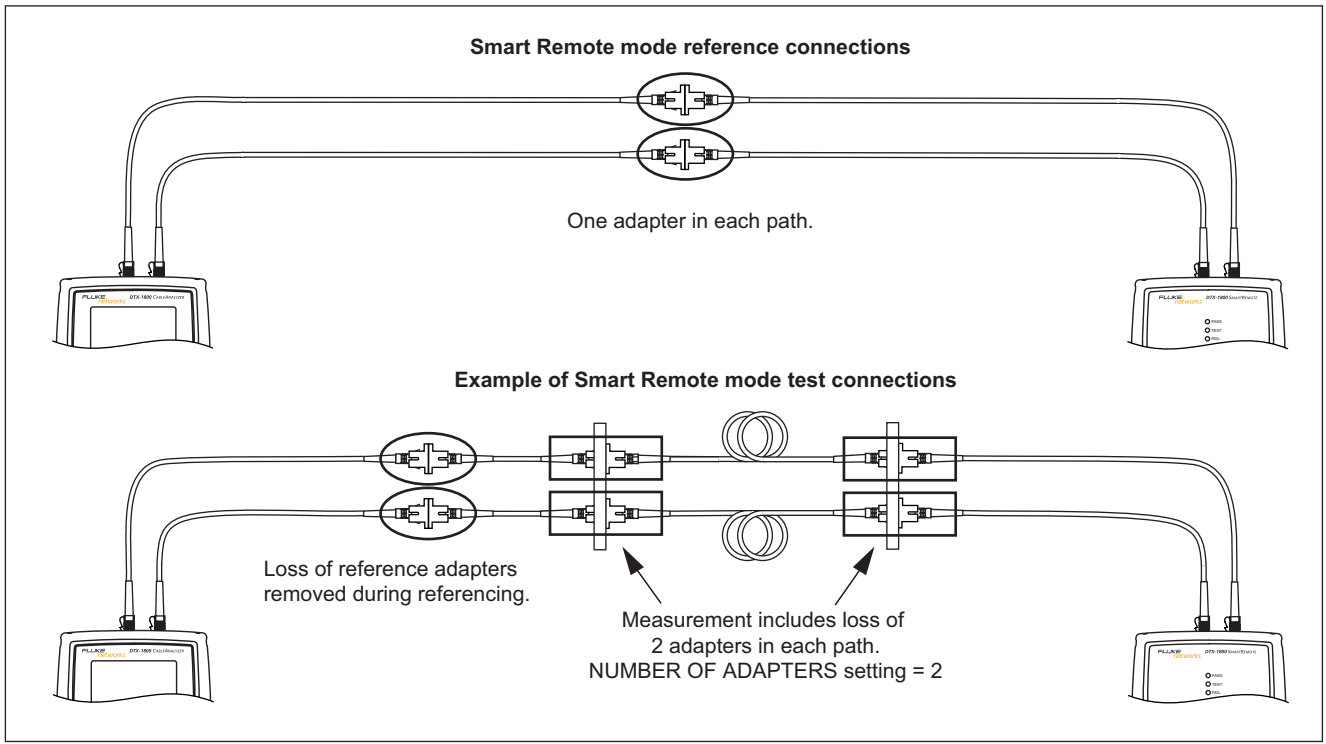



**Figure 5-5. Example of How to Determine the Number of Adapters Setting**

**Table 5-2. Fiber Test Settings (cont.)**

| Setting | Description |
|---|---|
| **SETUP > Fiber > Test Method > Method A, B, C** | Loss results include connections added after referencing. The reference and test connections determine which connections are included in results. The **Test Method** refers to the number of end connections included:<br><br>**Method A**: Loss results include one connection at one end of the link.<br><br>**Method B**: Loss results include connections at both ends of the link. The reference and test connections shown in this manual produce Method B results, but are modified versions of connections shown in the standards. The modified connections let you connect to links that do not use SC connectors, while ensuring Method B results. For links with small form-factor (SFF) connectors or different connector types at each end, use hybrid patch cords or alternate reference and test connections. See Appendix B or visit the Fluke Networks Knowledge Base for suggestions.<br><br>**Method C**: Loss results exclude connections at the ends of the link. Only the fiber loss is measured.<br><br>Different standards have different names for the three test methods. See Appendix A for details.<br><br>This setting does not affect loss results. It is only saved with the results to record which method you used. |

-continued-

**Table 5-2. Fiber Test Settings (cont.)**

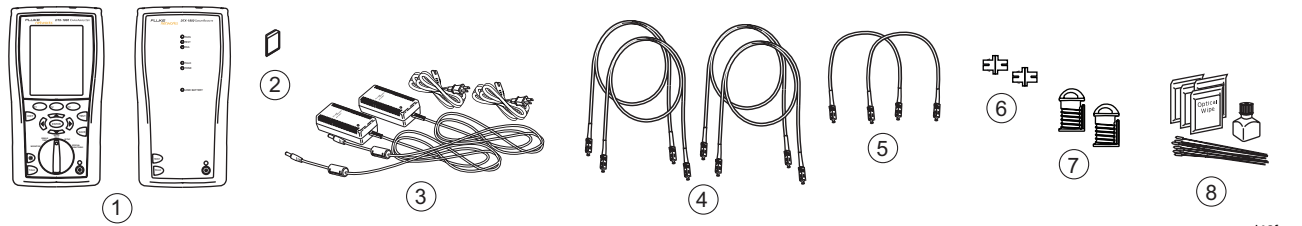
| Setting | Description |
|---|---|
| **SETUP** > **Fiber** > **Index of Ref. Source (n)** > **User Defined** or **Default** | The tester uses the index of refraction (n) defined in the currently selected fiber type (**Default**) or a value you define (**User Defined**). The default value defined by the selected fiber type represents the typical value for that fiber type. You may enter a different value if necessary. To determine the actual value, change the index of refraction until the measured length matches the known length of a fiber.<br><br>Increasing the index of refraction decreases measured length. |
| **SPECIAL FUNCTIONS** > **Set Reference**<br><br>**Patch Lengths** (softkey on the **View Connections** screen) | Setting a reference sets the baseline power level for loss measurements. See "About Setting the Reference" on page 5-6.<br><br>After you set the reference, you can enter the lengths of the patch cords used for reference and test connections. The lengths you enter do not affect measurements. They are included with saved results to meet TSB-140 reporting requirements. |
| **SETUP** > **Instrument Settings**<br><br>Settings for saving tests | **Cable ID Source**, **Current Folder**, **Result Storage Location** (DTX-1800, DTX-1200), **Operator**, **Site**, and **Company**. See "Preparing to Save Tests" in Chapter 2. |

## *Autotest in Smart Remote Mode*

Use Smart Remote mode to test and certify dual-fiber cabling.

In this mode, the tester measures loss, length, and propagation delay on two fibers at two wavelengths in one or both directions.

Figure 5-6 shows the equipment required for testing fiber in Smart Remote mode.




1. Tester and smart remote with fiber modules
2. Memory card (optional)
3. Two ac adapters with line cords (optional)
4. Four patch cords (match fiber and connectors to be tested, SC at tester end)
5. Two short patch cords (match fiber and connectors to be tested)
6. Two adapters of the appropriate type
7. Mandrels. Recommended when testing multimode fiber. See page 7.
8. Fiber cleaning supplies

**Figure 5-6. Equipment for Testing in Smart Remote Mode**

## *Setting the Reference for Smart Remote Mode*

1 Turn on both testers and let them sit for 5 minutes. Allow additional time if the modules have been stored above or below room temperature.

2 Turn the rotary switch to **SETUP**, then select **Fiber**.

3 Select **Remote End Setup**, then select **Smart Remote**.

4 Turn the rotary switch to **SPECIAL FUNCTIONS**, then select **Set Reference**. If both a fiber module and twisted pair adapter are attached, select **Fiber Module** next.

5 Clean the connectors on the tester, smart remote, and patch cords. Connect the tester and smart remote as shown on the tester.

*Notes*

*The **Set Reference** screen shows reference connections for the selected test method. Figure 5-7 shows connections for modified Method B.*

*The patch cords in the tester's diagrams are numbered. If you want to meet TSB-140 reporting requirements, you can enter lengths for each patch cord number after setting the reference.*

6 Press TEST.

The **View Reference** screen shows the reference values and the date and time the reference was set.

7 Press F2 **OK**.

The **View Connections** screen shows the test connections for the selected test method.

8 To enter patch cord lengths to meet TSB-140 reporting requirements, press F1 **Patch Lengths**.

On the **Patch Lengths** screen, enter the lengths of the patch cords used for reference and test connections.

Press SAVE when you are done.

### Caution

**Do not disconnect the patch cords from the tester's or smart remote's output port after setting the reference. If you do, you must set the reference again to ensure valid measurements.**

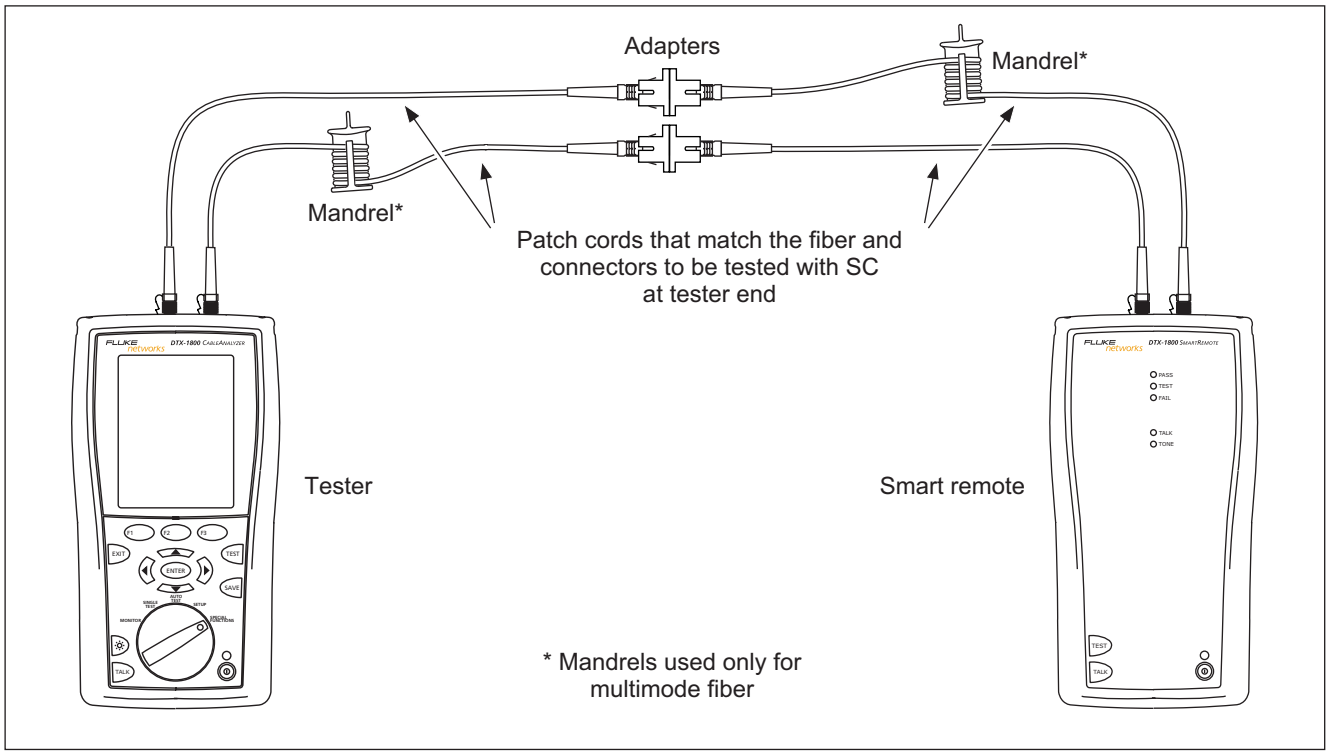



**Figure 5-7. Smart Remote Mode Reference Connections (Modified Method B)**

## *Running the Autotest in Smart Remote Mode*

### Caution

**If the patch cords have been disconnected from the tester's or smart remote's output since the reference was set, you must set the reference again to ensure valid measurements.**

1 Turn on the tester and smart remote and let them sit for 5 minutes. Allow additional time if the modules have been stored above or below room temperature.

2 Verify that the settings described in Table 5-2 are appropriate.

3 Clean the connectors on the cabling to be tested.

4 Connect the tester to the cabling. Figure 5-8 shows test connections for Method B.

5 Turn the rotary switch to **AUTOTEST**. Verify that the media type is set to **Fiber**. Press F1 **Change Media** to change it if necessary.

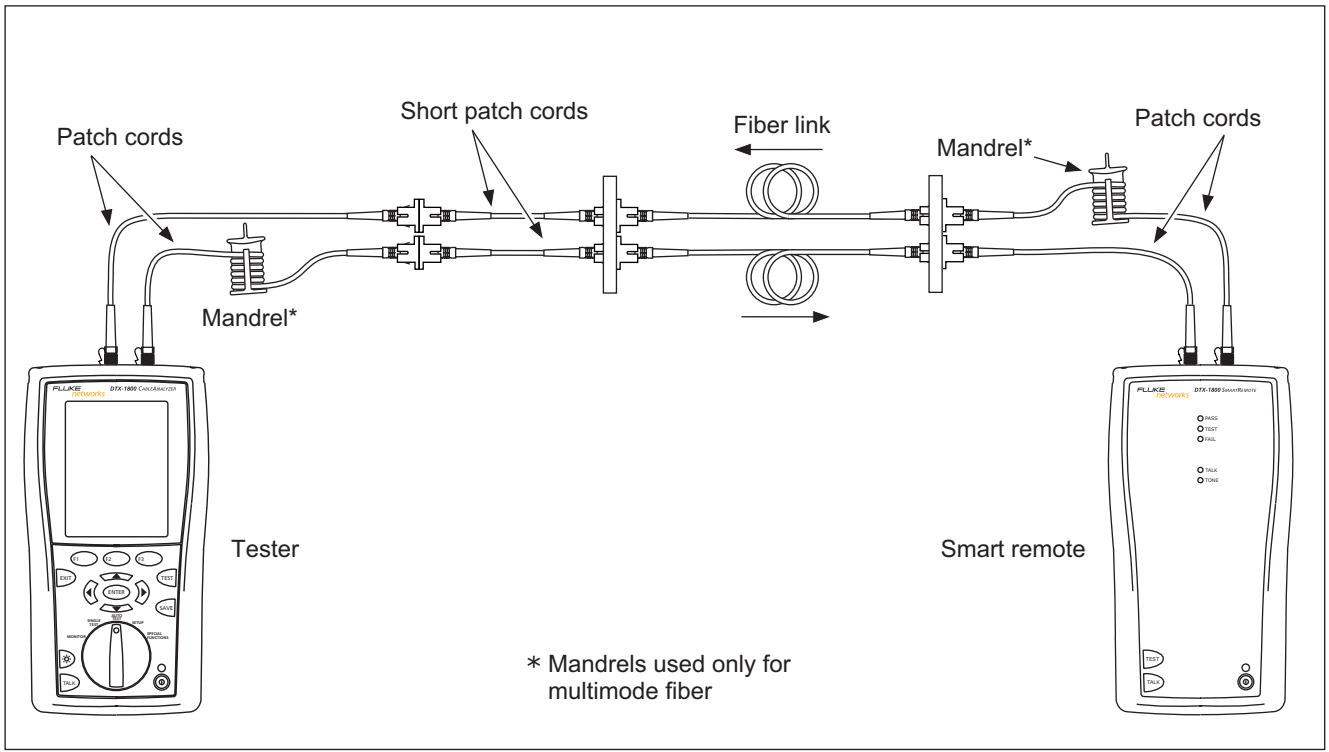
6 Press TEST.

7 If **Open** or **Unknown** appears as the status, try the following:

- Verify that all connections are good.
- Verify that the remote tester is on.
- Try different connections to the cabling until the test continues. See "Using FindFiber in Smart Remote Mode" on page 5-40 for details on FindFiber messages.
- Use a the visual fault locator to verify fiber continuity.

8 To save the results, press SAVE, select or create a fiber ID for one fiber; then press SAVE.

Select or create a fiber ID for the other fiber; then press SAVE again.




amd48f.eps

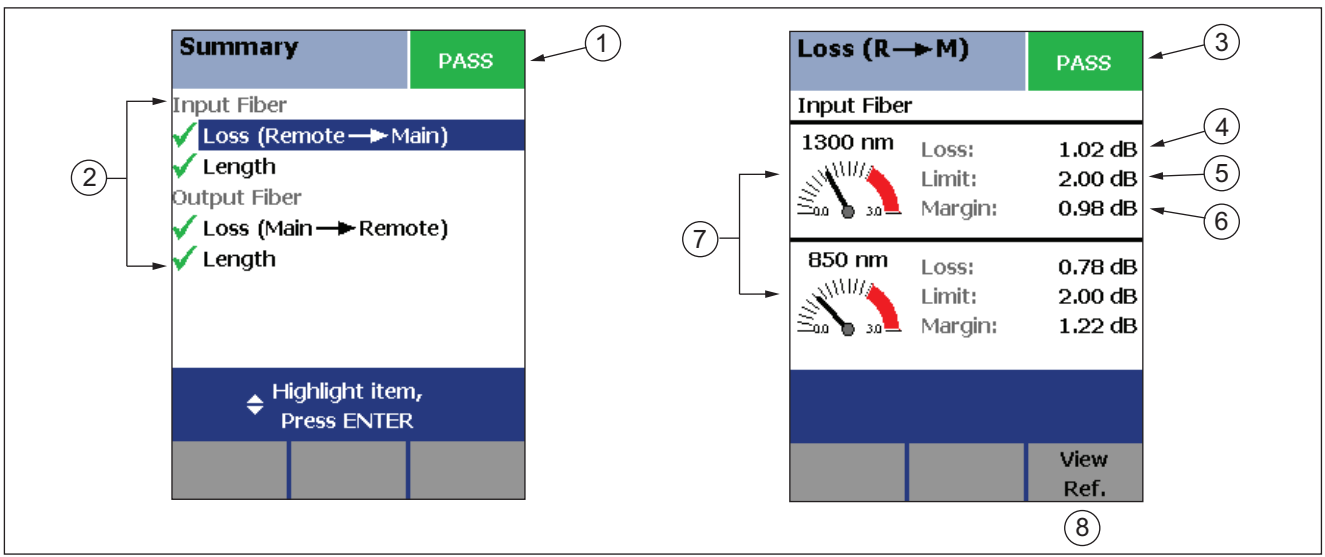
**Figure 5-8. Smart Remote Mode Test Connections (Modified Method B)**

## *Smart Remote Mode Autotest Results*

The **Summary** screen appears when the test is finished. To see more detailed results, use ◡ to highlight a measurement; then press ENTER.

Figure 5-9 describes the **Summary** screen and loss results screen for an unsaved, single-directional Autotest in Smart Remote mode.

For bi-directional results in Smart Remote mode, see "Bi-Directional Testing" on page 5-38.




amd26f.eps

**Figure 5-9. Smart Remote Mode Summary and Loss Result Screens (unsaved, single-directional)**

*Note*

*The results described here are for an unsaved test. Unsaved tests for Smart Remote mode show results for both fibers. Saved tests are saved in two records. Each saved record shows results for one fiber.*

① The overall result for the test.

② Overall results for the two fibers (✔ is PASS, ✘ is FAIL):

**Input Fiber/Output Fiber**: The fiber connected to the tester's input and output ports, respectively.

**Loss (Remote -> Main)**: Loss on the fiber connected between the remote's output and the main tester's input.

**Loss (Main->Remote)**: Loss on the fiber connected between the main tester's output and the remote's input.

**Length**: Half of the length from the main tester to the remote and back again. This equals the length of one fiber if the two fibers are equal length.

To see the propagation delay, select the length result. Propagation delay is half the time taken for a signal to travel from the main tester to the remote and back again. Propagation delay is measured in nanoseconds (ns).

