DTX Series

CableAnalyzer™

Technical Reference Handbook

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 for the mainframe is one year and begins on the date of purchase. Parts, accessories, product repairs and services are warranted for 90 days, unless otherwise stated. Ni-Cad, Ni-MH and Li-Ion batteries, cables or other peripherals are all considered parts or accessories. The warranty extends only to the original buyer or end user customer of a Fluke Networks authorized reseller, and does not apply to any product which, in Fluke Networks' opinion, has been misused, abused, 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).

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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.

4/04

Fluke Networks
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USA

SOFTWARE NOTICE

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Chapter 1: Getting Acquainted

Overview of Features

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

- The DTX-1800 certifies twisted pair and coaxial cabling to Class F limits (600 MHz) in less than 25 seconds and Category 6 cabling in less than 10 seconds. The DTX-1200 certifies Category 6 cabling in less than 10 seconds. Meet Level III and Level IV accuracy requirements.

- The DTX-LT and DTX-ELT certify Category 6 cabling in less than 28 seconds. The DTX-CLT certifies Category 5e cabling in less than 28 seconds. All models meet Level III and 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.

- Stores up to 250 Cat 6 Autotest results, including graphical data, in internal memory.

- The DTX-1800 and DTX-1200 store up to 4,000 Autotest results, including graphical data, on a 128 MB removable memory card. See page 13-1 for storage recommendations.

- Runs for at least 12 hours on the rechargeable lithium ion battery pack.

- 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.

The DTX-1800, DTX-1200, and DTX-LT offer the following additional features:

- Optional DTX Compact OTDR™ modules let you locate and characterize reflective and loss events in multimode and singlemode fiber.

- Optional fiber modules let you certify multimode and singlemode fiber optic cabling.

- Smart remote with optional fiber module can be used with Fluke Networks OF-500 OptiFiber® Certifying OTDR for loss/length certification.

- Optional DTX-NSM module lets you verify network service.

The DTX-1800 also supports the optional DTX 10 Gig kit. This lets you test and certify Cat 6 and Augmented Cat 6 (Cat 6A) cabling for 10 Gigabit Ethernet applications.

The DTX-CLT also supports the optional fiber modules and DTX-NSM module.

The DTX-CLT CertiFiber® lets you certify fiber optic cabling.

For a comparison chart of features, see page 14-11.

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**.

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 **Customer Support** > **Knowledge Base**.

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 3759 7600

- Canada: 1-800-363-5853

- Europe: +31-(0) 40 2675 600

- Hong Kong: 852 2721-3228

- Japan: 03-6714-3117

- Korea: 82 2 539-6311

- Singapore: 65-6799-5566

- Taiwan: (886) 2-227-83199

- USA: 1-800-283-5853

Visit our website for a complete list of phone numbers.

Unpacking

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

For a complete list of the DTX kits, options, and accessories available, visit the Fluke Networks website.

DTX-1800

- DTX-1800 CableAnalyzer with lithium-ion battery pack
- DTX-1800 Smart Remote with lithium-ion battery pack
- Two Cat 6A/Class E_A permanent link adapters
- Two 6A/Class E_A channel adapters
- Two headsets
- Carrying case
- Two carrying straps
- 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 6A/Class E_A permanent link adapters
- Two 6A/Class E_A channel adapters
- Two headsets
- Carrying case
- Two carrying straps
- 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 Smart Remote with lithium-ion battery pack
- Two Cat 6A/Class E_A permanent link adapters
- One 6A/Class E_A channel adapter
- Carrying case
- Two carrying straps

- USB cable for PC communications
- Two ac adapters
- DTX Series CableAnalyzer Users Manual
- DTX Series CableAnalyzer Product CD
- LinkWare Software CD

DTX-ELT
- DTX-ELT CableAnalyzer with lithium-ion battery pack
- DTX-ELT SmartRemote with lithium-ion battery pack
- Two 6A/Class E_A channel adapters
- Carrying case
- Two carrying straps
- DTX-REFERENCE module
- USB cable for PC communications
- Two ac adapters
- DTX-ELT CableAnalyzer Getting Started Guide
- DTX-ELT CableAnalyzer Product Manuals CD
- LinkWare Software CD

DTX-CLT
- DTX-CLT CableAnalyzer with lithium-ion battery pack
- DTX-CLT SmartRemote with lithium-ion battery pack
- Two 6A/Class E_A channel adapters
- Carrying case
- Two carrying straps
- DTX-REFERENCE module
- USB cable for PC communications
- Two ac adapters
- DTX-CLT CableAnalyzer Getting Started Guide
- DTX-CLT CableAnalyzer Product Manuals CD
- LinkWare Software CD

DTX-CLT CertiFiber

DTX-CertiFiber-M Multimode Kit

- DTX-CLT CertiFiber with lithium-ion battery pack
- DTX-CLT CertiFiber SmartRemote with lithium-ion battery pack
- Two DTX-MFM2 Fiber Modules for testing at 850 nm and 1300 nm
- Two 50/125 µm multimode test reference cords, 2 m, SC/SC
- Two red mandrels for 50 /125 µm fiber with 3 mm jackets
- DTX-CLT CertiFiber Getting Started Guide
- DTX-CLT CertiFiber Product Manuals CD
- LinkWare Software CD

DTX-CertiFiber-S Singlemode Kit

- DTX-CLT CertiFiber with lithium-ion battery pack
- DTX-CLT CertiFiber SmartRemote with lithium-ion battery pack
- Two DTX-SFM2 Fiber Modules for testing at 1310 nm and 1550 nm.
- Two 9/125 µm singlemode test reference cords, 2 m, SC/SC

- DTX-CLT CertiFiber Getting Started Guide
- DTX-CLT CertiFiber Product Manuals CD
- LinkWare Software CD

DTX-CertiFiber-MS Multimode/Singlemode Kit

- DTX-CLT CertiFiber with lithium-ion battery pack
- DTX-CLT CertiFiber SmartRemote with lithium-ion battery pack
- Two DTX-MFM2 Fiber Modules for testing at 850 nm and 1300 nm
- Two 50/125 µm multimode test reference cords, 2 m, SC/SC
- Two red mandrels for 50 /125 µm fiber with 3 mm jackets
- Two DTX-SFM2 Fiber Modules for testing at 1310 nm and 1550 nm.
- Two 9/125 µm singlemode test reference cords, 2 m, SC/SC
- DTX-CLT CertiFiber Getting Started Guide
- DTX-CLT CertiFiber Product Manuals CD
- LinkWare Software CD

DTX-MFM2 Multimode Fiber Modules (optional)

- Two DTX-MFM2 Fiber Modules for testing at 850 nm and 1300 nm
- Two 62.5/125 µm duplex multimode test reference cords, 2 m, SC/SC
- Two gray mandrels for 62.5 /125 µm fiber with 3 mm jackets
- Two red mandrels for 50/125 µm fiber with 3 mm jackets
- Two 50/125 µm duplex multimode test reference cords, 2 m, SC/SC
- DTX-MFM2/GFM2/SFM2 Fiber Modules Users Manual

DTX-GFM2 Multimode Fiber Modules (optional)

- Two DTX-GFM2 Fiber Modules for testing at 850 nm and 1310 nm (for Gigabit Ethernet applications)
- Two 50/125 µm multimode test reference cords, 2 m, SC/SC
- DTX-MFM2/GFM2/SFM2 Fiber Modules Users Manual

DTX-SFM2 Singlemode Fiber Modules (optional)

- Two DTX-SFM2 Fiber Modules for testing at 1310 nm and 1550 nm.
- Two 9/125 µm singlemode test reference cords, 2 m, SC/SC
- DTX-MFM2/GFM2/SFM2 Fiber Modules Users Manual

Note

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

DTX Compact OTDR Optical Time Domain Reflectometry Module (optional)

Singlemode/multimode OTDR module for testing at 850 nm, 1300 nm, 1310 nm, 1550 nm

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 and OTDR ports on optional modules). Risk of eye damage from hazardous radiation. Class 2 laser (VFL port on optional modules). Do not stare into beam.
☒	Do not put products containing circuit boards into the garbage. Dispose of circuit boards in accordance with local regulations. To return unwanted products, contact the manufacturer's web site shown on the product or your local sales office or distributor.

⚠ 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 every thirty days as described under "Setting the Reference" in Chapters 3 and 5.**

- **The permanent link interface adapters may not perform properly or may be damaged if they are handled improperly. See page 1-20 for important handling information.**

- **Turn off the tester before attaching or removing modules.**

- **Leave the module bay covers in place when modules are not installed. See page 1-12.**

- **Never remove the memory card while the memory card's LED is on. Doing so can corrupt the data on the card.**

- **Memory cards may be lost, damaged, or accidentally formatted, resulting in data loss. Therefore, Fluke Networks recommends saving no more than one day's worth of test results on a memory card.**

⚠Warning: Class 1 and Class 2 Laser Products ☀

To avoid possible eye damage caused by hazardous radiation, when using a DTX-MFM2/ SFM2/GFM2 or DTX Compact OTDR module follow the safety guidelines given in Chapter 7 and Chapter 8 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.
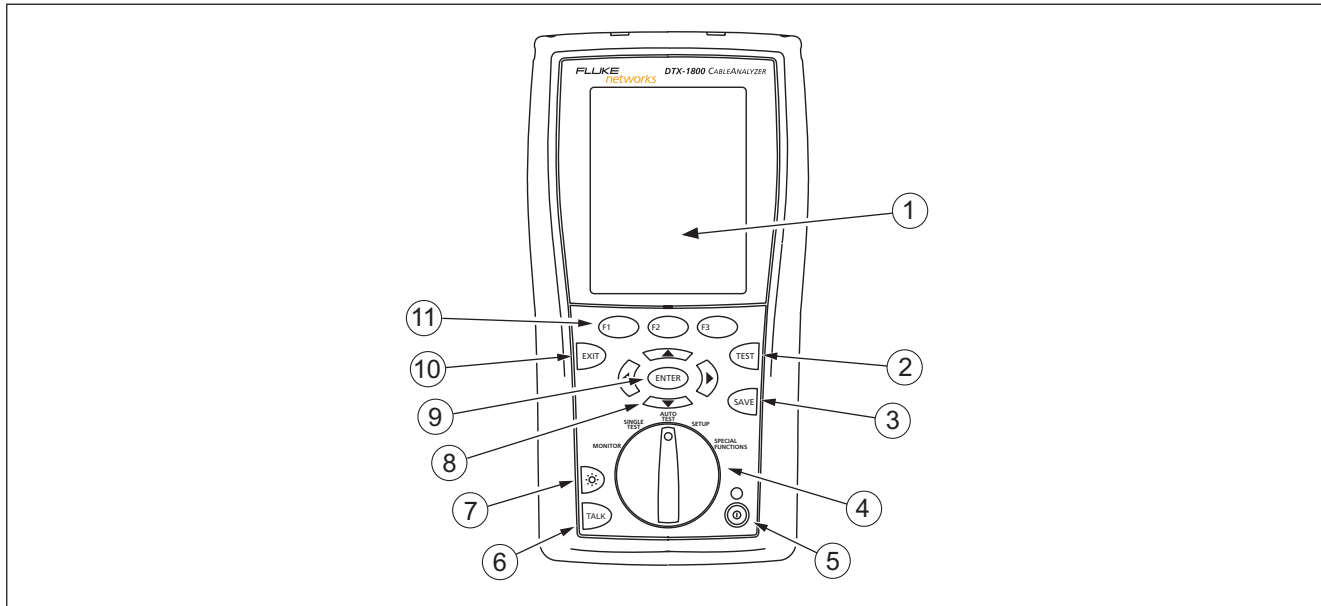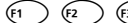
amd29f.eps

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 switch the backlight between bright and dim settings. 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.
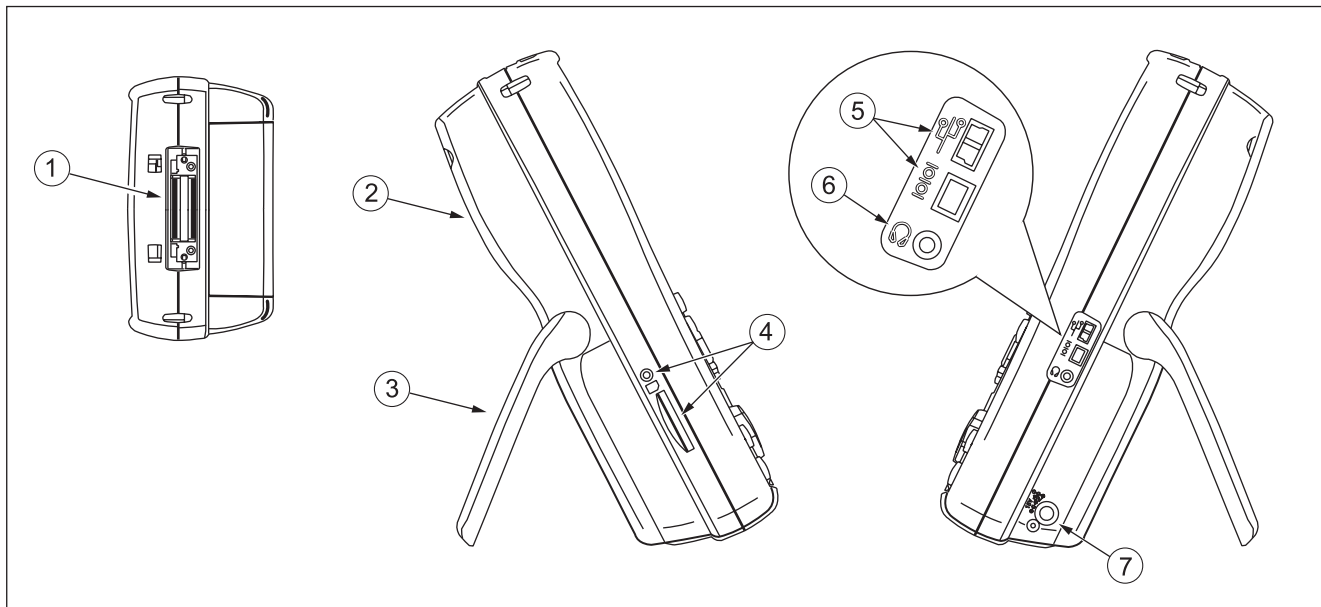
amd33f.eps

Figure 1-2. Tester Side and Top Panel Features

① Connector for the twisted pair interface adapters. Not available on the DTX-CLT CertiFiber.

② Cover for the module bay. Slide off the cover to install optional modules, such as the fiber module.

③ Bail.

④ DTX-1800 and DTX-1200: Slot and activity LED for the removable memory card. To eject the card, push in then release the card.

⑤ USB (⊟) and RS-232C (‖◎‖◎‖): DTX-1800, DTX-1200) ports for uploading test reports to a PC and updating the tester's software. The RS-232C port uses a custom DTX cable available from Fluke Networks. See Chapter 14 for more information.

⑥ Headset jack for talk mode.

⑦ Connector for the ac adapter. The LED turns on when the tester is connected to ac power.

- Red: Battery is charging.

- Green: Battery is charged.

- Flashing red: Charge timeout. The battery failed to reach full charge within 6 hours. See "If Something Seems Wrong" on page 14-9.
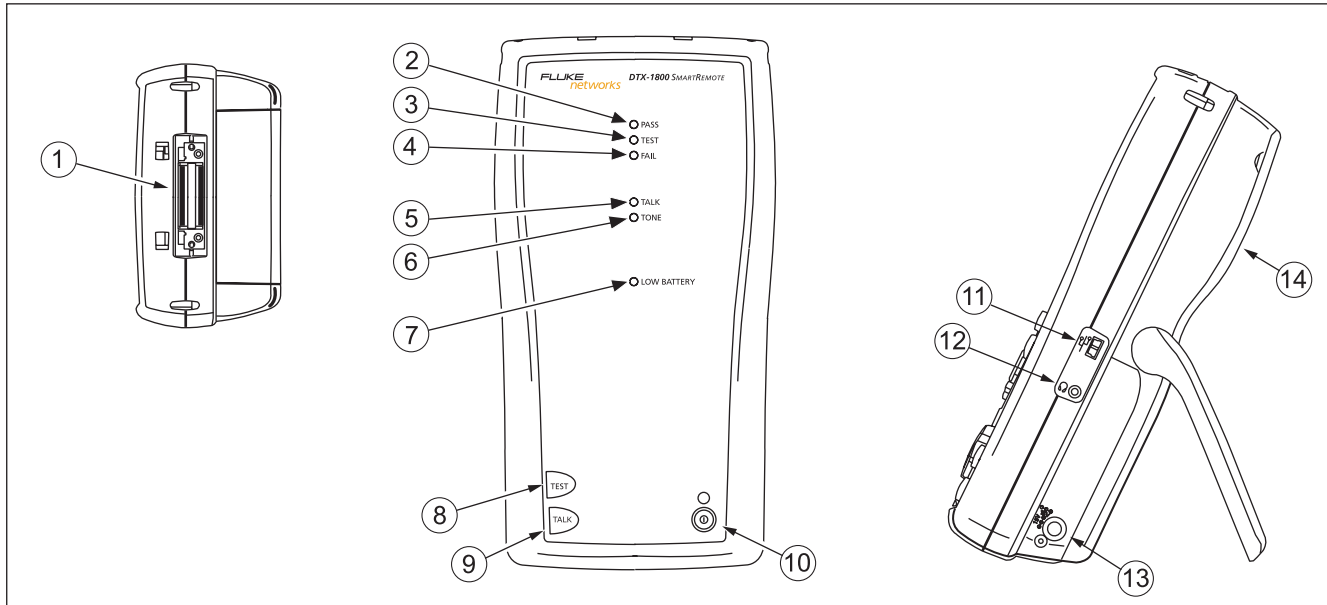
Figure 1-3. Smart Remote Features

amd30f.eps

⚠ **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 Figure 1-6 on page 1-19.

① Connector for the twisted pair interface adapters. Not available on the DTX-CLT CertiFiber.

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.

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).

5 Use the arrow keys and (ENTER) to find and change other local settings on tabs **2**, **3**, and **4** under **Instrument Settings**.

Powering the Tester

⚠**Warning**☀

Read the safety information starting on page 1-8 before using the tester.

You may 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" on page 14-9.

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 does not reach full charge within 6 hours, the battery LED flashes red. Verify that the battery was within the temperature range given above during charging and that the correct ac adapter was used. Disconnect then reconnect ac power and try charging the battery again. If the battery does not charge the second time, retrain the battery gauge as described on page 14-6.

• If the battery LED flashes red or the tester will not turn on, see "If Something Seems Wrong" on page 14-9.

Charging the battery

Removing the battery
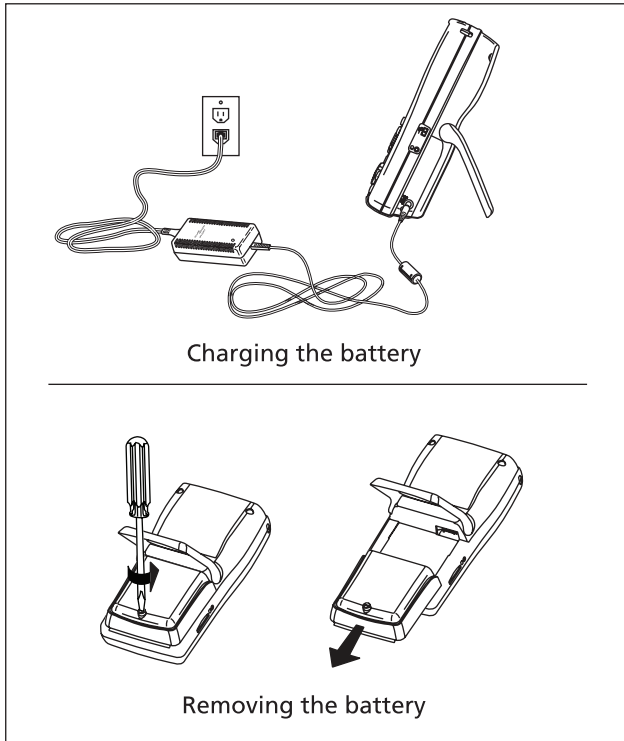
amd124f.eps

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 Connect the tester and smart remote as shown in Figure 1-6. You may also connect the testers through a link.

2 **If you connected the testers through twisted pair adapters:**

On the main Autotest screen, verify that the test type is set to **Twisted Pair**. Press (F1) **Change Media** to change it if necessary.

If you connected the testers through fiber modules:

On the main Autotest screen, verify that the test type is set to **Fiber Loss**. Press (F1) **Change Media** to change it if necessary.

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, retrain the battery gauge as described in Chapter 14.
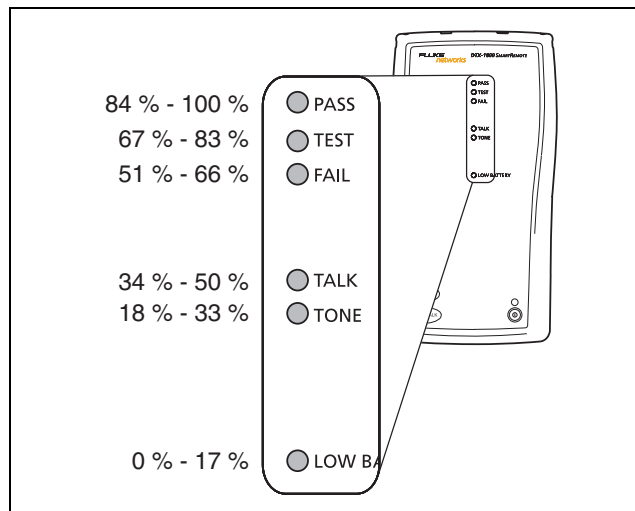
amd167.eps

**Figure 1-5. Remote Battery Status
Shown After Power-up**
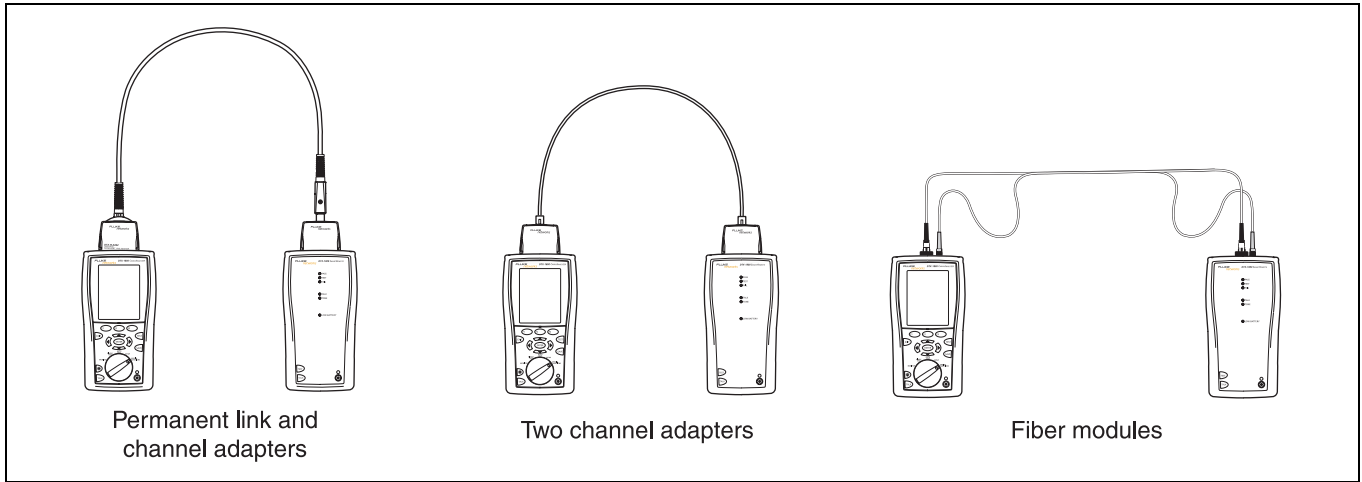
amd102f.eps

Figure 1-6. Connections for Using the Battery Status Function

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.

Optional coaxial adapters let you test coaxial cabling.

For information on other adapter types, contact Fluke Networks or visit the Fluke Networks website.

The adapter's Autotest counters are helpful for gauging wear on the adapter's jack or plug and for tracking the number of tests run on a job. You can view and reset the counters on the **Version Information** screen in **SPECIAL FUNCTIONS**. See "Checking the Hardware and Software Versions" on page 1-25.

Figure 1-7 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 1-8.

Modules provide optional testing capabilities. For example, the DTX-MFM2, DTX-GFM2, and DTX-SFM2 modules let you certify fiber optic cabling. The DTX-NSM module lets you verify network service. See Chapters 8 and 11 for details on these modules.
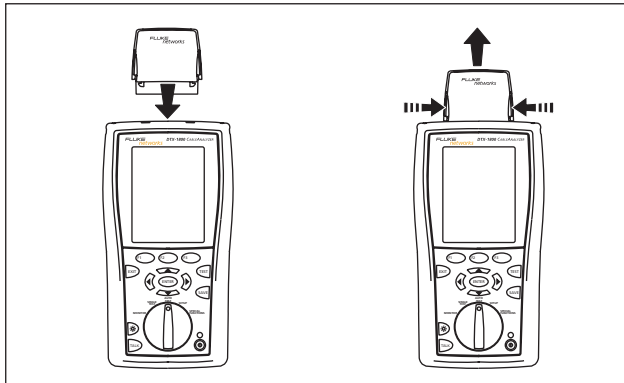
amd35f.eps

Figure 1-7. Attaching and Removing Adapters
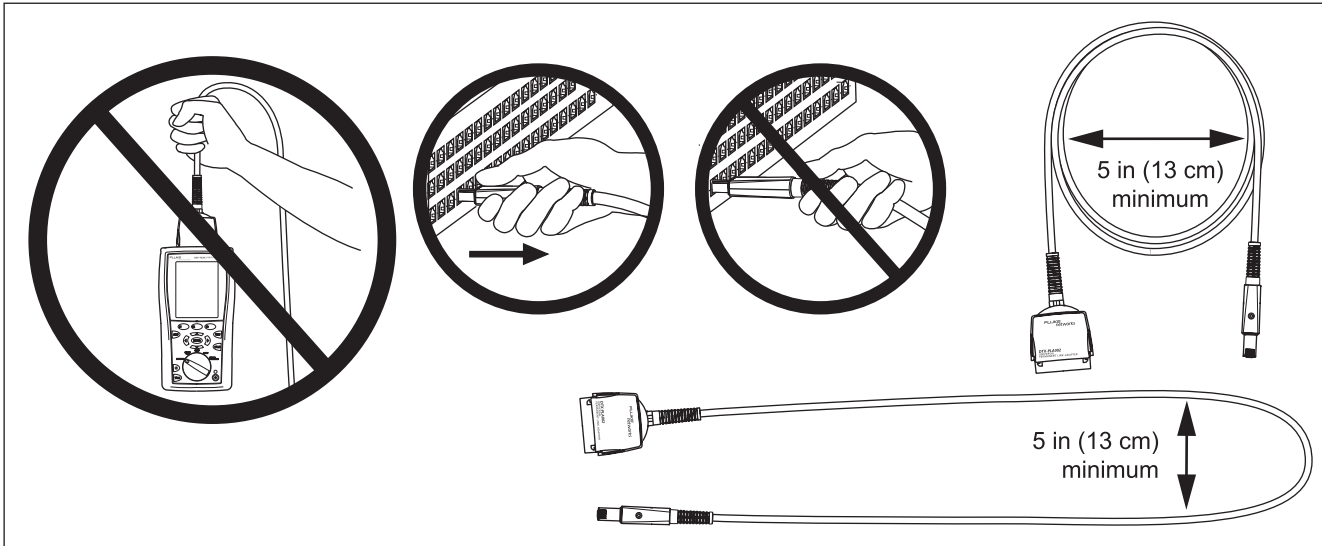
amd36f.eps

Figure 1-8. 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 1-9):

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.

Store the module in its original, static protection bag.

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.
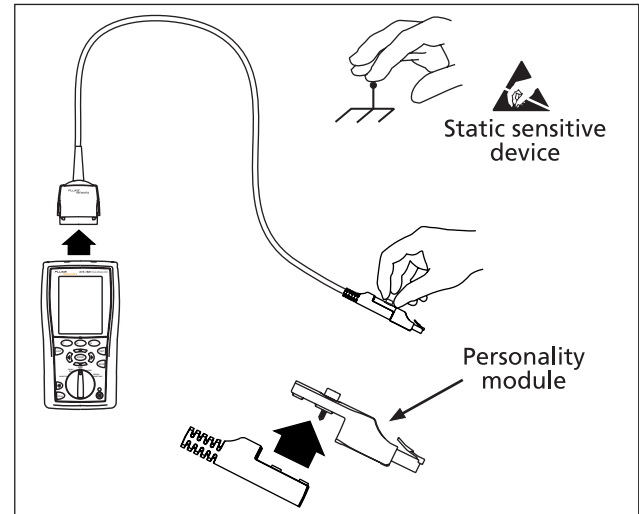
amd74f.eps

Figure 1-9. Changing the Personality Module on a DTX-PLA001 Adapter

The optional DTX-PLCAL automated calibration kit lets you calibrate your permanent link adapters to compensate for physical changes that occur over time to the adapter's cable and other components. Contact Fluke Networks for more information.

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 using one of the methods shown in Figure 1-10.

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

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

4 If fiber modules are installed in addition to twisted pair adapters, select **Mainframe**.

5 Press ⬭TEST.

If the tester reports an error, refer to "If Something Seems Wrong" on page 14-9.

Permanent link
adapter

Channel
adapter

DTX-REFERENCE module

Twisted pair adapters

Fiber modules
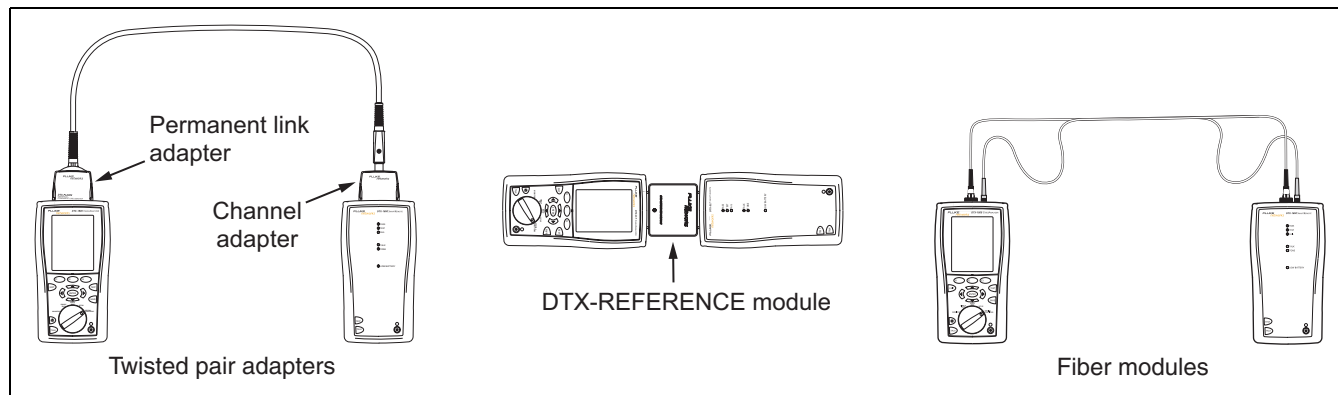
amd168.eps

Figure 1-10. Self Test Connections

Checking the Hardware and Software Versions

To see information about the tester's hardware and software, the test limits and cable types databases, and the Autotest counts for attached link adapters:

1 Connect the tester and smart remote through adapters, as in Figure 1-10.

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

3 Use ⟨▼⟩ to highlight **Version Information**; then press ⟨ENTER⟩.

4 Use the softkeys to switch among information screens for the tester, remote, and any modules or adapters attached.

Information for link adapters includes the number of Autotests run with the adapter:

- **Autotest Count** is the total number of tests run with the adapter.