③ The overall result for the loss measurement.

④ The measured loss for the fiber.

*Note*

*If loss is negative, set the reference again and retest the cabling. See Chapter 7 for more information on negative loss.*

⑤ The maximum loss allowed by the selected test limit.

⑥ The difference between the limit and the measured loss. Margin is negative if the loss exceeded the limit.

⑦ Loss meters for the two wavelengths. Values in the red zone exceed the selected test limit.

⑧ Press F3 **View Ref.** to view the reference information.

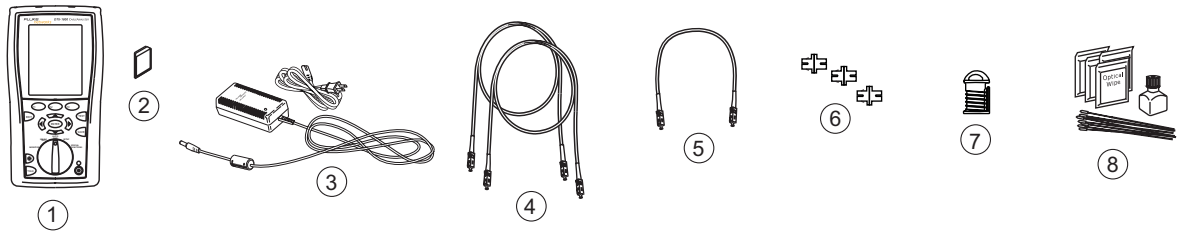
**Figure 5-9. Smart Remote Mode Summary and Loss Result Screens (cont.)**

## *Autotest in Loopback Mode*

Use Loopback mode to test spools of cable, segments of uninstalled cable, and patch cords.

In this mode, the tester measures loss, length, and propagation delay at two wavelengths in one or both directions.

Figure 5-10 shows the equipment required for testing fiber in Loopback mode.




1. Tester with fiber module
2. Memory card (optional)
3. AC adapter with line cord (optional)
4. Two patch cords (match fiber and connectors to be tested, SC at tester end)
5. One short patch cord (match fiber and connectors to be tested)
6. Three adapters of the appropriate type
7. Mandrel. Recommended when testing multimode fiber. See page 7.
8. Fiber cleaning supplies

**Figure 5-10. Equipment for Testing in Loopback Mode**

## *Setting the Reference in Loopback Mode*

1 Turn on the tester and let it sit for 5 minutes. Allow additional time if the modules have been stored above or below room temperature.

2 Turn the rotary switch to **SETUP**; then select **Fiber**.

3 Select **Remote End Setup**; then select **Loopback**.

4 Turn the rotary switch to **SPECIAL FUNCTIONS**, select **Set Reference**, then press ENTER. If both a fiber module and twisted pair adapter are attached, select **Fiber Module** next.

5 Clean the connectors on the tester and patch cords. Connect the patch cords as shown on the tester.

*Notes*

*The **Set Reference** screen shows reference connections for the selected test method. Figure 5-11 shows connections for modified Method B.*

*The patch cords in the tester's diagrams are numbered. If you want to meet TSB-140 reporting requirements, you can enter lengths for each patch cord number after setting the reference.*

6 Press TEST.

The **View Reference** screen shows the reference values and the date and time the reference was set.

7 Press F2 **OK**.

The **View Connections** screen shows the test connections for the selected test method.

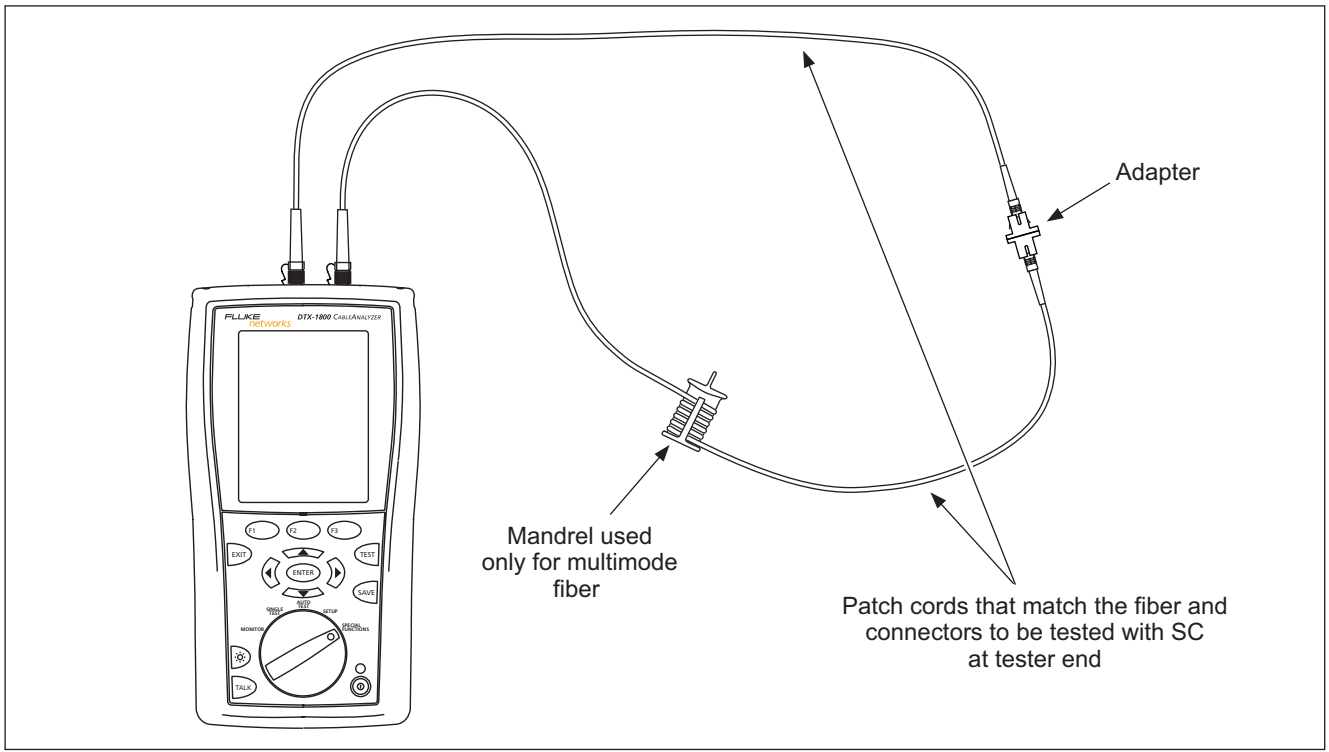
8 To enter patch cord lengths to meet TSB-140 reporting requirements, press F1 **Patch Lengths**.

On the **Patch Lengths** screen, enter the lengths of the patch cords used for reference and test connections.

Press SAVE when you are done.

### Caution

**Do not disconnect the patch cords from the tester's output after setting the reference. If you do, you must set the reference again to ensure valid measurements.**




amd50f.eps

**Figure 5-11. Loopback Mode Reference Connections (Modified Method B)**

## *Running the Autotest in Loopback Mode*

### Caution

**If the patch cords have been disconnected from the tester' output since the reference was set, you must set the reference again to ensure valid measurements.**

1 Turn on the tester and let it sit for 5 minutes. Allow additional time if the module has been stored above or below room temperature.

2 Verify that the settings described in Table 5-2 are appropriate.

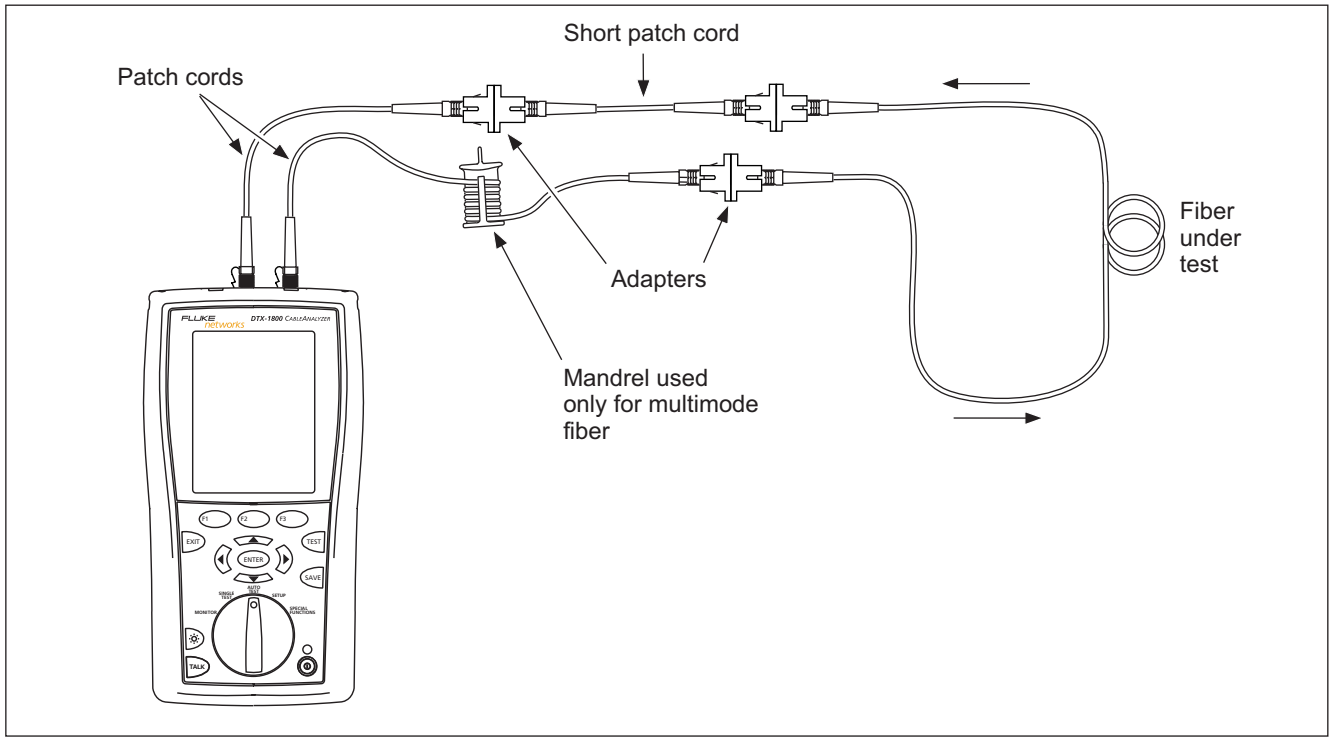
3 Clean the connectors on the cabling to be tested.

4 Connect the tester to the cabling. Figure 5-12 shows connections for Method B.

5 Turn the rotary switch to **AUTOTEST**. Verify that the media type is set to **Fiber**. Press F1 **Change Media** to change it if necessary.

6 Press TEST.

7 To save the results, press SAVE; select or create a fiber ID; then press SAVE again.




amd24f.eps

**Figure 5-12. Loopback Mode Test Connections (Modified Method B)**

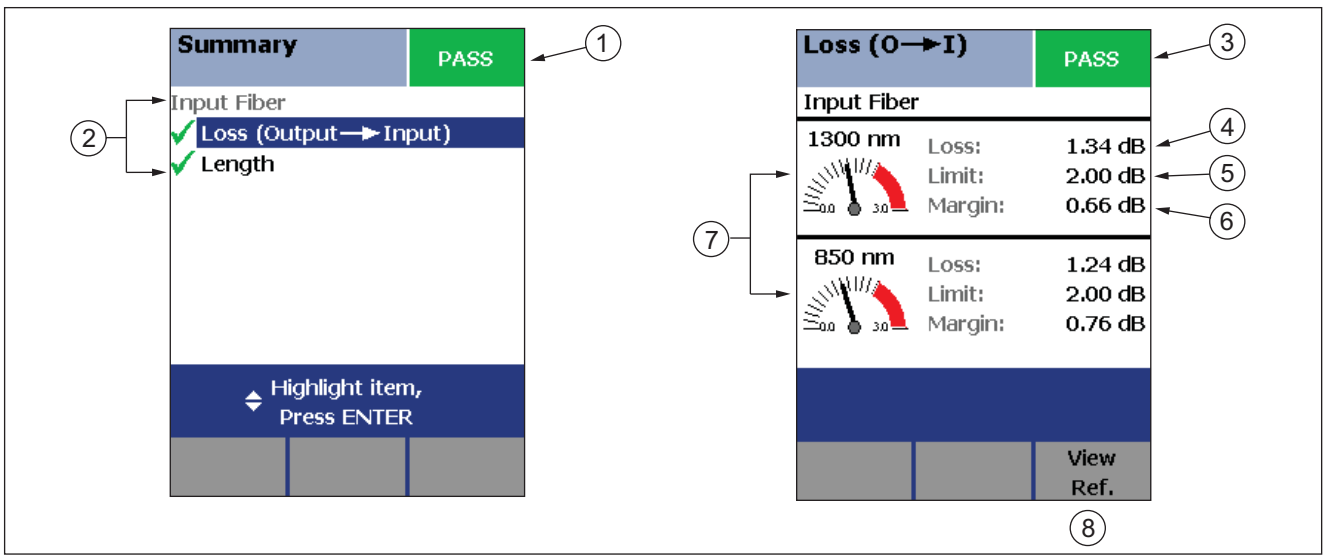
## *Loopback Mode Autotest Results*

The **Summary** screen appears when the test is finished.

To see more detailed results, use ⟨ ⟩ to highlight a measurement; then press ENTER.

Figure 5-13 describes the **Summary** screen and loss results screen for a single-directional Autotest in Loopback mode.

For bi-directional results in Loopback mode, see "Bi-Directional Testing" on page 5-38.




amd27f.eps

**Figure 5-13. Loopback Mode Summary and Loss Result Screens (single-directional)**

① The overall result for the test.

② Overall results for the fiber (✔ is PASS, ✘ is FAIL):

**Loss (Output -> Input)**: Loss on the fiber connected between the tester's output and input ports.

**Length**: The length of the fiber between the tester's output and input ports. To see the propagation delay, select the length result. Propagation delay is the time taken for a signal to travel between the tester's output and input ports. Propagation delay is measured in nanoseconds (ns).

③ The overall result for the loss measurement.

④ The measured loss for the fiber.

*Note*

*If loss is negative, set the reference again and retest the cabling. See Chapter 7 for more information on negative loss.*

⑤ The maximum loss allowed by the selected test limit.

⑥ The difference between the limit and the measured loss. Margin is negative if the loss exceeded the limit.

⑦ Loss meters for the two wavelengths. Values in the red zone exceed the selected test limit.

⑧ Press F3 **View Ref.** to view the reference information.

**Figure 5-13. Loopback Mode Summary and Loss Result Screens (cont.)**

## *Autotest in Far End Source Mode*

Use Far End Source mode to measure power or power loss at one wavelength on individual fibers.

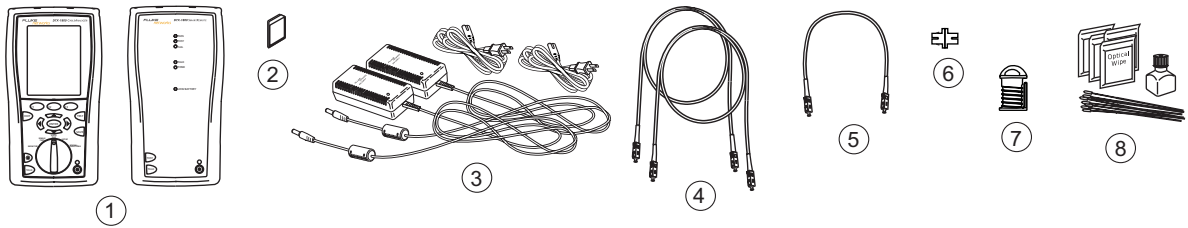
Far End Source mode requires a stand-alone optical source, such as a DTX smart remote with a fiber module.

You can also use other sources, such as a Fluke Networks SimpliFiber® source or LS-1310/1550 laser source.

Figure 5-14 shows the equipment required for measuring loss in Far End Source mode.

*Note*

*The Autotest in Far End Source mode does not show a PASS/FAIL result, limit, or margin if the selected test limit calculates loss based on fiber length. An example of such a limit is the TIA-568B Fiber Backbone limit. The tester does not measure length in Far End Source mode.*




1. Tester and smart remote with fiber modules
2. Memory card (optional)
3. Two AC adapters with line cords (optional)
4. Two patch cords (match fiber and connectors to be tested, SC at tester end)
5. One short patch cord (match fiber and connectors to be tested)
6. One adapter of the appropriate type
7. Mandrel. Recommended testing multimode fiber. See page 7.
8. Fiber cleaning supplies

**Figure 5-14. Equipment for Testing in Far End Source Mode**

## *Setting the Reference in Far End Source Mode*

1 Turn on the tester and smart remote and let them sit for 5 minutes. Allow additional time if the fiber modules have been stored above or below room temperature. For other sources, warm up according to the manufacturer's recommendations.

2 Turn the rotary switch to **SETUP**; then select **Fiber**.

3 Select **Remote End Setup**; then select **Far End Source**.

4 Turn the rotary switch to **SPECIAL FUNCTIONS**, select **Set Reference**, then press ENTER. If both a fiber module and twisted pair adapter are attached, select **Fiber Module** next.

5 If you need to change the reference wavelength, press F2 **Change λ**.

6 Clean the connectors on the tester, source, and patch cords. Connect the tester and source as shown on the tester.

*Notes*

*The **Set Reference** screen shows reference connections for the selected test method. Figure 5-15 shows connections for modified Method B.*

*The patch cords in the tester's diagrams are numbered. If you want to meet TSB-140 reporting requirements, you can enter lengths for each patch cord number after setting the reference.*

7 Hold down the button on the smart remote's fiber module for 3 seconds to turn on the output port at 850 nm (DTX-MFM) or 1310 nm (DTX-SFM). Press again to switch to 1300 nm or 1550 nm.

The LED is red for 850 nm and 1310 nm and green for 1300 nm and 1550 nm.

For other sources, verify the output is set to the correct wavelength and is in continuous-wave mode.

9 Press TEST.

The **View Reference** screen shows the reference values and the date and time the reference was set.

10 Press F2 **OK**.

The **View Connections** screen shows the test connections for the selected test method.

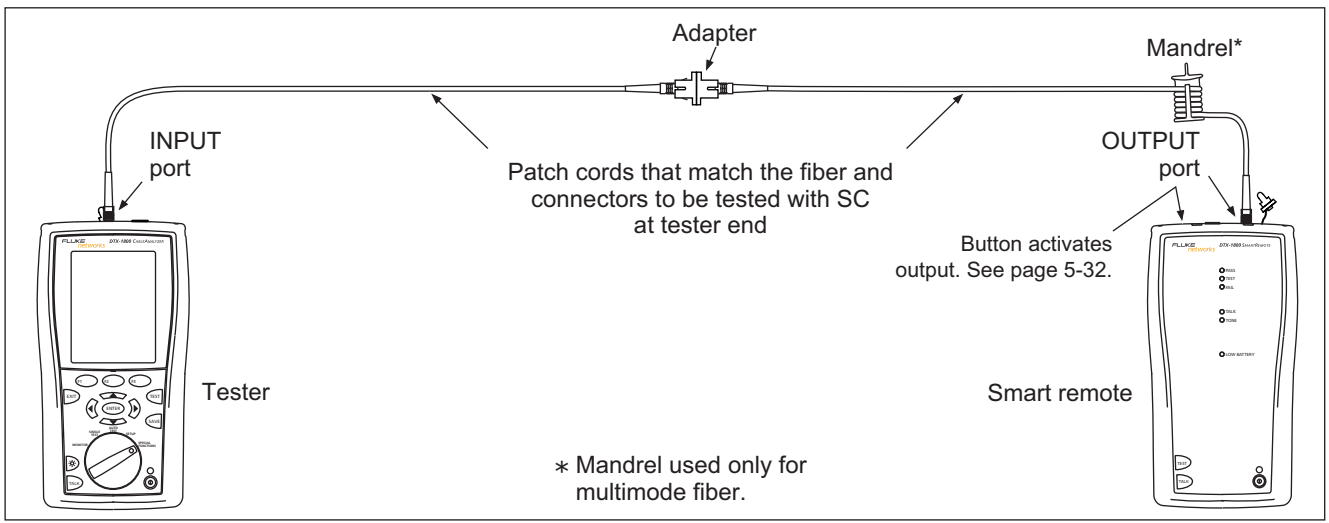
**11** To enter patch cord lengths to meet TSB-140 reporting requirements, press F1 **Patch Lengths**.