- **Current Series** is a counter you can reset.

To reset the **Current Series** counter, use the softkeys to access the link adapter's **Version** screen; then press ⟨ENTER⟩.

To determine if your tester needs a software update, visit the Fluke Networks website to see if an update is available. See Chapter 14 for details on updating the tester's software.

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 1-11 describes this screen. You can change these settings in **SETUP**, as described in Chapters 2, 3, 5, 7, and 8.

⑤ **Outlet Configuration**: The wire mapping used for testing twisted pair cabling.

⑥ Press F3 to check the memory status.

⑦ Press F2 to view the results of the previous test.

⑧ If a copper adapter and a fiber module are installed, press F1 to change the type of media you will test.

⑨ **Store Plot Data**

• **No**: Plot data is not saved, which lets you save more results. Saved results show worst margins and worst values for each pair.

• **Standard**: The tester displays and saves plot data for frequency-based tests such as NEXT, return loss, and attenuation. The tester saves data for the frequency range required by the selected test limit.

• **Extended**: The tester saves data beyond the frequency range required by the selected test limit.

⑩ **Folder**: The folder where results will be saved.

⑪ **Operator, Site: Operator:** The person using the tester and the job site name. These are stored with saved results.

① The media type selected for testing.

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.

Figure 1-11. 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.

5   Press (SAVE) when you are done.

6   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).

Changing the Numeric Format

The tester can show decimal fractions with a decimal point (0.00) or a comma (0,00).

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

2   Press ⬦ to go to the tab with the **Numeric Format** selection.

3   Use ⬦⬦ to highlight **Numeric Format**; 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.

3   (F1) **Default Setting** sets the contrast to the default
level.

4   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 60 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.

The card capacities supported depend on the DTX software version. See the Fluke Networks Knowledge Base on the Fluke Networks website for details.

Inserting and Removing the Memory Card

Insert the memory card into the slot on the side of the tester.

Figure 1-12 shows how to insert and remove the card.

Formatting the Memory Card (DTX-1800 and DTX-1200) or Internal Memory

Formatting erases all contents of the memory card or internal memory.

1   To format the memory card or internal memory:

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

3   For a DTX-1800 or DTX-1200 with a memory card installed, press (F1) to select the memory card or internal memory.

4   Press (F2) **Format**.

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Figure 1-12. Inserting and Removing the Memory Card
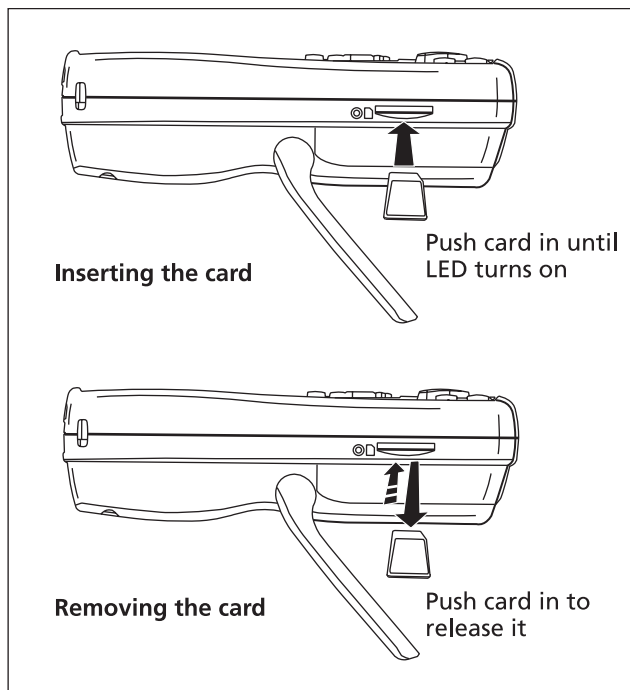
Creating Folders

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).

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.*

See Chapter 13 for more information on memory features.

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).

5 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 page 2-22 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 page 2-22 for details.

- **None:** Lets you create an ID each time you press ⓈⒶⓋⒺ.

After you press ⓈⒶⓋⒺ, 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 ⓈⒶⓋⒺ when you are finished.

3 Select **Stop ID**. Use the softkeys, ⊛⊛ ⌃ ⌄, and (ENTER) to enter the last ID in the sequential list. Press ⓈⒶⓋⒺ 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 page 2-22 for more information on the **Auto Sequence** feature.

Automatically Saving Results (DTX-1800, DTX-1200, DTX-LT, DTX-CLT, DTX-CLT CertiFiber)

When **Auto Save Results** is set to **Yes,** the tester automatically saves Autotests using the next ID available from the **Cable ID Source**. The main Autotest screen shows the next ID. If **Cable ID Source** is set to **None** or all the IDs have been used, **Next ID** is blank and you enter IDs manually after each Autotest.

Selecting **No** lets you enter or select IDs manually after each Autotest.

To change the **Auto Save Results** setting:

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

2 Use ⌄ to highlight **Instrument Settings**; then press (ENTER).

3 Press ⓘ to go to the tab with the **Auto Save Results** setting.

4 Press (ENTER) to select **Auto Save Results**.

5 Use ⌄ to highlight **No** or **Yes**; then press (ENTER).

Saving Different Types of Results in the One Record

You can save results from different types of DTX modules in the same test record. For example, you can save network connectivity results from a DTX-NSM module in a record that contains cable test results for the same link. Or you can save OTDR results from a DTX Compact OTDR module in a record that contains fiber loss results from a DTX fiber module.

To save results with existing results, press SAVE , enter the ID of the existing results or select the ID from the **Auto Increment** ID list or the **List** of downloaded IDs; then press SAVE again.

IDs that already contain the type of results you are trying to save are preceded with a "$".
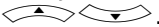
The tester warns you if you are about to overwrite existing results of the same type, or if the media type for the existing results does not match the type for the results you are trying to save.

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.

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

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

6   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 page14-2.

- 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.

- Create and download data to the DTX, such as Setup data and cable ID lists.

- Calibrate the permanent link adapters (DTX-PLCAL kit required for DTX-PLA002 adapters. DSP-PLCAL kit required for DTX-PLA001 adapters.)

- Transfer custom limits between testers.

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 Procedures

The tutorials in this chapter guide you through setting up the tester, checking the tester's status, testing twisted pair cabling, testing fiber cabling with the DTX-xFM2 fiber modules, 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 ⓔⓝⓣⓔⓡ.

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 ⓔⓝⓣⓔⓡ.

2-3 Press ◗ to go to the tab with the **Operator Name** setting. Press ⓔⓝⓣⓔⓡ to select **Operator Name**.

2-4 Press (F1) **Create**; then use (F1) (F2) (F3), ◀▶▲▼, and ⓔⓝⓣⓔⓡ to enter your name in the box. Press ⓢⓐⓥⓔ when you are done.

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

2-6 Use ⬍ to highlight **Site**; then press ⓔⓝⓣⓔⓡ.

-continued-

2-7 Press (F1) **Create**; then 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 for the customer's **Company**
name.

Step 3: Setting the Storage Location (DTX-1800 and DTX-1200)

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

3-1 Turn the rotary switch to **SETUP**, use (▽) to highlight
Instrument Settings; then press (ENTER).

3-2 Use (▽) to highlight **Result Storage Location**; then
press (ENTER).

3-3 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 4: 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:

4-1 DTX-1800, DTX-1200: Insert a memory card into the
tester, if that is where you wan to create a folder.

4-2 Turn the rotary switch to **SETUP**.

4-3 Use (▽) to highlight **Instrument Settings**; then press
(ENTER).

4-4 Press (▽) to highlight **Current Folder**; then press
(ENTER).

4-5 Press (F1) **Create Folder**.

4-6 Use (F1) (F2) (F3), (◁▷) (△) (▽), and (ENTER) to
enter a folder name. Press (SAVE) when you are done.

4-7 Use (△) (▽) to highlight the new folder in the list
of folders; then press (ENTER).

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.

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Figure 2-1. Using the Text Editing Screen

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.

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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 main and remote testers using one of the methods 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 If fiber modules are installed in addition to twisted pair adapters, select **Mainframe**.

1-6 Press TEST to start the self test.

Note

You can also check the battery status by connecting with channel adapters and a patch cord or by connecting through a link.
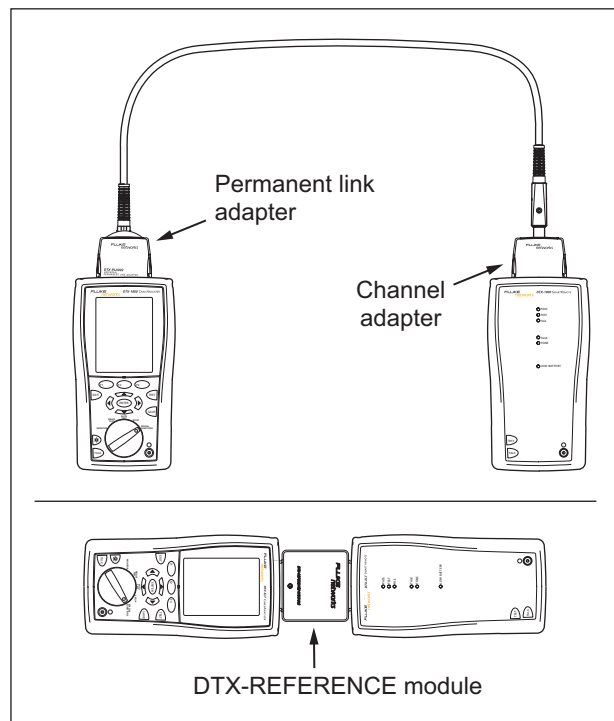
amd16.6eps

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

Step 2: Selecting a Test Limit, Cable Type, and Outlet Configuration

Select the test limit, cable type, and outlet configuration specified for the job. The outlet configuration determines which cable pairs are tested and which pair numbers are assigned to the pairs.

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

2-2 On the **Twisted Pair** menu use (▼) and (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

Custom: Cable types entered by a DTX user (not available on the DTX-ELT).

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, press (ENTER) to select **Test Limit**.

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.

2-8 If the currently-selected **Outlet Configuration** is not compatible with the selected **Test Limit**, the **Outlet Configuration** screen appears. Use (▲)(▼) to highlight an appropriate configuration; then press (ENTER).

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 2-6, or connect using two channel adapters and a patch cord.

3-3 Turn the rotary switch to **AUTOTEST**.

3-4 If a fiber module is installed, verify that the media type is set to **Twisted Pair**. Press (F1) **Change Media** to change it if necessary.

3-5 Press (TEST) on the tester or smart remote.
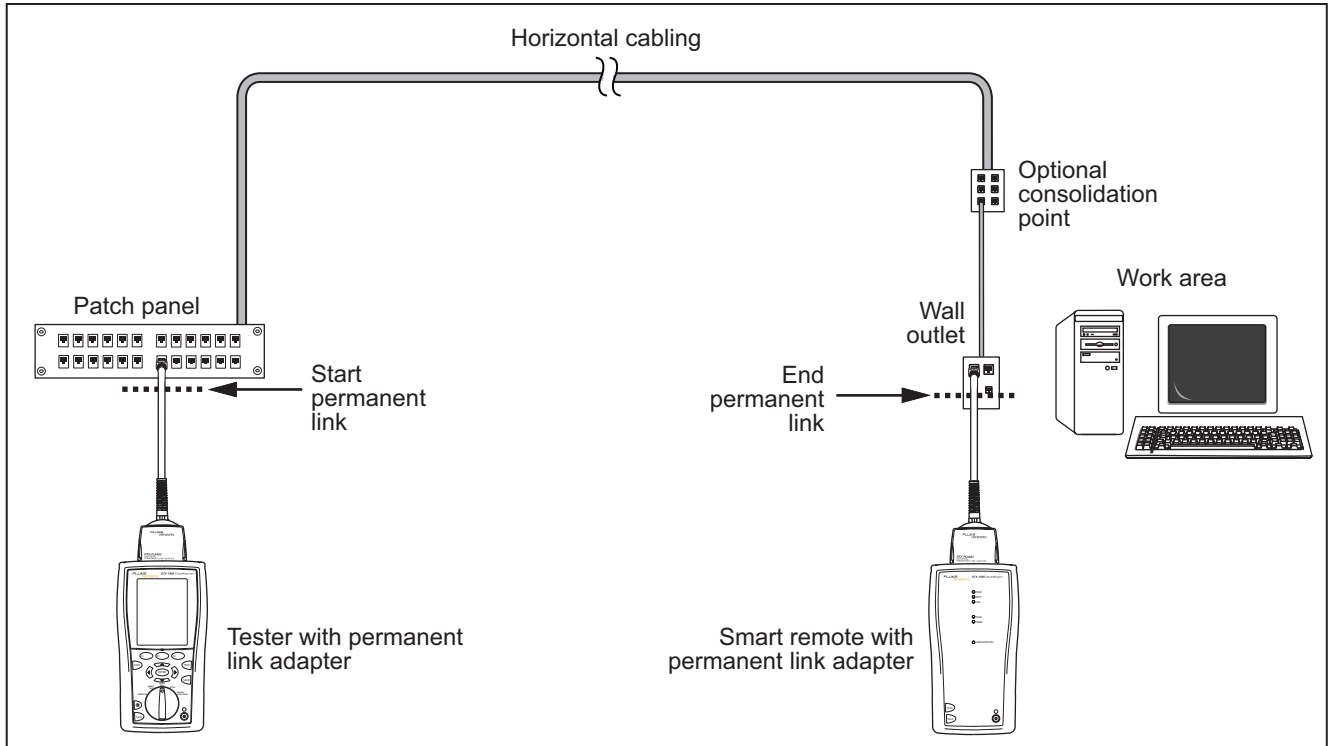
amd22.eps

Figure 2-4. Permanent Link Test Connections
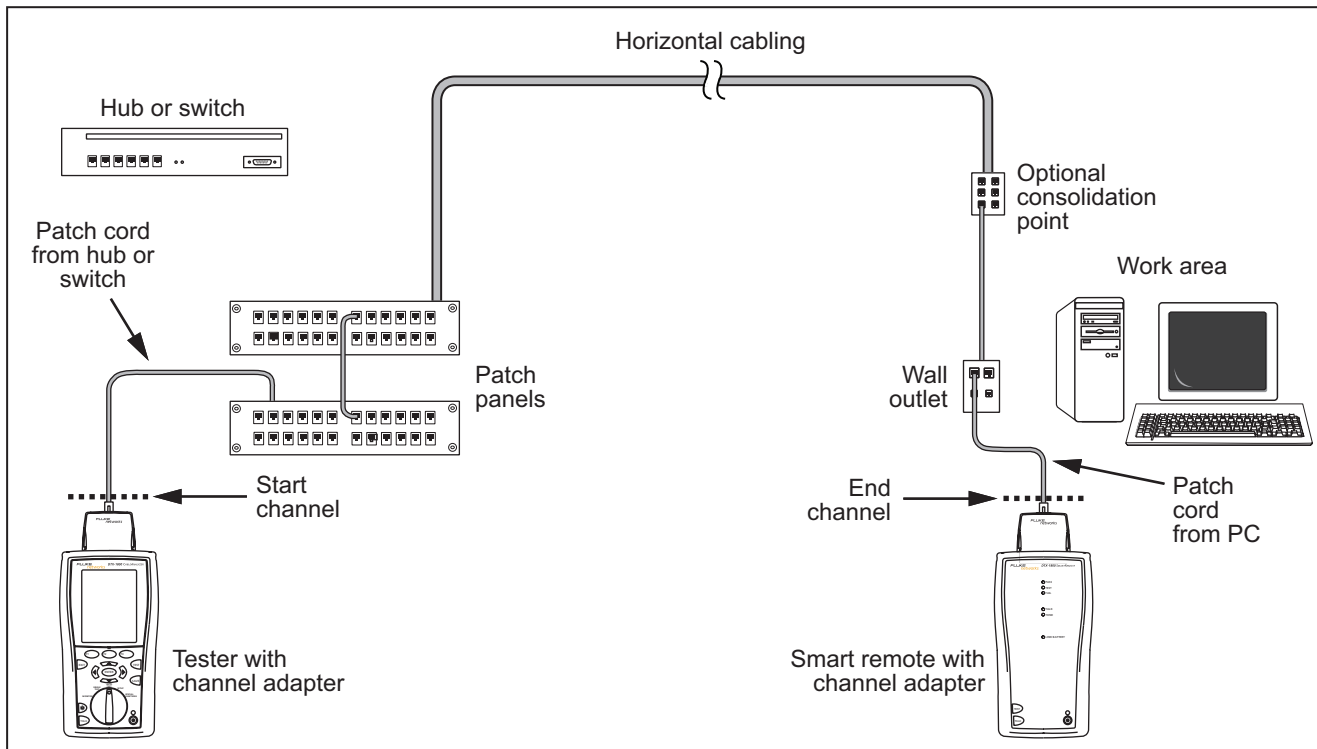
amd21f.eps

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 page 3-12 for details.

To see the results for an individual measurement, use ⬇ to highlight the test; then press ⓔⓝⓣⓔⓡ.

If the test failed, press Ⓕ₁ **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 6 for more information on diagnosing faults.

See Chapter 3 for details on twisted pair test results.
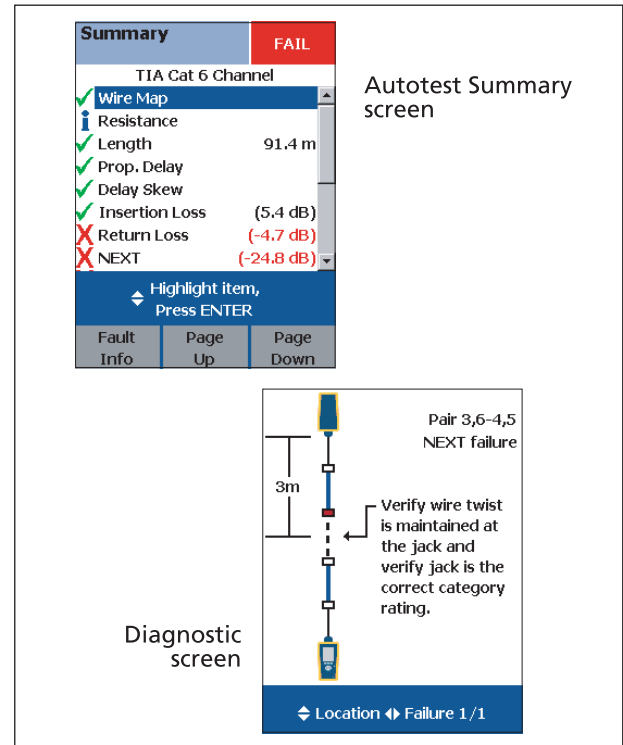
amd119f.eps

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 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

Note

The fiber modules are not compatible with the DTX-ELT.

This section familiarizes you with the optional DTX-MFM2, DTX-GFM2, and DTX-SFM2 fiber modules and the DTX-CLT CertiFiber tester 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.

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① Tester and smart remote with fiber modules. Use DTX-MFM2 modules for testing multimode fiber. Use DTX-GFM2 modules for testing multimode fiber for Gigabit Ethernet applications. Use DTX-SFM2 modules for testing singlemode fiber.

② Memory card (optional)

③ Two ac adapters with line cords (optional)

④ Test reference cords. Match the fiber to be tested. Long ends must have SC connectors. For the other connectors, match the connectors in the link.

⑤ Two singlemode adapters of the appropriate type

⑥ Two mandrels. Recommended when testing multimode fiber with DTX-MFM2 modules. See page 8-12.

⑦ Fiber cleaning supplies

⑧ A microscope for inspecting fiber connectors (the FT500 FiberInspector Mini Video Microscope is shown)

Note

To run an Autotest without connecting to cabling, you may connect the tester and remote together with an SC/SC test reference cord.

Figure 2-7. Equipment for Testing in Smart Remote Mode (1 Jumper Method)

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-MFM2, DTX-GFM2, or DTX-SFM2 module in each unit, as shown in Figure 2-8.

⚠**Caution**
**Turn off the tester
before attaching or
removing modules**

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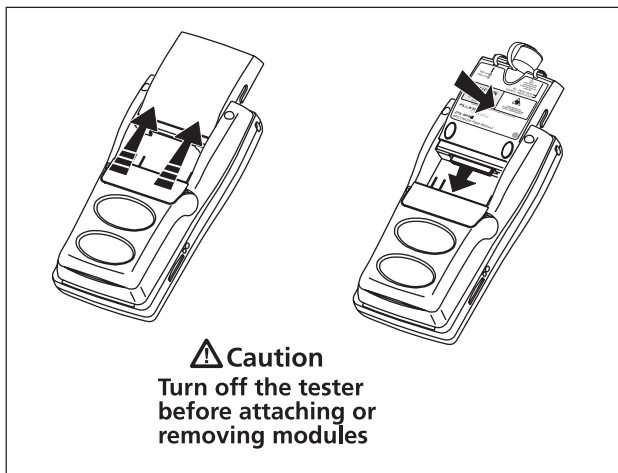
Figure 2-8. Installing Fiber Modules

⚠**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 and inspect the tester's connectors and the connectors on two SC/SC test reference cords. See page 8-9 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.

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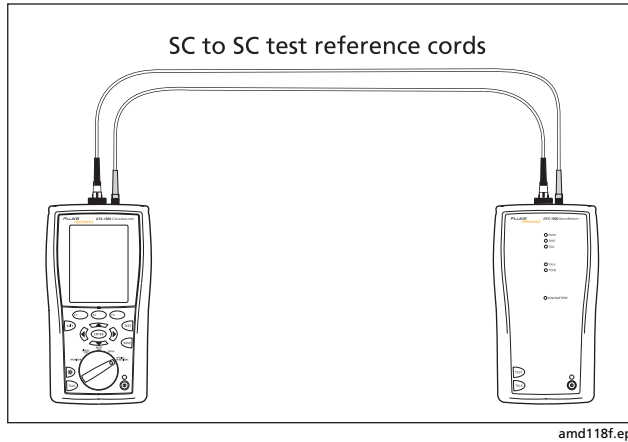
Figure 2-9. Self Test Connections for Fiber Modules

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 Loss**; then press (ENTER).

3-3 On the **Fiber** menu use ⌄ and (ENTER) to select **Fiber Type**. Fiber types are organized in groups:

- **Generic**: Generic types of fiber
- **Custom**: Fiber types entered by a DTX user
- **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** (if it is not highlighted); 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 Loss**; then press ⓔⓝⓣⓔⓡ.

4-3 Use ⬇ to highlight **Remote End Setup**; then press ⓔⓝⓣⓔⓡ.

4-4 Use ⬇ ⬆ to highlight **Smart Remote**; then press ⓔⓝⓣⓔⓡ.

4-5 Use ⬇ and ⓔⓝⓣⓔⓡ 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**: **1 Jumper**

Step 5: Setting the Reference

5-1 Clean the connectors on the tester and the two test reference cords.

5-2 Turn the rotary switch to **SPECIAL FUNCTIONS**. Press ⓔⓝⓣⓔⓡ 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 ⓣⓔⓢⓣ.

⚠ Caution

If you disconnect the test reference cords from the tester's or smart remote's output, you must set the reference again to ensure valid measurements.
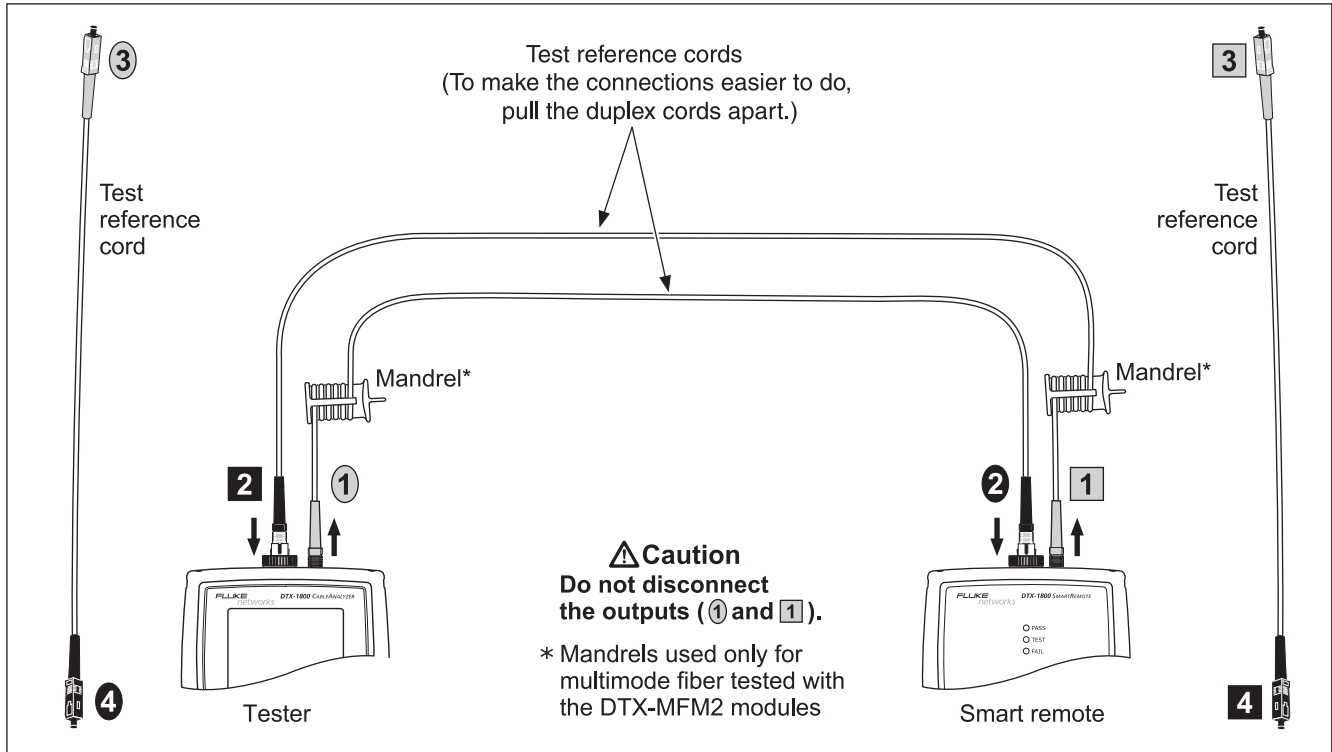
amd145f.eps

Figure 2-10. Setting the Reference in Smart Remote Mode (1 Jumper Method)

Step 6: Testing the Test Reference Cords

6-1 Disconnect the test reference cords from the INPUT ports on the tester and smart remote.

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

6-3 Turn the rotary switch to **AUTOTEST**, then press ⓣ.

6-4 Press ⓔⓝⓣⓔⓡ to see the test results. The results for each fiber (**Input Fiber** and **Output Fiber**) must be no more than these limits:

⚠ Caution

An overall result of PASS does not show that the test reference cords are good. You must compare the loss to the limits given here to make sure the cords are good.

Multimode test reference cord:

850 nm: 0.11 dB or less

1300 nm: 0.10 dB or less

(The limits are different because fiber has more loss at 850 nm than at 1300 nm.)

Singlemode test reference cord:

0.20 dB or less for 1310 nm and 1550 nm

6-5 If a result is more than the limit shown above, use the procedure given in Appendix A to test the cords in the path that failed (**Input Fiber** or **Output Fiber**). When you have good test reference cords, set the reference and do these steps (6-1 through 6-5) again before you test a fiber link.

Note

*The **Input Fiber** is the fiber connected to the INPUT port on the main tester. The **Output Fiber** is the fiber connected to the OUTPUT port on the main tester.*

6-6 Save the test results to show that you used good test reference cords to test the link:

6-7 Press ⓢⓐⓥⓔ.

6-8 Use the text editing screen to enter a name for the results. See Figure Figure 2-1 on page 2-3 for details on editing text.

6-9 Press ⓢⓐⓥⓔ when you are done.

Note

Fluke Networks recommends that you use this procedure to make sure your test reference cords are good before you test each fiber link.
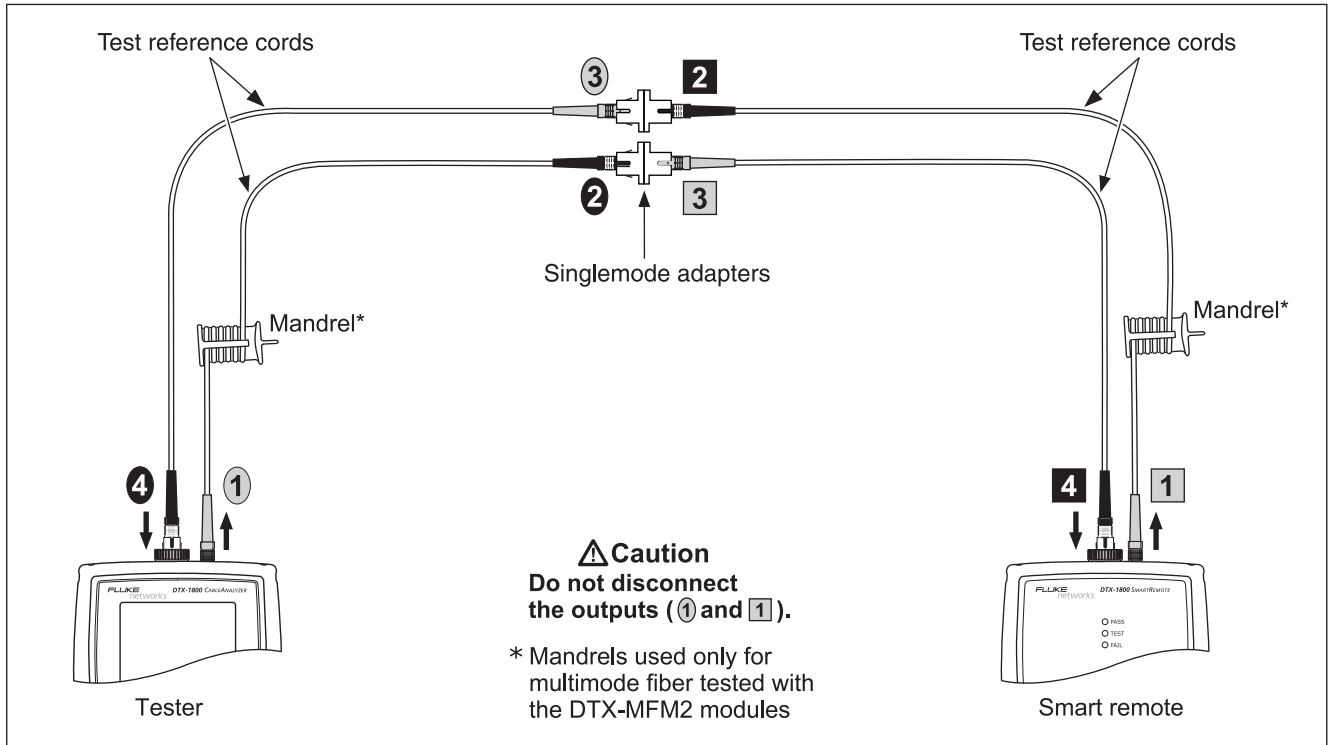
amd175.eps

Figure 2-11. Testing the Test Reference Cords in Smart Remote Mode

Step 7: Running the Test

7-1 Clean the connectors on the cabling to be tested.

7-2 Make the connections as shown in Figure 2-12.

7-3 Turn the rotary switch to **AUTOTEST**. If a copper adapter is attached, verify that the media type is set to **Fiber**. Press (F1) **Change Media** to change it if necessary.

7-4 Press (TEST).
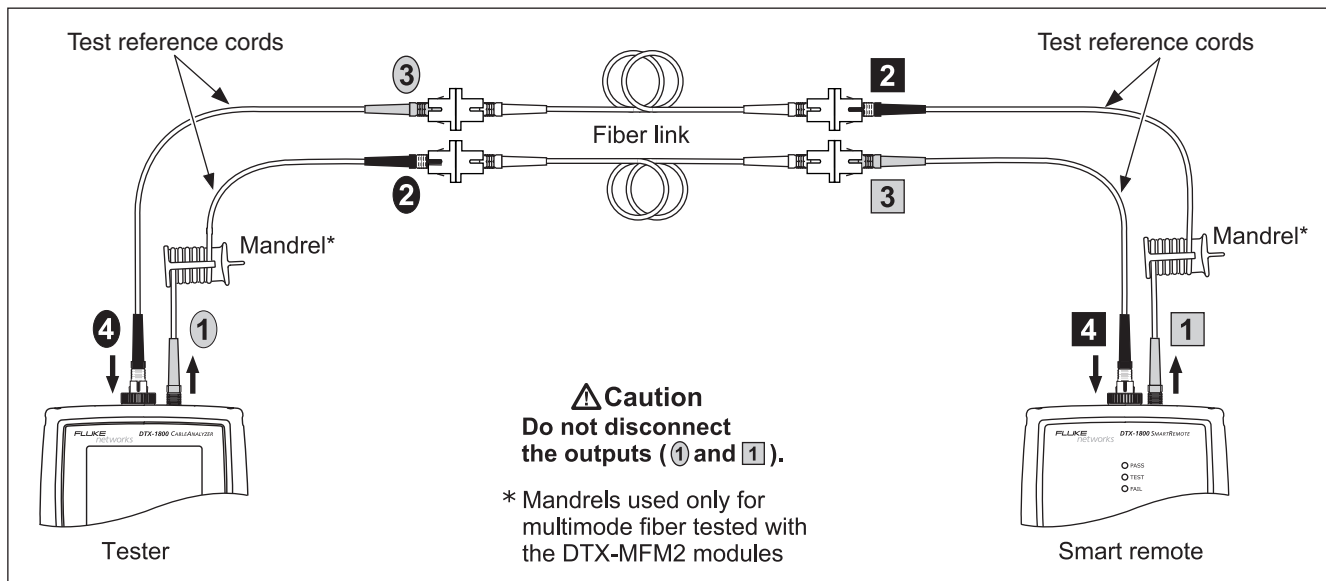
Figure 2-12. Testing a Fiber Link in Smart Remote Mode (1 Jumper Method)

amd146a.eps

Step 7: Viewing the Results

The **Summary** screen, shown in Figure 2-13, 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 8 for details on fiber test results.
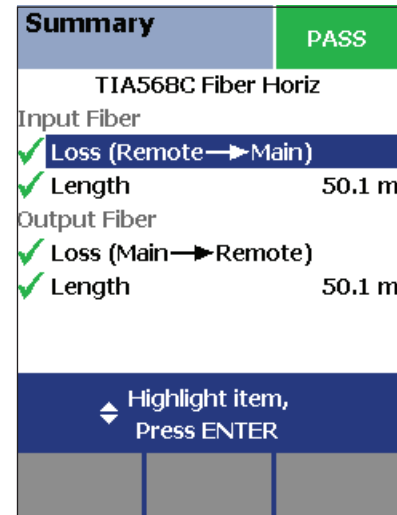
Step 8: Saving the Results

8-1 Press (SAVE).

8-2 Use the text editing screen to enter a name for the results. See Figure 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 8

amd121f.eps

Figure 2-13. Summary Results Screen for an Autotest on Fiber

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 auto increment 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 ⌄⌃ to highlight **Auto Increment**; then press (ENTER).

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 2-25 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
ⒺⓃⓉⒺⓇ.

5 Use ⬇ to highlight **Template,** then press ⒺⓃⓉⒺⓇ.

6 Use ⬆ ⬇ to highlight **Horizontal**, then press
ⒺⓃⓉⒺⓇ.

7 On the **Auto Sequence** screen, press Ⓕ1 **Default** to
transfer the default pattern into the **START ID** and
STOP ID.

8 Use ⬆ to highlight **Start ID**; then press ⒺⓃⓉⒺⓇ.

9 Use Ⓕ1 Ⓕ2 Ⓕ3, ◀▶ ⬆ ⬇, and ⒺⓃⓉⒺⓇ to
change the default ID to **03A-A01**.

Press ⓈⒶⓋⒺ when you are done.

10 Use ⬇ to highlight **Stop ID**; then press ⒺⓃⓉⒺⓇ.

11 Use Ⓕ1 Ⓕ2 Ⓕ3, ◀▶ ⬆ ⬇, and ⒺⓃⓉⒺⓇ to
change the default ID to **03A-B06**.

Press ⓈⒶⓋⒺ when you are done.

12 Press Ⓕ3 **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, check your
Start and **Stop** IDs for the problems listed below.

13 Press ⒺⓍⒾⓉ to leave the sample list.

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

14 Press ⓈⒶⓋⒺ 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 auto sequence list:

1   Verify that the **Cable ID Source** in **SETUP** is set to **Auto Sequence**.

2   Run a test; then press ⌖.

3   To scroll through the ID list, use ⌃ ⌄. To scroll one page at a time, use ◁▷.

4   Select an ID from the ID list; then press ⌖ 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
- s = telecom room letter
- a = patch panel letter
- n = For a horizontal link: port number
     For a backbone: backbone cable letter or number
- d = copper pair or fiber strand number in backbone cable
- b = building

Horizontal Link Identifier

Horizontal links run between telecommunications closets and work areas.

Format: fs-an

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: fs1/fs2-n.d

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 s1]/[b2-fs2]-n.d

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, ACR-F, 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.

To set the reference:

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 ℉).

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

     For the DTX-ELT and DTX-CLT, which do not include permanent link adapters, use the reference module included to connect the main and remote testers, as shown in Figure 3-2. (You may use the reference module, if available, to make reference connections for any DTX model.)

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

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

4   Press ⓉⒺⓈⓉ.

amd41f.eps
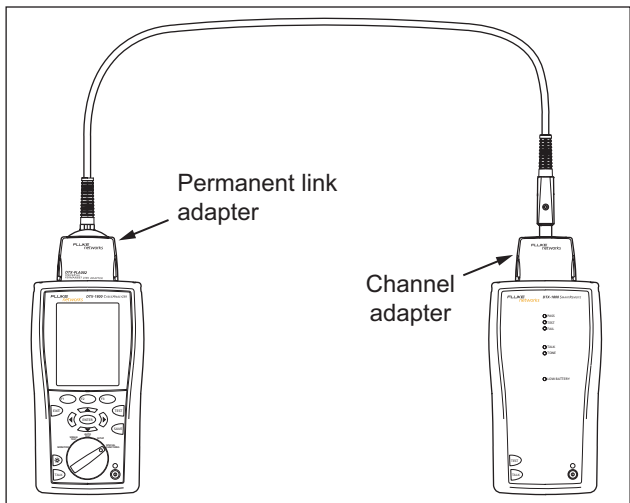
Figure 3-1. Twisted Pair Reference Connections for the DTX-1800, DTX-1200, and DTX-LT

ezz01.eps
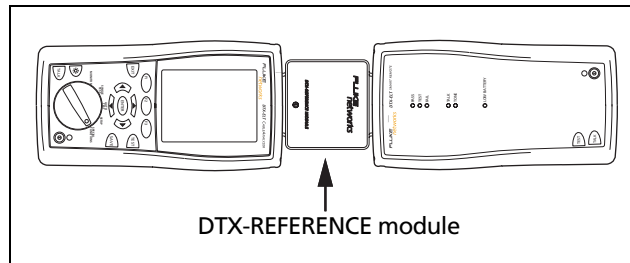
Figure 3-2. Twisted Pair Reference Connections for the DTX-ELT and DTX-CLT

Testing Twisted Pair Patch Cords

Because up to 70 % of Cat 5e and Cat 6 patch cords fail to meet TIA requirements, Fluke Networks recommends testing patch cords before using them with your tester or in a network.

Patch cord testing requires the optional DTX-PCU6S Patch Cord Adapter Set. Contact Fluke Networks or visit the Fluke Networks website for more information.

Note

The DTX-PCU6S Patch Cord Adapter Set is not compatible with the DTX-ELT.

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 > Test Limit	Select the appropriate test limit for the job. The **Cable Type** and **Outlet Configuration** screens appear if the current selections are not compatible with the test limit. Selecting **Custom** lets you create a test limit. See Chapter 12 for details.
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. Selecting **Custom** lets you create a cable type. See page 12-1 for details.
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 30 m (100 ft) long. See page 12-10. Increasing the NVP increases measured length.
SETUP > Twisted Pair > Outlet Configuration	The **Outlet Configuration** setting determines which cable pairs are tested and which pair numbers are assigned to the pairs. See Figure 3-3. To see the wire map for a configuration, press (F1) **Sample** from the **Outlet Configuration** screen. Selecting **Custom** lets you create a configuration. See page 12-1 for details.
SETUP > Twisted Pair > HDTDX/ HDTDR	**PASS*/FAIL Only:** The tester shows HDTDX and HDTDR results only for Autotests with **PASS***, **FAIL***, or **FAIL** results. **All AUTOTESTs:** The tester shows HDTDX and HDTDR for all Autotests.

-continued-

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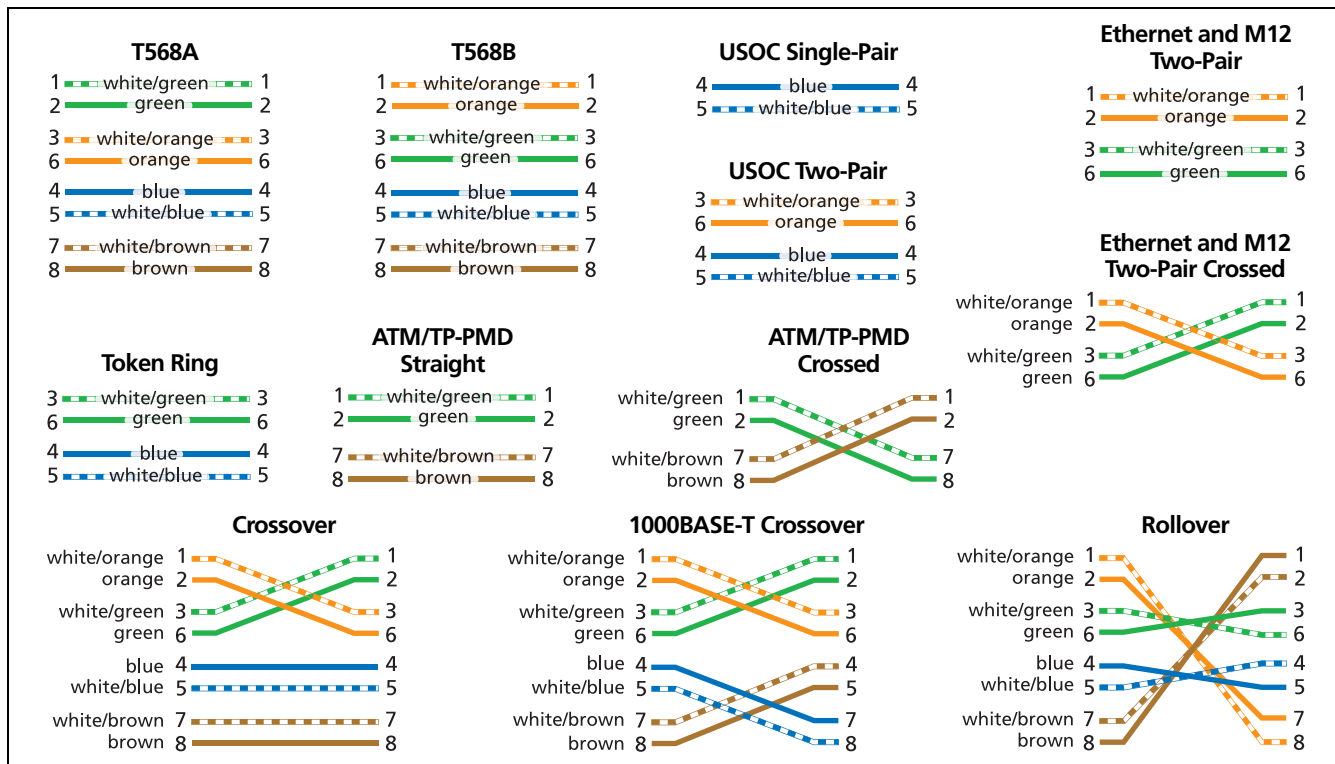
Figure 3-3. Outlet Configurations

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

Setting	Description
SETUP > Twisted Pair > AC Wire Map	Select **Enable** to test cabling through a mid-span PoE (Power over Ethernet) device. Always disable the **AC Wire Map** test when not testing through a PoE device. See Chapter 4.
SETUP > Instrument Settings > Store Plot Data	**Standard**: The tester displays and saves plot data for frequency-based tests such as NEXT, return loss, and attenuation. The tester saves data for the frequency range required by the selected test limit. **Extended**: The tester saves data beyond the frequency range required by the selected test limit. **No**: Plot data is not saved, which lets you save more results. Saved results show worst margins and worst values for each pair.
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 Settings for saving tests	**Cable ID Source, Current Folder, Result Storage Location** (DTX-1800, DTX-1200), **Operator, Site, Company**, and **Auto Save Results** setting. See "Preparing to Save Tests" on page 2-1 and "Automatically Saving Results" on page 1-32.
SETUP > Instrument Settings > Power Line Frequency	Set to the power frequency in the area where the tester will be used. This setting helps keep ac noise (50 Hz or 60 Hz) from affecting wiremap and resistance measurements.
SETUP > Instrument Settings > Plot Grid	Select **Yes** to see a measurement grid on plots.

Autotest on Twisted Pair Cabling

Figure 3-4 shows the equipment needed for certifying twisted pair cabling.

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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
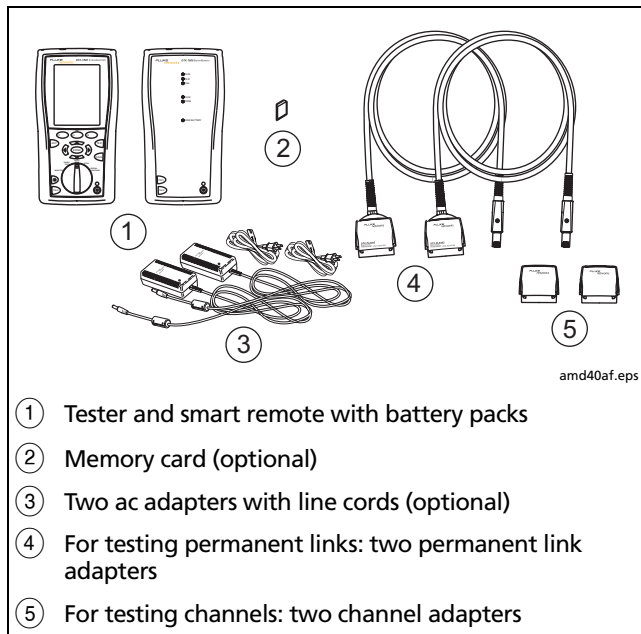
Figure 3-4. Equipment for Certifying Twisted Pair Cabling

To run the 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 3-5 for a permanent link or Figure 3-6 for a channel.

4 If a fiber module is installed, you may need to press Ⓕ₁ **Change Media** to select **Twisted Pair** as the media type.

5 Press Ⓣᴇˢᵀ on the tester or smart remote. To stop the test at any time, press ᴇˣᴵᵀ .

6 The tester shows the Autotest **Summary** screen when the test is complete (see page 3-10). To view results for a specific parameter, use ▲ ▼ to highlight the parameter; then press ᴇɴᴛᴇʀ .

If the Autotest failed, press Ⓕ₁ **Fault Info** for possible causes of the failure.

7 To save the results, press ˢᴬᵛᴱ . Select or create a cable ID; then press ˢᴬᵛᴱ again.
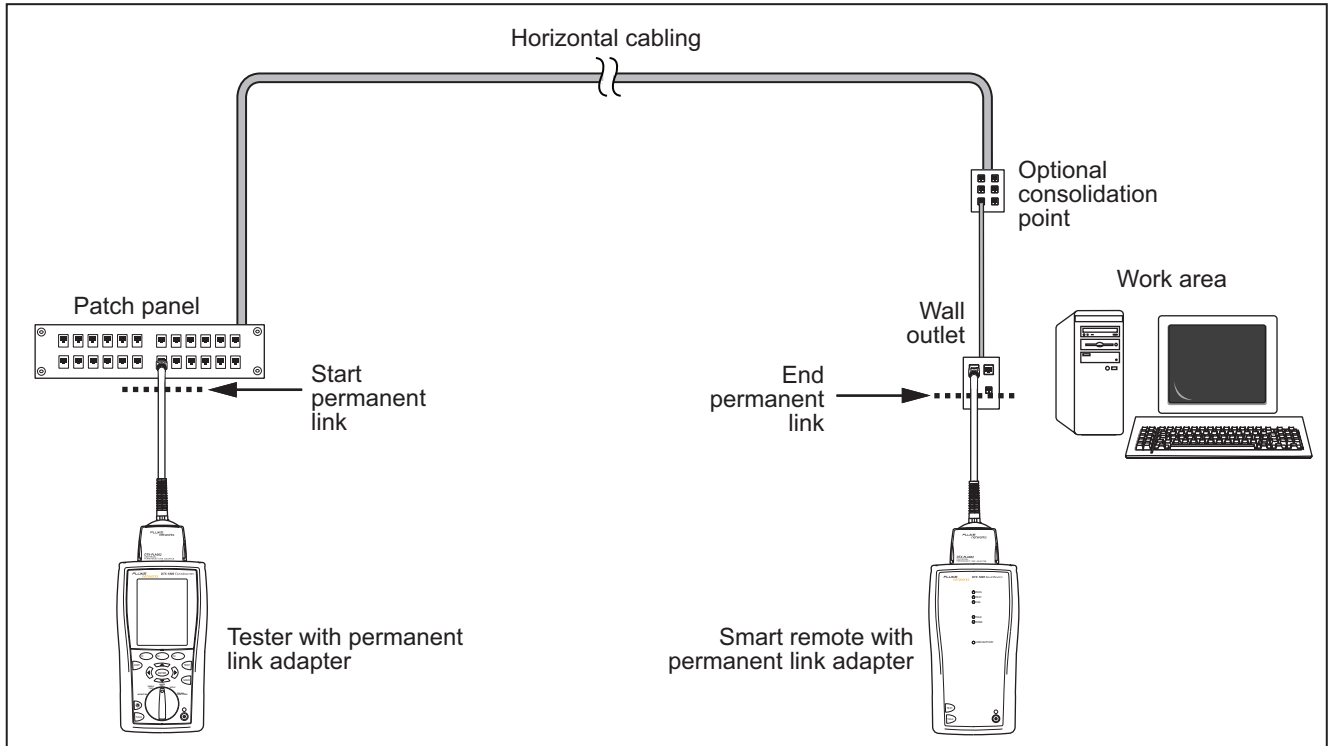
amd22f.eps

Figure 3-5. Permanent Link Test Connections
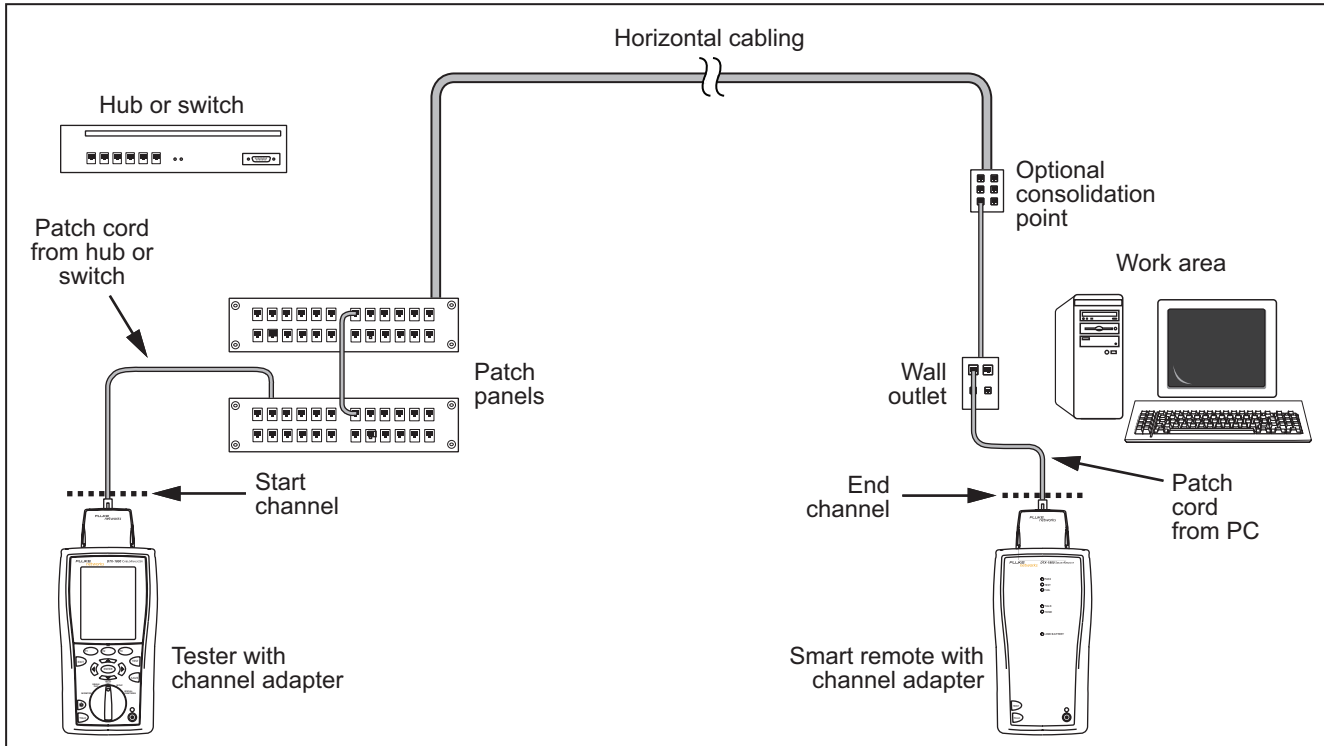
Figure 3-6. Channel Test Connections

amd21f.eps

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-N (attenuation to crosstalk ratio at the near end) and ACR-N at the smart remote
- PS ACR-N (power-sum attenuation to crosstalk ratio) and PS ACR-N at the smart remote
- ACR-F (equal level far-end crosstalk)
- PS ACR-F (power-sum equal level far-end crosstalk)

Figure 3-7 describes the Autotest **Summary** screen.

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

FAIL: One or more parameters exceed 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. See pages 3-13, 3-17, and 3-18.

X: The measurement exceeds the limit.

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

⑥ The worst margin found for the test.

amd77f.eps

Figure 3-7. 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 ⟨↑⟩⟨↓⟩⟨◁▷⟩ to see additional screens.

Figure 3-8 shows examples of diagnostic screens.
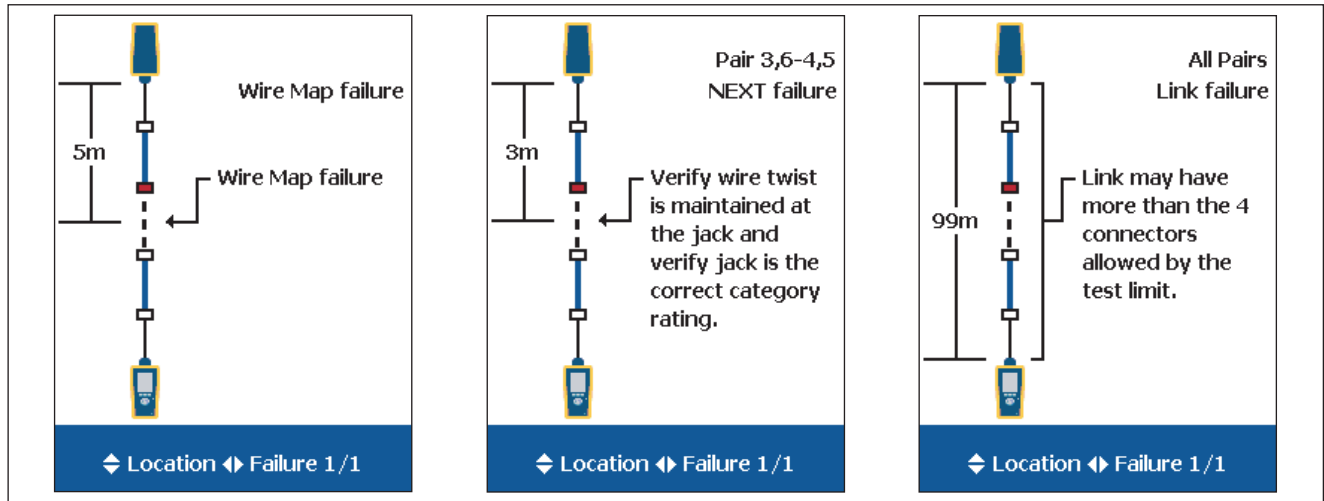
amd75f.eps

Figure 3-8. 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 3-9) 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.

A **PASS*** may be considered a passing result.

A **FAIL*** should be considered a failure.
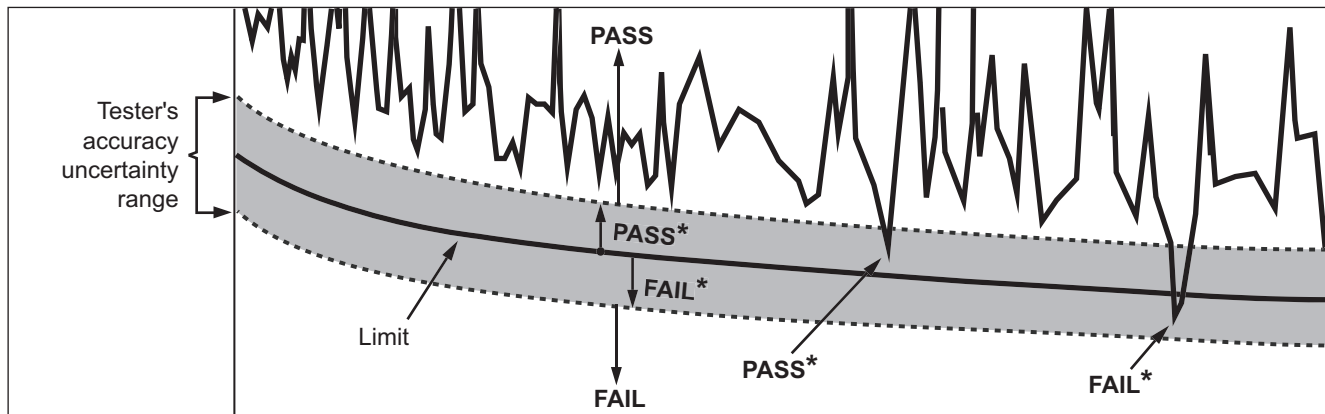
amd42f.eps

Figure 3-9. PASS* and FAIL* Results

About dB Rules

For some test limits, the results from some tests are ignored when a measurement is less than a certain value. For example, for all limits where return loss is measured, the return loss measurement is not evaluated against a limit at frequencies where insertion loss is less than 3 dB. This is the 3 dB rule.

When a measurement is not evaluated against a limit, the tester shows an **i** for the result. On the plot for that measurement, the limit line is black where the result is not evaluated. When you upload the results to LinkWare, N/A shows for the result.

The following sections summarize the dB rules. Tables 3-2 and 3-3 show the dB rules that apply to each test and the test limits that use the rules. For more information, see the Knowledge Base on the Fluke Networks website.

3 dB Rule

This rule applies to all test limits where return loss is measured.

At frequencies where insertion loss is less than 3.0 dB, return loss is not evaluated against a limit.

4 dB Rule

This rule applies to the following test limits:

- ISO/IEC 11801
- EN 50173
- Aus/NZ
- JIS

At frequencies where insertion loss is less than 4.0 dB, the measurements shown in Tables 3-2 and 3-3 are not evaluated against a limit.

12 dB Rule

This rule applies to the following test limits:

- ISO Class Ea Ch AMD1
- ISO Class Ea PL2 25N1599

If insertion loss is less than 12 dB at 450 MHz, a relaxed NEXT limit is used. See the Knowledge Base on the Fluke Networks website for details.

67 dB Rule

This rule applies to all channel and permanent link test limits where PS ACR-F is measured.

At frequencies where PS FEXT is less than 67 dB, PS ACR-F cannot fail.

70 dB Rule

This rule applies to any channel or permanent link test limit where ACR-F is measured.

At frequencies where FEXT is less than 70 dB, ACR-F cannot fail.

Table 3-2. dB Rules for Permanent Link Test Limits

Test	Class for Permanent Link Test Limit				
	D	E	E_A	F	F_A
NEXT	4 dB	4 dB	4 dB	4 dB	4 dB
PS NEXT	4 dB	4 dB	4 dB	4 dB	4 dB
ACR-N	4 dB	4 dB	4 dB	4 dB	4 dB
PS ACR-N	4 dB	4 dB	4 dB	4 dB	4 dB
ACR-F			70 dB	70 dB	70 dB
PS ACR-F			67 dB	67 dB	67 dB
Return Loss	3 dB	3 dB	3 dB	3 dB	3 dB

Table 3-3. dB Rules for Channel Test Limits

Test	Class for Channel Test Limit				
	D	E	E_A	F	F_A
NEXT	4 dB	4 dB	4 dB	4 dB	4 dB
PS NEXT	4 dB	4 dB	4 dB	4 dB	4 dB
ACR-N					
PS ACR-N					
ACR-F			70 dB	70 dB	70 dB
PS ACR-F			67 dB	67 dB	67 dB
Return Loss	3 dB	3 dB	3 dB	3 dB	3 dB

Wire Map

Wire map results show the connections between the main and remote testers. The tester checks the cable pairs required by the selected test limit. If the wire map test fails, you can continue or stop the Autotest. Figure 3-10 describes

examples of wire map screens. For information on AC wire map screens, see Chapter 4.

Tip: The wire map test in Single Test mode features a scanning function that runs the wire map test continuously. This function is helpful for locating intermittent wiring faults.

Correct wiring (568B)

Shield continuity is shown if a shielded cable type (such as FTP or SSTP) is selected in SETUP.

Open

Wire 3 is open 1.0 m from the tester and 91.6 m from the smart remote.

Short

Wires 1 and 2 are shorted 1 m from the smart remote. Shorts not within a cable pair are always show at the near end (left side) of the wire map screen.