On the **Patch Lengths** screen, enter the lengths of the patch cords used for reference and test connections.

Press SAVE when you are done.

## Caution

**Do not disconnect the patch cord from the smart remote's output after setting the reference. If you do, you must set the reference again to ensure valid measurements.**




amd125f.eps

**Figure 5-15. Far End Source Mode Reference Connections (Modified Method B)**

## *Running the Autotest in Far End Source Mode*

### Caution

**If the patch cord has been disconnected from the smart remote's output since the reference was set, you must set the reference again to ensure valid measurements.**

1 Turn on the tester and smart remote and let them sit for 5 minutes. Allow additional time if the fiber modules have been stored above or below room temperature. For other sources, warm up according to the manufacturer's recommendations.

2 Verify that the settings described in Table 5-2 are appropriate. Clean the connectors on the cabling to be tested.

3 Connect the tester to the cabling as shown in Figure 5-16.

4 Verify the source is set to the correct wavelength.

To set the wavelength on a DTX-MFM/SFM module used as a source, hold down the button on the smart remote's fiber module for 3 seconds. This turns on the output port at 850 nm (DTX-MFM) or 1310 nm (DTX-SFM). Press again to switch to 1300 nm or 1550 nm.

The LED is red for 850 nm and 1310 nm and green for 1300 nm and 1550 nm.

For other sources, verify the output is set to the correct wavelength and is in continuous-wave mode.

5 Turn the rotary switch to Autotest. Verify that the media type is set to **Fiber**. Press F1 **Change Media** to change it if necessary.

6 Press TEST.

7 To save the results, press SAVE, select or create a fiber ID; then press SAVE again.

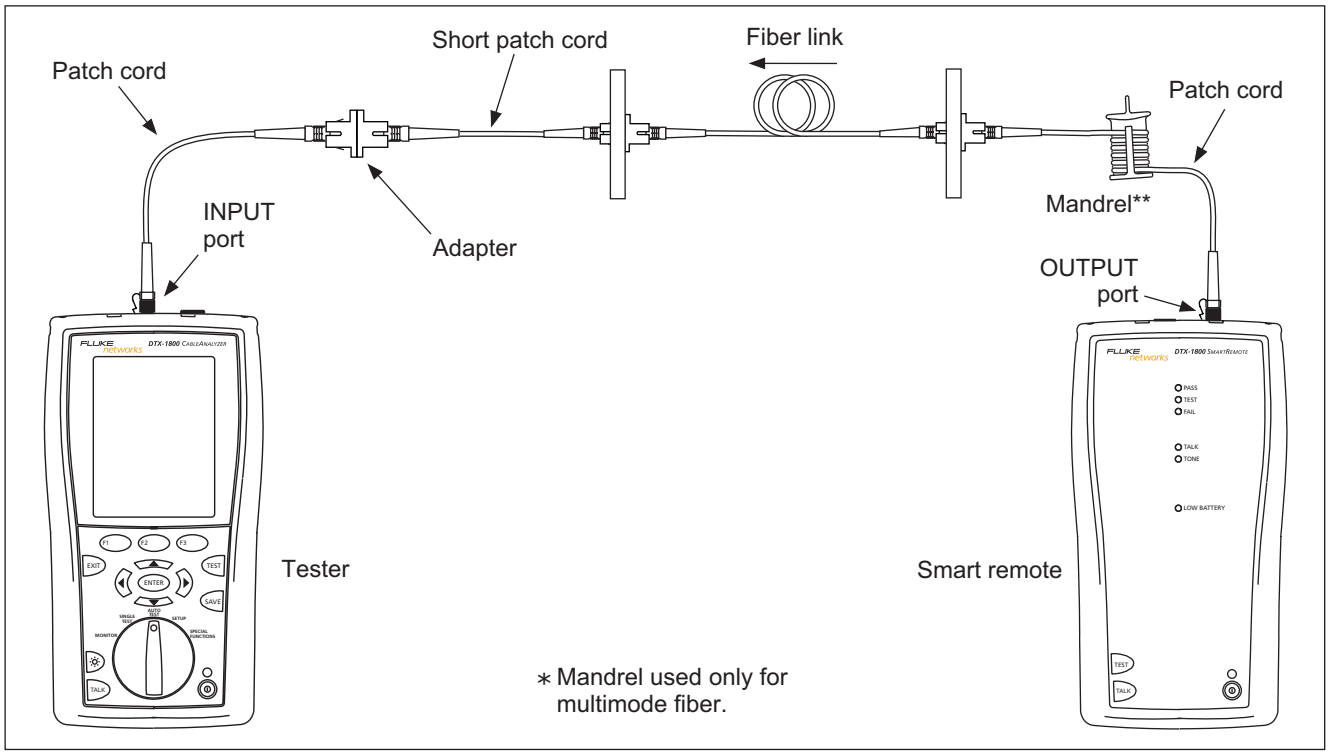


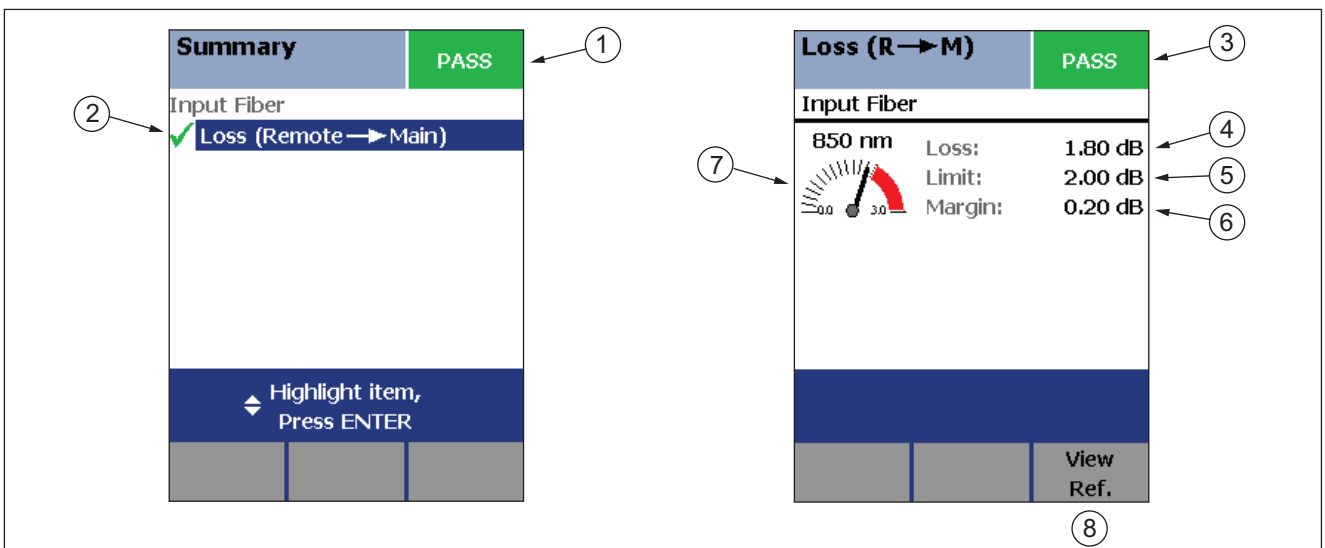

**Figure 5-16. Far End Source Mode Test Connections (Modified Method B)**

## *Far End Source Mode Autotest Results*

The **Summary** screen appears when the test is finished.

To see more detailed results, use  to highlight a measurement; then press  .

Figure 5-17 describes the **Summary** screen loss results screen for an Autotest in Far End Source mode.




amd28f.eps

**Figure 5-17. Far End Source Mode Summary and Results Screens**

① Overall results for the fiber:

② **Loss (Remote -> Main)**: Overall loss on the fiber connected between the tester's output and input ports. ✔ is PASS, ✘ is FAIL.

③ The overall result for the loss measurement.

④ The measured loss for the fiber.

*Note*

*If loss is negative, set the reference again and retest the cabling. See Chapter 7 for more information on negative loss.*

⑤ The maximum loss allowed by the selected test limit.

⑥ The difference between the limit and the measured loss. Margin is negative if the loss exceeded the limit.

⑦ Meter for the loss measurement. Values in the red zone exceed the selected test limit.

⑧ Press F3 **View Ref.** to view the reference information.

*Note*

*In Far End Source mode, the results do not show a PASS/FAIL result, limit, or margin if the selected test limit calculates loss based on fiber length. An example of such a limit is the TIA-568B Fiber Backbone limit. The tester does not measure length in Far End Source mode.*

**Figure 5-17. Far End Source Summary and Loss Result Screens (cont.)**

# Bi-Directional Testing

The **Bi-Directional** setting lets you test cabling in both directions and save the bi-directional test results in Smart Remote and Loopback modes.

To run a bi-directional test:

1. Turn the rotary switch to **SETUP**; then select **Fiber**.
2. Select **Bi-Directional**; then select **Yes**.
3. Run an Autotest test on the cabling, as described in the previous sections for Smart Remote mode and Loopback mode.
4. Halfway through the test, the tester prompts you to swap the fibers at each end of the cabling.

   **Caution**

   **Swap the connections at the patch panel, not at the tester's ports. Disconnecting the patch cord from the tester's output port invalidates the reference.**

5. Press SAVE to save the test. Select or create a fiber ID; then press SAVE again. In Smart Remote mode, you will need to save two results, one for each fiber.

## Bi-Directional Results for Smart Remote Mode

Unsaved tests show the results for both fibers in one set of screens, as shown at the left of Figure 5-18. **Input Fiber** and **Output Fiber** refer to the fibers connected to the main tester's input and output ports at the *end* of the test.

On the results screen for loss and length measurements for each fiber, press F1 **Other Dir.** to see results for the other direction.

Saved tests for Smart Remote mode are stored in two records, one for each fiber, as shown at the right of Figure 5-18. Each record contains bi-directional results for one fiber.

## Bi-Directional Results for Loopback Mode

In the results for Loopback mode, **Output to Input** refers to the direction from the tester's output port to its input port. **Input to Output** refers to the direction from the tester's input port to its output port. Both results are stored in one record.


amd127f.eps

**Figure 5-18. Unsaved and Saved Bi-Directional Results for Smart Remote Mode**

# Finding Connections with FindFiber

The FindFiber™ function helps you trace connections at patch panels and quickly check fiber continuity.

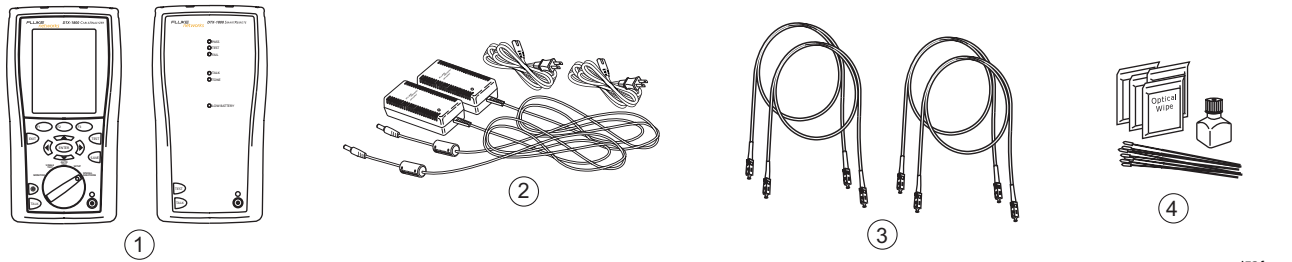
*Note*

*The FindFiber function is not available in Far End Source mode.*

## Using FindFiber in Smart Remote Mode

Use the FindFiber function in Smart Remote mode to help you determine which fibers go to which connectors at a patch panel.

Figure 5-19 shows the equipment needed for using FindFiber in Smart Remote mode.




① Tester and smart remote with fiber modules

② Two ac adapters with line cords (optional)

③ Four patch cords (match fiber and connectors to be tested, SC at tester end)

④ Fiber cleaning supplies

**Figure 5-19. Equipment for Using FindFiber in Smart Remote Mode**

To use the FindFiber function in Smart Remote mode:

1 Turn the rotary switch to **SETUP**; then select **Fiber**.

2 Select **Remote End Setup**; then select **Smart Remote**.

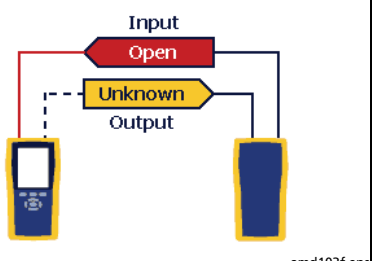
3 Clean all connectors; then make the connections shown in Figure 5-21.

4 Turn the rotary switch to **MONITOR**; then select **FindFiber**.

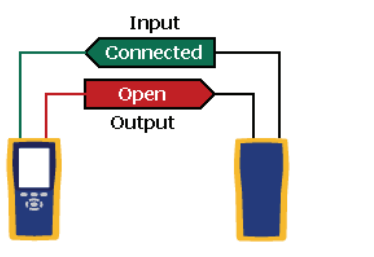
5 Try various connections to the patch panel with the main tester's INPUT fiber until the input fiber's status shows **Connected**.

6 Then try various connections with the main tester's OUTPUT fiber until the output fiber's status shows **Connected**.

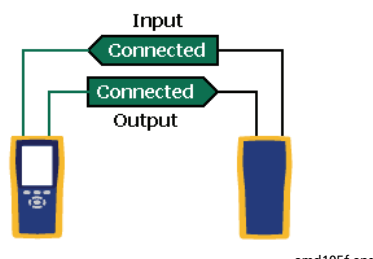
Figure 5-20 shows the main tester results for Smart Remote mode.




The main tester's INPUT fiber path is not complete. The main tester cannot determine the state of the OUTPUT fiber path.

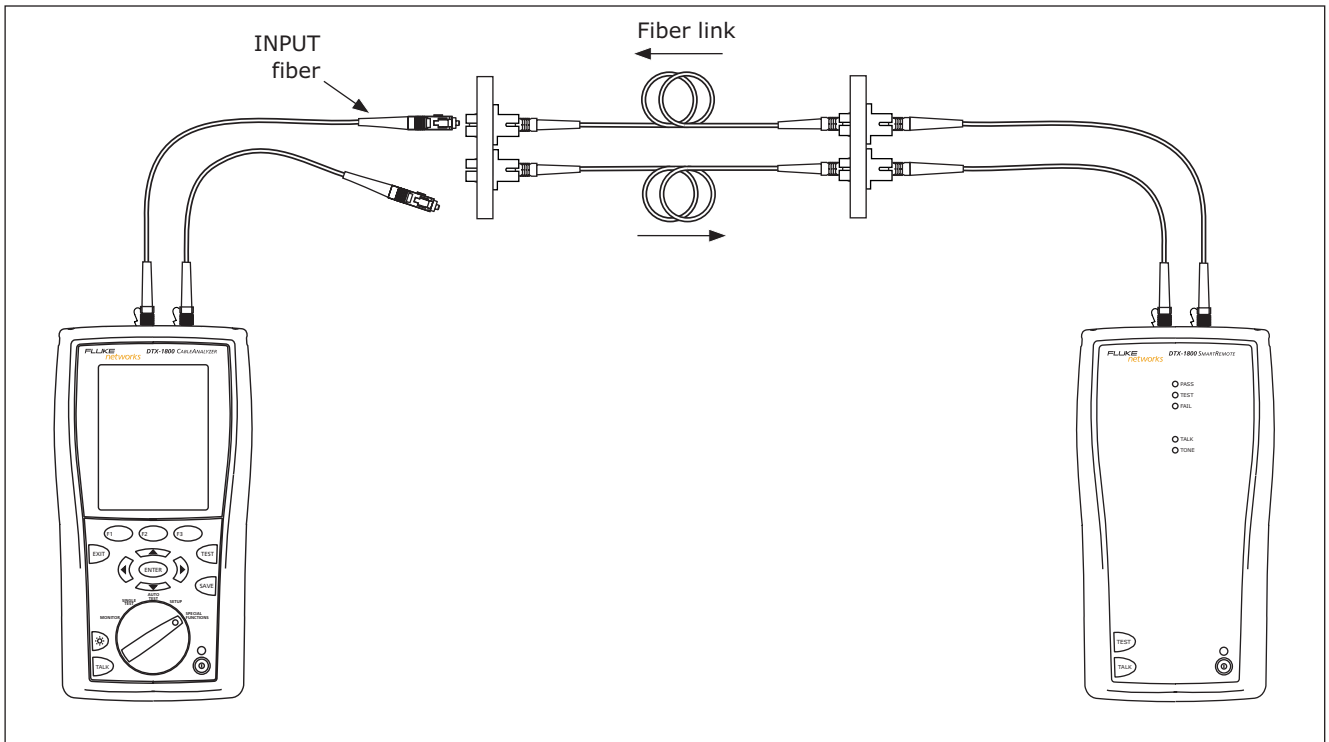



The main tester's INPUT fiber path is complete. The main tester's OUTPUT fiber path is not complete.




Both fiber paths are complete.

**Figure 5-20. Main Tester Results for FindFiber Test (Smart Remote Mode)**




amd54f.eps

**Figure 5-21. Using FindFiber in Smart Remote Mode**

## *Using FindFiber in Loopback Mode*

Use FindFiber in Loopback mode to quickly check the continuity of patch cords and fiber spools. Figure 5-22 shows the equipment needed for using FindFiber in Loopback mode.

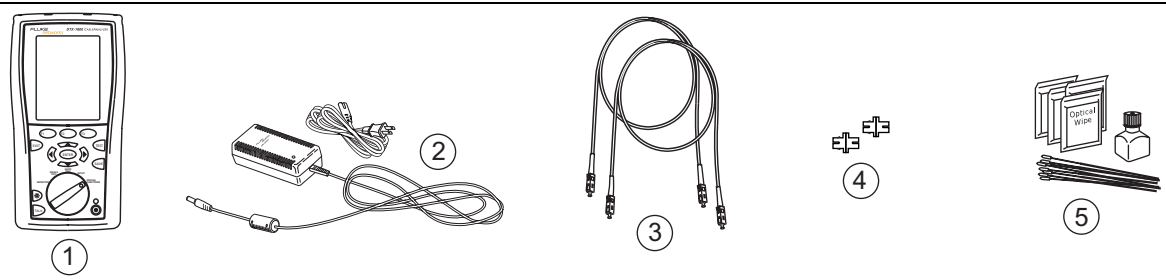
1 Turn the rotary switch to **SETUP**; then select **Fiber**.