Figure 3-10. Wire Map Examples

-continued-
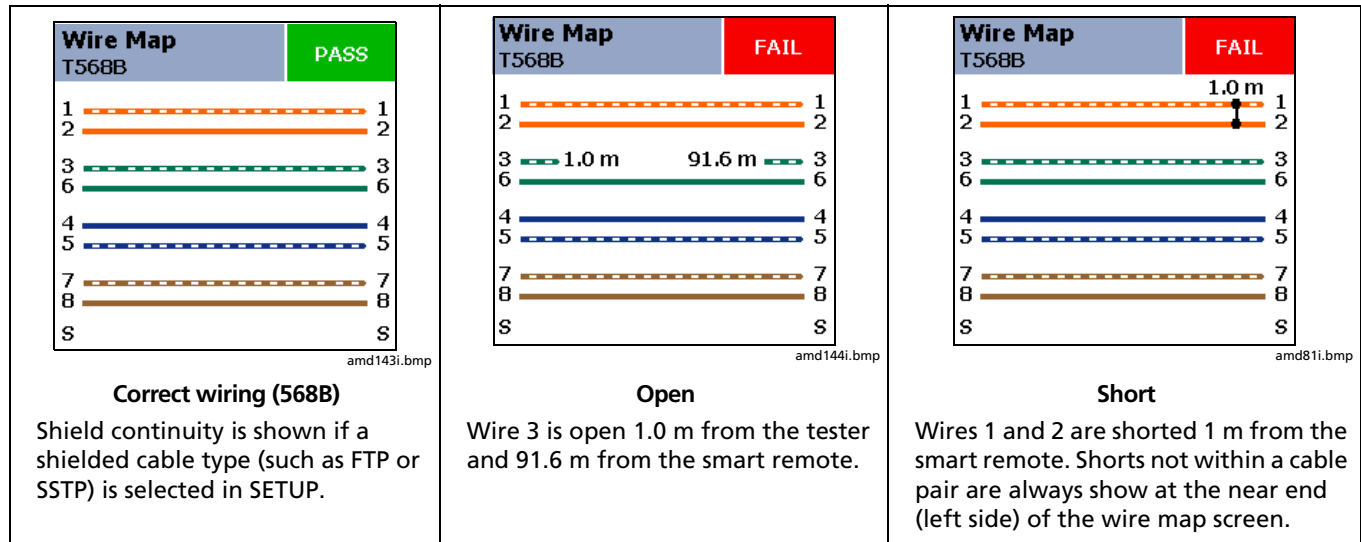
Split pair	**Reversed pair**	**Crossed pairs**
A wire in the 3,6 pair is crossed with a wire in the 4,5 pair.	Wires 1 and 2 are crossed.	Pairs 1,2 and 3,6 are crossed.
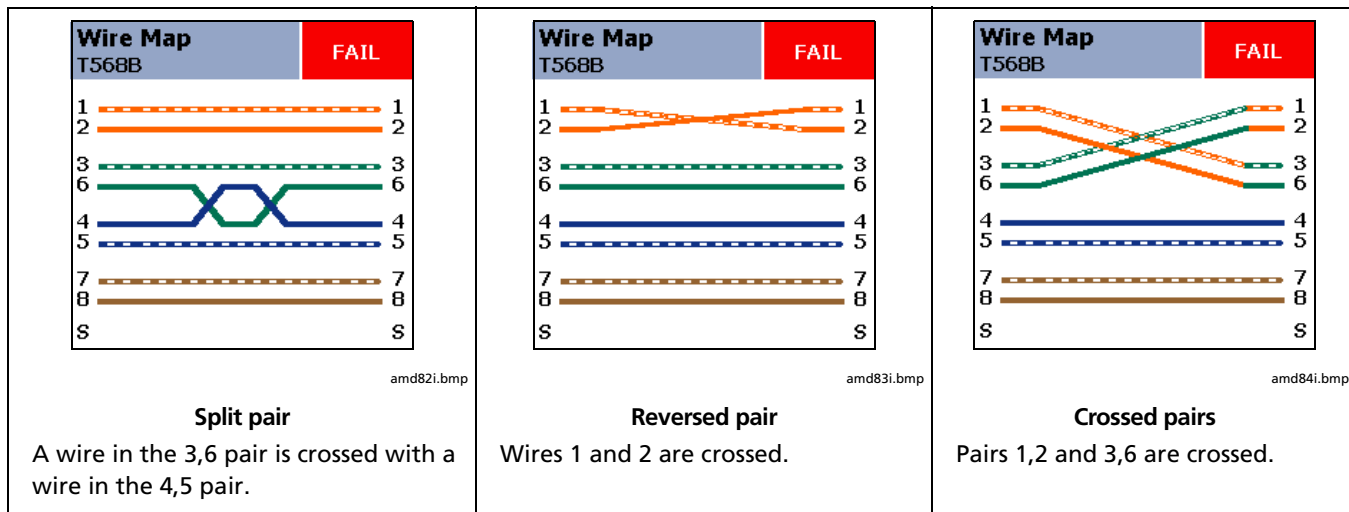
Figure 3-10. Wire Map Examples (cont.)

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 3-11 shows the resistance results screen.

Tip: The resistance test in Single Test mode features a scanning function that runs the resistance test continuously. This function is helpful for locating intermittent resistance faults.

amd85f.eps

Figure 3-11. Resistance Results

Characteristic Impedance

Notes

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 13 ft (4 m) long. The tester shows **Unknown** for cables shorter than this.*

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. The lengths of the other pairs are shown with an **i**, meaning the measurements are for informational purposes only.

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 3-12 shows a length results screen.

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.

If the length of the shortest pair does not exceed the limit by 10 %, then the length test passes even if other pairs exceed the limit. This is the 10 % rule for length, as given in the ANSI/TIA standard. See the Fluke Networks Knowledge base for details.

amd87f.eps

Figure 3-12. 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. One nanosecond is one-billionth of a second, or 0.000000001 second. 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 3-13 shows the propagation delay and delay skew results screens.

Prop. Delay		PASS
	Prop. Delay	Limit
✓ 1 2	277 ns	555 ns
✓ 3 6	277 ns	555 ns
✓ 4 5	(276 ns)	555 ns
✓ 7 8	278 ns	555 ns

Delay Skew		PASS
	Delay Skew	Limit
✓ 1 2	1 ns	50 ns
✓ 3 6	1 ns	50 ns
✓ 4 5	(0 ns)	50 ns
✓ 7 8	2 ns	50 ns

The pair with the shortest electrical length
is usually the shortest pair
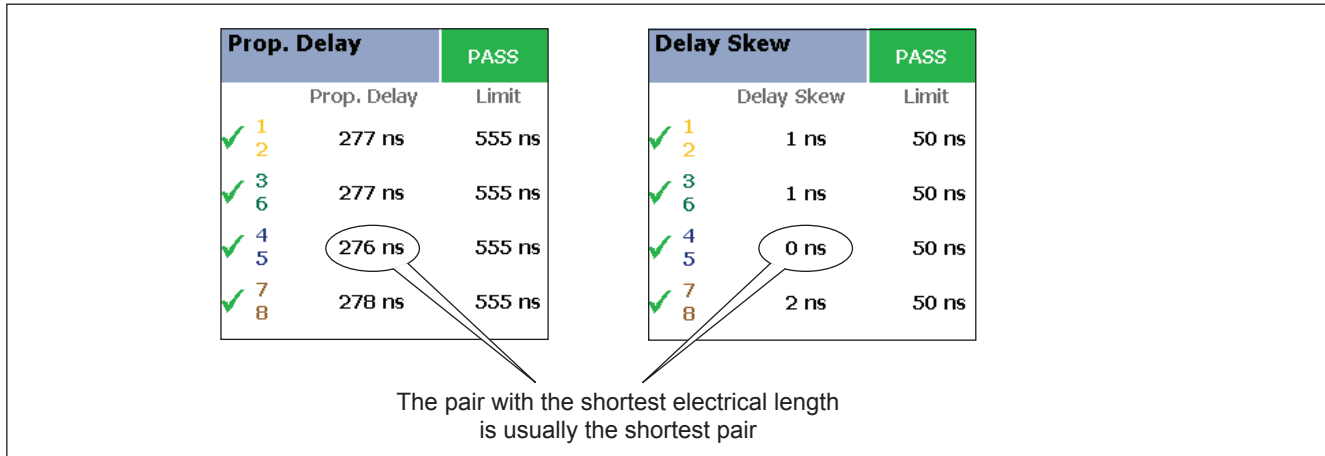
amd88f.eps

Figure 3-13. 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 3-14. 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 3-15 describes the insertion loss plot.
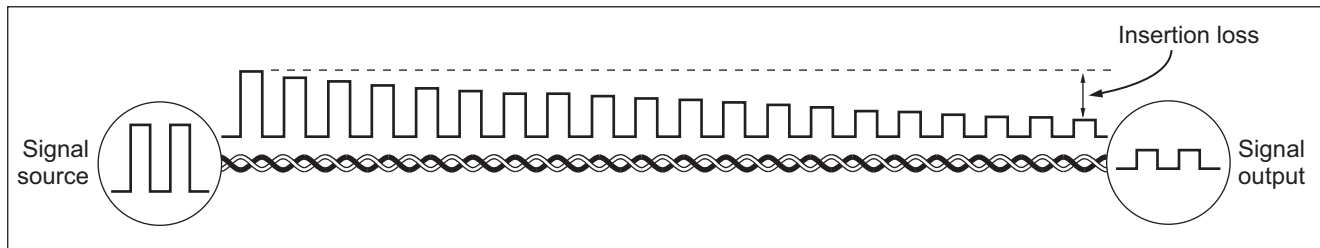
amd90f.eps

Figure 3-14. Insertion Loss is a Decrease in Signal Strength

amd09f.eps

① The overall insertion loss result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.

② Horizontal and vertical magnification levels for the plot. To change the magnification, press (F2) **Change To Zoom**; then use ⟨⟩ or ⌃⌄ to zoom horizontally or vertically.

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 (if the plot is in zoom mode, press (F2) **Change To Cursor** first).

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 3-15. 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 3-16). For this reason, NEXT is measured from both ends of the cabling.

For NEXT failures, the tester's 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 page 6-7 for details. Figure 3-17 describes the NEXT plot.

Note

The 4 dB rule may apply to your NEXT results. See page 3-13.
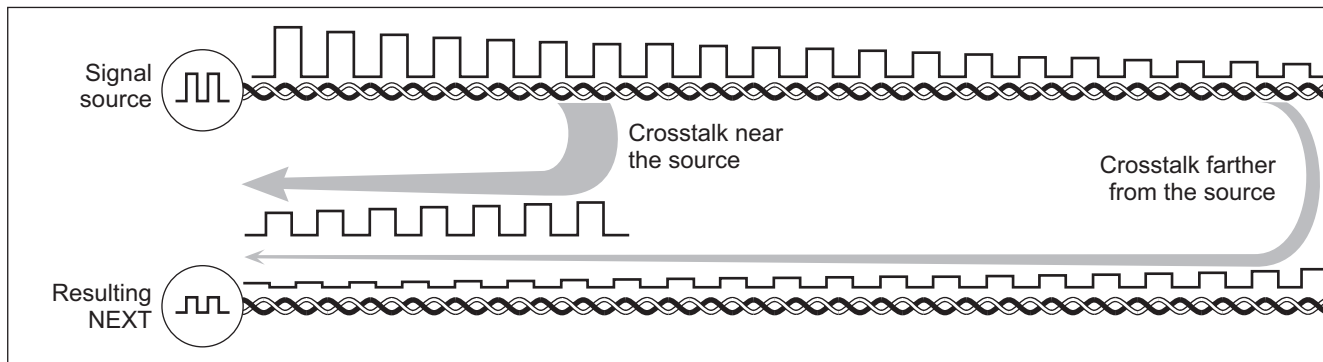
amd89f.eps

Figure 3-16. Near-End Crosstalk (NEXT)

amd07f.eps
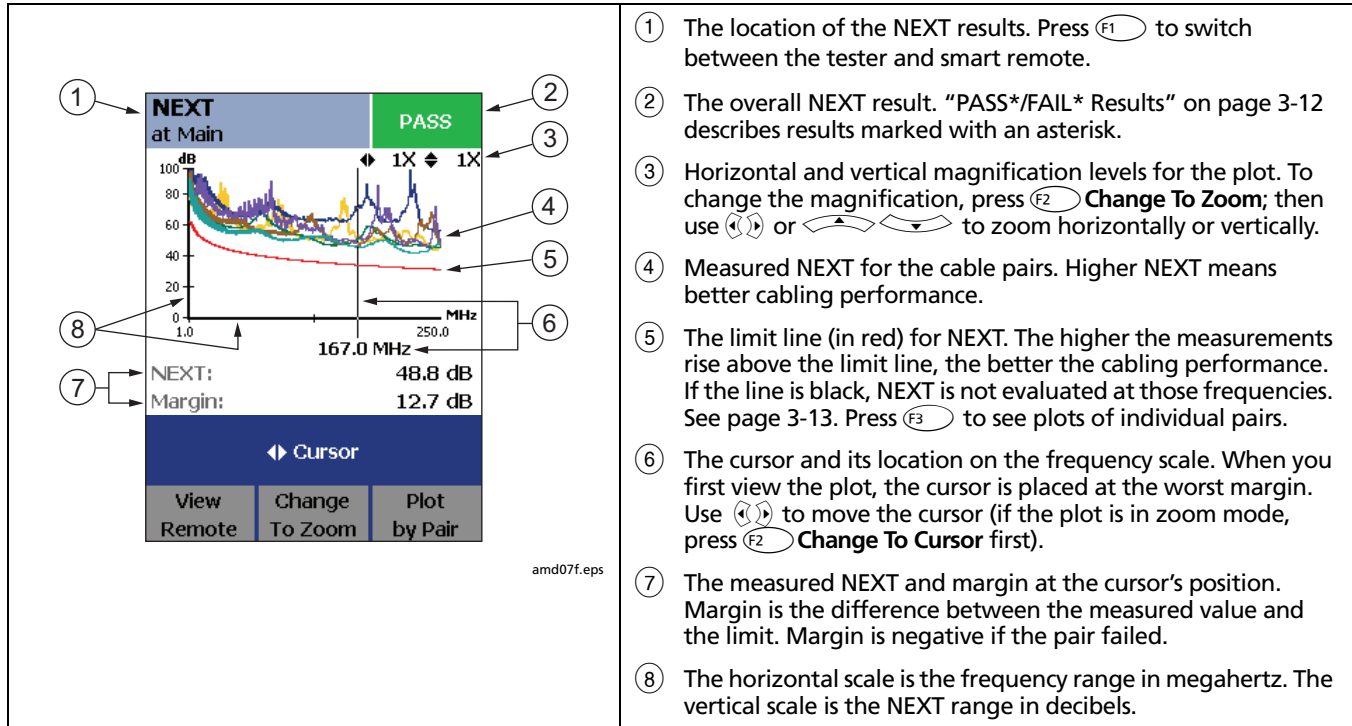
① The location of the NEXT results. Press ⒡ to switch between the tester and smart remote.

② The overall NEXT result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.

③ Horizontal and vertical magnification levels for the plot. To change the magnification, press ⒡ **Change To Zoom**; then use ⬱ or ⬦⬧ to zoom horizontally or vertically.

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. If the line is black, NEXT is not evaluated at those frequencies. See page 3-13. Press ⒡ 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 (if the plot is in zoom mode, press ⒡ **Change To Cursor** first).

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 3-17. NEXT Plot

ACR-N (Attenuation to Crosstalk Ratio at the Near End)

Note

ACR-N is also known as ACR.

ACR-N is like a signal-to-noise ratio. ACR-N 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 3-18. The tester calculates ACR-N as the difference (in dB) between NEXT and attenuation (insertion loss). Higher ACR-N values mean received signals are much larger than crosstalk signals. Higher ACR-N values correspond to better cabling performance.

Figure 3-19 describes the ACR-N plot.

Note

The 4 dB rule may apply to your ACR-N results. See page 3-13.
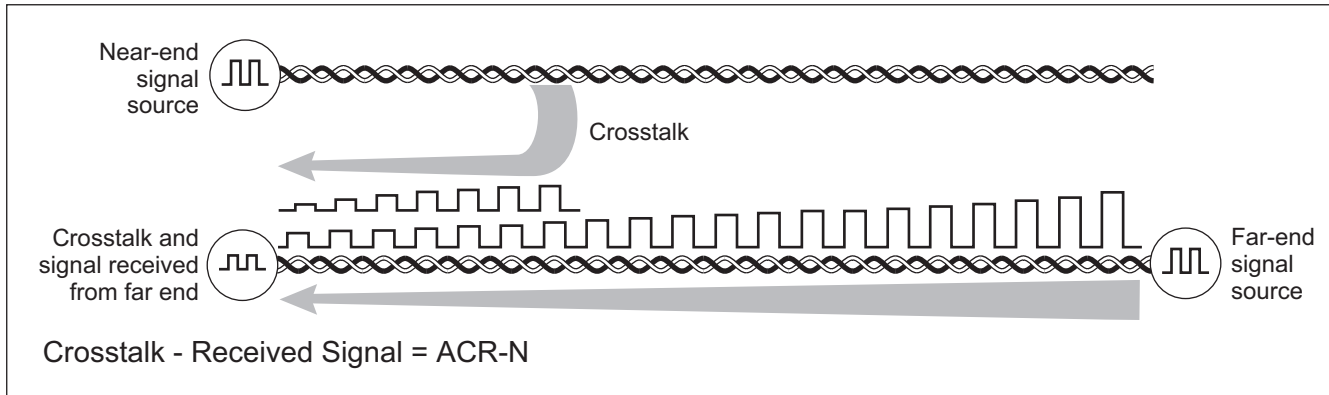
amd91f.eps

Figure 3-18. Attenuation to Crosstalk Ratio, Near End (ACR-N)

amd11f.eps
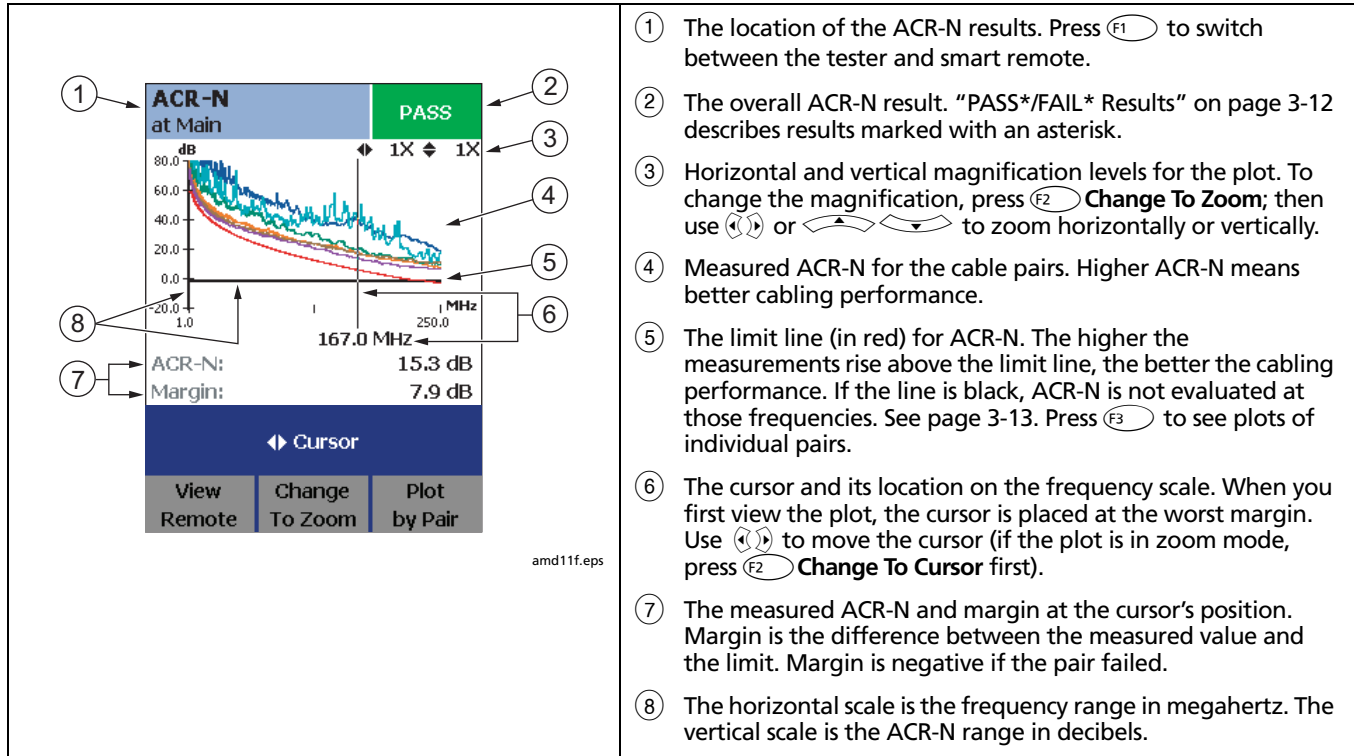
① The location of the ACR-N results. Press (F1) to switch between the tester and smart remote.

② The overall ACR-N result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.

③ Horizontal and vertical magnification levels for the plot. To change the magnification, press (F2) **Change To Zoom**; then use (◁ ▷) or ◁▽▷ ◁▽▷ to zoom horizontally or vertically.

④ Measured ACR-N for the cable pairs. Higher ACR-N means better cabling performance.

⑤ The limit line (in red) for ACR-N. The higher the measurements rise above the limit line, the better the cabling performance. If the line is black, ACR-N is not evaluated at those frequencies. See page 3-13. 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 (if the plot is in zoom mode, press (F2) **Change To Cursor** first).

⑦ The measured ACR-N 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-N range in decibels.

Figure 3-19. ACR-N 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 3-20 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 3-21 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 page 6-10 for details.

Note
The 3 dB rule applies to return loss results. See page 3-13.
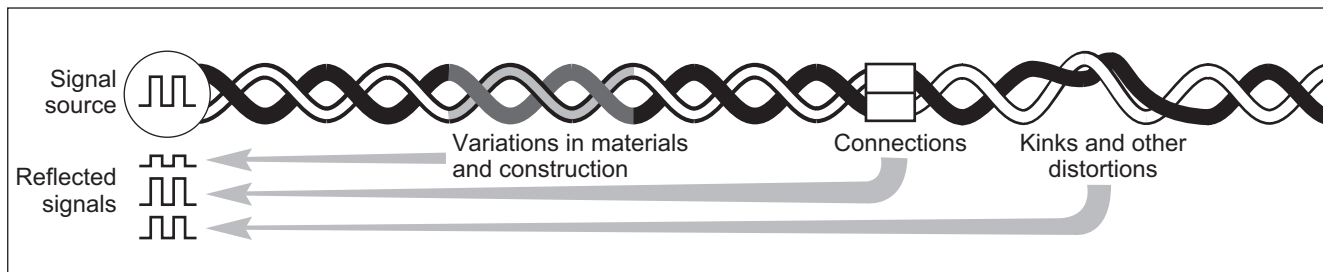
amd93f.eps

Figure 3-20. Sources of Return Loss

amd12f.eps
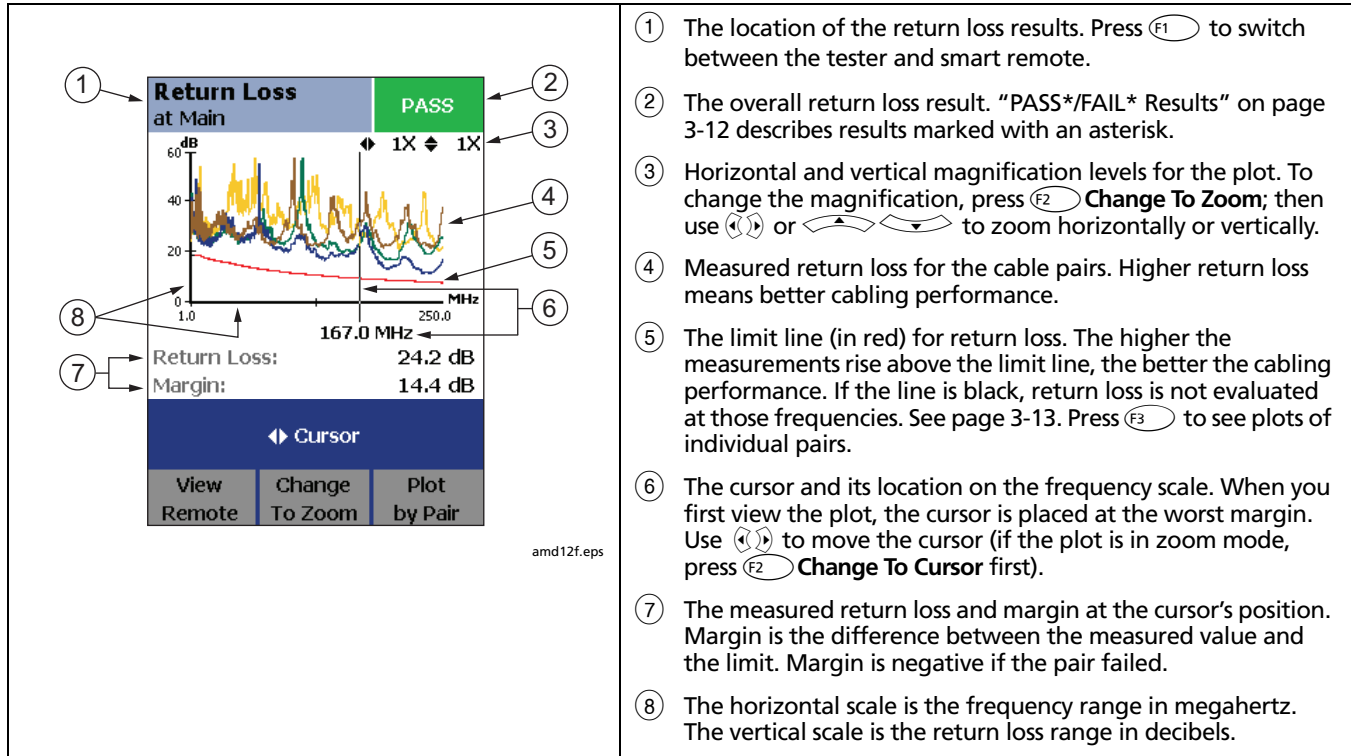
① The location of the return loss results. Press (F1) to switch between the tester and smart remote.

② The overall return loss result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.

③ Horizontal and vertical magnification levels for the plot. To change the magnification, press (F2) **Change To Zoom**; then use ◁▷ or ⌃⌄ to zoom horizontally or vertically.

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. If the line is black, return loss is not evaluated at those frequencies. See page 3-13. 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 (if the plot is in zoom mode, press (F2) **Change To Cursor** first).

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 3-21. Return Loss Plot

PS NEXT (Power Sum Near End Crosstalk)

PS NEXT results show how much each cable pair is affected by the combined crosstalk from the other pairs. PS NEXT 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 PS NEXT. Higher PS NEXT values correspond to better cabling performance.

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

Note
The 4 dB rule may apply to your PS NEXT results.
See page 3-13.

PS ACR-N (Power Sum Attenuation to Crosstalk Ratio, Near End)

Note
PS ACR-N is also known as PSACR.

PS ACR-N 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. PS ACR-N is the difference (in dB) between PS NEXT and attenuation (insertion loss). The tester uses the PS NEXT and attenuation results to calculate PS ACR-N values. Higher PS ACR-N values mean received signals are much larger than the crosstalk from all the other cable pairs. Higher PS ACR-N values correspond to better cabling performance.

PS ACR-N 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 PS NEXT and attenuation values to calculate PS ACR-N values.

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

Note
The 4 dB rule may apply to your PS ACR-N results.
See page 3-13.

ACR-F (Attenuation to Crosstalk Ratio, Far End)

Note
ACR-F is also known as ELFEXT.

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 3-16. 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 3-22).

Note
The 70 dB rule may apply to your ACR-F results.
See page 3-13.
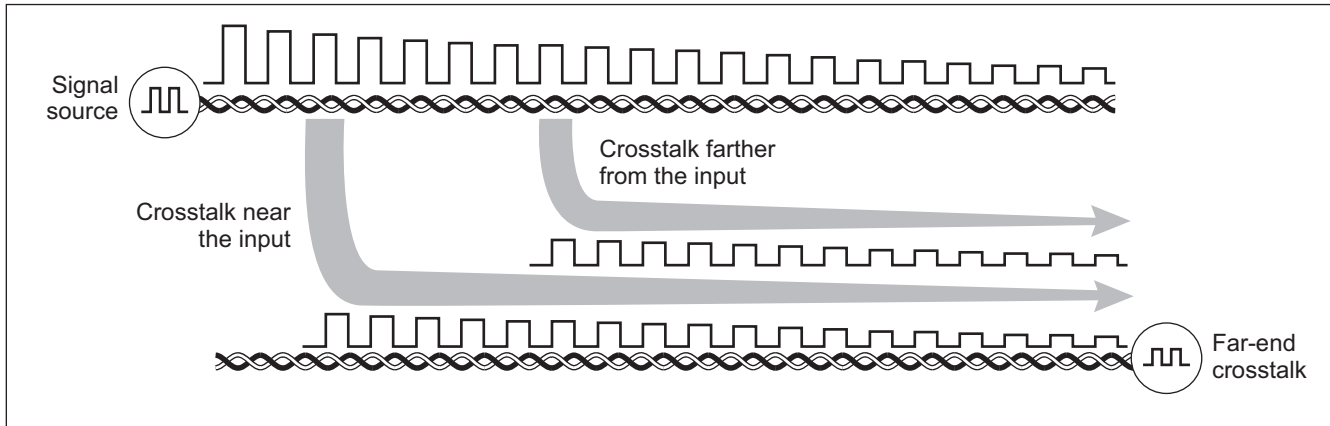
amd94f.eps

Figure 3-22. Far-End Crosstalk (FEXT)

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 ACR-F (attenuation to crosstalk ratio, far end) values. Since ACR-F 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 ACR-F 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 ACR-F is a critical parameter for 1000BASE-T certification.

Like ACR-N, ACR-F represents a signal-to-noise ratio for the cabling. Higher ACR-F 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 ACR-F values correspond to better cabling performance.

NEXT and ACR-F 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 ACR-F performance.

Figure 3-23 describes the ACR-F plot.

PS ACR-F Test

Note

PS ACR-F is also known as PSELFEXT (power sum attenuation to crosstalk ratio, far-end).

PS ACR-F results show how much the far end of each cable pair is affected by the combined far-end crosstalk from the other pairs. PS ACR-F 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 ACR-F values to calculate PS ACR-F. Higher PS ACR-F values correspond to better cabling performance.

PS ACR-F results are typically a few dB lower than worst-case ACR-F results.

Note

The 67 dB rule may apply to your PS ACR-F results. See page 3-13.

amd13f.eps
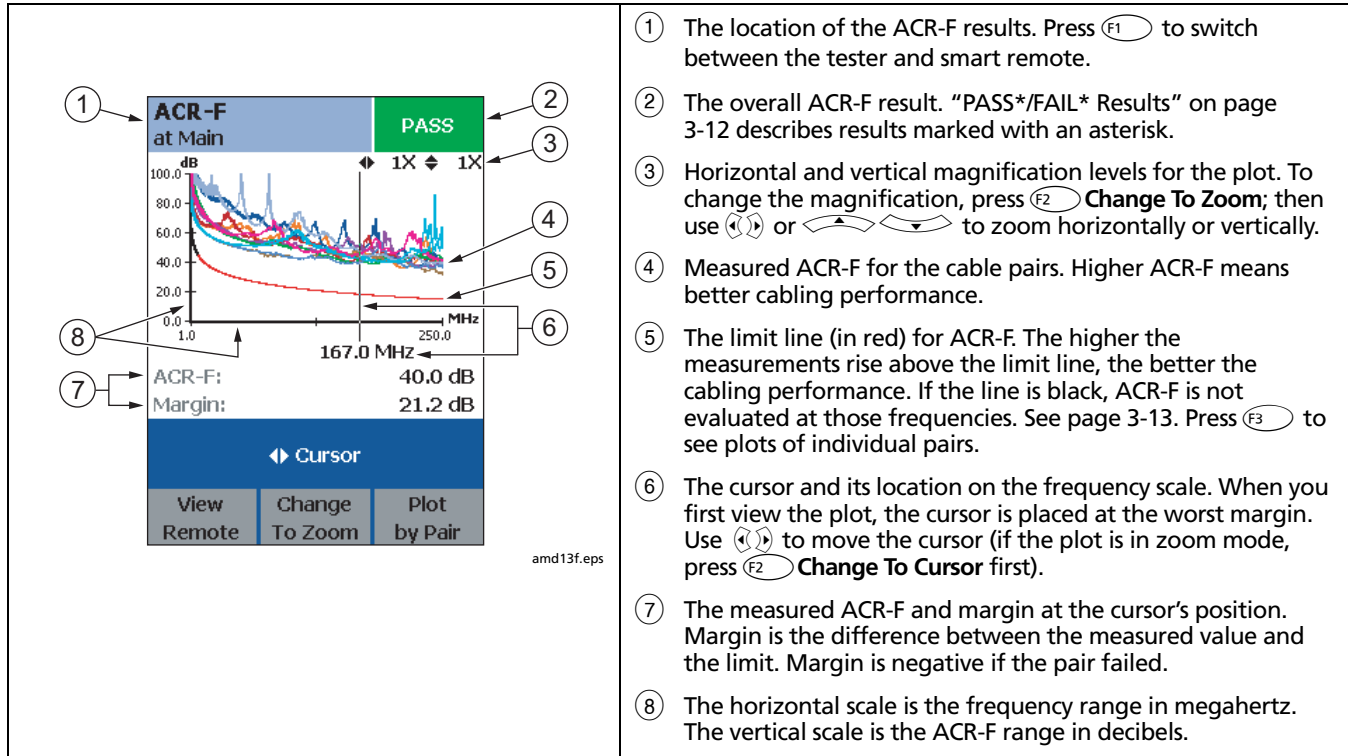
① The location of the ACR-F results. Press (F1) to switch between the tester and smart remote.

② The overall ACR-F result. "PASS*/FAIL* Results" on page 3-12 describes results marked with an asterisk.

③ Horizontal and vertical magnification levels for the plot. To change the magnification, press (F2) **Change To Zoom**; then use ⦷ or ⦶⦷ to zoom horizontally or vertically.

④ Measured ACR-F for the cable pairs. Higher ACR-F means better cabling performance.

⑤ The limit line (in red) for ACR-F. The higher the measurements rise above the limit line, the better the cabling performance. If the line is black, ACR-F is not evaluated at those frequencies. See page 3-13. 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 (if the plot is in zoom mode, press (F2) **Change To Cursor** first).

⑦ The measured ACR-F 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-F range in decibels.

Figure 3-23. ACR-F Plot

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 3-4 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 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 3-4. Smart Remote Requirements for Twisted Pair 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.
AC Wire Map	Required. See Chapter 4.
Resistance	Optional.
Impedance	Optional. Test is available only for limits that require the impedance measurement.
Length	Optional.
Propagation Delay	Optional.
Delay Skew	Optional.
Insertion Loss	Required.
NEXT/PS NEXT	Recommended. The NEXT test may fail if the end of the cabling is not properly terminated with a remote or resistors.
ACR-F/PS ACR-F	Required.
ACR-N/PS ACR-N	Required.
Return Loss	Recommended. The return loss test may fail if the end of the cabling is not 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 3-24. 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.
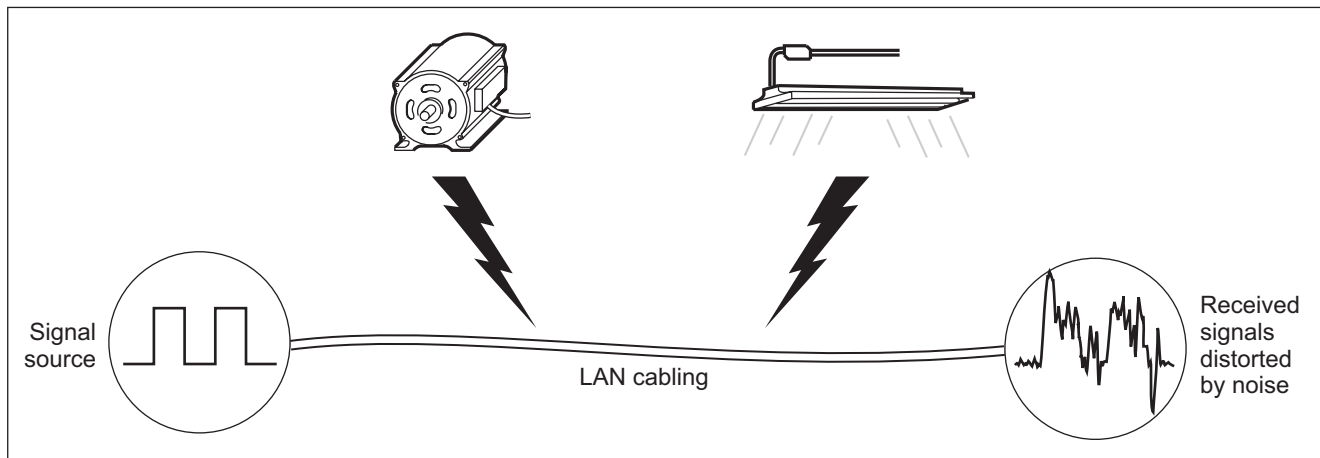
amd95f.eps

Figure 3-24. 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.

Note

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.

4 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 3-25 describes the impulse noise test results.

Impulse Noise

Testing...

Average: 0.00 /s ①
Peak: 0.00 /s
4:34:35 p.m. ②

Impulse Noise Threshold: ③
40mV

Press F3 to stop or
change threshold

Stop

④

amd18f.eps

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 ▲ ▼.

④ To stop the test, press F3 **Stop**.

Figure 3-25. 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 3-26.

3 To turn on the tester's toner, turn the rotary switch to **AUTOTEST** or **SINGLE TEST**; then press ⌨TEST.

4 To turn on the smart remote's toner, press ⌨TEST.

5 Use a tone probe to locate the cable or jack transmitting the tone.

Note
The toner's signal may not be detectable along shielded cable, but can be detected at a patch panel or outlet.

6 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.

Patch panel

Tone probe, such as
the Fluke Networks
IntelliTone probe

Volume
control

Tester or
smart remote

Press (TEST) to start the toner
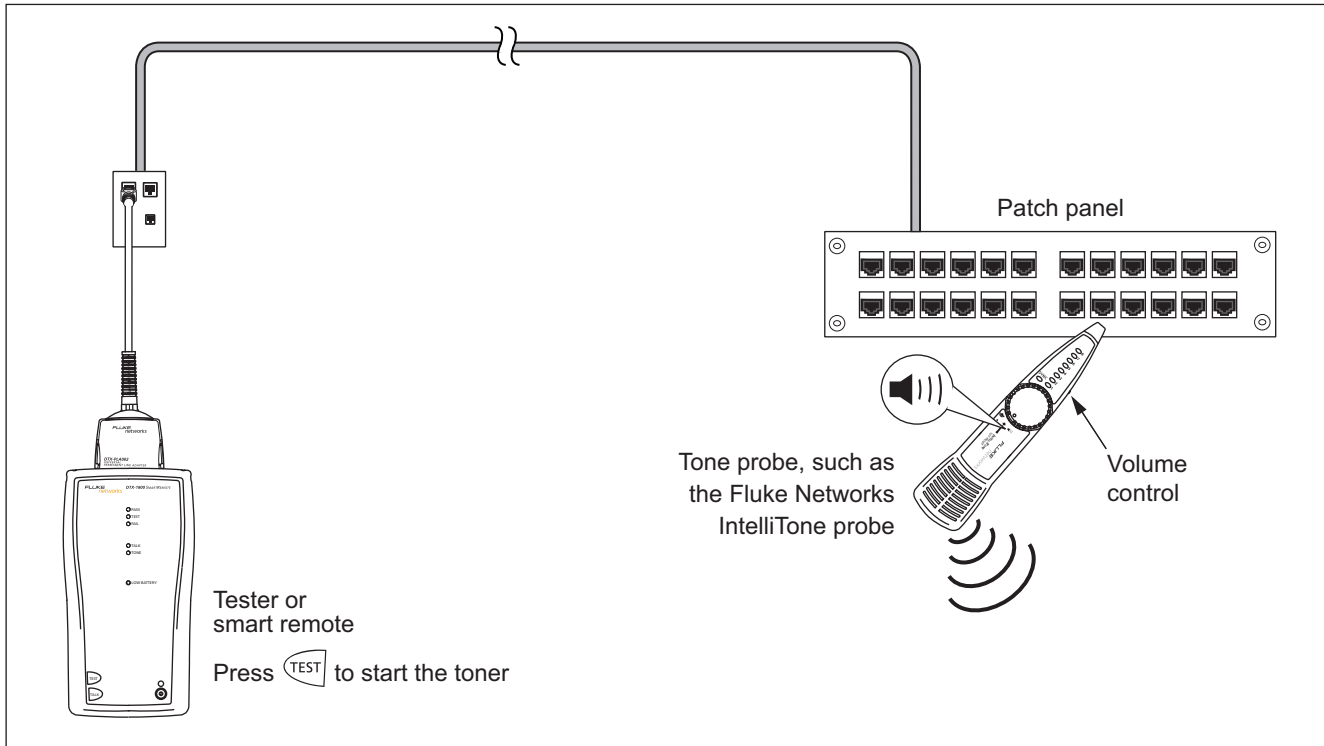
amd96f.eps

Figure 3-26. Using the Tone Generator

Chapter 4: Testing Twisted Pair Through a PoE Device

The AC wire map test lets you test links connected through midspan PoE (Power over Ethernet) devices. When you enable this test, the tester uses AC signals instead of DC signals to test the wire map between the main and remote testers. The tester does not provide information on the PoE device.

> *Note*
>
> *The DTX-ELT does not include the AC wire map test.*

Enabling the AC Wire Map Test

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

2 Press ⓔⓝⓣⓔⓡ to select **Twisted Pair**.

3 Press ⓘ to select tab **2**.

4 Press ⬍ to highlight **AC Wire Map**; then press ⓔⓝⓣⓔⓡ.

5 Use ⬍ to highlight **Enable**; then press ⓔⓝⓣⓔⓡ.

> *Note*
>
> *Always disable the AC Wire Map test when not testing through a PoE device.*

Autotest Through a PoE Device

1 Enable the **AC Wire Map** test.

2 Connect to the cabling as shown in Figure 4-1 for a permanent link or Figure 4-2 for a channel

3 Verify that the PoE device is turned off.

4 Run an Autotest as described on page 3-6.

> *Notes*
>
> *When the AC Wire Map test is enabled:*
>
> - *The Autotest may run slower.*
> - *Some tests, such as resistance, are not run.*
> - *The Autotest does not stop if a wire map fault is detected.*
> - *The AC Wire Map test requires a smart remote.*

Horizontal cabling

Patch panel

Unpowered midspan
PoE device

Start
permanent
link

Optional
consolidation
point

Work area

Wall
outlet

End
permanent
link

Tester with permanent
link adapter

Smart remote with
permanent link adapter
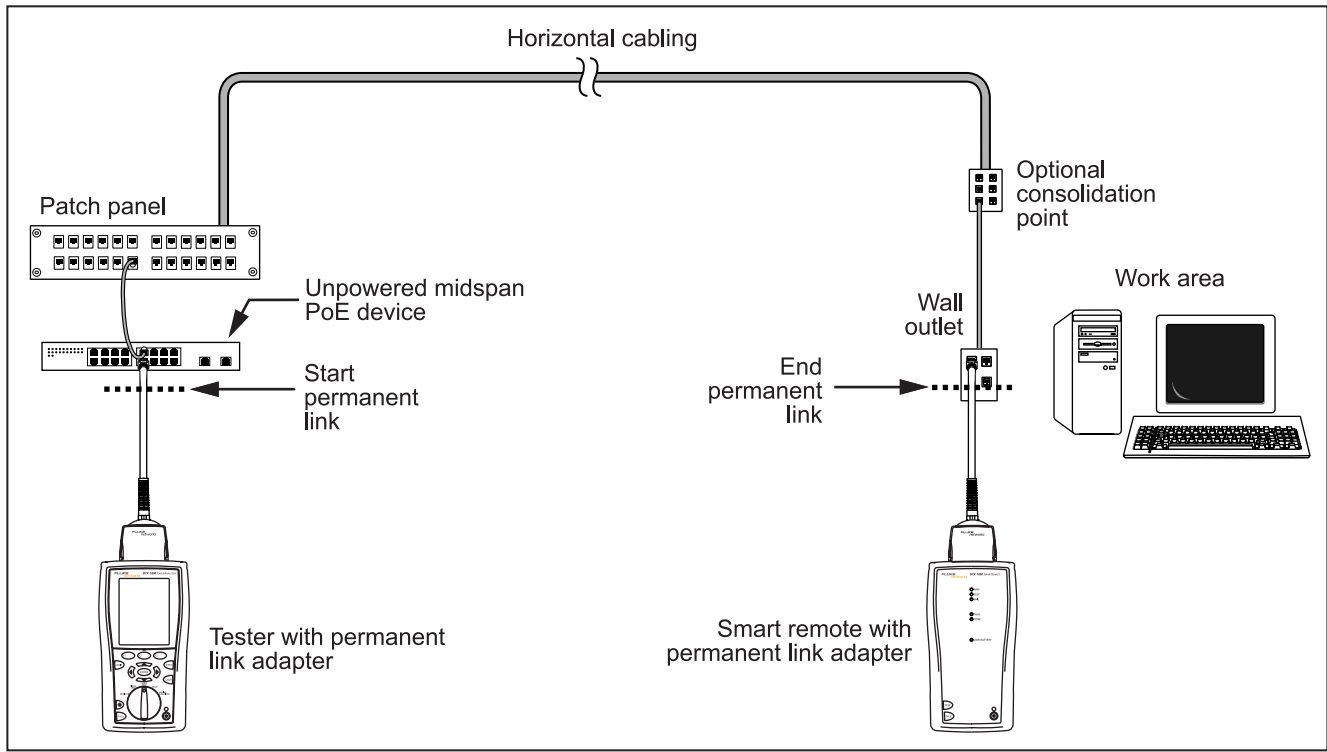
amd24f.eps

Figure 4-1. Testing a Permanent Link Through a PoE Device

amd58f.eps
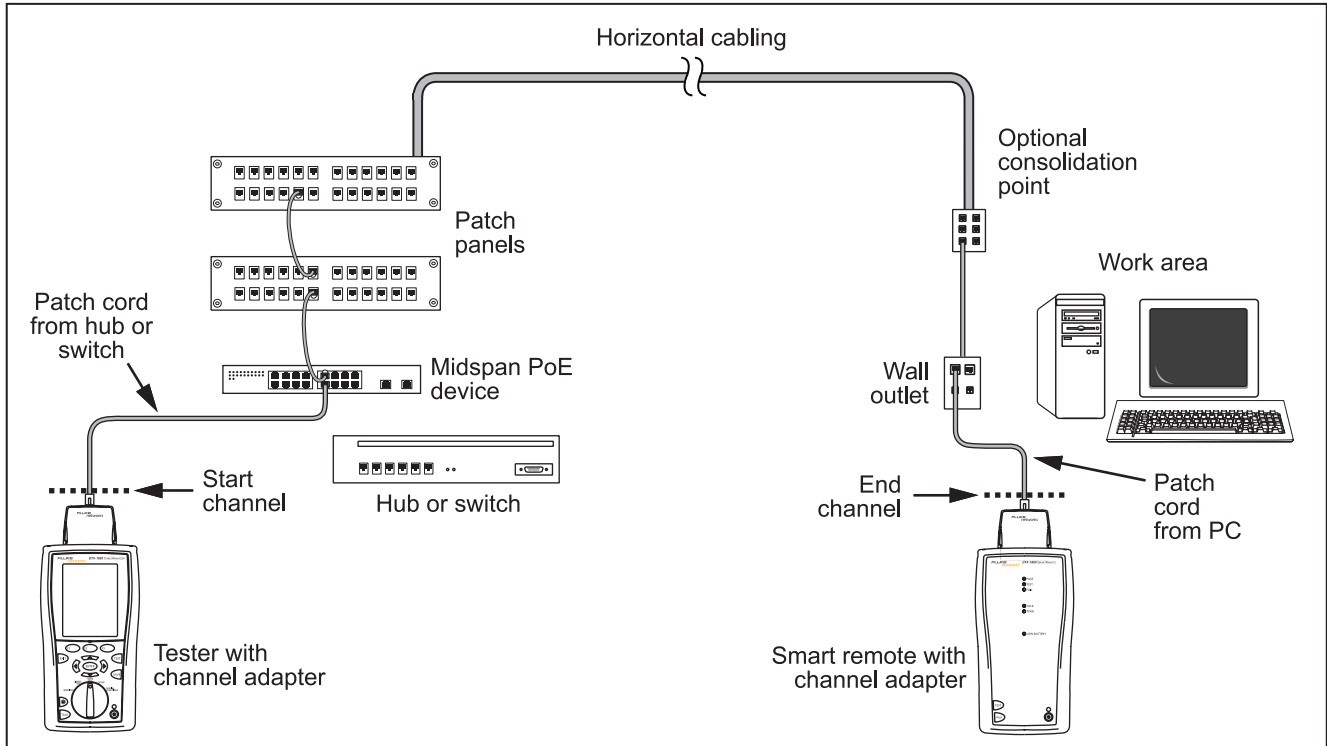
Figure 4-2. Testing a Channel Through a PoE Device

AC Wire Map Results

AC wire map results are similar to the wire map results shown in Chapter 3. In some cases, the fault information provided by AC wire maps is less specific. For example, if a wire is shorted to a wire in another pair, the AC wire map shows all four wires shorted. This occurs because the AC electrical characteristics of some faults limit the measurements available from the fault.

Figure 4-3 describes examples of AC wire map screens.

When the tester detects multiple wire map faults or cannot map the cable wiring, it may not display the wire map screen, but may show a diagnostics screen instead. Figure 4-4 describes examples of these screens.

Tip: To isolate faults when limited wire map or fault information is available, disable the AC wire map test; then test the cabling after the PoE device. Also test the patch cord connecting the PoE to the link.

Wire Map T568B — FAIL	Wire Map T568B — FAIL	Wire Map T568B — FAIL
Open on pair 1,2. The open is 21.7 m from the tester and 61.4 m from the remote. The open may be on either or both wires.	Short between pairs 1,2 and 3,6. The short is 1.7 m from the tester. The short may be between two, three, or all four wires.	Split pair on pairs 1,2 and 3,6. The split pair starts 30.0 m and ends 52.2 m from the main tester.

Notes

AC wire maps show the wire pair numbers next to each other if there is a fault on the cable.

AC wire maps do not show the shield connection unless there is a short to the shield.

Figure 4-3. AC Wire Map Examples

amd43.bmp

amd44.bmp

The tester detected one or more wire map faults on pairs 1,2 and 3,6 about 4 ft from the tester. The distance to faults may not be given for some types of complex faults.

The tester detected multiple, complex faults on the cabling.
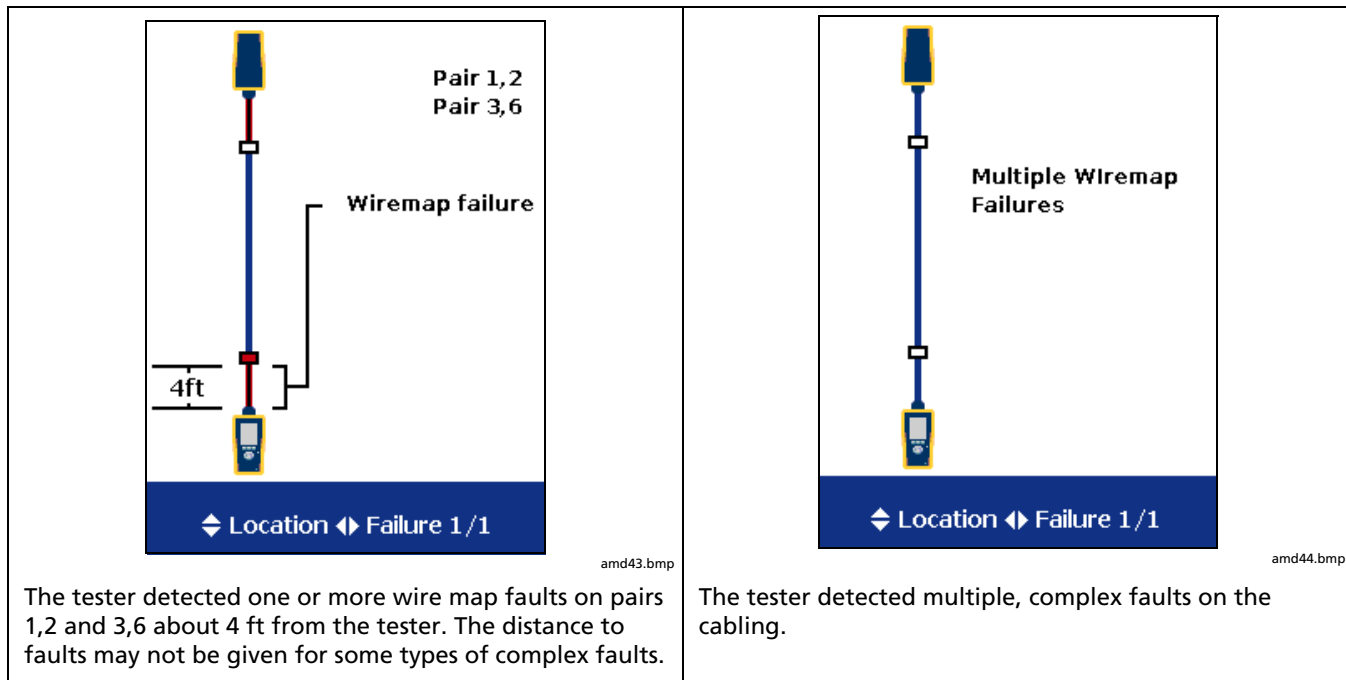
Figure 4-4. Examples of AC Wire Map Results for Complex Faults

Running the AC Wire Map Test as a Single Test

To run the AC Wire Map test as a single test, enable the test in SETUP, turn the rotary switch to **SINGLE TEST**; then select **Wire Map**.

Note

The scanning function is not available for the AC wire map test.

Chapter 5: Certifying Coaxial Cabling

Certifying coaxial cabling requires the optional DTX-COAX coaxial adapters.

Note

The DTX-COAX adapters are not compatible with the DTX-CLT.

Setting the Reference

The reference procedure sets a baseline for insertion loss and 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.

To set the reference, do the following:

Note

Turn on the tester and let it 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 ℉).

1   Attach coaxial adapters to the main and remote testers, screw in the F-connector to BNC adapters; then make the connections shown in Figure 5-1.

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**.

4   Press (TEST).

amd140.eps
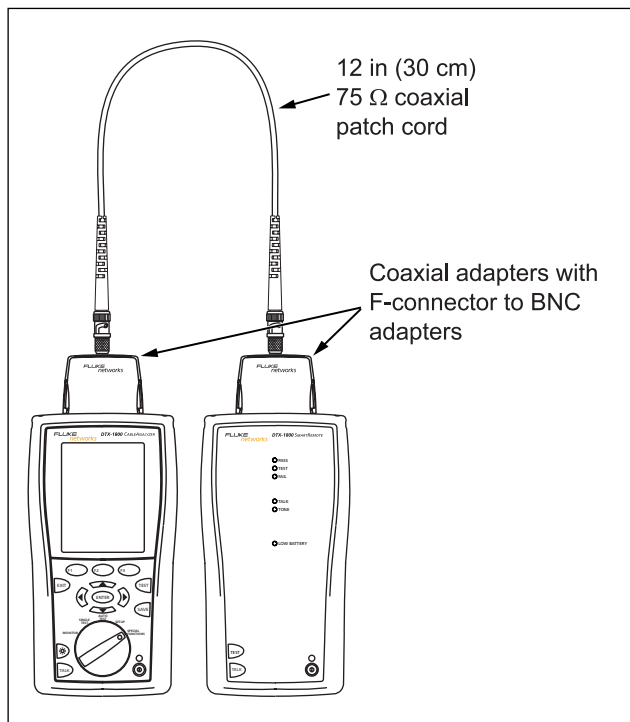
Figure 5-1. Coaxial Reference Connections

12 in (30 cm)
75 Ω coaxial
patch cord

Coaxial adapters with
F-connector to BNC
adapters

Verifying Operation

1 Connect the main and remote testers as shown for setting the reference in Figure 5-1.

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

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

4 Press (TEST).

If the tester reports an error, refer to "If Something Seems Wrong" on page 14-9.

Coaxial Test Settings

Table 5-1 describes the settings that apply to coaxial cabling tests.

To access the settings, turn the rotary switch to **SETUP**, use ⬇️ to highlight **Coax**; then press (ENTER).

Table 5-1. Coaxial Cable Test Settings

Setting	Description
SETUP > Coaxial > Test Limit	Select the appropriate test limit for the job.
SETUP > Coaxial > Cable Type	Select a cable type appropriate for the type you will test.
SETUP > Coaxial > 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 30 m (100 ft) long. See page 12-10. Increasing the NVP increases measured length.

Table 5-1. Coaxial Cable Test Settings (cont.)

Setting	Description
SETUP > Instrument Settings > Store Plot Data	**Standard**: The tester displays and saves plot data for insertion loss. The tester saves data for the frequency range required by the selected test limit.
	Extended: The tester saves data beyond the frequency range required by the selected test limit.
	No: Plot data is not saved, which lets you save more results. Saved results show only worst margins and worst values for each pair.
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 5-1.
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 on page 2-1.
SETUP > Instrument Settings > Power Line Frequency	Set to the power frequency in the area where the tester will be used. This setting helps keep ac noise (50 Hz or 60 Hz) from affecting resistance measurements.

Autotest on Coaxial Cabling

Figure 5-2 shows the equipment needed for certifying coaxial cabling.

amd138.eps

① Tester and smart remote with battery packs

② Memory card (optional)

③ DTX coaxial adapters with female-to-female F-connector adapters installed

④ F-connector-to-BNC adapters (for testing network coaxial cabling)

⑤ Two ac adapters with line cords (optional)
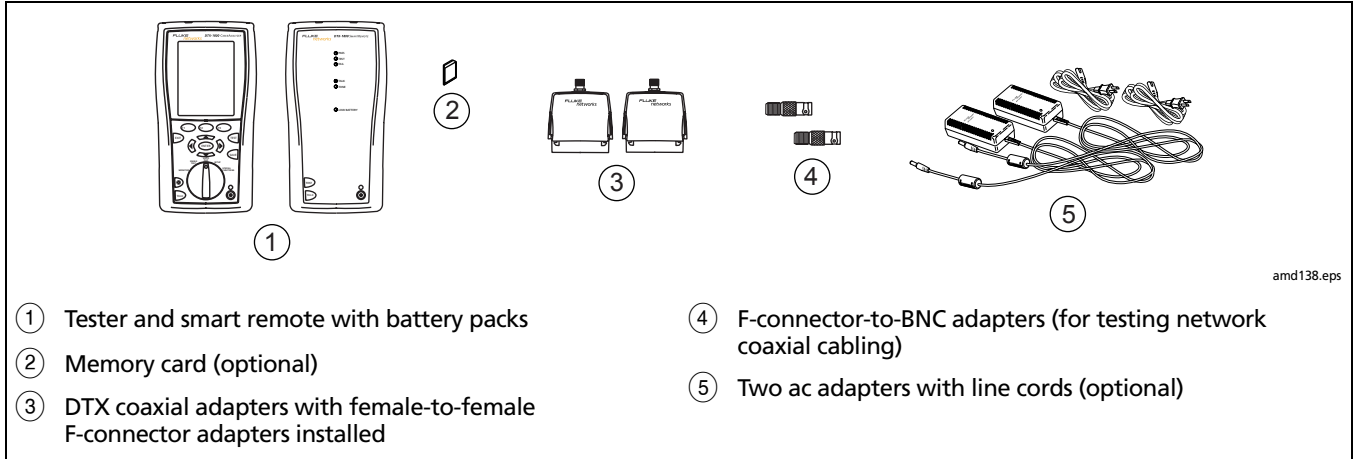
Figure 5-2. Equipment for Certifying Coaxial Cabling

To run the Autotest on coaxial cabling:

1. Verify that the settings listed in Table 5-1 are appropriate.

2. Attach coaxial adapters appropriate 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 5-3 for network cabling or Figure 5-4 for video cabling.

   If a fiber module is installed, you may need to press �F1 **Change Media** to select **Coax** as the media type.

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

   The tester shows the Autotest **Summary** screen when the test is complete (see page 5-9). To view results for a specific parameter, use ▲ ▼ to highlight the parameter; then press ENTER.

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

   Note

   If you turn off the main or remote unit while the two units are connected through coaxial adapters, the unit will turn on again.