2 Select **Remote End Setup**; then select **Loopback**.

3 Clean all connectors; then connect the tester's OUTPUT fiber to one end of the fiber path, as shown in Figure 5-23.

4 Turn the rotary switch to **MONITOR**; then select **FindFiber**.

5 Try various connections with the INPUT fiber. The status shows **Loopback** for both fibers when the path is complete.




① Tester with fiber module

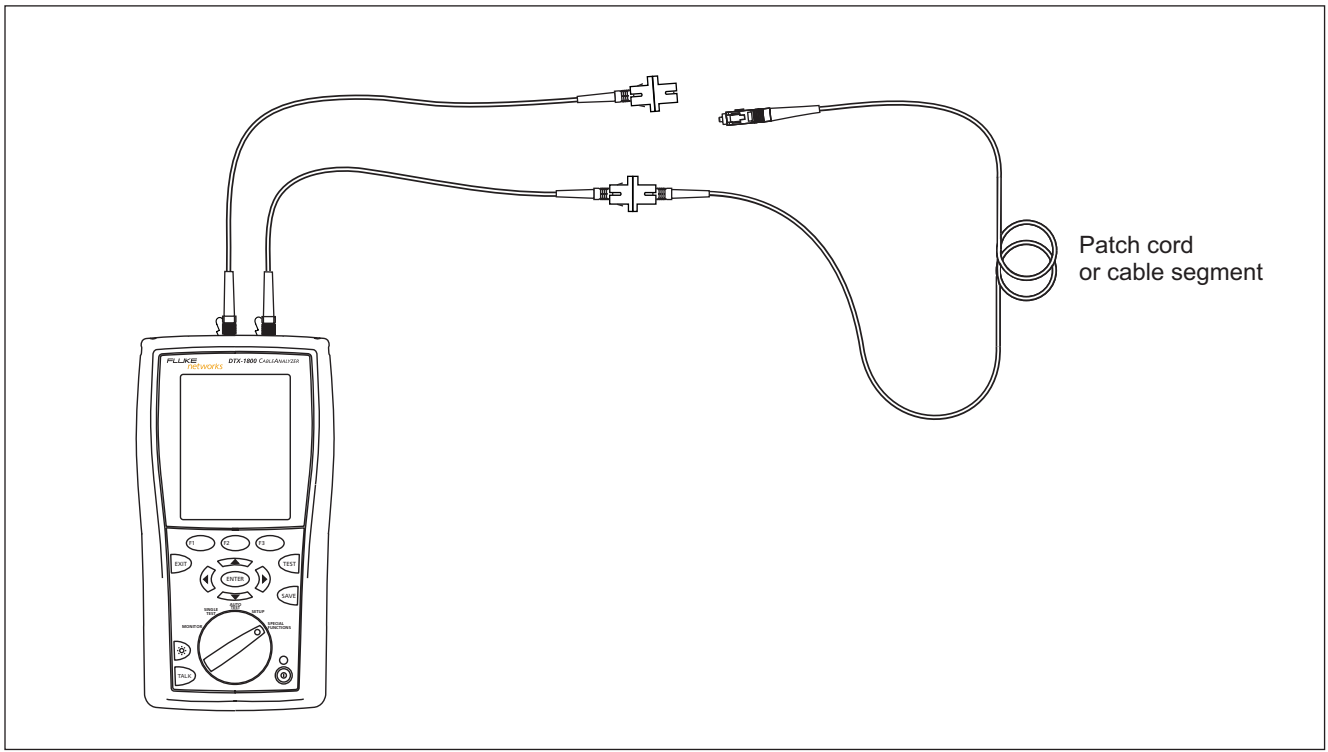
② AC adapters with line cord (optional)

③ Two patch cords (match fiber and connectors to be tested, SC at tester end)

④ Two adapters of the appropriate type

⑤ Fiber cleaning supplies

**Figure 5-22. Equipment for Using FindFiber in Loopback Mode**




amd56f.eps

**Figure 5-23. Using FindFiber in Loopback Mode**

## *Using the Power Meter*

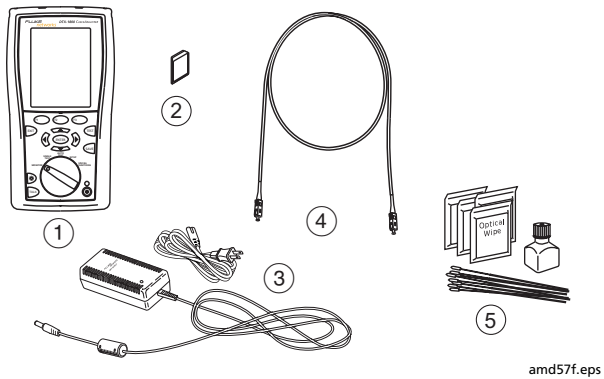
The power meter lets you measure the optical power produced by a source such as an optical network interface card or optical test equipment.

The tester offers two versions of the power meter function:

- **SINGLE TEST** mode: Measures power in the current remote end configuration (Smart Remote, Loopback, or Far End Source mode). Takes one power measurement at 850 nm and 1300 nm (DTX-MFM) or 1310 nm and 1550 nm (DTX-SFM). You can save the power measurement in this mode.
- **MONITOR** mode: Monitors power continuously at the input port at 850 nm, 1300 nm, 1310 nm, or 1550 nm. This measurement cannot be saved.

The power meter functions do not compare the power measurement to a limit and do not produce **PASS/FAIL** results.

Figure 5-24 shows the equipment required for using the power meter.




1. Tester with fiber module
2. Memory card (optional for **SINGLE TEST** mode)
3. AC adapter with line cord (optional)
4. One patch cord (match fiber and connectors to be tested, SC at tester end)
5. Fiber cleaning supplies

**Figure 5-24. Equipment for Using the Power Meter**

To use the power meter:

*Note*

*If you need to save the power reading, use the power meter function in the **SINGLE TEST** mode.*

**1** Turn the rotary switch to **SINGLE TEST** or **MONITOR**; then select **Power Meter**.

**2** Clean the tester's input port, the patch cord connectors, and the source connector.

**3** Use the patch cord to connect the source to the tester's input port, as shown in Figure 5-25.

**4** Turn on the source.

**5** Press TEST.

**6** For **MONTOR** mode, select the appropriate wavelength. The power meter in **MONITOR** mode runs continuously until you press EXIT.

**7** For **SINGLE TEST** mode, you may press SAVE to save the results.

Figure 5-26 describes the power meter screens for **SINGLE TEST** and **MONITOR** modes.

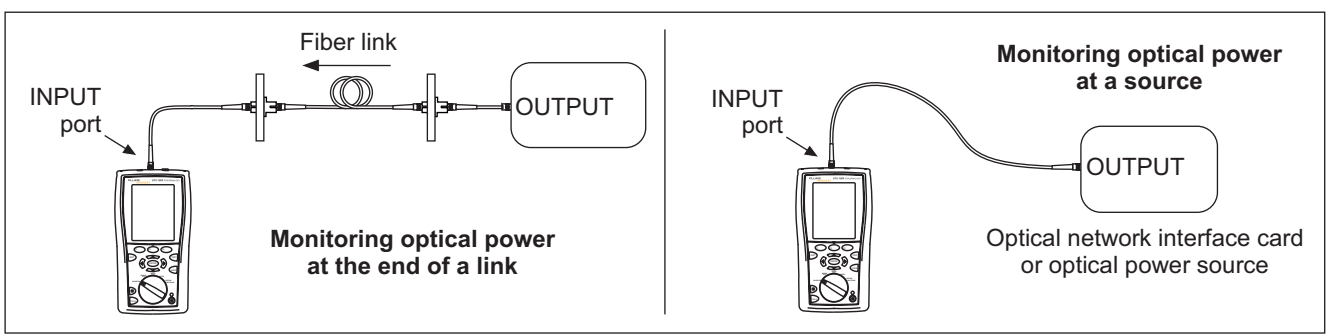
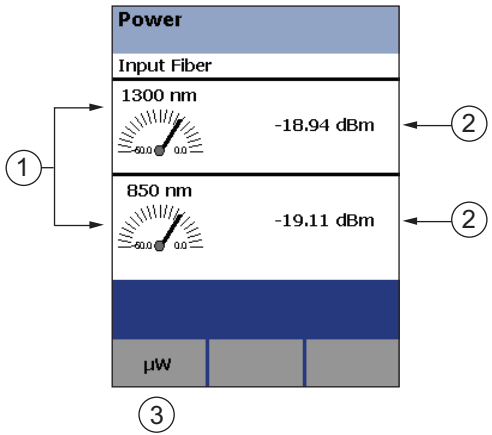


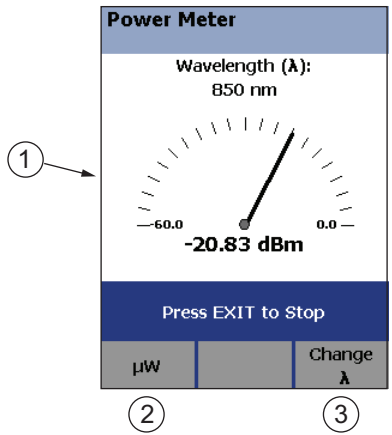

**Figure 5-25. Connections for Monitoring Optical Power**




Results for SINGLE TEST mode
(Smart Remote mode)

amd106f.eps

1. Meters showing the power readings taken at each wavelength. The tester takes one measurement for each wavelength.
2. Power readings in decibels (dB) or microwatts (µw).
3. To switch between decibels and microwatts, press F1.




Results for MONITOR mode

amd107f.eps

1. Meter showing the power reading. The reading updates continuously until you press EXIT.
2. To switch between decibels and microwatts, press F1.
3. To switch wavelengths, press F3 **Change λ**.

**Figure 5-26. Power Meter Screens**

## *Running Single Tests*

The tester's **SINGLE TEST** mode lets you run individual tests for isolating cabling failures and quickly testing repairs.

In the **SINGLE TEST** mode, you can run and save the following tests individually:

- Loss
- Length (includes propagation delay)
- Power meter measurement

## *Using the Remote Tester with an OptiFiber™ Tester*

You can use a DTX Series smart remote with a fiber module as the remote for a Fluke Networks OptiFiber Certifying OTDR. The DTX remote takes the place of a second OptiFiber tester for measuring loss and length with the OptiFiber loss/length option in Smart Remote mode. You can buy a smart remote separately for this purpose. See the Fluke Networks website or contact Fluke Networks for details.

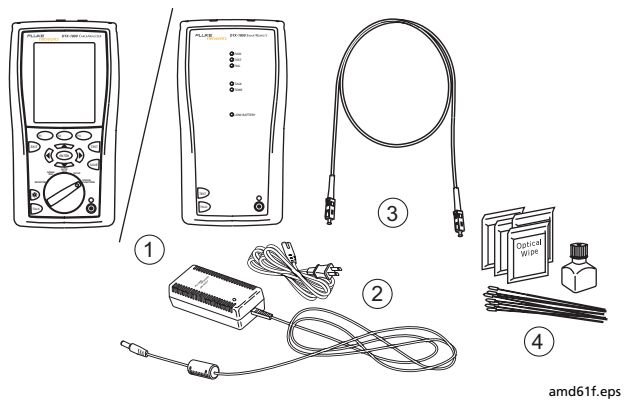
# Chapter 6
# Locating Fibers and Faults with the Visual Fault Locator

## Visual Fault Locator Applications

The fiber test module includes a visual fault locator that helps you do the following:

- Quickly check fiber continuity. Trace fibers to determine the polarity of duplex connections and identify connections between patch panels.
- Locate breaks and bad splices. These faults scatter the locator's light, causing a red glow in the affected area.
- Reveal high-loss bends. If the locator's light is visible around a bend in a fiber, the bend is too sharp.
- Reveal problems in connectors. A damaged fiber inside a connector causes a red glow in the connector.
- Optimize mechanical splices and pre-polished connectors: Before sealing the splice or connector, adjust the fiber alignment for minimal glow where the fibers meet. (Follow the manufacturer's assembly instructions for splices and connectors.)

Figure 6-1 shows the equipment needed for using the visual fault locator.




① Tester or smart remote with fiber module

② AC adapter with line cord (optional)

③ One patch cord. Match fiber and connectors to be tested; SC, ST, or FC at tester end. (optional)

④ Fiber cleaning supplies

**Figure 6-1. Equipment for Using the Visual Fault Locator**

## Using the Visual Fault Locator

The visual fault locator port accepts connectors with 2.5 mm ferrules (SC, ST, or FC). To connect to other ferrule sizes, use a patch cord with the appropriate connector at one end and a SC, ST, or FC connector at the tester end.

To use the visual fault locator:

**1** Clean the connectors on the patch cord, if used, and the fiber to be tested.

**2** Connect the fiber directly to the tester's VFL port or connect using the patch cord.

**3** Turn on the visual fault locator by pressing the button near the VFL connector, as shown in Figure 6-2. Press again to switch to flashing mode. Press again to turn off the locator.

**4** Look for the glow to locate fibers or faults, as shown in Figure 6-2.

*Note*

*The locator's light may not be visible through dark-colored fiber jackets.*

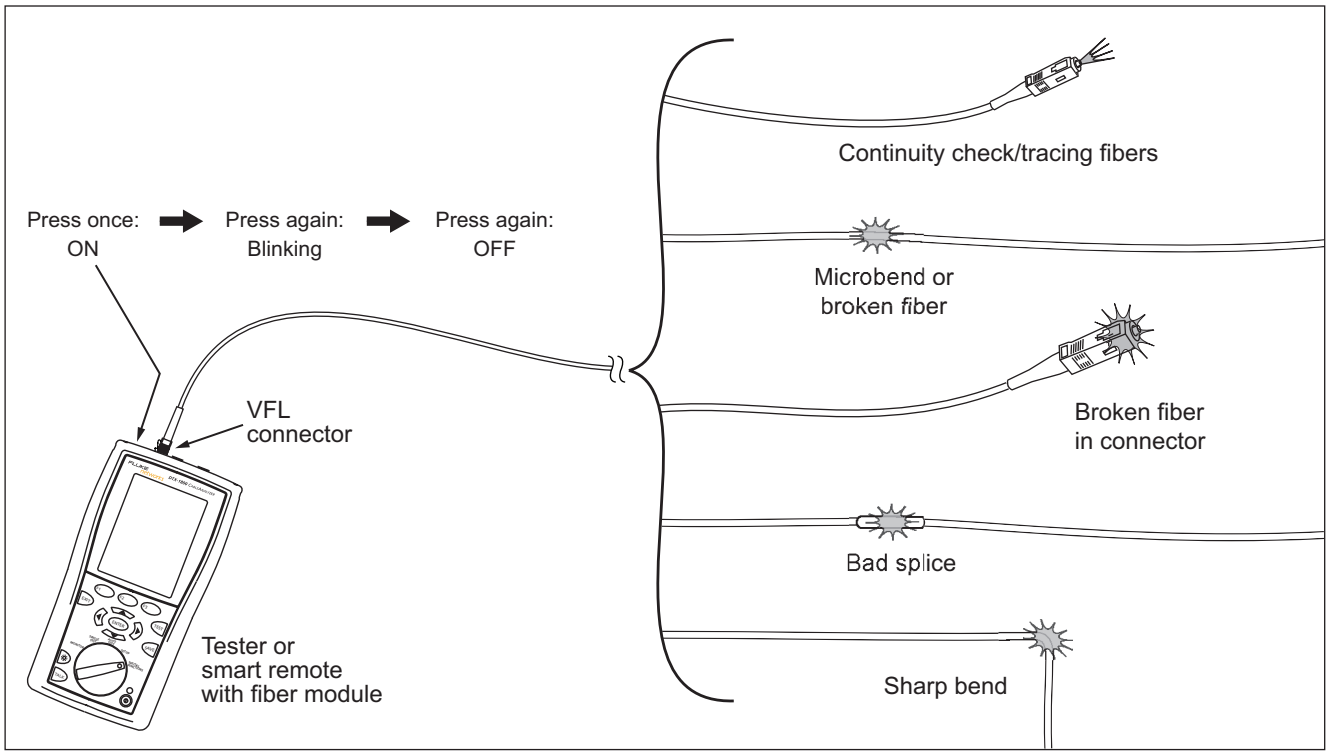



**Figure 6-2. Using the Visual Fault Locator**

# Chapter 7
# Diagnosing Fiber Cabling Faults

## Common Causes of Failures

Most problems in fiber links are caused by dirty, scratched, or damaged connectors, as shown in Table 7-1.

The table shows results of a survey of 89 contractors and private network owners. The results show what percentage of each group commonly found the faults listed.

**Table 7-1. Causes of Failures in Fiber Links**

| Fault | Network Owners | Contractors |
|---|---|---|
| Dirty end-faces | 80 % | 98 % |
| Poor polishing | 72 % | 88 % |
| Broken connectors | 40 % | 86 % |
| Mislabeling | 8 % | 86 % |
| Shattered end-faces | 34 % | 82 % |
| Bad splices | 36 % | 74 % |
| Excessive bends | 6 % | 66 % |

## *Diagnosing Failures*

Table 7-2 describes some typical causes of fiber test failures.

**Table 7-2. Diagnosing Fiber Test Failures**

| **Loss measurement gives FAIL result** |
| --- |
| • There is one or more dirty, damaged, misaligned, or unseated connections in the cabling. Check all connections and clean all fiber endfaces, then retest. The tester's visual fault locator can reveal damaged connectors and other faults. See Chapter 6 for details. An OTDR, such as the Fluke Networks OF-500 OptiFiber™ Certifying OTDR, can help you locate faults not revealed with the visual fault locator. |
| • There is a kink or sharp bend in a patch cord or the fiber under test. Use the visual fault locator to reveal these faults. |
| • A patch cord is broken. |
| • The number of adapters or splices on the **Fiber** Setup menu is too low (for standards that use a calculated loss value). |
| • The wrong fiber type is selected on the **Fiber** Setup menu. |
| • The reference is incorrect. Set the reference again using the same patch cords to be used for testing. |
| • For multimode fiber, the wrong mandrel size was used for testing. Smaller mandrels create tighter bends in the fiber, resulting in more loss. |
| • A patch cord or fiber segment has the wrong core size. An OTDR is useful for locating mismatched fiber in cabling. |
| • The cabling has a bad fusion or mechanical splice or a sharp bend. Use the visual fault locator to reveal these faults. |
| • The fibers are connected to the wrong ports on the tester, or are swapped at one end of the cabling. |

-continued-

**Table 7-2. Diagnosing Fiber Test Failures (cont.)**

| **Loss is negative.** |
|---|
| • The fiber ends were dirty during referencing.<br>• The connections to the tester were disturbed after referencing.<br>• There was a kink in a reference patch cord during referencing.<br>• The connectors were not properly aligned during referencing.<br>• The testers were much colder during referencing than during testing.<br>• Some other problem caused a bad reference value.<br>If loss is negative, set the reference again and retest the cabling. |
| **A known length of cable measures too long or too short.** |
| • The wrong fiber type is selected on the **Fiber** Setup menu<br>• The index of refraction needs adjustment. Change n on the **Fiber** Setup menu |

-continued-

**Table 7-2. Diagnosing Fiber Test Failures (cont.)**

| **Power meter measurement is too low** |
| --- |
| • Fiber endface is dirty or damaged.<br>• Patch cord not connected to tester's INPUT port, or a connection is loose.<br>• Wavelength selected on tester doesn't match source wavelength.<br>• Source set to modulated output.<br>• Patch cord or adapter is the wrong type (SM or MM) or patch cord has the wrong core size.<br>• Cabling is cracked or broken. |
| **Power meter measurement is too high** |
| Tester is connected to an active CATV fiber. |

# Chapter 8
# Memory Functions

## Storage Locations and Capacities

All DTX Series testers can store up to 250 Cat 6 Autotest results, including graphical data, in internal memory.

The maximum capacity of internal memory depends on the space taken by the tester's software.

The DTX-1800 and DTX-1200 can store up to 500 Cat 6 Autotest results, including graphical data, on a 16 MB removable memory card.

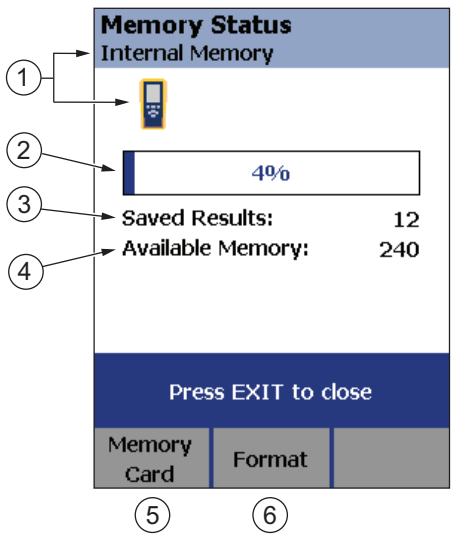
The DTX-1800 and DTX-1200 testers can use MultiMediaCard (MMC) or Secure Digital memory cards (SD).

## Checking the Memory Status

To check the memory status, the rotary switch to **SPECIAL FUNCTIONS**, use ◁▽▷ to highlight **Memory Status**; then press ENTER.

Or, press F3 **Memory** from the main Autotest screen.

Figure 8-1 describes the memory status screen.




1. The memory status currently displayed. is shown for internal memory. is shown for the memory card (DTX-1800, DTX-1200)

   DTX-1800/DTX-1200: Press F1 to switch between the memory card and internal memory status.
2. The bar graph shows the space used in the current memory destination.
3. The number of results saved in the location being displayed.
4. The approximate number of results you can save in the location being displayed. The exact number depends on the selected test limit and other test settings, as well as the length of the cables you test.
5. DTX-1800/DTX-1200: Press F1 to switch between the memory card and internal memory status.
6. DTX-1800/DTX-1200: Press F2 to format the memory card, if present.

**Figure 8-1. Memory Status Screen Features**

## Setting the Storage Location (DTX-1800, DTX-1200)

To set the destination for saved results on a DTX-1800 or DTX-1200 tester:

1 Turn the rotary switch to **SETUP**.

2 Use ▼ to highlight **Instrument Settings**; then press ENTER.

3 Use ▼ to highlight **Result Storage Location**; then press ENTER.

4 Use ▼ to highlight **Internal Memory** or **Memory Card (if present)**; then press ENTER.

*Note*

*If you change the **Result Storage Location**, and the selected **Current Folder** does not exist in the new location, the tester creates a new folder with the current folder's name in the new location.*

## Working with Folders

You can create folders for each job to organize your test results. The tester saves test results in the folder you select.

### Creating a New Folder

To create a new folder:

1 Turn the rotary switch to **SETUP**.

2 Use ▼ to highlight **Instrument Settings**; then press ENTER.

3 Use ▼ to highlight **Current Folder**; then press ENTER.

4 DTX-1800, DTX1200: Use F1 to select the location (memory card or internal memory) for the new folder.

5 Press F3 **Create Folder**.

6 Use the softkeys, ◀▶ ▲ ▼, and ENTER to enter a folder name. Press SAVE when you are finished.

You can also create a new folder from the **View/Delete Results** screen:

1 Turn the rotary switch to **SPECIAL FUNCTIONS**.

2 Use ▼ to highlight **View/Delete Results**; then press ENTER.

3 Press F1 **Change Folder**.

4 DTX-1800, DTX1200: Use F1 to select the location (memory card or internal memory) for the new folder.

5 Press F3 **Create Folder**.

6 Use the softkeys, ◀ ▶ ▲ ▼, and ENTER to enter a folder name. Press SAVE when you are finished.

*Note for DTX-1800, DTX-1200*

*If you change the **Result Storage Location**, and the selected **Current Folder** does not exist in the new location, the tester creates a new folder with the current folder's name in the new location.*

## *Changing Folders*

To change the current folder:

1 Turn the rotary switch to **SETUP**.

2 Use ▼ to highlight **Instrument Settings**; then press ENTER.

3 Use ▼ to highlight **Current Folder**; then press ENTER.

4 DTX-1800, DTX1200: Use F1 to select the location (memory card or internal memory) of the folder you want.

5 Use ▲ ▼ to highlight a folder name; then press ENTER.

You can also change the current folder from the **View/Delete Results** screen:

1 Turn the rotary switch to **SPECIAL FUNCTIONS**.

2 Use ▼ to highlight **View/Delete Results**; then press ENTER.

3 Press F1 **Change Folder**.

6 Use ▲ ▼ to highlight a folder name; then press ENTER.

## *Deleting Folders*

To delete a folder and all the results it contains:

1 Turn the rotary switch to **SPECIAL FUNCTIONS**.

2 Use ▼ to highlight **View/Delete Results**; then press ENTER.

3 If necessary, press F1 **Change Folder** to find the folder you want to delete.

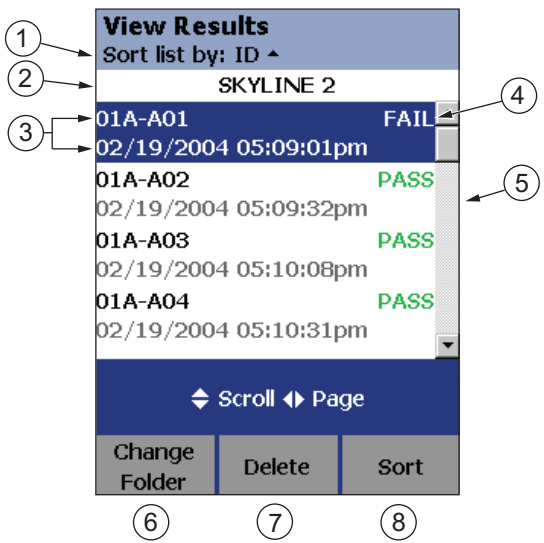
4 Press F2 **Delete**.

5 Use ▼ to highlight **Current Folder**; then press F3 **Delete**.

## *Viewing and Managing Saved Results*

To view and manage saved results, turn the rotary switch to **SPECIAL FUNCTIONS**, use ▼ to highlight **View/Delete Results**; then press ENTER.

Figure 8-2 describes the **View Results** screen.




1. Sorting order of the list of results. For example, **ID ▲** means the list is sorted by cable IDs in ascending order. Press F3 **Sort** to change the order.
2. Name of the current folder. Press F1 **Change Folder** to select a different folder.
3. The result's cable ID and the date and time the test was completed.
4. The overall result for the test. See Chapter 3 for details on **PASS*** and **FAIL*** results.
5. Scroll bar, which appears when there is more than one screen of results to view. Press ▲ ▼ to scroll up and down. Press ◀ ▶ to scroll up or down a screen at a time
6. Press F1 **Change Folder** to select a different folder.
7. Press F2 **Delete** to delete results or folders.
8. Press F3 **Sort** to sort the list of results.

**Figure 8-2. View Results Screen**

## Moving or Copying Results to a Memory Card (DTX-1800, DTX-1200)

To move or copy all results from internal memory to the memory card:

1 Turn the rotary switch to **SPECIAL FUNCTIONS**.

2 Select **Move/Copy Internal Results**; then select an option:

- **Move to Memory Card:** Moves all results and their folders to the memory card and deletes all results from internal memory.
- **Copy to Memory Card:** Copies all results and their folders to the memory card.
- **Delete from Internal Memory:** Deletes all results from internal memory.

The tester displays a message if it cannot move or copy a result. This occurs in the following cases:

- A result with the same ID and timestamp already exists on the memory card.
- The memory card is full.
- The memory card is not formatted or is damaged.

## Deleting Results

To delete results:

1 Turn the rotary switch to **SPECIAL FUNCTIONS.**

2 Use ▼ to highlight **View/Delete Results**; then press ENTER.

3 If necessary, press F1 **Change Folder** to find the result(s) you want to delete.

4 Press F2 **Delete**; then use ▼ to highlight an option:

- **Current Result:** Deletes the result highlighted on the previous screen.
- **All Results in Folder:** Deletes all results in the current folder.
- **All Results in Tester:** Deletes all results in internal memory. For the DTX-1200 and DTX-1800, this option also deletes all results on the memory card if one is present.
- **Current Folder:** Deletes the current folder and all its contents.

5 Press F3 **Delete**.

### *Sorting Results*

You can sort the list of saved results in ascending or descending order by the following parameters:

- PASS/FAIL result
- Cable ID
- Date and time the test was completed

To sort results:

1 On the **View Results** screen, press F3 **Sort**.

2 Use ▼ to highlight the field you want to sort by.

3 Press F1 **Ascending** or F3 **Descending**.

The sorting order applies only to the current folder. The current sorting order is indicated at the top of the **View Results** screen, as shown in Figure 8-2 on page 8-6

The default order is ascending by cable ID. The sorting order reverts to the default when you leave the **SPECIAL FUNCTIONS** mode, turn off the tester, or upload the results to a PC.

## *Formatting a Memory Card (DTX-1800, DTX-1200)*

To format a memory card:

1 Insert the card into the slot on the left side of the tester.

2 Turn the rotary switch to Autotest

3 Press F3 **Memory**.

4 Press F2 **Format**; then press F3 **Yes**.

You can also format a memory card in **SPECIAL FUNCTIONS** mode:

1 Turn the rotary switch to **SPECIAL FUNCTIONS.**

2 Use ▼ to highlight **Memory Status**; then press ENTER.

3 Press F2 **Format**; then press F3 **Yes**.

## Memory Card Care (DTX-1800, DTX-1200)

- Clean the card by wiping it with a slightly damp cloth. If the card's electrical contacts are dirty, use a pencil eraser to clean them.
- Keep the card out of direct sunlight and away from extreme heat or humidity.
- Do not drop the card on hard surfaces.
- Keep the card dry.

## Uploading Results to a PC

To upload results to a PC:

1. Install the latest version of LinkWare software on your PC.
2. Turn on the tester.
3. Connect the tester to the PC with the USB cable included or the DTX serial cable available from Fluke Networks.

   or

   Insert the memory card containing results into the PC's memory card reader.
4. Start LinkWare software on the PC.
5. Click **Import**  on the LinkWare toolbar. Select the tester's model from the list.

   or

   Select **Memory card or folder on PC**.
6. Select the records you want to import; then click **OK**.

See the LinkWare online help for details on creating reports with LinkWare.

# Chapter 9
# Maintenance and Specifications

## Maintenance

### ⚠⚠ Warning

**To avoid possible fire, electric shock, personal injury, or damage to the tester:**

- **Do not open the case. No user-serviceable parts are inside.**
- **Replacing electrical parts yourself will void the tester's warranty and might compromise its safety features.**
- **Use only specified replacement parts for user-replaceable items.**
- **Use only Fluke Networks authorized service centers.**

### Caution

**Replacing electrical parts yourself might void the tester's calibration and compromise its accuracy. If the calibration is void, cable manufacturers might not extend their warranty to the cabling you install.**

### Reference Procedure for Link Interface Adapters

The reference procedure sets a baseline for insertion loss, ELFEXT, and dc resistance measurements. You should perform the reference procedure every 30 days or whenever you start using the tester with a different remote.

See “Setting the Reference” in Chapter 3 for details.

## *Factory Calibration*

The tester requires calibration at a service center once a year to ensure that it meets or exceeds the published accuracy specifications. Contact an authorized Fluke Networks Service Center for information on getting your tester calibrated.

To see when the tester last received a service calibration, turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information**. The tester's calibration date is also shown on reports uploaded to a PC.

## *Updating the Tester's Software*

Keeping your tester's software current gives you access to new features and the latest test limits.

To get a software update, download the update from the Fluke Networks website or contact Fluke Networks to get the update by other means.

To see the software version installed in your main and remote testers, turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information**.

You can update your tester with a PC or with another tester that is already updated, as described in the following sections.

### Caution

**To avoid unexpected loss of power, connect the ac adapter to the tester when updating the software.**

*Note*

*Changes to the update procedure may be posted on the DTX CableAnalyzer software page on the Fluke Networks website.*

### Updating with a PC

1. Install the latest version of LinkWare software on your PC.
2. Download the DTX CableAnalyzer update file from the Fluke Networks website, or contact Fluke Networks to get the update by other means. You can access the software page at **www.flukenetworks.com/support**. Save the file to your hard drive.
3. Make the connections shown in Figure 9-3 using the USB or DTX serial cable. (The USB connection, if available, is faster.) Turn on the tester and the smart remote.

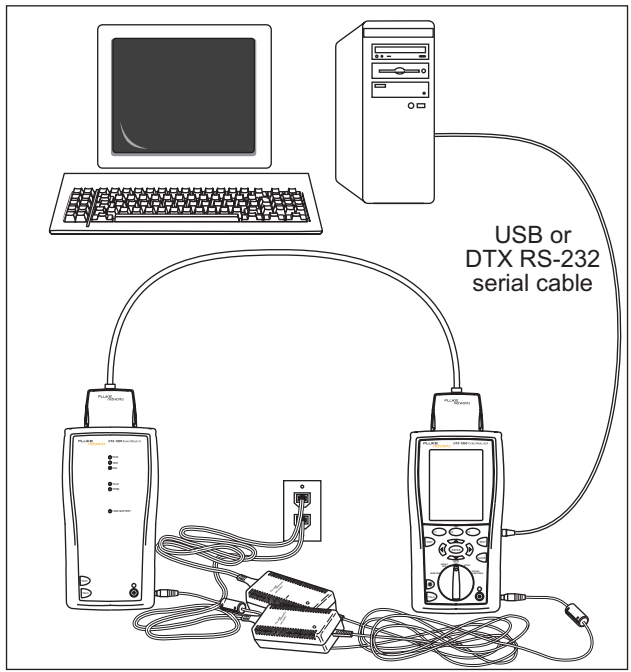
*Note*

*The DTX serial cable connects a PC's DB-9 RS-232 serial port to the miniature RS-232 serial port on the DTX-1800 and DTX-1200 testers. This cable is included with the DTX-1800 and is available from Fluke Networks. Table 9-4 shows the pin connections for this cable.*

**4** Select **Utilities** > **DTX Utilities** > **Software Update** from the LinkWare menu, locate and select the .dtx (DTX update) file; then click **Open**.

**5** The tester reboots, then prompts you about updating the smart remote's software. Press F2 **OK** to update the smart remote's software.

**6** To verify the update, turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information.**




amd72f.eps

**Figure 9-1. Updating the Software with a PC**

## Updating with Another Tester

You can update a tester's software using another tester that is already updated.

1 Use link interface adapters to connect an updated tester or smart remote to a tester or smart remote that needs updating (Figure 9-4).

*Note*

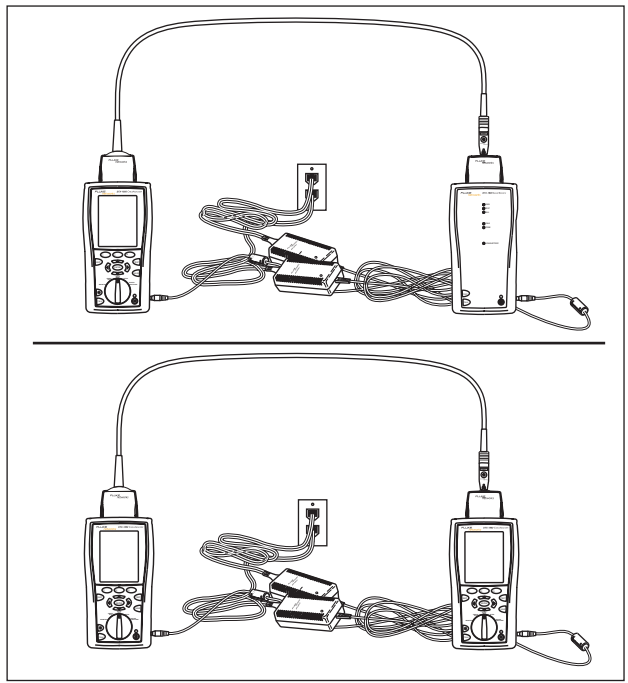
*One of the units must be a main tester.*

2 Turn on both units; then press TEST on either.

The testers compare software versions. If one has more recent software, the main tester prompts you about updating the older software.

3 Press F2 **OK** to start the update process.

4 To verify the update, turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information.**



amd73f.eps

**Figure 9-2. Updating the Software with an Updated Tester**

### Updating with a Memory Card (DTX-1800, DTX-1200)

You can update the tester's software using a memory card that contains the software update file.

1. Download the DTX CableAnalyzer update file from the Fluke Networks website, or contact Fluke Networks to get the update by other means. You can access the software page at **www.flukenetworks.com/support**. Save the file to your hard drive.
2. Copy the software update file to a memory card.
3. Connect the tester and smart remote together using a permanent link and a channel adapter or two channel adapters and a patch cord. Turn on the tester and the smart remote.
4. Put the memory card in the tester.
5. Turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Update Software**.
6. Press F3 **Yes** to start the update procedure.
7. When the tester is updated, it reboots, then prompts you about updating the smart remote's software. Press F2 **OK** to update the smart remote's software.
8. To verify the update, turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information**.

## *Cleaning*

Clean the display with glass cleaner or isopropyl alcohol and a soft, lint-free cloth. Clean the case with a soft cloth dampened with water or water and a mild soap.

**Caution**

**To avoid damaging the display or the case, do not use solvents or abrasive cleansers.**

## *Resetting the Battery Gauge*

The accuracy of the battery gauge may drift over time if the battery is frequently recharged before being fully discharged.

To reset the battery gauge:

1. Completely discharge the battery until the tester no longer operates.

   *Note*

   *To shorten the discharge time for the remote's battery, swap it with the battery on the main tester. The battery discharges faster on the main tester.*

2. Charge the battery for at least 4 hours with the unit turned off.

3. Repeat steps 1 and 2.

## *Replacing the Battery*

Replace the lithium ion battery pack when its life becomes noticeably shorter or when it fails to reach full charge. The battery is normally good for up to 400 charge/discharge cycles.


*Note*

*Dispose of the lithium ion battery pack in accordance with local regulations.*

An internal lithium battery maintains the tester's clock, when you remove the battery pack. This battery typically lasts about 5 years. When the battery begins to fail, the tester will lose the current date and time when you remove the battery pack. If the internal lithium battery fails, send the tester to a Fluke Networks service center for a replacement.

### *Fiber Test Module Maintenance*

The following sections apply to the optional DTX-MFM and DTX-SFM fiber modules.

#### Optical Connector and Adapter Care

Periodically clean and inspect the module's optical connectors as described in Chapter 5.

#### Replacing Fiber Patch Cords

Choose replacement fiber optic patch cords that meet the following requirements:

- Core and cladding size: match the fiber to be tested
- Connector polish: PC or UPC
- Patch cord length: minimum 2 m; maximum 5 m

To ensure optimum performance from your tester, get replacement patch cords from Fluke Networks.

## *Storage*

- Before storing the tester or an extra battery for an extended period, charge the battery to between 70 % and 90 % of full charge. Check the battery every 4 months and recharge if necessary.
- Keep a battery attached to the tester during storage. Removing the battery for long periods shortens the life of the internal lithium battery that maintains the clock.
- See "Environmental and Regulatory Specifications" on page 9-14 for storage temperatures.

## *If Something Seems Wrong*

If something seems wrong with the tester, refer to Table 9-1.

If Table 9-1 does not help you solve a problem with the tester, contact Fluke Networks for additional help. See Chapter 1 for contact information.

If possible, have the tester's serial number, software and hardware versions, and calibration date available. To see this information, turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Version Information**.

For warranty information, refer to the warranty at the beginning of this manual. If the warranty has lapsed, contact Fluke Networks for repair prices.

**Table 9-1. Troubleshooting the Tester**

| |
|---|
| **The keypad does not respond.** |
| Press and hold ⏻ until the tester turns off. Then turn the tester on again. If the problem persists, update the tester's software if a newer version is available. |
| **System error occurs.** |
| Press F2 **OK**. If the tester does not recover, press and hold ⏻ until the tester turns off. If the error recurs, update the tester's software. If the tester already has the latest software, contact Fluke Networks for assistance. |
| **The tester will not turn on, even with the ac adapter connected.** |
| The battery may be completely discharged. Let the battery charge for a few minutes with the tester off. |
| **The battery LED is flashing red.** |
| The battery did not reach full charge within 6 hours. Verify that the battery was charged within the temperature range of 32 °F to 113 °F (0 °C to 45 °C). Disconnect then reconnect ac power and try charging the battery again. If the battery does not charge the second time, it should be replaced. |
| **The tester will not turn on even when the battery is charged.** |
| The battery's safety switch has tripped. Connect the ac adapter for a few minutes to reset the switch. |

-continued-

**Table 9-1. Troubleshooting the Tester (cont.)**

| |
|---|
| **All the LEDs on the smart remote are flashing** |
| The smart remote detects excessive voltage on the cable. Unplug the cable immediately. |
| **Test results appear to be incorrect.** |
| The tester may not be configured correctly. For example, the wrong test standard or cable type may be selected or the NVP may be incorrect.<br>The tester may need referencing. See Chapter 3 for details. |
| **The reference fiber patch cords and adapters are good, but the reference power level is too low.** |
| Clean the tester's input and output connectors and use a fiber microscope to inspect the endfaces. If an endface is damaged, contact Fluke Networks for service information. |
| **A fiber test produces a negative loss reading.** |
| There is a problem with the reference. Set the reference and test the cabling again. See Chapter 7 for details. |

## Options and Accessories

To order options and accessories (Table 9-2), contact Fluke Networks as described in Chapter 1.