BNC "T"
connectors
between segments
(if installed)

F-connector to BNC
adapter

F-connector to BNC
adapter

Tester with coaxial
adapter

Smart remote with
coaxial adapter
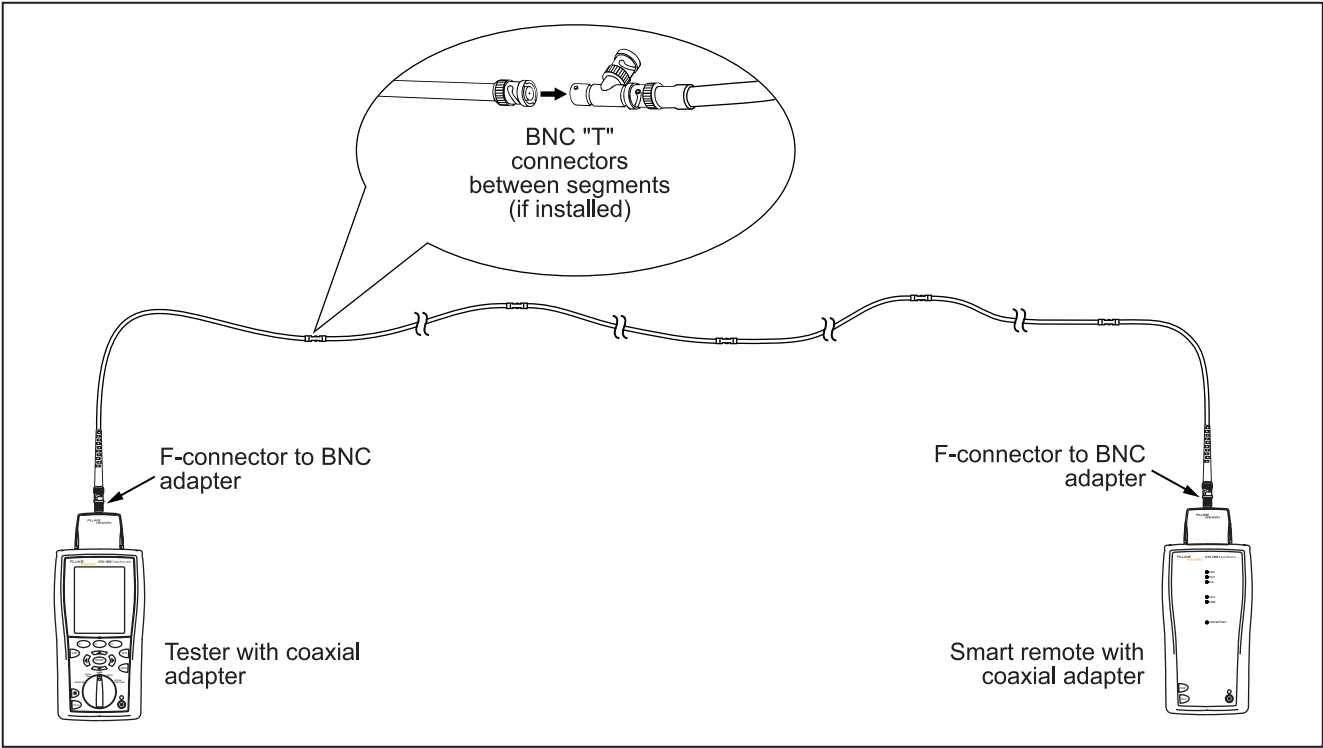
amd139.eps

Figure 5-3. Coaxial Network Cabling Test Connections

5-7
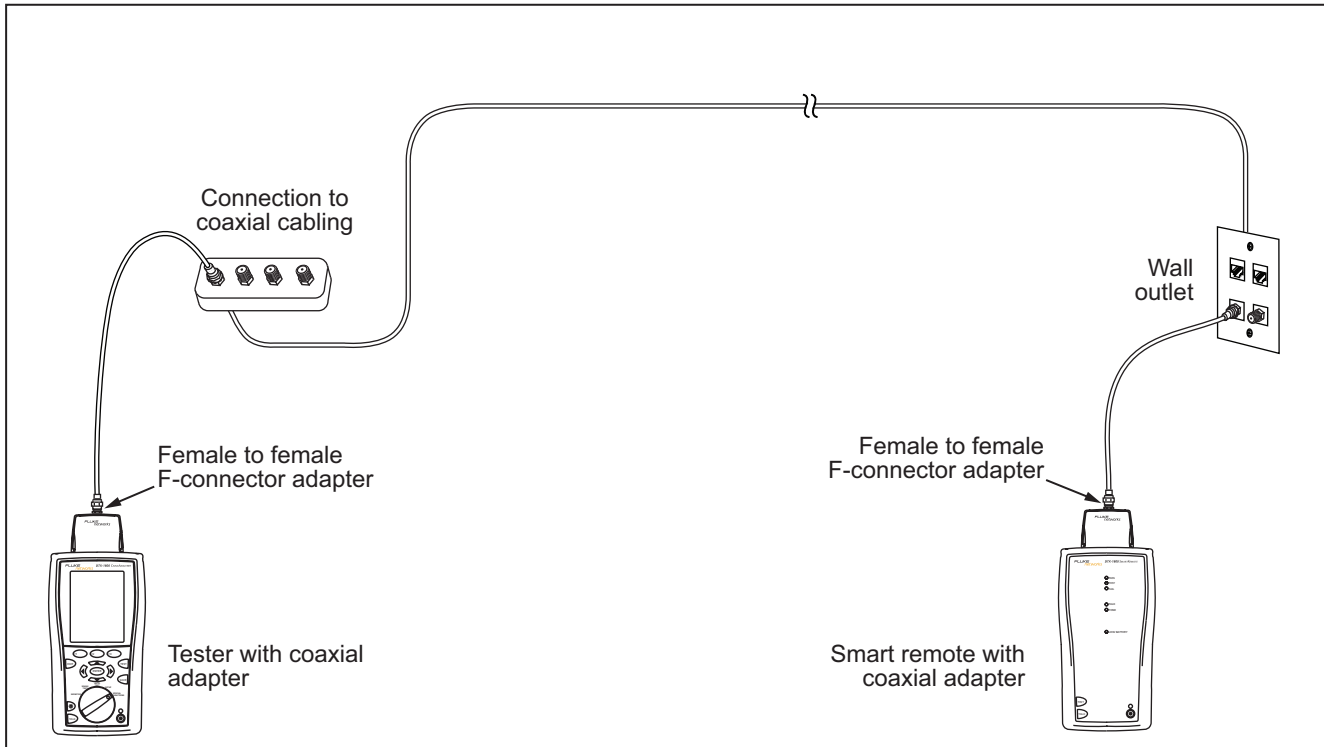
amd142.eps

Figure 5-4. Coaxial Video Cabling Test Connections

Coaxial Autotest Results

Figure 5-5 describes the Autotest **Summary** screen, which lists the tests that apply to coaxial cabling.
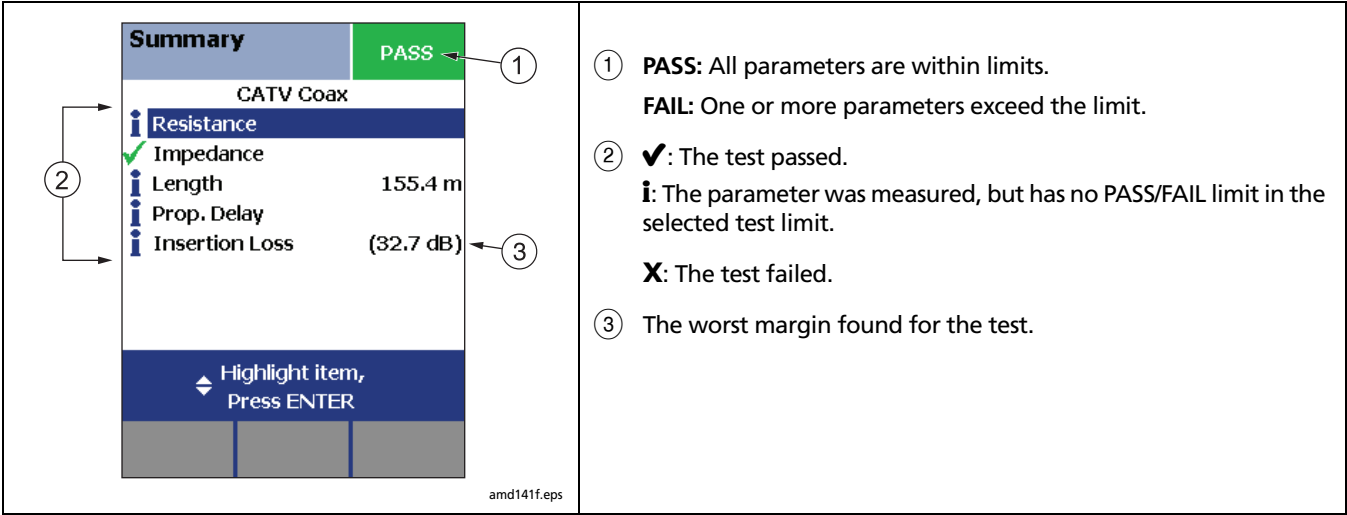
Figure 5-5. Autotest Results for Coaxial Cabling

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

   FAIL: One or more parameters exceed the limit.

② ✔: The test passed.

   i: The parameter was measured, but has no PASS/FAIL limit in the selected test limit.

   X: The test failed.

③ The worst margin found for the test.

HDTDR Analyzer

The HDTDR™ (High-Definition Time Domain Reflectometry) analyzer plots the locations and magnitudes of reflections caused by impedance anomalies. See page 6-10.

Resistance

Resistance results show the dc loop resistance for the center conductor and shield. The smart remote shorts the conductor and shield to create the loop.

Most standards do not have a limit for resistance. The tester shows an **i** when no limit is available.

Tip: The resistance test in Single Test mode features a scanning function that runs the resistance test continuously. This function is helpful for locating intermittent faults.

Impedance

Note

*Impedance measurements require a cable at least 13 ft (4 m) long. The tester shows **Unknown** for cables shorter than this.*

Impedance results show the approximate characteristic impedance of the cable at a point approximately 13 ft (4 m) from the tester.

Characteristic impedance is the impedance a cable would have if the cable were infinitely long. Good cabling has relatively constant characteristic impedance throughout the cable and connectors.

Changes in impedance cause signal reflections in cabling. In computer networks, signal reflections can cause network faults. In video systems, reflections can cause poor reception.

Length

Length results show the length of the cabling.

Note

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.

Propagation Delay

Propagation delay is the time taken for a test pulse to travel the length of the cabling. The delay is measured in nanoseconds. One nanosecond is one-billionth of a second, or 0.000000001 second.

Insertion Loss

Insertion loss is the loss of signal strength over the cabling. 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.

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 5-2 shows which tests require a smart remote.

Single tests use the selected test limit to produce a PASS/ FAIL result for the test.

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

Table 5-2. Smart Remote Requirements for Coaxial Single Tests

Test	Smart Remote Requirements*
HDTDR analyzer	Optional. Without a smart remote, the plot shows large reflections at the end of the cabling.
Resistance	Smart remote or terminator required for loop resistance measurement.
Length	Not required. Because a coaxial cable terminator eliminates signal reflections, the tester cannot measure the length of terminated cabling. The tester shows **End Not Found** in this case.
Impedance	Optional. Without a smart remote or terminator, the tester cannot measure the impedance of cables longer than 984 ft (300 m). The tester shows **Unknown** in this case.
Propagation delay	Not required. Because a coaxial cable terminator eliminates signal reflections, the tester cannot measure the propagation delay of terminated cabling. In this case, the tester shows **End Not Found**.
Insertion Loss	Required.
* If a remote is not required for a test, the test runs without activating the toner when no remote is detected.	

Chapter 6: Diagnosing Copper Cabling Faults

Using the Automatic Diagnostics

The DTX Series testers helps you isolate cabling faults by automatically diagnosing Autotest failures. For twisted pair tests, 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 page 14-2 for details on installing updates.

- Set the reference for the twisted pair adapters every 30 days. See page 3-1 for details.

- Run the self test before going to the job site. See page 1-24 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 Copper Cabling Failures

Table 6-1 describes common causes of test failures on twisted pair and coaxial cabling.

Table 6-1. Diagnosing Twisted Pair Test Failures

Wire Map: open • Wires connected to wrong pins at connector or punchdown blocks • Faulty connections • Damaged connector	**Tip:** The wire map test in Single Test mode features a scanning function that runs the wire map test continuously. This function is helpful for locating intermittent wiring faults.

Wire Map: split pair or reversed pair

Wires connected to wrong pins at connector or punchdown block.

Wire Map: crossed wires

• Wires connected to wrong pins at connector or punchdown block.

• Mix of 568A and 568B wiring standards (12 and 36 crossed).

• Crossover cables used where not needed (12 and 36 crossed).

Table 6-1. Diagnosing Twisted Pair Test Failures (cont.)

Wire Map: short	
• Damaged connector	• Improper connector termination
• Damaged cable	• Wrong application for cable
• Conductive material stuck between pins at connector.	

"Bad patch cord" message appears (indicates excessive crosstalk over the first 2 m of the cabling)

- Poor quality patch cord used for channel
- Cable on permanent link interface adapter is badly distorted or damaged
- Wrong test standard selected

A test passes, but the plot shows that measurements exceed the limit

A dB rule may apply. See "About dB Rules" on page 3-13.

Resistance gives FAIL, FAIL*, or PASS* result	
• Cabling is too long	**Tip:** The resistance test in Single Test mode features a scanning function that runs the resistance test continuously. This function is helpful for locating intermittent resistance faults. Note that the resistance test is available in Single Test mode only if the selected standard has a limit for resistance.
• Bad connection due to oxidized or loose contacts	
• Wire gauge is too thin	
• Wrong patch cord type used	

-continued-

Table 6-1. Diagnosing Twisted Pair Test Failures (cont.)

Characteristic impedance exceeds the limit or an anomaly is detected	
• Bad connection	• Water in cable jacket
• Cable compression (tight cable ties, pinches, kinks, etc.)	• Excessive loading at coaxial cable tap
• Mismatch of cable types	• Incorrect terminator value (coaxial cable)
Length gives a FAIL result	
• Cable is too long (may need to remove coiled service loops)	
• NVP is set incorrectly	
Length exceeds the limit, but the length test did not fail	
If the length of the shortest pair does not exceed the limit by 10 %, then the length test passes even if other pairs exceed the limit. This is the 10 % rule for length, as given in the ANSI/TIA standard. See the Fluke Networks Knowledge base for details.	
Propagation delay or delay skew gives FAIL result	
• Cable is too long (may need to remove coiled service loops)	
• Cable uses different insulation materials on different pairs	
Insertion loss gives FAIL, FAIL*, or PASS* result	
• Cabling is too long	• Wrong cable type in installation
• Poor quality patch cord	• Wrong test standard selected
• Bad connection	

Table 6-1. Diagnosing Twisted Pair Test Failures (cont.)

Return loss gives FAIL, FAIL*, or PASS* result

- Patch cord or cable impedance not 100 Ω
- Patch cord handling causing changes in impedance
- Excessive amount of cable jammed into outlet box
- Tight service loops in telecommunications closet
- Excessive untwisting of pairs at connector
- Poor quality connectors
- Cable impedance not uniform (poor quality cable)
- Mismatches in cable construction (such as cable from different manufacturers)
- Water in cable jacket
- Cable compression (tight cable ties, pinches, kinks, etc.)

- Poorly matched plug and jack (6A/Class E_A applications)
- Wrong test standard selected
- Defective link interface adapter

Tip: The HDTDR test in Single Test mode features a scanning function that runs the HDTDR test continuously. This function can be helpful for locating return loss faults caused by tight loops and cable compression. See page 6-10.

Table 6-1. Diagnosing Twisted Pair Test Failures (cont.)

NEXT, PS NEXT, ACR-F, PS ACR-F gives FAIL, FAIL*, or PASS* result	
• Excessive untwisting of pairs at connector	*Note*
• Poor quality patch cords	*Fixing NEXT problems usually corrects ACR-F problems.*
• Poor quality connectors	
• Poor quality cable	
• Poorly matched plug and jack (6A/Class E$_A$ applications)	**Tip:** The HDTDX test in Single Test mode features a scanning function that runs the HDTDX test continuously. This function can be helpful for locating crosstalk faults caused by cable compression and noise sources. See page 6-7.
• Incorrect link interface adapter	
• Cable compression (tight cable ties, pinches, kinks, etc.)	
• Inappropriate use of couplers	
• Excessive noise source near cabling under test. Use the impulse noise test to check for noise.	
• Wrong test standard selected	
Impulse noise is detected	
• Electrical devices near the cabling are generating noise pulses.	
• There is an active link in the same bundle as the cabling under test.	
• 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 ACR-F failures.

Running the HDTDX Analyzer

After an Autotest, you can view HDTDX results if the Autotest test failed or had a **PASS*** result, or if **HDTDX/ HDTDR** in Setup is set to **All AUTOTESTs**.

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 $\boxed{\text{TEST}}$.

5   To run the HDTDX analyzer continuously, press $\overline{\text{F3}}$ **Plot by Pair** to select a pair; then press $\overline{\text{ENTER}}$ to start the scanning function.

6   To save the results, press $\boxed{\text{SAVE}}$. Select or create a cable ID; then press $\boxed{\text{SAVE}}$ again.

Note

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

Figure 6-1 describes the HDTDX plot.

amd19f.eps

① The magnitude of crosstalk. Crosstalk levels plotted are adjusted to compensate for insertion loss. This means the plot represents the magnitudes of signals at the crosstalk source.

② The beginning and end of the cabling under test. For a permanent link, the plot shows some of the permanent link adapter cable before and after the cabling under test.

③ Horizontal and vertical magnification levels for the plot. In zoom mode, use ◁▷ and ▱▱ to zoom in or out at the cursor's location.

④ The distance to the end of the cabling.

⑤ The cursor and the distance to the cursor from the tester. In cursor mode, use ◁▷ to move the cursor.

⑥ The crosstalk magnitude at the cursor's location.

⑦ Shows the crosstalk plots by pair. Press EXIT to return to the plot of all pairs.

⑧ Toggles the display between zoom and cursor modes.

⑨ Sets or clears the measurement marker. See ⑩.

⑩ The distance between the measurement cursors.

To use the measurement cursors (with the plot in cursor mode):

1 Press F1 **Clear Mark** if necessary; then 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 Mark**; then use ◁▷ to move the second cursor to the end of the area of interest.

Figure 6-1. HDTDX Plot (permanent link adapters used)

Recognizing Faults on HDTDX Plots

Figure 6-2 shows how some common faults appear on HDTDX plots.

① Bad patch cord   ② Bad section of cable   ③ Bad spool of cable

amd98f.eps

① A bad patch cord about 53 m from the 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.
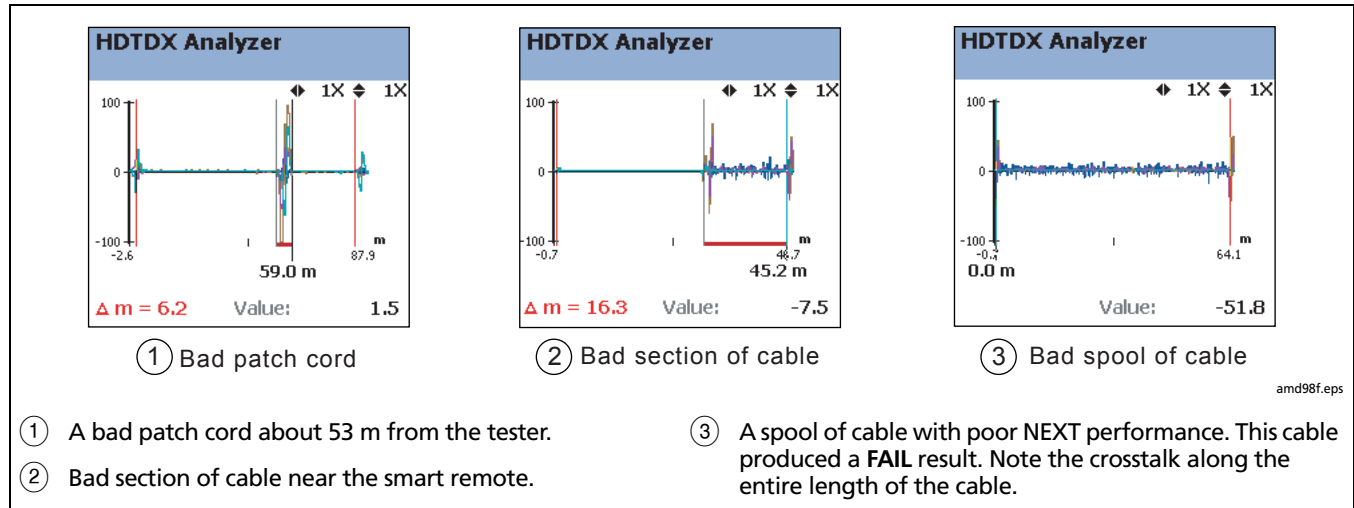
Figure 6-2. Interpreting HDTDX Plots

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 if the Autotest test failed or had a **PASS*** result, or if **HDTDX/ HDTDR** in Setup is set to **All AUTOTESTs**.

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 run the HDTDR analyzer continuously, press (F3) **Plot by Pair** to select a pair; then press (ENTER) to start the scanning function.

6   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 6-3 describes the HDTDR analyzer plot.

Recognizing Faults on HDTDR Plots

Figure 6-4 on page 6-12 shows how some common faults appear on HDTDR plots.

amd97f.eps

① The percentage of the HDTDR test signal reflected back to the tester. See Figure 6-4. Reflections plotted are adjusted to compensate for insertion loss. This means the plot represents the magnitudes of signals at the reflection source.

② The beginning and end of the cabling under test. For a permanent link, the plot shows some of the permanent link adapter cable before and after the cabling under test.

③ Horizontal and vertical magnification levels for the plot. In zoom mode, use ⟨⟨⟩⟩ and ⌣⌣⌣ to zoom in or out at the cursor's location.

④ The distance to the end of the cabling.

⑤ The cursor and the distance to the cursor from the tester. In cursor mode, use ⟨⟨⟩⟩ to move the cursor.

⑥ The reflection percentage at the cursor's location.

⑦ Shows the reflection plots by pair. Press ⏏ to return to the plot of all pairs.

⑧ Toggles the display between zoom and cursor modes.

⑨ Sets or clears the measurement marker. See ⑩.

⑩ The distance between the measurement cursors.

To use the measurement cursors (with the plot in cursor mode):

1 Press F1 **Clear Mark** if necessary; then 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 Mark**; then use ⟨⟨⟩⟩ to move the second cursor to the end of the area of interest.

Figure 6-3. HDTDR Plot (permanent link adapters used)
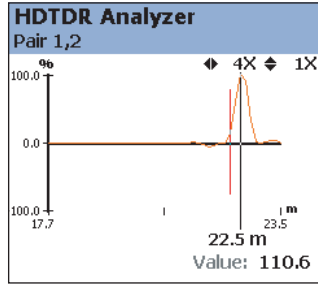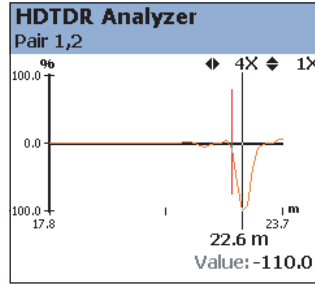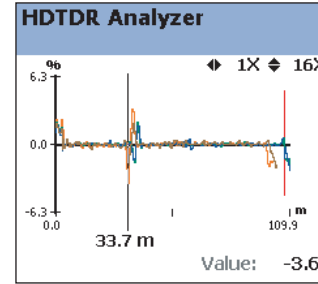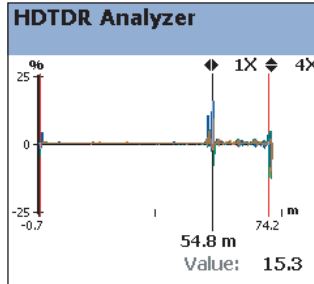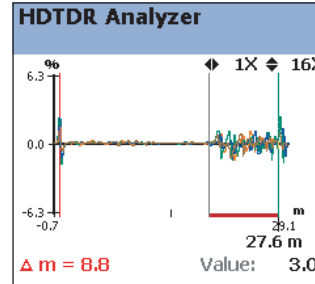
Figure 6-4. Interpreting HDTDR Plots

amd100f.eps

① Open on pair 1,2 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 1,2 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 patch cord at about 33 m.

④ A link with a section of cable that has higher impedance (120 Ω) than the rest of the cable. The bad section starts at about 54 m. 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 section.

⑤ A link with a section of cable that has poor return loss. The section produces reflections along its entire length.

Chapter 7: Using the OTDR Module

Note

The DTX-OTDR module is not compatible with the DTX-ELT, DTX-CLT, or DTX-CLT CertiFiber.

Overview of Features

The optional DTX Compact OTDR™ Optical Time Domain Reflectometry modules are used with a DTX Series CableAnalyzer to locate and characterize reflective and loss events in optical fibers. The modules offer the following features:

- Automated OTDR trace and event analysis help you locate and analyze reflective and loss events on multimode (850 nm and 1300 nm; 50 μm and 62.5 μm) and singlemode (1310 nm and 1550 nm; 9 μm) fiber.

- Displays OTDR results in summary format, as a table of events, or as an OTDR trace. PASS/FAIL results are based on factory-installed limits or limits you specify.

- Visual fault locator helps you locate breaks, bad splices, bends, and check fiber continuity and polarity. See Chapter 9.

Safety Information

⚠Warning☀

To avoid possible eye damage caused by hazardous radiation and to avoid possible fire, electric shock, or personal injury:

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

- Never run any tests that activate the OTDR or VFL outputs unless a fiber is attached to the port.

- 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 a module is not installed.

- 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. See page 7-8.

- Cover all connectors with protective caps when not in use.

- For modules that support two wavelengths, never run a test with a fiber connected to the unused port. Reflections from the fiber can affect measurements on the port being used.

- Never connect the OTDR ports to an optical source. Doing so can damage the OTDR receiver.

- Never connect the OTDR to an active network. Doing so causes unreliable test results and can disrupt network operations.

- Avoid touching reflective surfaces (such as metal) to the end of a fiber cable plugged into the OTDR when the OTDR is operating. An open fiber connector end face has about a 4% reflection. Holding a reflective surface near the connector end face may cause much greater than a 4% reflection, which may damage the photodetector in the OTDR.

- Read the instructions for splice machines before using the OTDR to monitor splicing procedures. The OTDR can interfere with the light injection detection techniques used by some splicers.

Installing the OTDR Module

⚠Caution

To avoid damaging the DTX mainframe or the OTDR module and to ensure proper operation:

- **Turn off the tester before removing or attaching modules.**

- **Leave the module bay cover in place when a module is not installed.**

To install the module, refer to Figure 7-1 and do the following:

① Turn off the tester.

② Remove and discard the standard bail.

③ Install the bail included with the DTX Compact OTDR module. This new bail has a keyed hole at the bottom where the OTDR module locks onto the bail.

④ Remove the module bay cover or the module currently attached to the tester.

⑤ Slide the OTDR module onto the tester.

⑥ Push the locking pin into the keyed hole in the bail; then turn the pin 1/4 turn to the right to lock the module onto the bail.
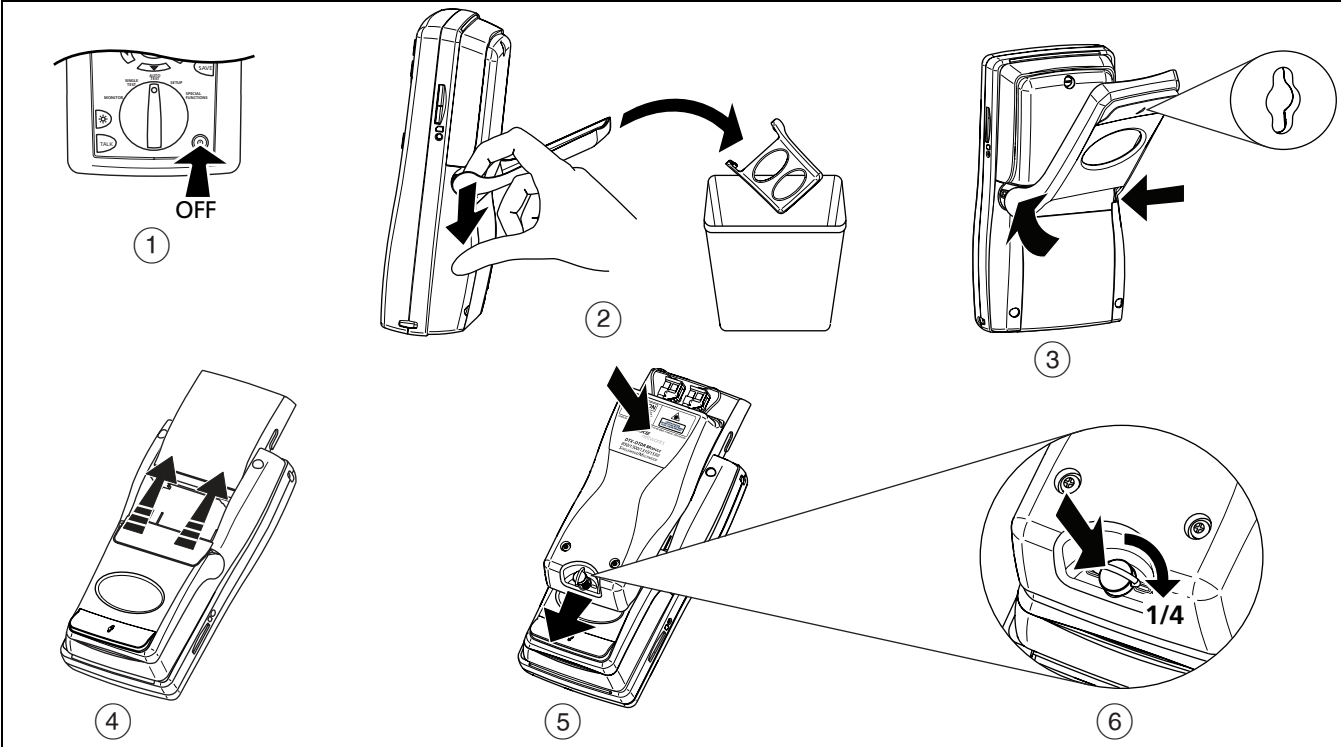
amd157f.eps

Figure 7-1. Installing the OTDR Module

Using the Cradle

Figure 7-2 shows how to use the cradle to stand the tester up on a flat surface when a DTX Compact OTDR module is attached.
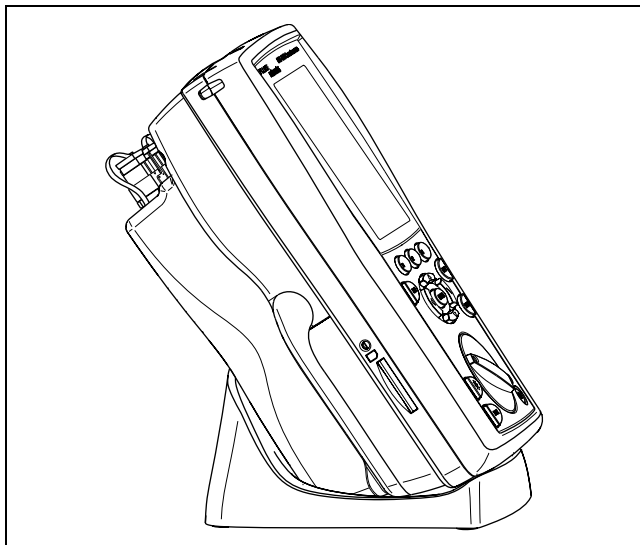
amd165.eps

Figure 7-2. Using the Cradle

Software Requirements

The following software supports the DTX Compact OTDR module. Software upgrades are available on the Fluke Networks website.

- DTX software: version 2.0 or higher.

- LinkWare software: version 3.0 or higher.
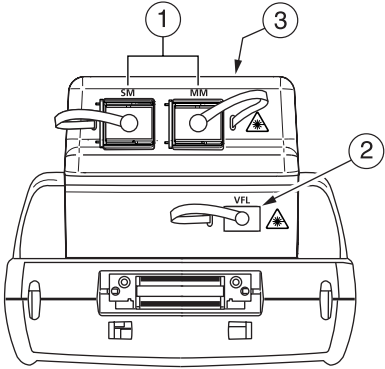
See the *DTX CableAnalyzer Users Manual* for instructions on updating the tester's software.

Notes

Update the software with the OTDR module attached to the tester.

If your tester's software version is lower than 2.0, you will need to do the software update procedure twice.

OTDR Module Features
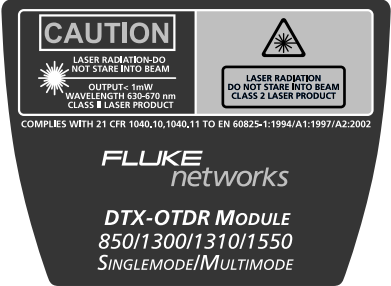
Ⓐ Warning ⚠

Never look directly into optical output connectors (①). Some sources produce invisible radiation that can permanently damage your eyes.

amd155f.eps

① OTDR ports for singlemode (left) and multimode (right) fiber. The ports have removable SC connector adapters with protective caps.

② Visual fault locator (VFL) output with universal fiber connector and protective cap. The connector accepts 2.5 mm ferrules.

③ Laser safety label (shown below):

amd156f.eps

Figure 7-3. OTDR Module Features

Verifying Operation

The tester performs a basic self test on the mainframe and OTDR module when you turn it on. To run the self test manually, select **Self Test** from the **SPECIAL FUNCTIONS** menu.

Setting Up for OTDR Testing

For information on configuring the tester's job settings, such as fiber IDs and folders for saving test results, see "Preparing to Save Tests" on page 2-1.

For information on setting user preferences, such as length units and numeric formats, see "Setting User Preferences" on page 1-27.

Always clean and inspect fiber connectors before making connections. Use fiber optic solvent and optical-grade wipes or swabs to clean connectors as follows:

Cleaning Bulkhead Connectors

1 Touch the tip of a fiber optic solvent pen or swab soaked in solvent to a lint-free dry wipe or fiber cleaning card.

2 Touch a new, dry swab to the solvent spot on the wipe or card. Push the swab into the connector, twist it around 3 to 5 times against the end-face, then remove and dispose of the swab.

3 Dry the connector with a dry swab by twisting it around in the connector 3 to 5 times.

4 Inspect connectors with a fiber microscope, such as the Fluke Networks FiberInspector Video Microscope before making connections.

Cleaning Fiber Adapters

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

Cleaning Connector Ends

1 Touch the tip of a fiber optic solvent pen or swab soaked in solvent to a lint-free dry wipe or fiber cleaning card.

2 Wipe the connector end-face across the solvent spot, then back and forth once across the dry area of the wipe or card.

Note

Some connector styles, such as VF-45, may require a different cleaning method.

3 Inspect connectors with a fiber microscope, such as the Fluke Networks FiberInspector Video Microscope before making connections.

Always cover unused connectors with protective caps. Clean caps periodically with a swab or wipe and fiber optic solvent.