For the latest list of DTX CableAnalyzer options and accessories and a complete list of fiber test accessories visit the Fluke Networks website at **www.flukenetworks.com**.

**Table 9-2. Options and Accessories**

| Option or Accessory | Fluke Networks Model Number |
|---|---|
| Cat 6/Class E Channel Adapter | DTX-CHA001 |
| Cat 6/Class E Channel Adapters, set of 2 | DTX-CHA001S |
| Universal Permanent Link Adapter | DTX-PLA001 |
| Universal Permanent Link Adapters, set of 2 | DTX-PLA001S |
| Cat 6 Centered Personality Module | DSP-PM06 |
| Personality modules for IDC and legacy cabling systems<br>Many models are available. Contact Fluke Networks or visit the Fluke Networks website for details. | DSP-PMxx |

-continued-

**Table 9-2. Options and Accessories (cont.)**

| Option or Accessory | Fluke Networks Model Number |
|---|---|
| Siemon Tera Channel Adapter | DTX-CHA011 |
| Siemon Tera Permanent Link Adapter | DTX-PLA011 |
| Siemon Tera adapter kit | DTX-TERA |
| Nexans GG45 Channel Adapter | DTX-CHA012 |
| Nexans GG45 Permanent Link Adapter | DTX-PLA012 |
| Nexans GG45 adapter kit | DTX-GG45 |
| Lithium ion battery pack | DTX-LION |
| DTX RS-232 serial cable (DB-9 to IEEE1394) | DTX-SER |
| USB interface cable | DTX-USB |
| Carrying strap | DTX-STRP |
| Carrying case | DTX-CASE |

-continued-

**Table 9-2. Options and Accessories (cont.)**

| Option or Accessory | Fluke Networks Model Number |
|---|---|
| AC Charger, North America, 120VAC | DTX-ACNA |
| AC Charger, universal, 120-240VAC | DTX-ACUN |
| Headset for DSP and DTX CableAnalyzers | DTX-TSET |
| MultiMedia card (MMC),16 MB | DSP-MMC16 |
| MultiMedia card (MMC), 32 MB | DSP-MMC32 |
| MultiMedia card (MMC) reader, USB | DSP-MCR-U |
| MultiMedia card (MMC) carry case | MMC CASE |
| IntelliTone IT100 Probe | MT-8200-53A |
| LinkWare Cable Test Management Software<br>(You may download this at no charge from the Fluke Networks website.) | LinkWare |
| LinkWare Stats Statistical Report Option | LinkWare-Stats |
| DTX-1800 main unit replacement with battery pack | DTX-1800/MU |
| DTX-1800 smart remote replacement with battery pack | DTX-1800/RU |

-continued-

**Table 9-2. Options and Accessories (cont.)**

| Option or Accessory | Fluke Networks Model Number |
|---|---|
| DTX-1200 Main Replacement with Battery Pack | DTX-1200/MU |
| DTX-1200 Smart Remote Replacement with Battery Pack | DTX-1200/RU |
| DTX-LT Main Replacement with Battery Pack | DTX-LT/MU |
| DTX-LT Smart Remote Replacement with Battery Pack | DTX-LT/RU |

# Specifications

Specifications apply at 23 °C (73 °F), unless otherwise noted.

## Environmental and Regulatory Specifications

| | |
|---|---|
| **Operating temperature** | 32 °F to 104 °F (0 °C to 40 °C) |
| **Storage temperature** | -4 °F to +140 °F (-20 °C to +60 °C) |
| **Operating relative humidity (% RH without condensation)** | 32 °F to 95 °F (0 °C to 35 °C): 0 % to 90 %<br>95 °F to 113 °F (35 °C to 45 °C): 0 % to 70 % |
| **Vibration** | Random, 2 g, 5 Hz-500 Hz |
| **Shock** | 1 m drop test with and without module and adapter attached |
| **Safety** | CSA C22.2 No. 1010.1: 1992<br>EN 61010-1 1st Edition + Amendments 1, 2 |
| **Pollution degree** | 2 |
| **Altitude** | Operating: 4000 m; Storage: 12000 m |
| **EMC** | EN 61326-1 |
| **Laser safety (for fiber test module)** | Class I CDRH. Complies to EN 60825-2 |

**⚠Warning**

**Under no circumstances is this product intended for direct connection to telephony inputs, systems, or equipment, including ISDN inputs. Doing so is a misapplication of this product, which could result in damage to the tester and create a potential shock hazard to the user.**

## *Service Calibration Period*

One year.

## *Standard Link Interface Adapters*

- Cat 6/Class E permanent link adapters

  Plug type and life: shielded 8-pin modular (RJ45); >5000 insertions

  Tests supported: shielded and unshielded cable, TIA Cat 3, 4, 5, 5e, and 6 and ISO/IEC Class C and D, and E permanent link

- Cat 6/Class E channel adapters

  Plug type and life: shielded 8-pin modular (RJ45); >5000 insertions

  Tests supported: shielded and unshielded cable, TIA Cat 3, 4, 5, 5e, and 6 and ISO/IEC Class C and D channels

## *Cable Types Tested*

Shielded and unshielded twisted pair (STP, FTP, SSTP, and UTP) LAN cabling:

- TIA Category 3, 4, 5, 5e, and 6: 100 Ω
- ISO/IEC Class C and D: 100 Ω and 120 Ω

*Note*

*For availability of additional adapters that allow testing to other performance standards, different cabling types, or fiber optic cabling, contact Fluke Networks.*

## Time for Autotest

Full 2-way Autotest of Category 6 UTP cable in 12 seconds or less.

## Summary of Performance Specifications

*Note*

*All specifications for tests on twisted pair cabling apply to 100 Ω cable. Contact Fluke Networks for information on measurement performance for cable with a different impedance.*

For Category 6/Class E test modes or below, the DTX CableAnalyzer is compliant with Level III requirements of TIA/EIA-568-B.2-1 and IEC 61935-1.

For Class F test modes, the DTX-1800 is compliant with Level IV requirements as in the draft 2nd edition of IEC 61935-1.

## Length

*Note*

*Length specifications do not include the uncertainty of the cable's NVP value.*

| Parameter | Twisted Pair Cabling | |
|---|---|---|
| | **Single-ended Test** | **Dual-ended Test (main and remote)** |
| Range | 800 m (2600 ft) | 150 m (490 ft) |
| Resolution | 0.1 m or 1 ft | 0.1 m or 1 ft |
| Accuracy | ± (1 m + 4 %) | ± (1 m + 4 %) |

### *Propagation Delay*

| Parameter | Twisted pair cabling | |
|---|---|---|
| | **Single-ended Test** | **Dual-ended Test (main and remote)** |
| Range | 4000 ns | 750 ns |
| Resolution | 1 ns | 1 ns |
| Accuracy | ± (5 ns + 4 %) | ± (5 ns + 4 %) |

### *Delay Skew*

| Parameter | Twisted Pair Cabling |
|---|---|
| Range | 0 ns to 100 ns |
| Resolution | 1 ns |
| Accuracy | ± 10 ns |

### *DC Loop Resistance Test*

| Parameter | Twisted pair cabling |
|---|---|
| Range | 0 Ω to 530 Ω |
| Resolution | 0.1 Ω |
| Accuracy | ± (1 Ω + 1 %) |
| Overload Recovery Time | Less than 10 minutes to rated accuracy following an overvoltage. Referencing is required after repeated or prolonged overvoltage. |

**Table 9-3. Level IV Accuracy Performance Parameters per IEC Guidelines***

| Parameter | Baseline Field Tester | Field Tester with Level IV Permanent Link Adapter | Field Tester with Level IV Channel Adapter |
|---|---|---|---|
| Dynamic range | 3 dB over test limit<br>PPNEXT and FEXT 65 dB<br>PSNEXT and FEXT 62 dB | | |
| Amplitude resolution | 0.1 dB | | |
| Frequency range and resolution | 1 MHz to 31.25 MHz: 125 kHz<br>31.25 MHz to 100 MHz: 250 kHz<br>100 MHz to 250 MHz: 500 kHz<br>250 MHz to 600 MHz: 1 MHz | | |
| Dynamic Accuracy NEXT | ± 0.75 dB | | |
| Dynamic Accuracy ELFEXT | ± 1.0 dB (FEXT dynamic accuracy is tested to ± 0.75 dB) | | |
| * DTX-1800 up to 900 MHz. DTX-1200 and DTX-LT up to 350 MHz. | | | |

-continued-

**Table 9-3. Level IV Accuracy Performance Parameters per IEC Guidelines (cont.)***

| Parameter | Baseline Field Tester | Field Tester with Level IV Permanent Link Adapter | Field Tester with Level IV Channel Adapter |
|---|---|---|---|
| Source/load return loss | 1 MHz to 300 MHz: 20 – 12.5 log(f/100), 20 dB maximum<br>300 MHz to 600 MHz: 14 dB | 1- 300 MHz: 18 – 12.5 log(f/100), 20 dB maximum<br>300 MHz to 600 MHz: 12 dB | |
| Random Noise Floor | 100 - 15 log(f/100), 90 dB maximum | 95 - 15 log(f/100), 85 dB maximum | |
| Residual NEXT | 90 – 20 log(f/100) (measured to 85 dB maximum) | 85 - 20 log(f/100) (measured to 85 dB maximum) | 72.4 - 15 log(f/100) (measured to 85 dB maximum) |
| Residual FEXT | 80 - 20 log(f/100) (measured to 85 dB maximum) | 75 - 20 log(f/100) (measured to 85 dB maximum) | 60 - 15 log(f/100) (measured to 85 dB maximum) |
| Output Signal Balance | 40 - 20 log(f/100) (measured to 60 dB maximum) | 37 - 20 log(f/100) (measured to 60 dB maximum) | |
| * DTX-1800 up to 900 MHz. DTX-1200 and DTX-LT up to 350 MHz. | | | |

-continued-

**Table 9-3. Level IV Accuracy Performance Parameters per IEC Guidelines (cont.)***

| Parameter | Baseline Field Tester | Field Tester with Level IV Permanent Link Adapter | Field Tester with Level IV Channel Adapter |
|---|---|---|---|
| Common Mode Rejection | 40 - 20 log(f/100)<br>(measured to 60 dB maximum) | 37 - 20 log(f/100)<br>(measured to 60 dB maximum) | |
| Tracking | ± 0.5 dB (applicable when IL > 3 dB) | | |
| Directivity | (applicable when IL > 3 dB)<br>1 MHz to 300 MHz:<br>27 - 7log(f/100),<br>30 dB maximum<br>300 MHz to 600 MHz: 23.7 dB | 1 MHz to 300 MHz: 25 - 7log(f/100), 25 dB maximum<br>300 MHz to 600 MHz: 21.7 dB<br>(applicable when IL > 3 dB) | |
| Source Match | 20 dB (applicable when IL > 3dB) | | |
| Return loss of Termination | (applicable when IL > 3 dB)<br>1 MHz to 250 MHz:<br>20 - 15log(f/100),<br>25 dB maximum<br>250 MHz to 600 MHz: 14 dB | 1 MHz to 250 MHz: 18 - 15log(f/100), 25 dB maximum<br>250 MHz to 600 MHz: 12 dB<br>(applicable when IL > 3dB) | |

* DTX-1800 up to 900 MHz. DTX-1200 and DTX-LT up to 350 MHz.

## *Typical Measurement Accuracy*

The typical measurement accuracy of the DTX Series CableAnalyzer testers meets or exceeds accuracy Level IV. The DTX-1800 measures up to 900 MHz and is fully compliant with accuracy Level IV. The DTX-1200 and DTX-LT measure up to 350 MHz with accuracy Level IV performance.

The following typical accuracy performance parameters are used for asterisk (*) results reporting. These are based on computation of the overall measurement accuracy based on the worst case of each parameter at each frequency data point. Observed differences between laboratory equipment and DTX CableAnalyzers using calibration verification artifacts were used as a confirmation.

Accuracies computed from the parameters in Table 9-3 are shown in Figures 9-3 through 9-6.

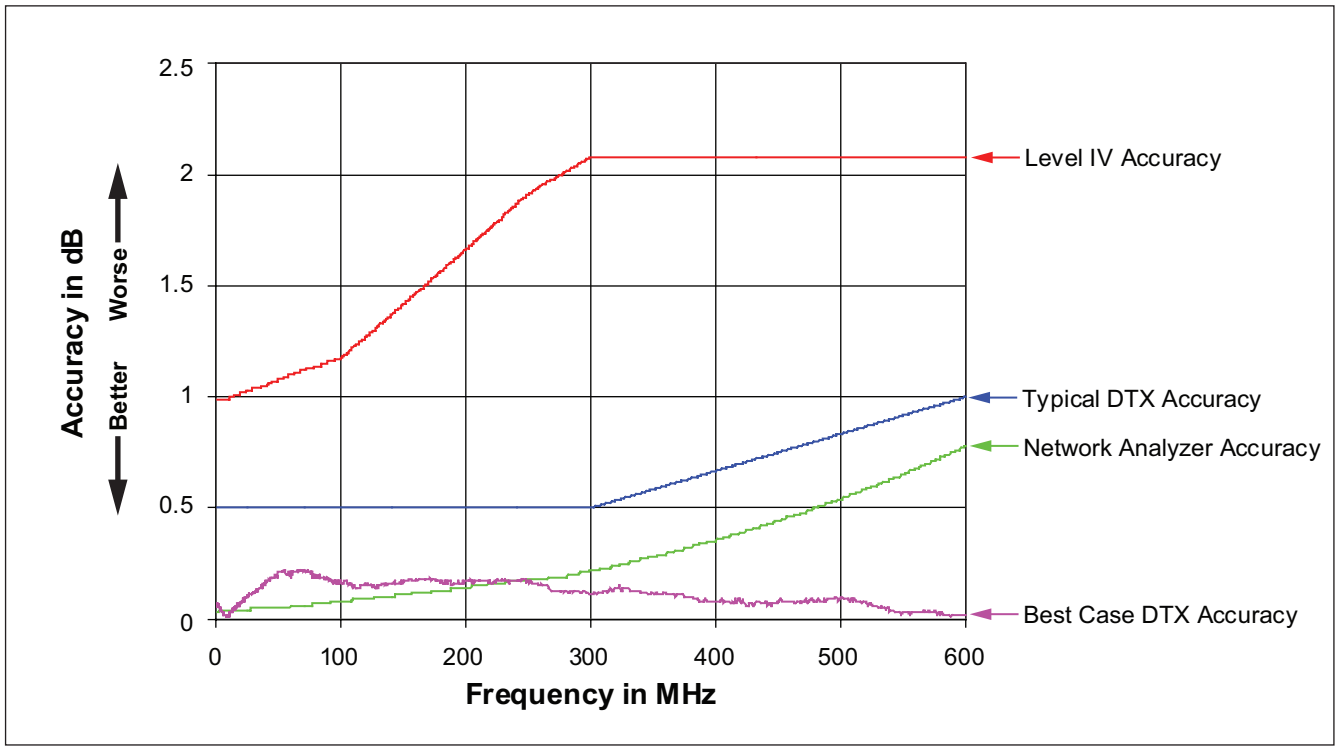
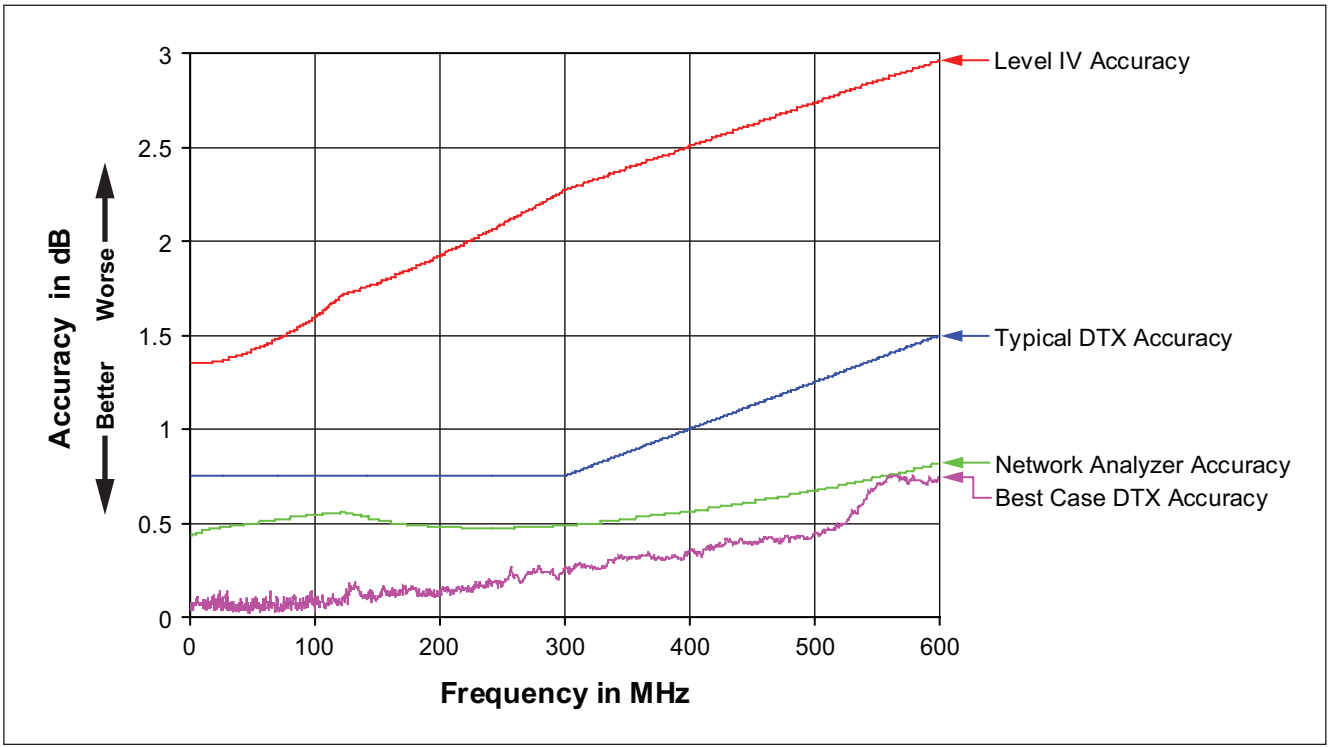