Cleaning the OTDR Ports

Use a dry, optical-grade wipe to clean the OTDR ports. Figure 7-4 shows how to remove the OTDR adapter to access the connector ferrule.

The OTDR port connection quality screen helps you determine when the OTDR ports needs cleaning. See page 7-21.

If the port is very dirty, wipe the end of the ferrule with an optical-grade wipe lightly moistened with fiber optic solvent. Dry with a dry wipe.

Inspect the ports with a fiber microscope at regular intervals.

Unlocking and removing the adapter

Cleaning the ferrule (see text for details)

Locking the adapter in place
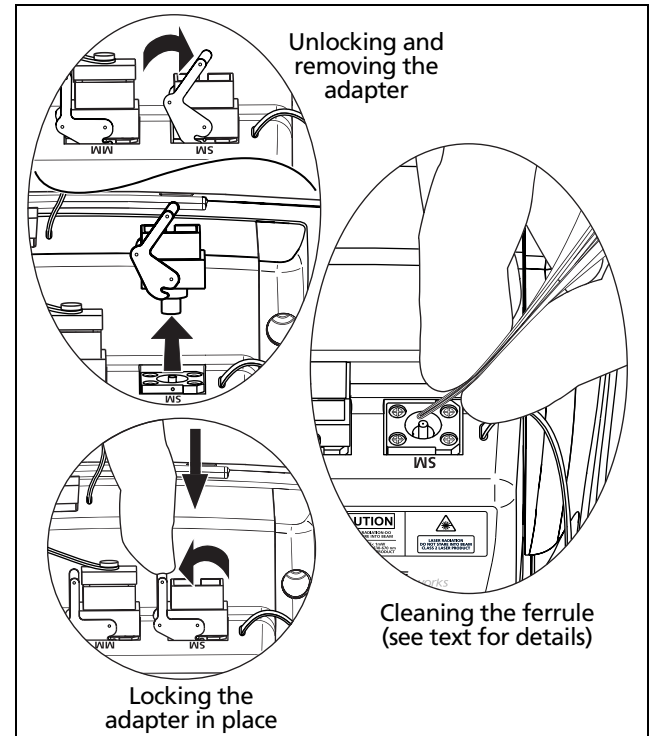
amd59f.eps

Figure 7-4. Cleaning the OTDR Ports

Selecting Auto or Manual OTDR Mode

Note

Typically, you should use Auto OTDR mode when certifying cabling with the OTDR.

From the **HOME** screen, press ⬭F3⬭ **Change Test**; then select **Auto** or **Manual**.

In **Auto** OTDR mode, the tester automatically selects certain settings based on the length and overall loss of the cabling. This mode is the easiest to use, provides the most comprehensive view of the events on the cabling, and is the best choice for most applications.

Manual OTDR mode lets you select the settings to optimize the OTDR for displaying specific events. See "Using Manual OTDR Mode" on page 7-48 for details.

About Launch and Receive Fibers

Launch and receive fibers let the tester measure the loss and reflectance of the first and last connectors in the cabling. Without launch and receive fibers, no backscatter is available before the first connector and after the last, so the tester cannot measure the connectors' characteristics.

If the first or last connection in the cabling is bad, and you do not use launch and receive fibers, the OTDR test may pass because it does include measurements from the bad connection.

Overall Loss and **Length** include the loss and length of the launch and receive fibers, unless launch compensation was enabled during the test.

Fluke Networks recommends that you use launch and receive fibers. You should also use launch compensation to remove the effects of these fibers from the OTDR measurements.

Note

Avoid using hybrid patch cords to connect to the cabling under test. Connect the launch and receive fibers directly to the cabling under test, using a launch fiber with the appropriate connectors. This provides the best view of the connectors at the ends of the cabling. Hybrid launch fibers with various connector styles are available from Fluke Networks.

⚠ Caution

When testing links with APC (angled physical contact) connectors, use only launch fibers with APC connectors on the ends connected to the link, and UPC connectors on the ends connected to the testers. Connecting non-APC connectors to the link will produce large reflections on the OTDR trace and may invalidate measurements.

Compensating for Launch and Receive Fibers

The launch compensation function marks the end of the launch fiber and the beginning of the receive fiber on OTDR traces and labels these events in the event table. It also removes these fibers' losses, lengths, and attenuation coefficients from overall OTDR results. The losses of the connections at the launch and receive fibers are not removed from the results.

Types of Compensation

The tester offers three types of compensation:

- **Launch Only:** Lets you compensate for a launch fiber.

- **Launch + Receive:** Lets you compensate for a launch fiber and a receive fiber.

- **Launch + Fiber + Receive:** Lets you compensate for a launch and receive fiber if you have forgotten to do so before the receive fiber was taken to the other end of the cabling.

Notes

Launch + Receive compensation usually provides the most accurate measurements.

Avoid using Launch + Fiber + Receive compensation on fibers longer than 8 km. Doing so may degrade measurement accuracy.

Setting the Launch Fiber Compensation

1   Turn the rotary switch to **SETUP,** select **Fiber OTDR**; then select the **OTDR Port** to be used (multimode or singlemode).

2   Turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Set Launch Fiber Compensation**.

3   On the **Set Launch Method** screen highlight the type of compensation you want to do.

4   Clean the tester's OTDR port and launch fiber connectors.

5   Connect the fibers to the tester's OTDR port as shown on the screen and in Figures 7-5, 7-6, or 7-7; then press ⓉⒺⓈⓉ.

The tester attempts to identify the launch and receive fiber ends based on the launch method you selected, and displays the results in the **Event Table** (Figure 7-8).

In the **Event Table**, the launch event is shown as ⊣▮, the receive event is shown as ▮⊢ and the launch/receive event is shown as ⊣▮⊢.

You can manually select the launch and receive events if necessary by highlighting events and using the softkeys. See page 7-17 for details.

6   To see where the markers are set on the trace, press Ⓕ❶ **View Trace**.

7   Press ⓈⒶⓋⒺ; then press Ⓕ❷ **OK**. **Launch Compensation** is automatically enabled in Setup.

Figure 7-9 shows an example of an OTDR trace with launch and receive markers enabled.

You should run the compensation function again if you change the launch or receive fiber used for a wavelength.

Viewing the Launch Compensation Settings

To view launch compensation settings that have been saved, turn the rotary switch to **SPECIAL FUNCTIONS,** select **Set Launch Fiber Compensation**; then press (F1) **View Settings**.

amd60f.eps
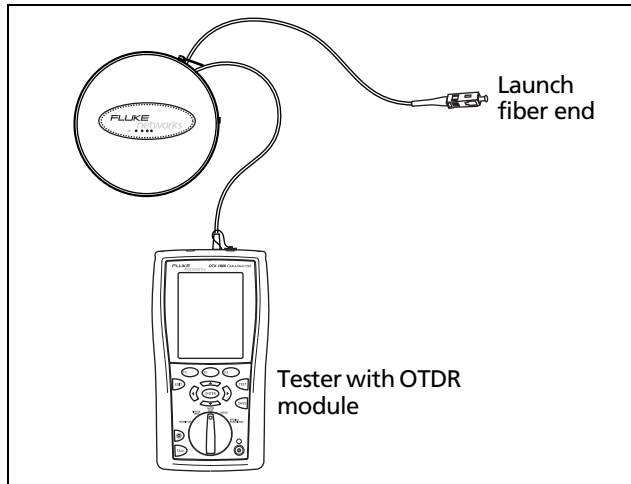
Figure 7-5. Launch Only Compensation Connections

amd63f.eps
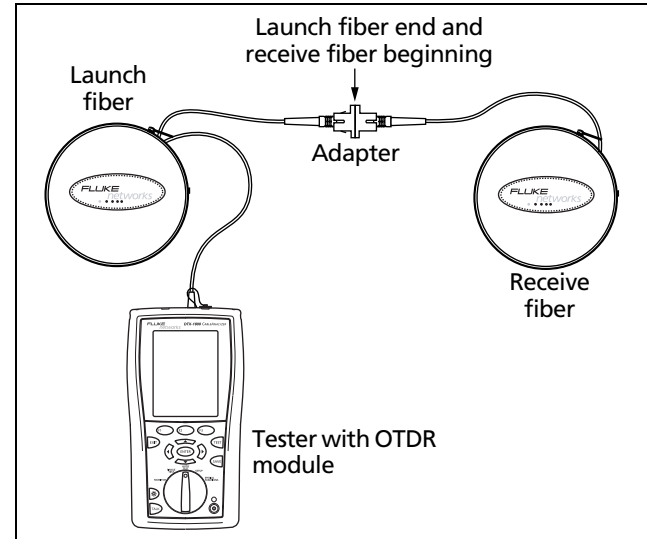
Figure 7-6. Launch + Receive Compensation Connections
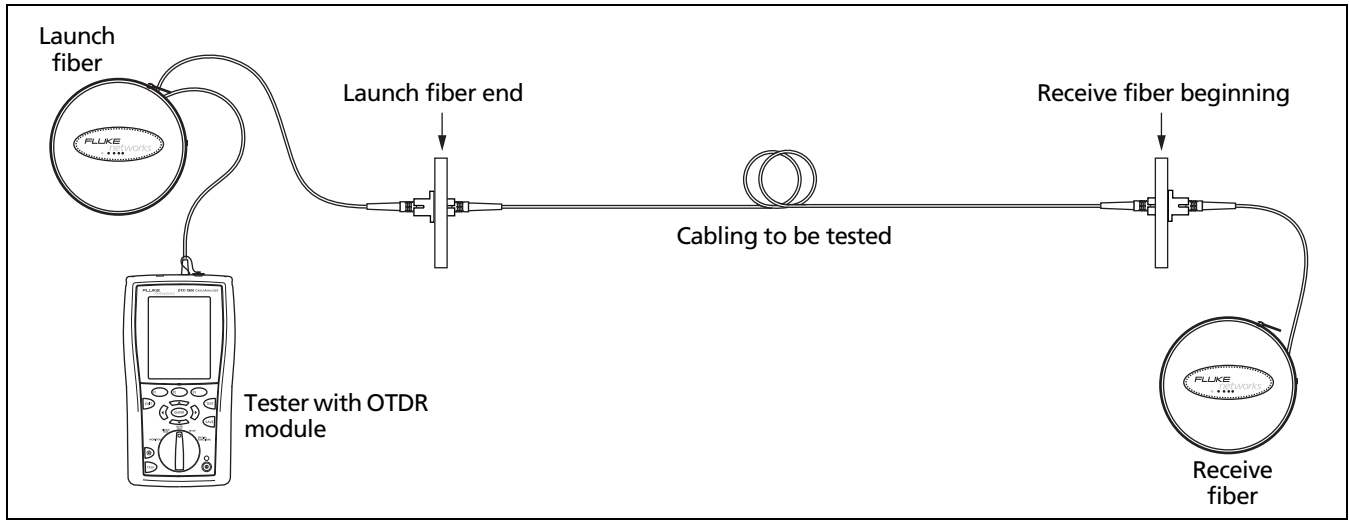
amd66f.eps

Figure 7-7. Launch + Fiber + Receive Compensation Connections

Figure 7-8. Launch/Receive Events in the Event Table

① Launch/receive event, indicated by the launch/receive event icon shown for **Launch + Receive** compensation.

② Press ⏹ **View Trace** to see the trace used for the launch compensation settings.

③ If the launch or receive event is misidentified in the event table, use ⬆︎⬇︎ to select the correct event, then use the ⏹ and ⏹ softkeys to remove or move the launch or receive event assignments. See page 7-17.
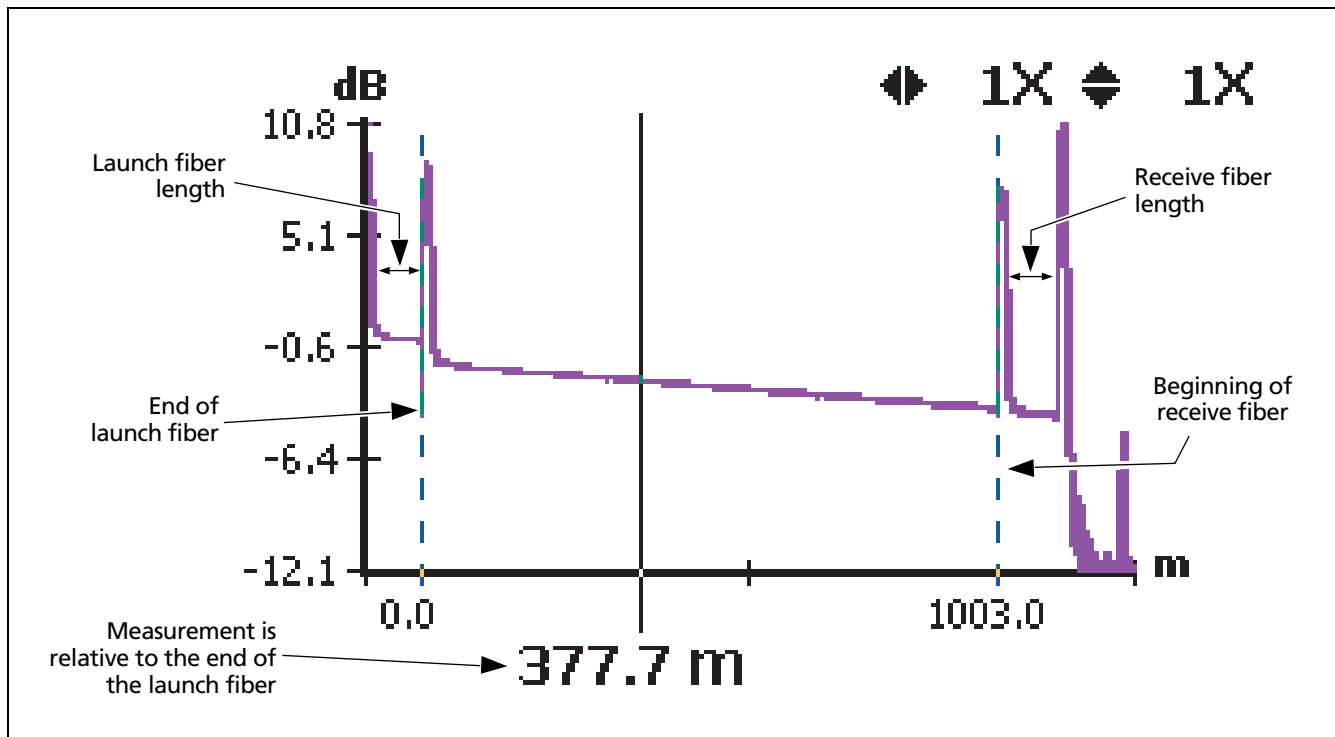
Figure 7-9. OTDR Trace with Launch Compensation Enabled

Manually Selecting the Launch and Receive Events

If necessary, you can manually select the launch and receive events on the **Event Table** screen, as follows:

1   Run the **Launch Compensation** function.

2   Set the launch/receive events:

⚠Caution

Do not set the launch or receive event to a hidden event. Do not set the receive event to an event followed by a hidden event. Doing so may make length and loss results unreliable.

Note

The tester might not identify a low-reflectance connection, such as an angled physical contact (APC) connection, as a launch/receive event. These connections may show as loss events, which you can manually select to be the launch/receive event.

- For **Launch Only** compensation, highlight the event that is the end of the launch fiber, press (F2) **Move Launch**; then press (SAVE).

- For **Launch + Receive** compensation, highlight the event that is the end of the launch fiber and the beginning of the receive fiber; then press (F2) and (F3) as necessary to move or set the launch and receive fibers.

- For **Launch + Fiber + Receive** compensation, highlight the event that is the end of the launch fiber; then press (F2) **Set Launch** or (F2) **Move Launch**.

  Next, highlight the event that is the beginning of the receive fiber; then press (F3) **Set Receive** or (F3) **Move Receive**.

3   To see where the markers are set on the trace, press (F1) **View Trace**.

4   Press (SAVE); then press (F2) **OK. Launch Compensation** is automatically enabled in Setup.

Settings for OTDR Tests

Table 7-1 describes the settings that apply to OTDR tests.

To access the settings (except for job settings), turn the rotary switch to **SETUP**; then select **Fiber OTDR**. Use ⊲⊳ to move among the tabs.

To see the limits used for an OTDR test, press F3 **View Limits** from the **OTDR Results** screen.

To see the settings used for an OTDR test:

1   On the **OTDR Results** screen, press F2 **View Events**.

2   On the **Event Table** screen, press F3 **View Details**.

3   On the **Overall Results** screen, press F1 **OTDR Settings**.

The settings used may be slightly different from the nominal values selected on the OTDR tab.

Table 7-1. OTDR Test Settings

Setting	Description
Job settings	Before you run a test you will save, you may want to set up a storage location and enter **Operator**, **Site**, and **Company** names. See "Preparing to Save Tests" on page 2-1.
OTDR Port	Select **Multimode** or **Singlemode** to view or edit those settings.
Test Limit	The tester compares the OTDR test results to the selected test limit to produce **PASS/FAIL** results. You can select factory-installed limits or custom limits. See page 12-7 for information on creating custom limits.
Fiber Type	Select a fiber type that is appropriate for the fiber you will test. You can select factory-installed fiber types or custom types. See page 12-3 for information on creating custom fiber types.

Table 7-1. OTDR Test Settings (cont.)

Setting	Description
Fiber Characteristics	When **Fiber Characteristics** is set to **User Defined**, the **n** and **Backscatter** values can be edited by the user. When the **Fiber Characteristics** is set to **Default**, the tester uses the values defined in the current **Fiber Type**.
n	The **n** value is the index of refraction. Index of refraction is used to calculate length. The default **n** values defined in the fiber types are suitable for most applications. Minor differences between the default **n** and a fiber's actual **n** usually do not make enough difference in length to fail a fiber. Increasing **n** decreases measured length.
Backscatter	**Backscatter** is the backscatter coefficient, which indicates the amount of light the fiber reflects back to the OTDR (using a 1 ns pulse). This value is used to calculate event reflectance for OTDR tests. Enter the backscatter coefficient of the fiber under test, if known. This value is specified by many fiber manufacturers.

-continued-

Table 7-1. OTDR Test Settings (cont.)

Setting	Description
Wavelength	You can test cabling at one or all the wavelengths supported by the installed module and the selected test limit. *Note* *If you select the dual-wavelength setting, be sure to select a fiber type and test limit that supports both wavelengths.*
Launch Compensation	Lets you remove the effects of launch and receive fibers from OTDR results. See page 7-11.
Testing From	The cable end where the tester is located. Based on this setting, the tester labels OTDR results as **End 1** or **End 2** to indicate which end of the cabling you tested.
End 1, End 2	Names you assign to the ends of the cabling. The names are saved with OTDR results.
Range **Averaging Time** **Pulse Width** **Loss Threshold**	These settings apply only in **Manual** OTDR mode. See "Using Manual OTDR Mode" on page 7-48.

OTDR Port Connection Quality

When you run an OTDR test, the tester determines the quality of OTDR port connection (Figure 7-10).

If the gauge is in the **Poor** range, you should clean the OTDR port and the fiber connector. Use a video microscope, such as the FT600 FiberInspector Pro Video Microscope, to inspect the port and fiber connector for scratches and other damage. If a connector on the tester is damaged, contact Fluke Networks for service information.

A poor OTDR connection increases the connector's deadzone, which can hide faults near the OTDR port.

A poor connection also decreases the light available for testing the fiber. The weakened test signal causes a noisier trace, poor event detection, and decreased dynamic range.

The port connection quality rating is saved with OTDR result details.
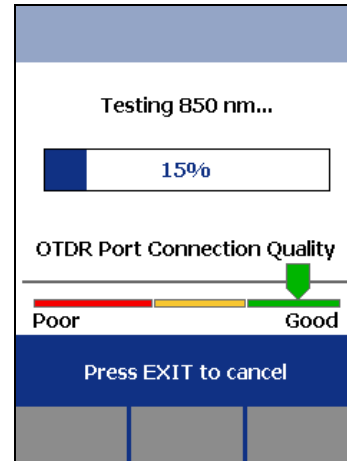
amd76.bmp

Figure 7-10. OTDR Port Connection Quality Gauge

Progress Screen for Extended Test Times

When the test time per wavelength exceeds 21 seconds, the tester shows the developing trace along with the progress indicator. Figure 7-11 shows an example of this screen. The tester updates the trace as measurement averaging proceeds.

To end a Manual OTDR test and see the results after the next trace update, press (F2) **Stop Averaging**. For dual-wavelength tests, press (F2) twice –once for each wavelength. This softkey is not available for Auto OTDR tests.
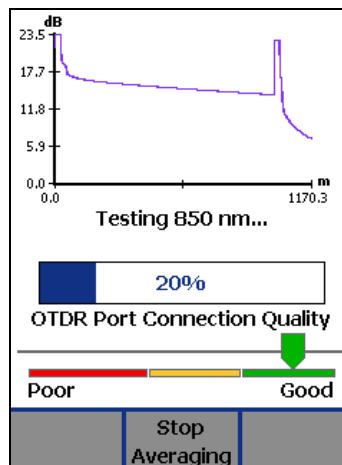
amd92.bmp

Figure 7-11. Progress Screen for Extended Test Times

Running the OTDR Test

Figure 7-12 shows the equipment needed for OTDR tests.

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① Tester with OTDR module

② Memory card (optional)

③ AC adapter with line cord (optional)

④ Launch fiber and receive fibers. Match the fiber to be tested. Match cable connectors at one end when possible.

⑤ Fiber cleaning supplies

⑥ A microscope for inspecting fiber connectors (the FT500 FiberInspector Mini Video Microscope is shown)
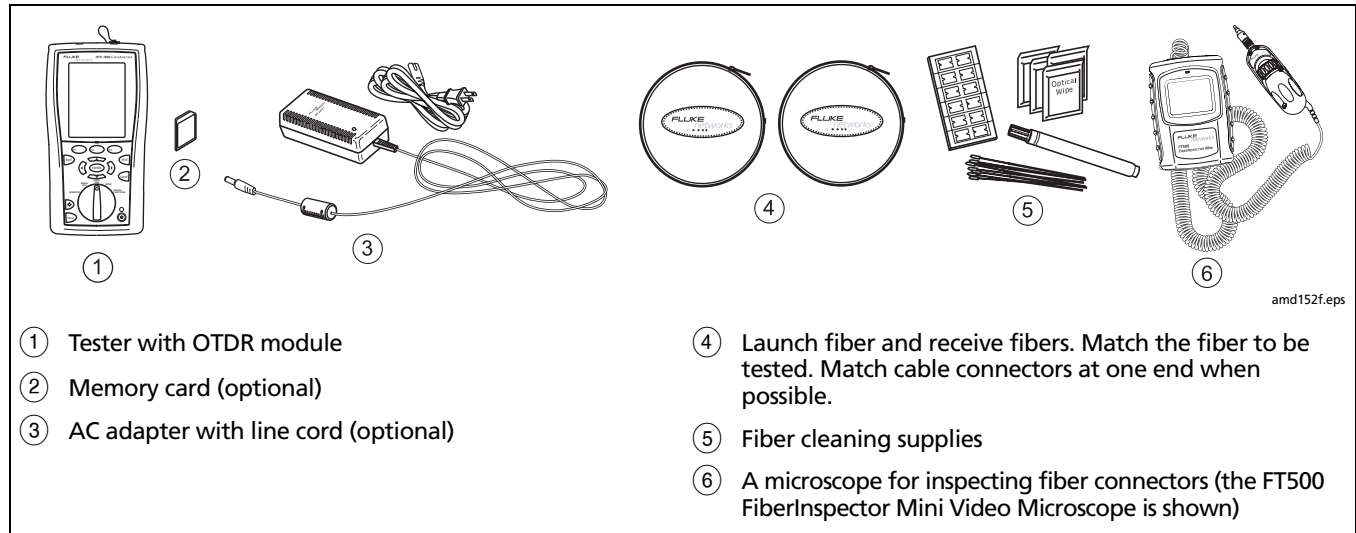
Figure 7-12. Equipment for OTDR Tests

To run the OTDR test:

1   Verify that the settings described in Table 7-1 are appropriate.

2   Select Auto OTDR mode: Turn the rotary switch to **AUTOTEST**, press ⑬ ◯ **Change Test**; then select **Auto**.

3   Clean and inspect the connectors on the launch fiber and the fiber to be tested.

4   Connect to the tester's OTDR port to the cabling as shown in Figures 7-13, 7-14, or 7-15.

5   Press ⬛ to start the OTDR test.

6   To save the results, press ⬛ ; then do one of the following:

- To save the results in a new record, create an ID or select an unused ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press ⬛ .

  IDs that already have an OTDR result from the same end are preceded with a "$".

- To save the results with existing OTDR results from the other end of the link, or with fiber loss or network connectivity results from the same link, enter the ID of the existing results or select the ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press ⬛ .

Launch fiber

Patch panel

Installed fiber

Patch panel

Tester with OTDR module
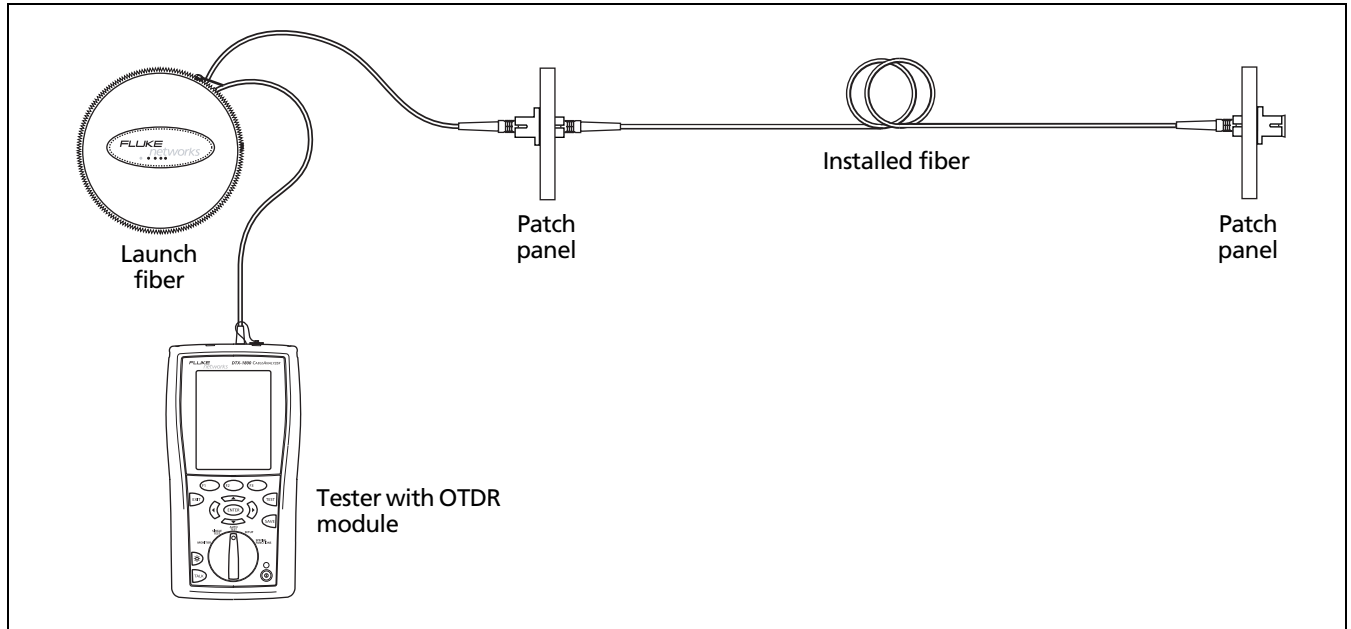
amd101f.eps

Figure 7-13. Connecting the OTDR to Installed Fiber (no receive fiber)
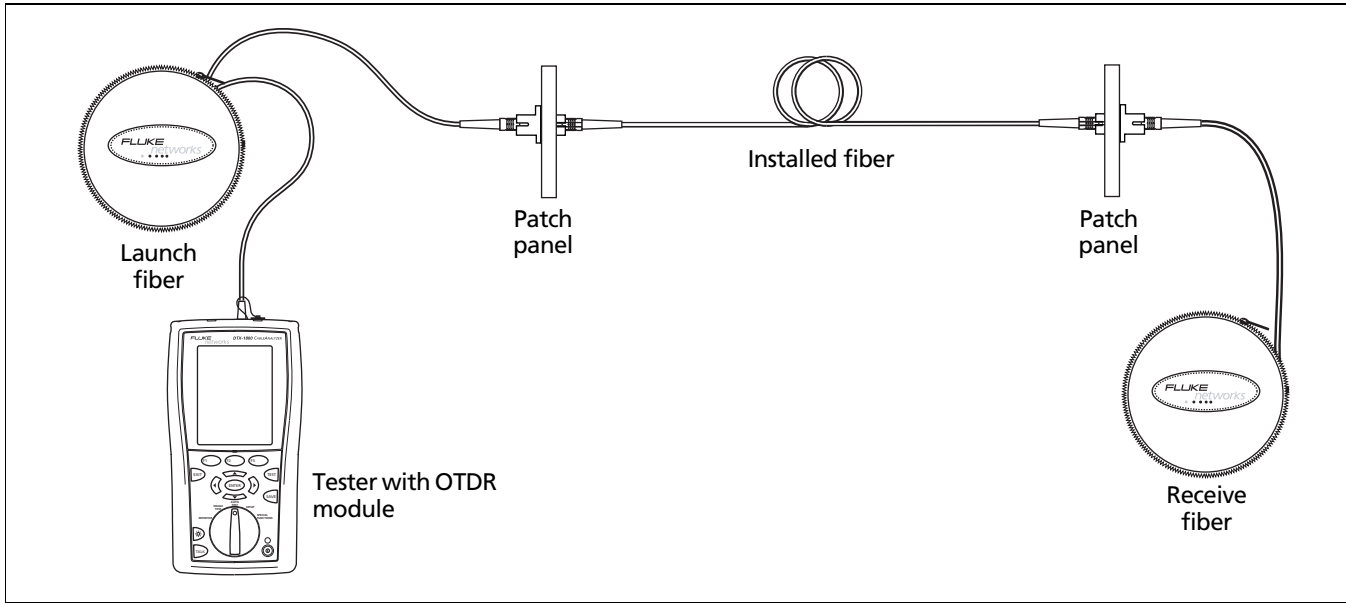
amd116f.eps

Figure 7-14. Connecting the OTDR to Installed Fiber (with receive fiber)

Pigtail patch cord and
mechanical splice

Tester with OTDR
module
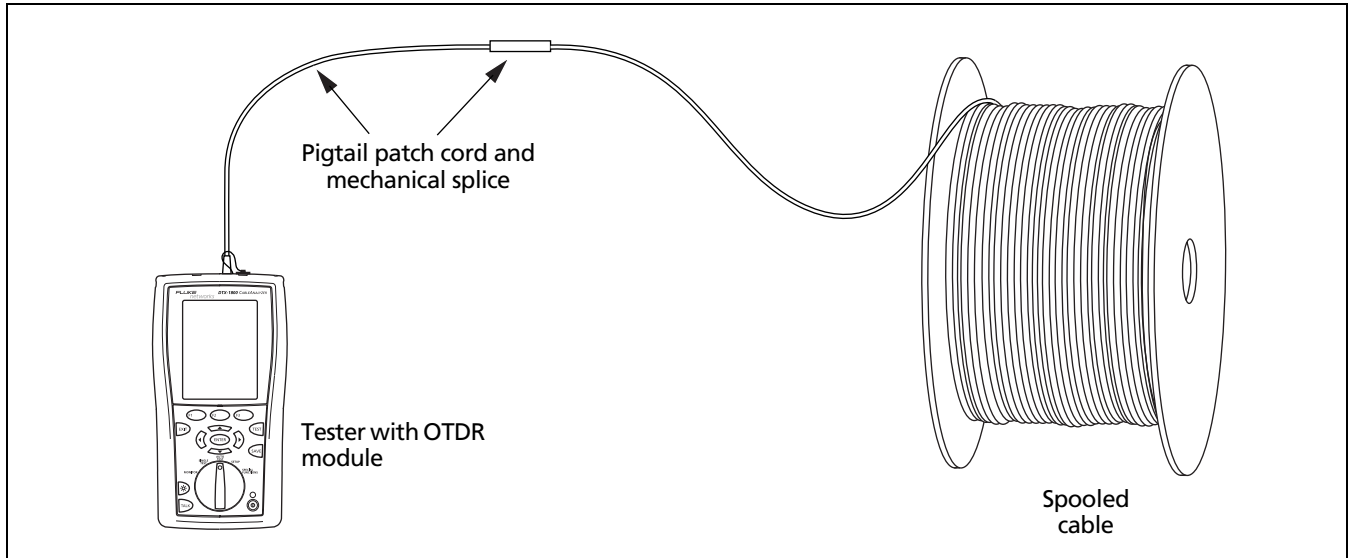
Spooled
cable

amd122f.eps

Figure 7-15. Connecting the OTDR to Spooled Cable

Looking at OTDR Test Results

The tester offers four different views of OTDR test results: summary results, an OTDR trace, an event table, and detailed results.