**Figure 9-3. Typical Baseline Insertion Loss Measurement Accuracy**




amd111f.eps

**Figure 9-4. Typical Baseline NEXT Loss Measurement Accuracy**

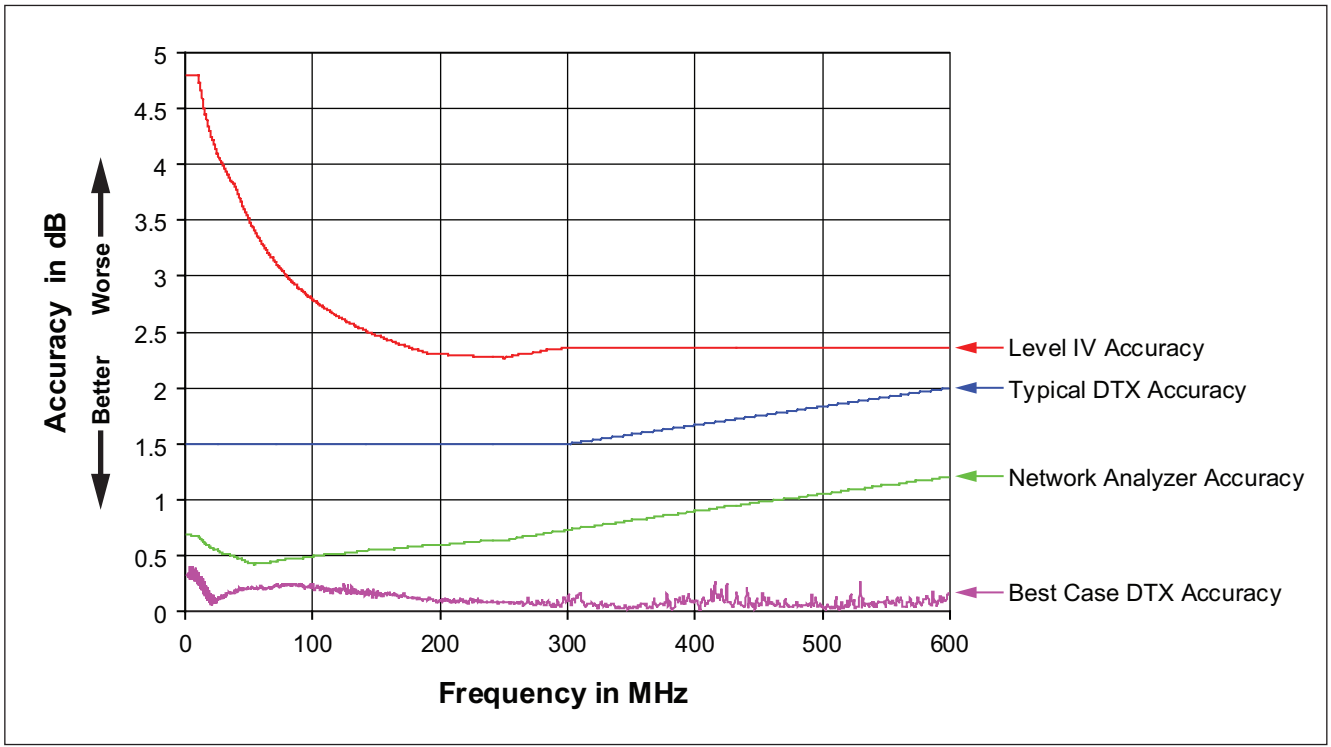



**Figure 9-5. Typical Baseline Return Loss Measurement Accuracy**

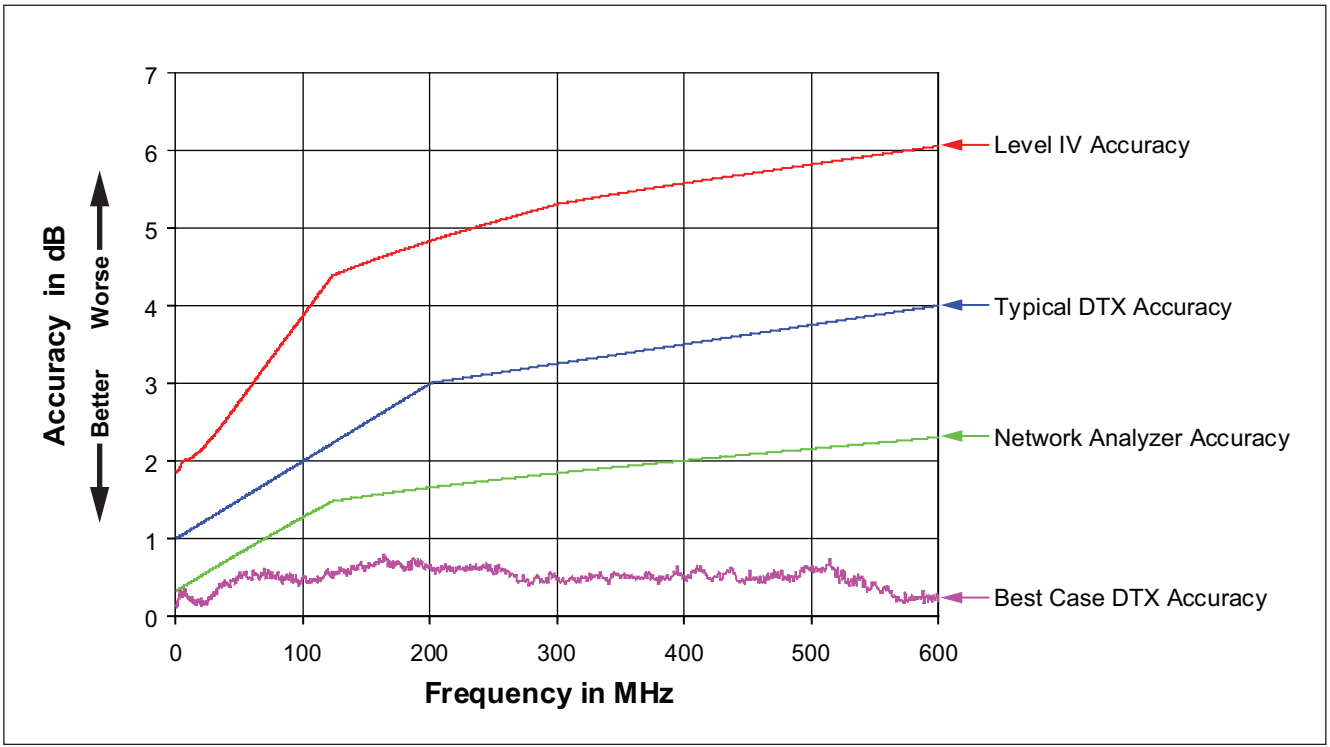



**Figure 9-6. Typical Baseline ELFEXT Measurement Accuracy**

## *HDTDX™ Analyzer Specifications for Cables <100 m (328 ft)*

The specifications below are typical for cables less than 100 m (328 ft).

| Parameter | Twisted Pair Cable |
|---|---|
| Distance accuracy | ± (1 ft (0.3 m) + 2 % distance) |
| Distance resolution | 1 ft or 0.1 m |

## *HDTDR™ Analyzer Specifications for Cables <100 m (328 ft)*

The specifications below are for HDTDR tests on cables less than 100 m (328 ft) long.

| Parameter | Twisted Pair Cable |
|---|---|
| Distance accuracy | ± (1 ft (0.3 m) + 2 % distance) |
| Distance resolution | 1 ft or 0.1 m |

## *Characteristic Impedance*

The tester reports an estimate of the cable's impedance at 4 m from the beginning of the link. The accuracy of the measurement is relative to a 100 Ω terminating resistance.

| Parameter | Twisted Pair Cable |
|---|---|
| Range | 70 Ω - 180 Ω |
| Accuracy | ± (5 Ω + 5 % \|Nominal – Measured\|) |
| Resolution | 1 Ω |

## *Impulse Noise*

Adjustable from 10 mV to 500 mV in 10 mV steps.

Monitors either polarity of noise on pair 3, 6.

Minimum detectable impulse width: 10 ns

## *DTX-MFM/DTX-SFM Fiber Module Specifications*

### Power Meter Specifications

| | |
|---|---|
| **Input connector** | SC |
| **Detector type** | InGaAs |
| **Calibrated wavelengths** | 850 nm, 1310 nm, 1550 nm |
| **Power measurement range** | 0 dBm to -60 dBm (1300/1310 nm and 1550 nm)<br>0 dBm to -52 dBm (850 nm) |
| **Display resolution** | dB, dBm: 0.01<br>Linear (μW): >400, >40, >4, >0.4, ≤0.4: 1, 0.1, 0.01, 0.001, 0.0001 |
| **Power measurement uncertainty (accuracy)** | ± 0.25 dB[1] |
| **Measurement linearity**<br>**(18 °C to 28 °C constant temperature)** | 1300/1310 nm and 1550 nm: ± 0.1 dB[2]<br>850 nm: ± 0.2 dB[3] |
| **Re-calibration period** | 1 year |
| **Display update rate** | 1 reading per second |

1. Under the following conditions:
   - Power level: -20 dBm, continuous wave
   - At 850 nm: 62.5/125 μm fiber with 0.275 NA
   - At 1310 nm and 1550 nm: 9 /125 μm
   - Ambient temperature: 23 °C ±5 °C
2. Linearity for 1310 nm and 1550 nm:
   - Between 0 dBm and -55 dBm: ± 0.1 dB
   - < -55 dBm: ± 0.2 dB
3. Linearity for 850 dBm:
   - Between 0 dBm and -45 dBm: ± 0.2 dB
   - < -45 dBm: ± 0.25 dB

## Loss/Length Specifications

| Specification | DTX-MFM<br>Multimode Modules | DTX-SFM<br>Singlemode Modules |
|---|---|---|
| **Testing speeds (excluding referencing times)** | Far End Source mode (1 wavelength): ≤ 4.5 s<br>Loopback mode (2 wavelengths, one direction): ≤ 5 s<br>Smart Remote mode (2 wavelengths, one direction): ≤ 15 s | |
| **Output/input connectors** | SC/SC | |
| **Fiber types tested** | 9/125 μm to 62.5/125 μm multimode | 9/125 μm singlemode |
| **Source type and wavelengths** | Multimode LED source<br>850 nm ± 30 nm<br>1300 nm ± 20 nm | Fabry-Perot laser diode<br>1310 nm ± 20 nm<br>1550 nm ± 30 nm |
| **Maximum length measurement** | 5 km of 50 μm or 62.5 μm multimode fiber | 10 km of 9 μm singlemode fiber |

-continued-

**Loss/Length Specifications (cont.)**

| Specification | DTX-MFM Multimode Modules | DTX-SFM Singlemode Modules |
|---|---|---|
| **Length measurement accuracy** | ± 1.5 m plus ± 2 % of length | |
| **Propagation time accuracy** | ± 15 ns plus ± 2 % of propagation time | |
| **Output power (nominal)** | -20 dBm | - 7 dBm |
| **Output power stability over 8-hour period (after 5 minute warmup)** | ± 0.10 dB over 8 hours, 5 minute warm-up time | ± 0.25 dB over 8 hours, 5 minute warm-up time |
| **Detector type** | InGaAs | |
| **Calibrated wavelengths** | 850 nm, 1310 nm, 1550 nm | |
| **Power measurement range** | 850 nm: 0 dBm to -52 dBm<br>1300/1310 nm, 1550 nm: 0 dBm to -60 dBm | |
| **Display Resolution** | dB, dBm: 0.01<br>Linear (μW): >400, >40, >4, >0.4, ≤0.4: 1, 0.1, 0.01, 0.001, 0.0001 | |

-continued-

## Loss/Length Specifications (cont.)

| Specification | DTX-MFM Multimode Modules | DTX-SFM Singlemode Modules |
|---|---|---|
| **Power measurement uncertainty (accuracy)** | ± 0.25 dB[1] | |
| **Measurement linearity (18 °C to 28 °C constant temperature)** | 1300/1310 nm and 1550 nm: ±0.1 dB[2]<br>850 nm: ±0.2 dB[3] | |
| **Dynamic Range for main-remote communication and nominal length measurement** | 12 dB | 22 dB |
| **Re-calibration period** | 1 year | |
| **Display update rate** | 1 reading per second | |

1. Under the following conditions:
   - Power level: -20 dBm, continuous wave
   - At 850 nm: 62.5/125 μm fiber with 0.275 NA
   - At 1310 nm and 1550 nm: 9 /125 μm
   - Ambient temperature: 23 °C ±5 °C

2. Linearity for 1310 nm and 1550 nm:
   - Between 0 dBm and -55 dBm: ± 0.1 dB
   - < -55 dBm: ± 0.2 dB

3. Linearity for 850 dBm:
   - Between 0 dBm and -45 dBm: ± 0.2 dB
   - < -45 dBm: ± 0.25 dB

## *Visual Fault Locator*

| | |
|---|---|
| **Output power*** | 316 µw (-5 dBm) ≤ peak power ≥ 1.0 mw (0 dbm) |
| **Operating wavelength** | 650 nm nominal |
| **Spectral width (RMS)** | ± 3 nm |
| **Output modes** | Continuous wave and pulsed mode (2 Hz to 3 Hz blink frequency) |
| **Connector adapter** | 2.5 mm universal |
| **Laser safety** | Class II CDRH |
| * Into SMF-28 singlemode fiber, continuous wave and pulse modes, SC/UPC connector. | |

## *Tone Generator*

Generates tones that can be detected by a tone probe, such as a Fluke Networks IntelliTone™ probe. The tones are generated on all pairs.

Frequency range of tones: 440 Hz to 831 Hz

## Power

*Notes*

*You do not need to fully discharge the battery before recharging it.*

*The battery will not charge at temperatures outside of 0 °C to 45 °C (32 °F to 113 °F). The battery charges at a reduced rate between 40 °C and 45 °C (104 °F and 113 °F).*

- Main unit and remote: Lithium-ion battery pack, 7.4 V, 4000 mAh
- Typical battery life: 10 to 12 hours
- Charge time (with tester off): 4 hours (below 40 °C)
- AC adapter/charger, USA version: Linear power supply; 108 V ac to 132 V ac input; 15 V dc, 1.2 A output
- AC adapter/charger, international version: Switching power supply; 90 V ac to 264 V ac input; 15 V dc; 1.2 A output
- Memory backup power in main unit: Lithium battery
- Typical life of lithium battery: 5 years

## Electromagnetic Compatibility

Emissions EN61326-1, Class A.

Immunity EN61326-1

## Input Ratings

A DTX Series tester and remote are designed to measure unpowered cables. The inputs are protected against continuous, current-limited telco voltages (<100 mA) and can withstand occasional overvoltages of less than 30 V rms (42 V peak, 60 V dc).

## Certification and Compliance

N10140 — Conforms to relevant Australian standards

CE — Conforms to relevant European Union directives.

C SA US — Listed by the Canadian Standards Association.

### *CSA Standards*

CAN/CSA-C22.2 No. 1010.1-92 + Amendment 2: 1997 and CAN/CSA-C22.2 No. 1010.1 2000 (2nd edition) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements.

### *Safety*

CAN/CSA-C22.2 No. 1010.1-92 + Amendment 2: 1997; Overvoltage Category II, Pollution degree 2, 30 V.

EN61010, 2nd Edition, MEASUREMENT (Installation) CATEGORY I, Pollution Degree 2 per IEC1010-1 refers to the level of Impulse Withstand Voltage protection provided. Equipment of MEASUREMENT CATEGORY I is for measurements performed on circuits not directly connected to mains.

### *Laser Classification and Safety for DTX-MFM and DTX-SFM Fiber Modules*

OUTPUT port: Class 1

VFL port: Class 2

Complies with EN60825-1 and EN61010-1 (CE) and CFR21

### *Memory for Test Results*

Internal memory stores up to 250 Cat 6 Autotest results, including graphical data.

The 16 MB memory card included stores up to 500 Cat 6 Autotest results, including graphical data.

1 MB Flash EPROM allows software and test limit updates.

LinkWare software lets you upload Autotest results to a PC from the tester or a memory card reader.

## Serial Interfaces

The tester and smart remote have a USB client interface. The main DTX-1800 and DTX-1200 testers also have an RS-232 (EIA/TIA-232) interface.

The RS-232 (EIA/TIA-232) serial port connects to a PC with a DB-9 to IEEE 1394 (Firewire) cable available from Fluke Networks. Table 9-4 shows the pin connections for the DTX serial cable.

**Table 9-4. DTX RS-232 Cable Pin Connections**

| Tester End (IEEE 1394) | | | PC End (female DB9) | |
|---|---|---|---|---|
| **Signal Name** | **Pin** | **Direction** | **Pin** | **Signal Name** |
| Data carrier detect | 1 | ← | 4 | Data terminal ready |
| Transmit data | 2 | → | 2 | Receive data |
| Receive data | 3 | ← | 3 | Transmit data |
| Signal ground | 4 | ←→ | 5 | Signal ground |

## Dimensions (without adapter or module)

8.5 in x 4.5 in x 2.3 in (21.6 cm x 11.4 cm x 5.8 cm), nominal

## Weight (without adapter or module)

2.4 lb (1.1 kg), nominal

## Display

3.7 in (9.4 cm) diagonal, 1/4 VGA, passive color, transmissive LCD with backlight.

# *Appendices*

# *Appendix A*
# *Fiber Test Method Reference Tables*

Industry standards use different names for equivalent fiber test methods. Table A-1 shows the names used in this manual and by four common industry standards for the three fiber test methods.

**Table A-1. Test Method Names**

| Link End Connections Included in Loss Results | This Manual | TIA/EIA-526-14A (multimode) | TIA/EIA-526-7 (singlemode) | IEC 61280-4-1 (multimode) | IEC 61280-4-2 (singlemode) |
|---|---|---|---|---|---|
| 1 connection | Method A | Method A | Method A.2 | Method 1 | Method A2 |
| 2 connections | Method B | Method B | Method A.1 | Method 2 | Method A1 |
| None | Method C | Method C | Method A.3 | Method 3 | Method A3 |

Table A-2 shows the test methods required by standards.

**Table A-2. Test Methods Required by Standards**

| Standard or Application | Test Method (as named in this manual) |
|---|---|
| TIA-568-B | B |
| ISO 11801 | B |
| EN50173 | B |
| 10BASE-FB | A |
| 10BASE-FP | A |
| 10BASE-FL | A |
| 10/100BASE-SX | B |
| 100BASE-FX | B |
| 1000BASE-LX | B |
| 1000BASE-SX | B |

| Standard or Application | Test Method (as named in this manual) |
|---|---|
| 10GBASE-S | B |
| 10GBASE-L | B |
| 10GBASE-LX | B |
| 10GBASE-E | B |
| Fibre Channel | B |
| ATMl | B |
| FDDI | B |
| Token Ring | B |
| Fluke Networks General Fiber | B |

# *Appendix B*
# *Loss Test Methods for Fiber Cabling*

## *Introduction*

*Note*

*The following discussion uses TIA/EIA-526 terminology for the names of the three common test methods. See Appendix A for a cross-reference of the method names in various standards.*

The number of fiber connections represented in loss test results depends on the method used for making reference and test connections. This appendix describes the three common methods, A, B, and C, which are defined in the ANSI/TIA/EIA-526-14A multimode standard, and their equivalents, A.2, A.1, and A.3, which are defined in the ANSI/TIA/EIA-526-7 singlemode standard.

This appendix also describes alternate reference and test connections you can use for all types of connectors, including installations that have different connector styles at the patch panels and outlets.

Use the **Test Method** setting on the tester's **Fiber** menu in **SETUP** to record the method used. This setting does not affect loss results. It is only saved with the results to record which method you used.

*Note*

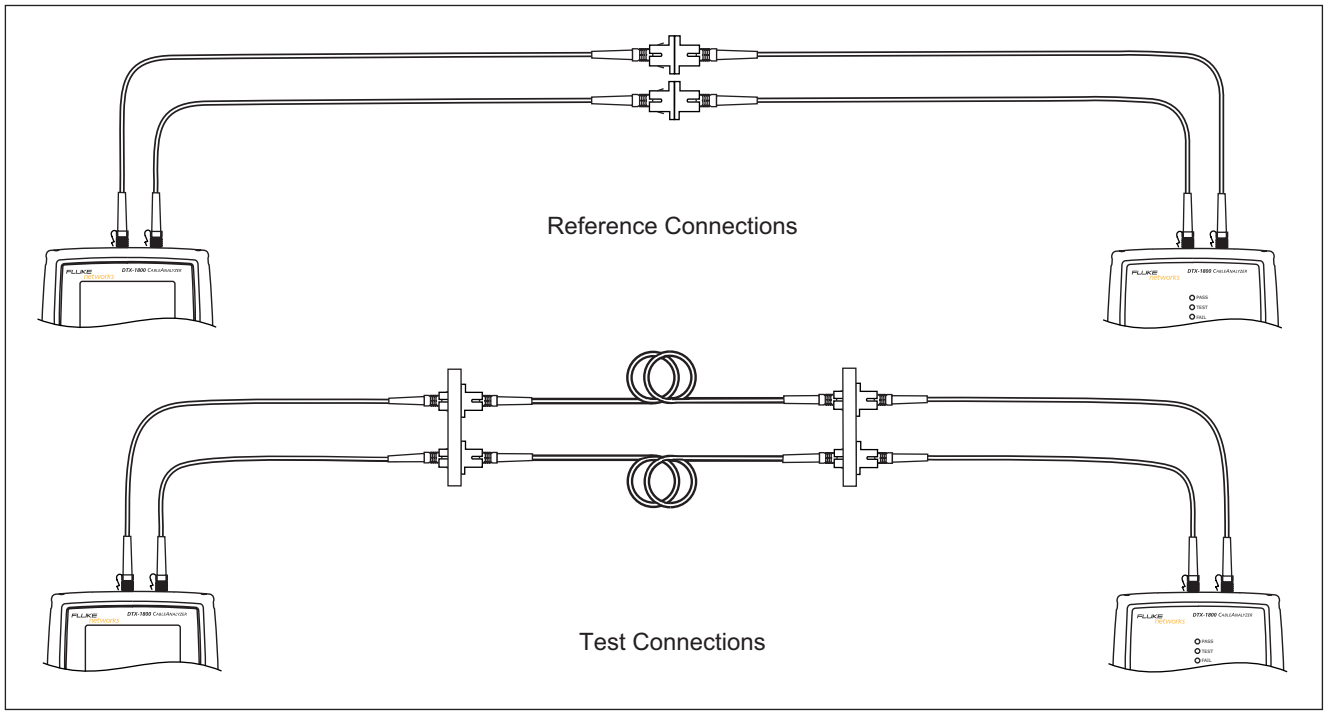
*ANSI/TIA/EIA-526-14A and 526-7 specify Method B for measuring loss on multimode premises fiber and Method A.1 for singlemode premises fiber, respectively. All reference and test procedures described in the DTX CableAnalyzer documentation produce Method B/A.1 results.*

## *Method A/A.2*

Method A/A.2 results account for the loss of one connection plus the fiber in the link. This method is suitable for links where the fiber's loss is a significant portion of the total loss, such as when the link is long or a patch cord is used at only one end. Method A is defined in the ANSI/TIA/EIA-526-14A multimode standard. Method A.2 is defined in the ANSI/TIA/EIA-526-7 singlemode standard.

Method A/A.2 reference connections cancel out the effects of one connection and two reference patch cords in each fiber path, as shown in Figure B-1.

The test connections add one connection, plus the fiber in the link, to each path. Loss results for Method A/A.2 therefore represent only one connection plus the fiber in the link. Because the results omit one connection, ANSI/TIA/EIA-526-14A and 526-7 do not recommend Method A/A.2 for testing premises fiber, where patch cords are typically used at both ends of a link and connector loss is a significant portion of total loss.




amd69f.eps

**Figure B-1. Method A/A.2 Reference and Test Connections (singlemode shown)**

## *Method B/A.1*

Method B/A.1 results account for the loss of two connections plus the fiber in the link. This method is suitable for testing premises fiber, where patch cords are typically used at both ends of the link and connector loss is a significant portion of the total loss. Method B is defined in the ANSI/TIA/EIA-526-14A multimode standard. Method A.1 is defined in the ANSI/TIA/EIA-526-7 singlemode standard.

The Method B/A.1 reference connections shown in Figure Figure B-2 cancel out the effects of one connection and two reference patch cords in each fiber path. Note that this method of achieving Method B/A.1 results includes adapters in the reference connections. The adapters do the following:

- The adapters let you use patch cords that match the tester's connectors at one end, and match the connectors in the link at the other end.

  The standard Method B/A.1 reference connections use just one patch cord for each fiber path. With these connections, you can test only links with the same connector style as the tester. To test links with different connectors you would have to add adapters after referencing. This would add the loss of a connection not present in the link.

- The adapters reduce wear on the tester's connectors, since it is not necessary to disconnect the patch cords from the tester to connect to the link.

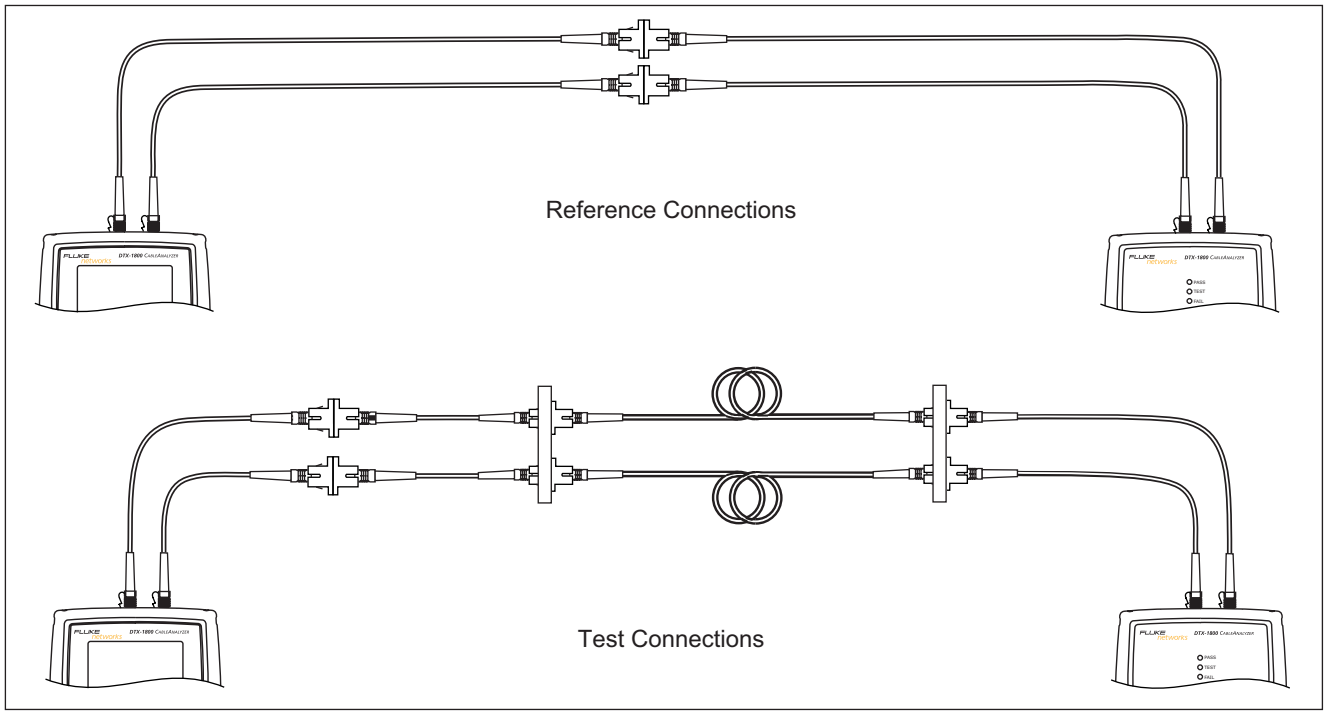
The test connections add two connections to each path, plus the fiber in the link. Note the two short patch cords used to connect the main tester's to the link. The extra cords ensure that the measured loss accounts for two connections in the link, since one connection was canceled out during referencing.

Loss results for Method B/A.1 therefore represent both connections plus the fiber in the link. ANSI/TIA/EIA-526-14A and 526-7 specify Methods B and A.1 for testing multimode and singlemode premises fiber, where connector loss is a significant portion of the total loss.

*Note*

*For testing links with small form-factor (SFF) connectors or different connector styles at each end, use the alternate method described under "The Alternate Method" on page B-8.*

*For testing links with the same SFF connectors at both ends, you may use the modified Method B/A.1 connections if you have the correct patch cords. SFF patch cord kits are available from Fluke Networks for this purpose.*




amd70f.eps

**Figure B-2. Modified Method B/A.1 Reference and Test Connections (singlemode shown)**

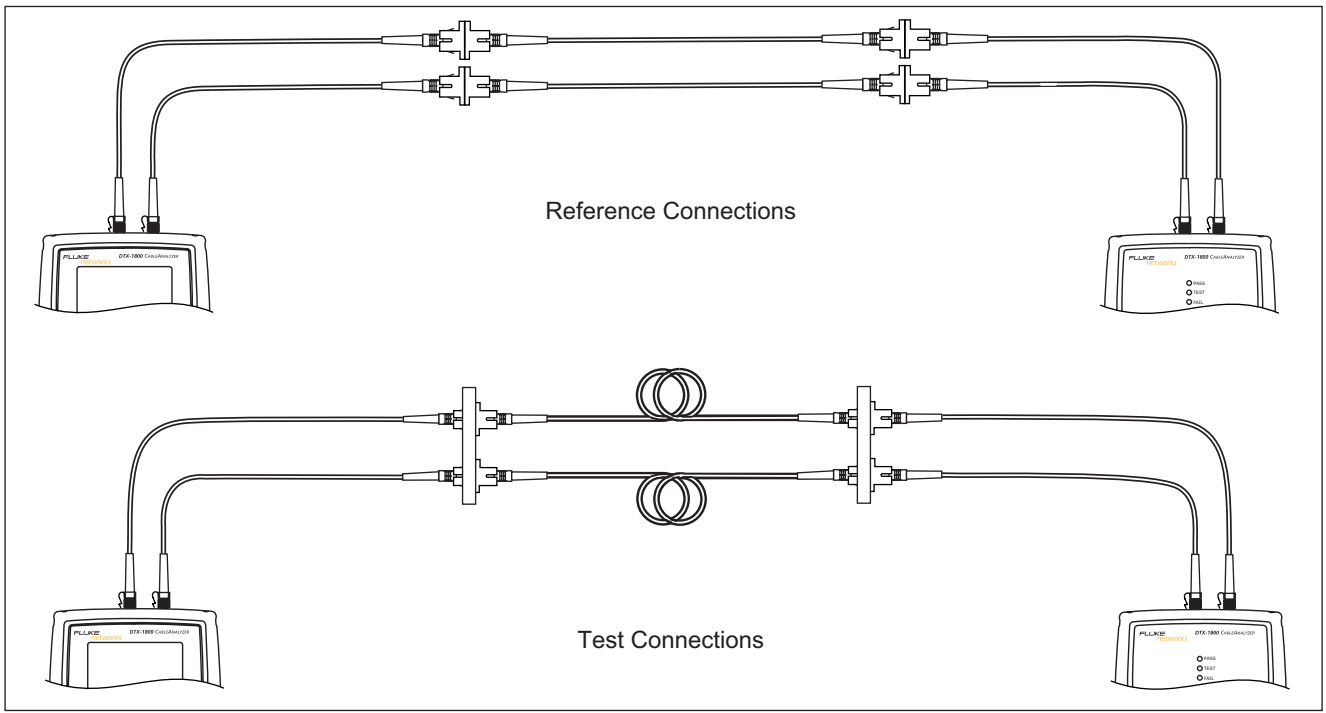
## *Method C/A.3*

Method C/A.3 results account for the loss of only the fiber in the link. Method C/A.3 is suitable for testing links where the fiber's loss is the majority of the total loss, such as when the link is very long or patch cords are not used at either end. Method C is defined in the ANSI/TIA/EIA-526-14A multimode standard. Method A.3 is defined in the ANSI/TIA/EIA-526-7 singlemode standard.

Method C/A.3 reference connections cancel out the effects of two connections and three reference patch cords in each fiber path, as shown in Figure B-3.

The test connections add only the fiber in link to each path. Loss results for Method C/A.3 therefore represent only the fiber in the link.

Because the results omit both connections in the link, ANSI/TIA/EIA-526-14A and 526-7 do not recommend Method C/A.3 for testing premises fiber, where patch cords are typically used at both ends of the link and connector loss is a large portion of the total loss.




amd71f.eps

**Figure B-3. Method C/A.3 Reference and Test Connections (singlemode shown)**

## The Alternate Method

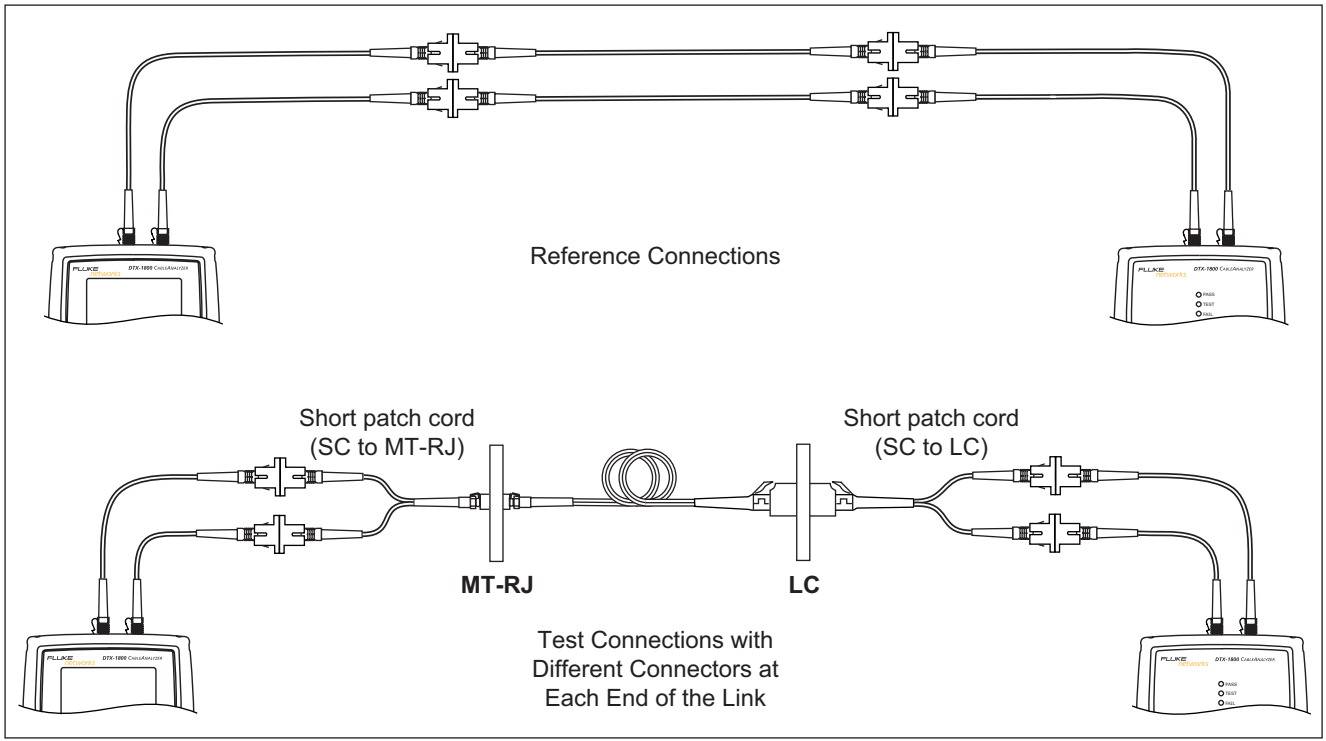
Like Method B/A.1, the alternate method described in this section produces results that account for the loss of two connections plus the fiber in the link. The advantage of this method is that you can test links that have small form-factor (SFF) connectors or different connector styles at each end.

Figure B-4 shows reference and test connections for the alternate method. The link under test has MT-RJ connectors at one end, and LC connectors at the other end.

Using an SC to MT-RJ patch cord and an SC to LC patch cord for reference and test connections may seem like the an easier way to connect to the link; however, that would require an MT-RJ to LC patch cord for reference connections. The reference and test connections would be the Method C/A.3 configuration, as shown in Figure B-3. The loss results would account for the loss of only the fiber in the link.

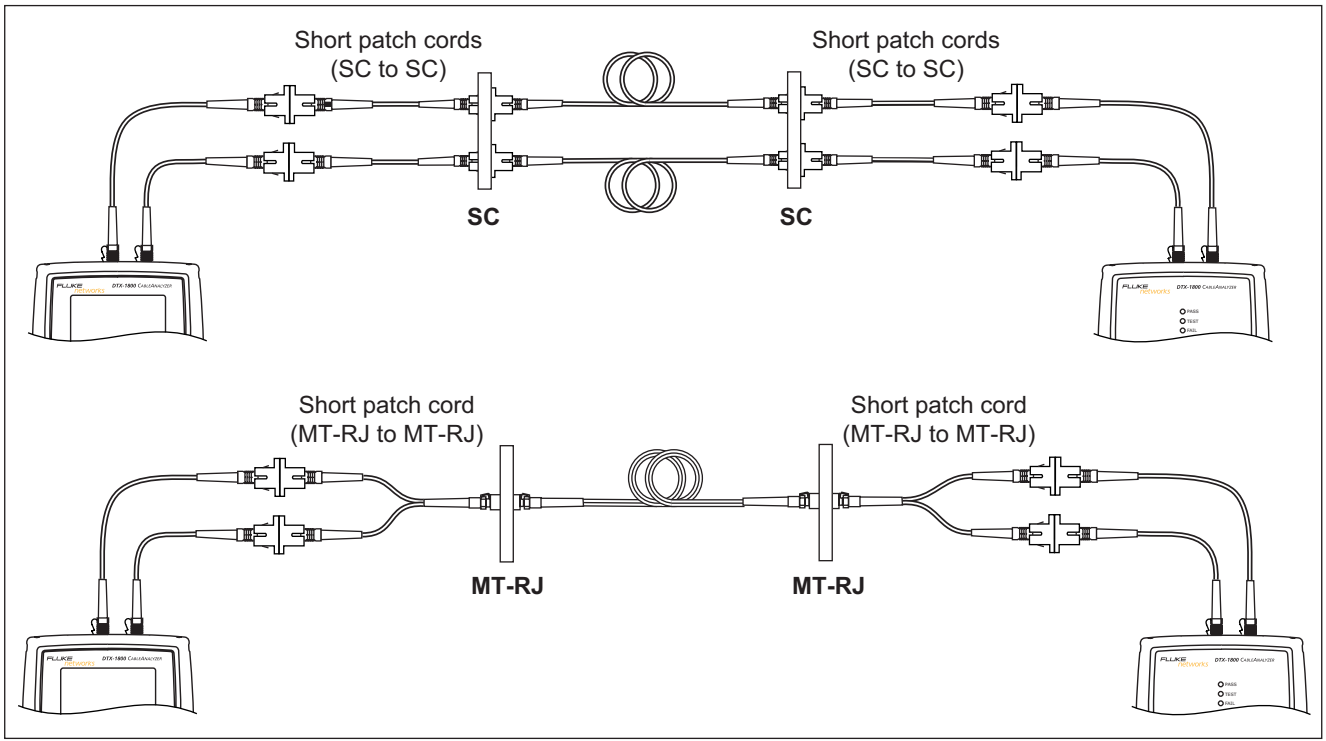
To account for the loss of both connections in the link, you must add connections to each end after referencing, as shown at the bottom of Figure B-4. Each fiber path then has four connections. Since two connections were canceled out during referencing, the test results include the loss of the two connections at the ends of the link.

You may also use the alternate method to test links that have the same connector style at both ends. For referencing, use the connections shown at the top of Figure B-4. For testing, add the appropriate short patch cords at each end. Figure B-5 shows two examples of these test connections: one for a link with SC connectors at both ends, and one for a link with MT-RJ connectors at both ends.




amd114f.eps

**Figure B-4. Alternate Method Reference and Test Connections (singlemode shown)**




amd115f.eps

**Figure B-5. Alternate Method Test Connections with Same Connectors at Each End of the Link (singlemode shown)**

# *Index*

## —C—



## —D—



## —E—

## —P—



## —R—



## —S—

## —T—



## —U—



## —V—



## —W—

## —X—

This page is for holding the Reference Document (RD) fields. Do not remove from this master document. All RD fields will be placed after this text