Reading the OTDR Results Screen

The **OTDR Results** screen, which appears when the test is finished, is described in Figure 7-16.

amd153f.eps

① Overall result for the test:

PASS: All measurements are within limits.

FAIL: One or more measurements exceed the limit.

② The limit, fiber type, wavelengths, and fiber end number (1 or 2) used for the test. See Table 7-1 on page 7-18.

③ Measurements taken (see Table 7-2) and each measurement's status:

✔: The measured value is within the limit. A yellow checkmark means there is a warning for the result. To see the warning, press ⒡₂ V**iew Events**; then press ⒡₃ **View Details**.

i: The measurement has no PASS/FAIL limit in the selected test limit and is provided for informational purposes.

✗: The measurement exceeds the limit.

④ Shows the OTDR trace.

⑤ Shows the **Event Table**. See page 7-36.

⑥ Shows the limits used for the test.

Figure 7-16. OTDR Results Screen

Table 7-2. OTDR Results Screen Measurements

Item	Description
Length	The length of the fiber in the cabling. If the measured length seems wrong, check the **Index of Refraction** in Setup. The length does not include launch and receive fibers if launch fiber compensation is enabled.
	Tip: In some cable types, some or all of the fibers may be longer than the cable jacket and some fibers may be longer than others in the same cable. To adjust the length measurements to represent cable jacket length, change the index of refraction until the measured length matches the jacket length.
Overall Loss	The end-to-end loss of the cabling, excluding the OTDR connection and the end event. The loss does not include launch and receive fibers if launch and receive fiber compensation are enabled.
	Overall Loss does not include the losses of the first and last connectors in the cabling if you did not use launch and receive fiber compensation.
	If the test ran at two wavelengths, the highest loss of the two wavelengths is reported.
Largest Event	The event with the largest loss.

Viewing the OTDR Trace

To see the OTDR trace, press (F1) **View Trace** from the **OTDR Results** or **Event Table** screen.

Figure 7-17 describes the readouts and navigational features on the OTDR screen. Figure 7-18 describes the features of a typical OTDR trace.
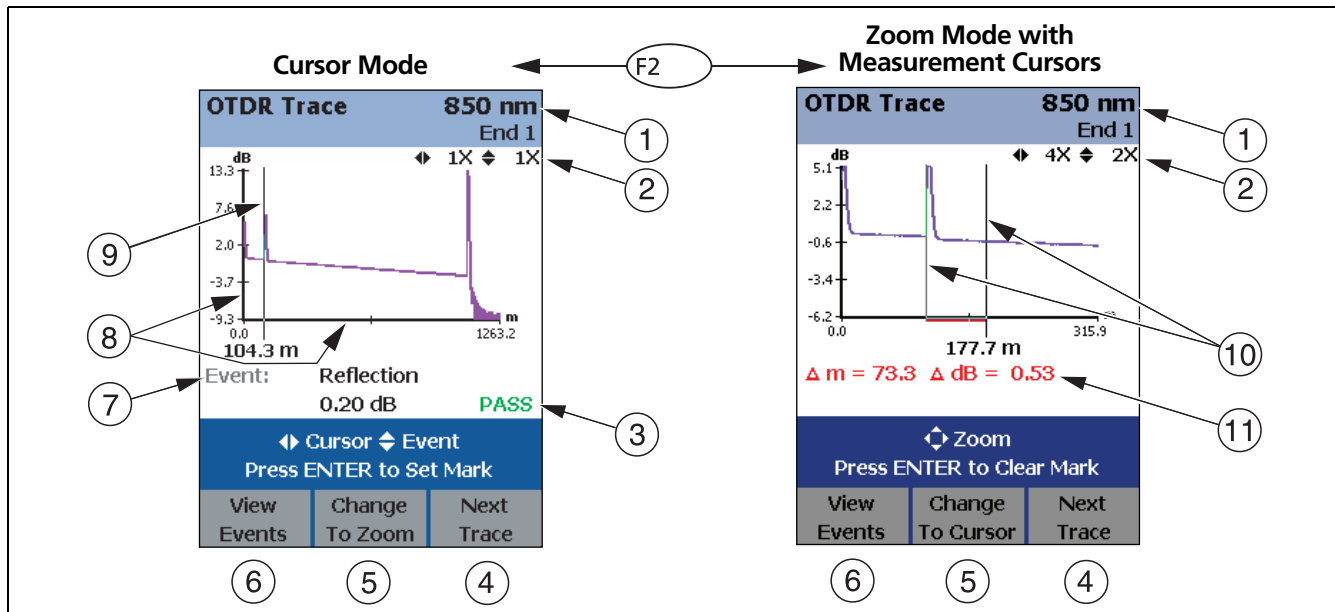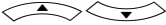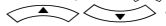
amd123f.eps

Figure 7-17. OTDR Trace Screens (launch compensation disabled)

① Wavelength for the trace and the **End** setting selected in Setup. If the test ran at two wavelengths, press ⒡₃ **Next Trace** to switch wavelengths. You can set the wavelengths in Setup.

② Horizontal and vertical zoom factors for the trace. In zoom mode, use ◁▷ to zoom horizontally and ◀▶ to zoom vertically.

③ Event PASS/FAIL status appears if the cursor is on an event. To see details about the event, press ⒡₁ **View Events**, then press (ENTER).

④ For dual-wavelength tests, press ⒡₃ to switch wavelengths.

⑤ Press ⒡₂ to change the arrow keys functions from moving the cursor (⑨) to zooming. The navigational cue above the softkey labels describes the arrow keys' current function.

⑥ Press ⒡₁ to see the **Event Table**. See page 7-35.

⑦ Event information appears if the cursor is on an event. Otherwise, the distance to the cursor is shown.

⑧ Horizontal scale for the distance along the cabling under test. Vertical scale for the OTDR backscatter measurements in decibels.

⑨ Cursor. See ⑤. In cursor mode, use ◁▷ to move the cursor left or right. Use ◀▶ to move the cursor to next or previous event.

⑩ Measurement marker and cursor. See "Using the Measurement Cursor" on page 7-34.

⑪ The distance (**m** or **ft**) and the power loss (**dB**) between the cursor and the measurement marker.
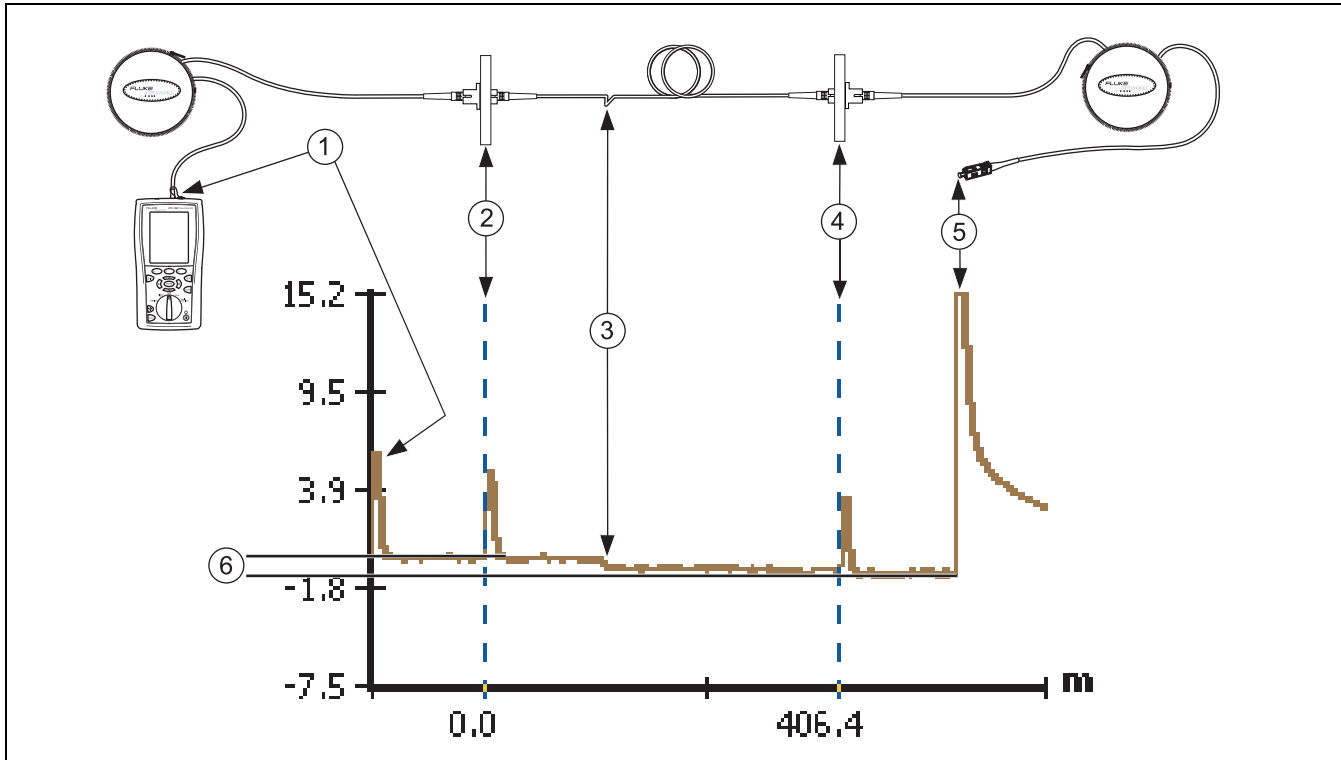
amd125f.eps

Figure 7-18. Typical OTDR Trace Features

① Reflective event caused by the OTDR port connection.

② Reflective event caused by the first connection in the cabling. This trace was produced using launch fiber compensation, so the end of the launch fiber is marked with a dotted line and is the 0 m point for length measurements.

③ Small event caused by a sharp bend in the fiber.

④ Reflective event caused by the last connection in the cabling. The dotted line marks the end of the fiber under test and the beginning of the receive fiber.

⑤ Reflective event caused by the end of the receive fiber.

⑥ Overall loss of the cabling. Since launch and receive fiber compensation was used, the overall loss excludes the loss of the launch and receive fibers.

See "Diagnosing OTDR Test Failures" on page 10-5 for descriptions of faults fiber cabling.

Using the Measurement Cursor

You can use the cursor on the OTDR trace to measure distances and losses along the cabling.

To make measurements with the cursor:

1 Press Ⓕ2 **Change to Cursor** if necessary to set the arrow keys to cursor mode.

2 Move the cursor to a starting point for a measurement. Use ◁ ▷ to move the cursor left or right or △ ▽ to move the cursor to the previous or next event.

3 Press (ENTER) to mark the starting point for the measurement.

4 Use ◁ ▷ △ ▽ to move the cursor to the ending point for the measurement.

The following readouts appear on the screen:

- Δ **m** or Δ **ft**: The distance between the cursor and the mark.

- Δ **dB**: The difference in the power levels (in decibels) between the cursor and the mark.

5 To clear the mark press (ENTER).

Zooming the Trace

The zoom function lets you magnify the trace horizontally or vertically.

To zoom the trace:

1 Press (F2) **Change to Cursor** if necessary to set the arrow keys to cursor mode.

2 Use ◁▷ to place the cursor near the feature you want to magnify.

3 Press (F2) **Change to Zoom** to set the arrow keys to zoom mode.

4 Use ◁▷ ◁▲▷ ◁▼▷ to zoom the trace vertically and horizontally.

The Event Table

To see a list of the events along the cabling, press (F1) **View Events** from the **OTDR Results** screen or the **OTDR Trace** screen.

Figure 7-19 describes the features of the event table.
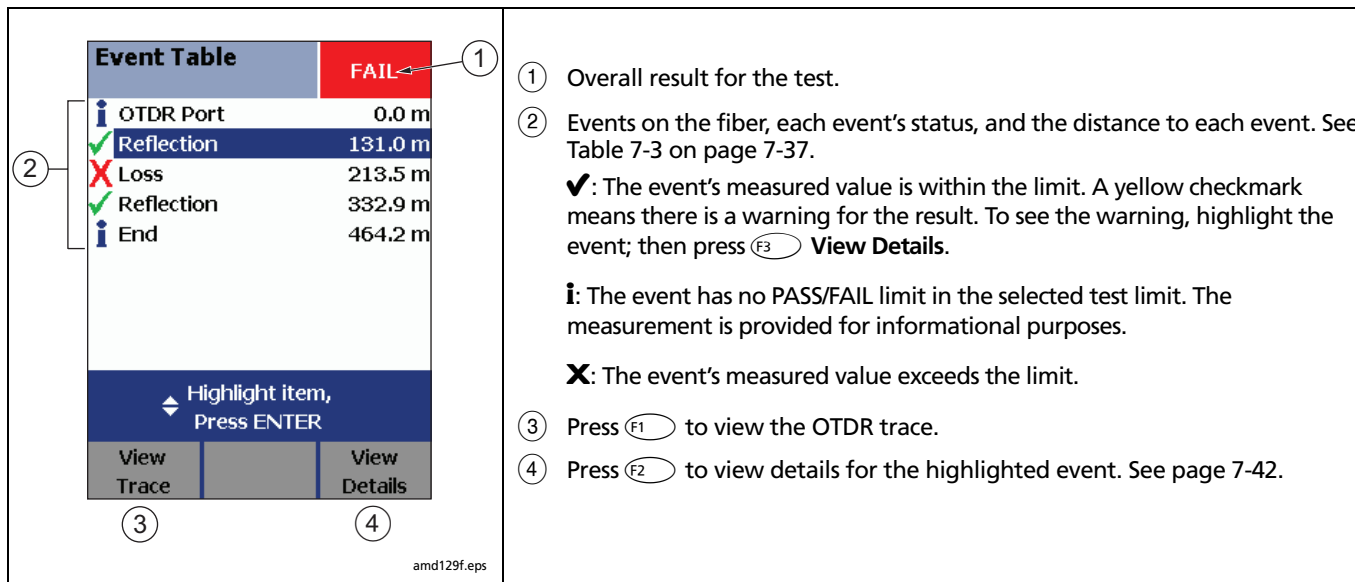
Figure 7-19. Event Table Features

① Overall result for the test.

② Events on the fiber, each event's status, and the distance to each event. See Table 7-3 on page 7-37.

✔: The event's measured value is within the limit. A yellow checkmark means there is a warning for the result. To see the warning, highlight the event; then press (F3) **View Details**.

i: The event has no PASS/FAIL limit in the selected test limit. The measurement is provided for informational purposes.

✘: The event's measured value exceeds the limit.

③ Press (F1) to view the OTDR trace.

④ Press (F2) to view details for the highlighted event. See page 7-42.

Table 7-3. Event Types

Event	Possible Causes
OTDR Port The tester's OTDR port connector.	The tester identifies the OTDR port connection and grades its quality, as shown on the OTDR details screens. See "OTDR Port Connection Quality" on page 7-21.
Reflection A pulse of light reflected back to the OTDR.	Caused by a connector, tight bend, or crack in the fiber. Small reflective events may actually be ghosts. If the reflection is not caused by a connector, inspect the cable for tight bends or damage. Use the visual fault locator to verify the fault. See Chapter 9.
Loss A point where the level of reflected light suddenly decreases.	Caused by a splice or bend. If the loss event is not caused by a splice, inspect the cable for tight bends. Use a visual fault locator to verify the fault.
Launch Event The end of the launch fiber. **Receive Event** The beginning of the receive fiber.	The tester identifies these events if launch and receive fibers are connected and **Launch Compensation** is enabled in Setup. See "Compensating for Launch and Receive Fibers" on page 7-12 for more information.

-continued-

Table 7-3. Event Types (cont.)

Event	Possible Causes
Ghost Source A reflective event that is causing a ghost.	**Tip:** On some traces with multiple ghosts, only the first ghost may be identified in the event table. You can usually determine that other reflections are ghosts because they occur at multiples of distances to connectors and they show almost no loss. Caused by a dirty or unseated connector, highly-reflective connector, a connector with the wrong polish, a sharp bend, or a crack in a fiber. Verify that the connector is seated properly. Inspect connectors that cause ghosts. If a connector does not seem to be the ghost source, use a visual fault locator to check for bends or cracks near the ghost source. A ghost may have multiple sources. The tester identifies only one possible source. Look for reflective events with high loss or excessive tailing for other possible sources.
Ghost The event is a duplicate reflection caused by light bouncing back and forth between connectors.	Caused by a dirty or unseated connector, highly-reflective connector, a connector with the wrong polish, a sharp bend, or a crack in a fiber. Find the **Ghost Source** in the event table to determine where to look for the fault. The ghost source is always before the ghost. The event table does not show ghosts that occur after the end event. If the ghost source is a hidden event, the tester may not identify a ghost event as a ghost.

Table 7-3. Event Types (cont.)

Event	Possible Causes
Hidden The event is within the attenuation deadzone of the previous event.	The event is detected, but not enough information is available to measure its loss separately from the previous event. Since the hidden event's loss can't be determined, it is not shown. The hidden event may be a connection, a sharp bend, or a crack within the deadzone of the previous connection. If the event is not a connection, inspect the fiber near the event's location. Use a visual fault locator to reveal faults.
Gainer An apparent gain in the strength of the returned signal.	Caused by a connection between two fibers with different backscatter coefficients, numerical apertures, core diameters, or mode field diameters. A gainer can also occur when measuring loss across a very reflective connection. Clean the connection. Check the fiber type on either side of the connection. Replace fiber if necessary. Matching fibers may have different tolerances, which can cause gainers at a connection. In these cases, the connection is good and does not require rework. **Tip:** If the gainer is caused by different backscatter coefficients, and you test the fiber from the other end, the gainer event will show a loss. Adding this loss to the event's gain provides the true loss of the event.

-continued-

Table 7-3. Event Types (cont.)

Event	Possible Causes
Weak Signal The signal is attenuated below the background noise level before the end event is reached.	No fiber is attached to the OTDR port, the fiber is too short, or there is a bad connector or broken fiber somewhere near the tester. May also occur if the fiber has very high loss, or if the tester is in **Manual** OTDR mode and the **Pulse Width** is too narrow. If the OTDR trace and event table show that the fiber is very short, check for bad connections and broken fibers within a few meters of the tester.
Out of Range The tester did not find an end event.	This can occur in **Manual** mode when the selected range is too short. In **Auto** mode, **Out of Range** can occur when the cabling is much longer than the module's range. Rarely, very bad connections along the cabling can cause the OTDR to select a range that is too short. For **Manual** mode, select a higher range in Setup. For **Auto** mode, compare the expected cabling length to the module's test range. If the length is within range, try testing in **Manual** mode with the maximum range setting.

Table 7-3. Event Types (cont.)

Event	Possible Causes
No Fiber No fiber is attached or the fiber is too short to measure.	No fiber is attached to the OTDR port, the fiber is too short, or there is a bad connector or broken fiber somewhere near the tester. Check for bad connections and broken fibers within a few meters of the tester.
No Signal There is a problem with the module.	If this continues to occur, contact Fluke Networks for assistance.
End The end of the cabling.	The tester identifies the end of the cabling as the point where the backscatter stops. The tester does not measure the loss of **End** events. Note that a very high-loss event, such as a sharp bend, can appear to be the end of the cabling.
Hidden End	The end of the cabling is hidden by a reflective event.

OTDR Details Screens

On the **Event Table**, you can highlight an event, then press
(F3) **View Details** to see more information about the
event.

Use the softkeys to move among the details screens. Table
7-4 describes the details that may appear on these screens.

Table 7-4. OTDR Measurement Details

Detail	Description
Length	Shown on the **Overall Results** screen. **Status: PASS** means the length is within the limit. **FAIL** means the length exceeds the limit. **Value:** The length measurement in meters or feet.
Loss	The optical power lost over the event. **Status: PASS** means the loss is within the limit. **FAIL** means the loss exceeds the limit. **Value:** The loss measurement in dB. **Limit**: The maximum loss allowed by the selected test limit. **Margin:** The difference between the limit and the measured loss. Margin is negative if the loss exceeded the limit.
Attenuation Coefficient	Shown on the **Overall Results** screen. The attenuation per kilometer for the entire length of the cabling. This value may not be shown if it could not be measured accurately.

Table 7-4. OTDR Measurement Details (cont.)

Detail	Description
Segment Attenuation Coefficient	The attenuation per kilometer for the fiber segment before the event. This value may not be shown if it could not be measured accurately. This can occur on short segments or if the connector before the segment has a large deadzone.
Reflectance	The power of the light reflected back to the OTDR from an event. A smaller (more negative) reflectance value means less light is reflected back. For example, a good connection may have a reflectance of -45 dB. A dirty connection that reflects more light back to the OTDR may have a reflectance of -20 dB.
	Reflectances that exceed the tester's measurement range are shown as the largest measurable value and are preceded by a ">" (greater than) symbol.
	Reflectance measurements are affected by the backscatter value entered in Setup.

-continued-

Table 7-4. OTDR Measurement Details (cont.)

Detail	Description
Warnings	**No fiber attached or fiber too short (also see page 7-41):** • No fiber is connected to the tester's OTDR port or launch fiber. • The fiber is too short for the tester to detect events after the first deadzone. • There is a bad connector or broken fiber within a few meters of the tester or launch fiber. • There is a problem with the launch fiber or patch cord. • The **Pulse Width** is too long. • The launch fiber is too short. **No signal detected (also see page 7-41):** There may be a problem with the module. If the error persists, contact Fluke Networks for assistance. **Unable to find end of fiber due to weak signal (also see page 7-40):** • The fiber or connections have too much loss. • For 850 nm, the fiber length exceeds the tester's measurement range. **End of fiber is beyond range (also see page 7-40):** • The fiber length exceeds the tester's measurement range. • If the tester is in **Manual** OTDR mode, the selected range is shorter than the fiber under test. **A valid launch/receive event was not found at the expected location:** **Launch Compensation** is enabled on the OTDR tab in Setup, but the tester does not detect launch or receive fibers that match the compensation settings. The tester can complete the OTDR test without compensating for the launch or receive fibers.

Table 7-4. OTDR Measurement Details (cont.)

Detail	Description
Warnings	**Cannot measure overall loss:** • Overall loss cannot be measured, either because no backscatter was detected or the fiber is too short for attenuation to be measured. • The fiber is too short for the tester to detect events after the first deadzone. • There is a bad connector or broken fiber within a few meters of the tester. • There are bad connections on the fiber. • The launch or receive fiber is too short. • There is a problem with the launch fiber or patch cord. • The pulse width is too long. **Fiber detected on other OTDR port:** There is a fiber connected to the unused OTDR port. Reflections from the fiber can affect measurements on the port being used. Remove the fiber. **A singlemode fiber is connected to the multimode OTDR port:** • The wrong fiber type is connected. • A multimode fiber is connected, but the connection is dirty.

-continued-

Table 7-4. OTDR Measurement Details (cont.)

Detail	Description
Warnings	**Negative loss value (a gainer) found in test result:** • One or more loss value is significantly negative (-0.2 dB or more). • There is a bad connection on the fiber. • There is a connection between fibers with different backscatter coefficients. For example, there is a connection between fibers with different core sizes. If you test the fiber from the other end, the gainer event will show a loss. Adding this loss to the event's gain gives the true loss of the event. If you do a bi-directional test, then upload the results to LinkWare software, you can use the bi-directional averaging utility in LinkWare to calculate the true loss of gainers. Gainers at launch events can occur when the launch fiber does not have the same properties as the fiber you are testing. In this situation, you can get more reliable results if you do a bi-directional test and calculate the true loss as described above. Use a receive fiber that has the same properties as the launch fiber and use Launch + Receive compensation.

Bi-Directional Testing

To test cabling in both directions and save the bi-directional results:

1   In Setup, enter names for **End 1** and **End 2** to identify the ends of the cabling. Name **End 1** as the end you will test first.

2   Set **This End** to **End 1**.

3   Test all the cabling and save the results from **End 1**.

4   In Setup, change **This End** to **End 2**.

5   Test the cabling from the other end. When you save each result, use the same fiber ID you used for the results from the first end.

Note

You can do bi-directional averaging in LinkWare software. See the LinkWare online help for details.

Using Manual OTDR Mode

Note

Typically, you should use Auto OTDR mode when certifying cabling with the OTDR.

Manual OTDR mode lets you optimize the OTDR trace for viewing specific events.

To select **Manual** OTDR mode, turn the rotary switch to **AUTOTEST**, press F3 **Change Test**; then select **Manual**.

Table 7-5 describes the settings you can change in manual OTDR mode and how the settings affect the trace. You can access these settings on the **Fiber OTDR** tabs in Setup.

Tip: To see the settings used for an OTDR test, press F2 **View Events** on the OTDR Results screen, press F3 **View Details**; then press F1 **OTDR Settings**. The settings used may be slightly different from the nominal values selected on the OTDR tab.

Table 7-5. Manual OTDR Settings

Setting	Description and Selection Guidelines
Range	The range setting determines the maximum distance shown on the trace.
	Auto: The tester selects the range that is nearest to, but not less than the end of the fiber. These ranges are not limited to the fixed ranges provided.
	Manual range selections: You select the range. Typically, you should select the range that is nearest to, but not less than, the distance to the event you want to study. If the tester does not correctly identify the end event, run the OTDR test again using the next higher range.

Table 7-5. Manual OTDR Settings (cont.)

Setting	Description and Selection Guidelines
Averaging Time	The averaging time sets the number of measurements averaged together to create the final trace. Longer times reduce noise on the trace which increases dynamic range and accuracy and reveals more details, such as smaller non-reflective events. Shorter times decrease test time, but produce a noisier trace with less dynamic range and decreased visibility of events.
	Auto: Adjusts the test parameters for a typical test time of 15 seconds per wavelength. This setting is used for **Auto OTDR** mode and is the default for **Manual OTDR** mode.
	Auto Test Time: Adjusts the test parameters for a typical test time of 5 seconds per wavelength. This setting speeds up testing but provides less accuracy and increased deadzones.
	Auto Deadzone: Adjusts the test parameters to minimize deadzones, which reveals more detail in and around reflective events. This usually takes longer than testing with **Auto** or **Auto Test Time** selected.
	Testing with **Auto**, **Auto Test Time**, or **Auto Deadzone** selected can take up to 3 minutes per wavelength, depending on the fiber's characteristics.
	Manual time selections: Lets you set the test time to 15 seconds, 30 seconds, 1 minute, or 3 minutes per wavelength. The tester adjusts the test parameters to meet the selected time.

-continued-

Table 7-5. Manual OTDR Settings (cont.)

Setting	Description and Selection Guidelines
Loss Threshold (Auto or **User Defined)**	**User Defined** lets you set the threshold (in decibels) for reporting loss events. Events at or above the threshold are included in the event table. The range for this setting is 0.01 dB to 1.50 dB inclusive. For smaller threshold values (0.01 dB to 0.3 dB), the tester reduces noise on the trace by taking more measurements for averaging or by using wider pulse widths. Therefore, smaller values may increase test times or deadzones on the trace. **Auto** sets the threshold to the default value of 0.10 dB for multimode and 0.15 dB for singlemode. *Note* *Setting a loss threshold does not guarantee that all events at or above the threshold will be found. The fiber's characteristics or using a manual **Averaging Time** or **Pulse Width** may also limit which events are found.* If the loss threshold is set below the default value, the tester may find many false events due to inherent imperfections in the fiber.

Chapter 8: Certifying Fiber Optic Cabling

Overview of Features

The optional DTX-MFM2, DTX-GFM2, and DTX-SFM2 fiber modules are used with a DTX-1800, DTX-1200 or DTX-LT CableAnalyzer to test and certify fiber optic cabling installations. The fiber modules are standard with the DTX-CLT CertiFiber. The modules offer the following functions and features:

- Measures optical power loss and length on dual-fiber cabling. The DTX-MFM2 tests multimode cabling at 850 nm and 1300 nm. The DTX-SFM2 tests singlemode cabling at 1310 nm and 1550 nm. The DTX-GFM2 features a VCSEL for testing multimode cabling at 850 nm and 1310 nm when a VCSEL source is required.

- Each module transmits both wavelengths (850 nm and 1300 nm, 850 nm and 1310 nm, or 1310 nm and 1550 nm).

- Interchangeable connector adapters allow reference and test connections that meet ISO standards for most SFF (small form factor) fiber connectors.

- 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.

Safety Information

⚠ 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 test reference 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. See page 8-9.

- Use only high-quality test reference cords that comply with ISO/IEC 14763-3. Test the cords at regular intervals. See Appendix A.

- Cover all connectors with dust caps when not in use.

- Store extra connector adapters for the fiber module in the canisters provided.

- Do not touch the photodiode lens (see page 8-7).

- Do not overtighten the adapter or use tools to tighten the adapter.

- Use a Fluke Networks FiberInspector Video Microscope to periodically inspect the fiber module's OUTPUT connector for scratches and other damage.

Installing and Removing Fiber Modules

Figure 8-1 shows how to install and remove the fiber modules.

⚠ Caution

To avoid damaging the DXT mainframe or the fiber module and to ensure proper operation:

- **Turn off the tester before removing or attaching modules.**

- **Leave the module bay cover in place when a module is not installed.**

⚠ Caution
Turn off the tester before attaching or removing modules
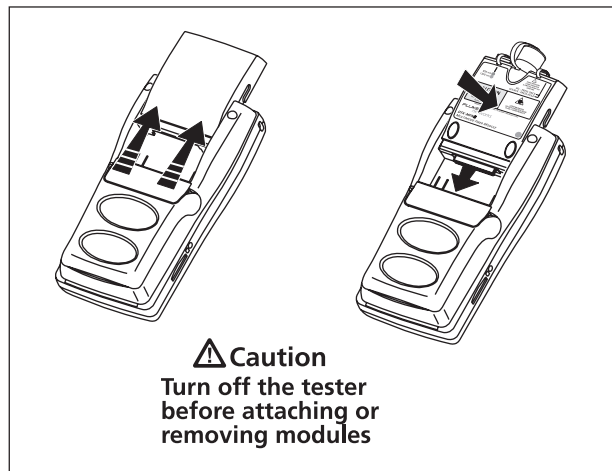
amd34af.eps

Figure 8-1. Installing and Removing Fiber Modules

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⚠ **Warning** ⚠

Never look directly into optical output connectors (②and④). 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 Chapter 9 and "Autotest in Far End Source Mode" on page 8-18.

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 Input connector with dust cap. Receives optical signals for loss, length, and power measurements. You can change the connector adapter to match the connectors on the fiber under test. See Figure 8-3.

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 transmitting the module's shorter wavelength, and green for the longer wavelength.

⑤ Laser safety label (shown at right).

Note

The connector for twisted pair and coaxial adapters (⑥) is not available on the DTX-CLT CertiFiber.

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Figure 8-2. Fiber Module Features

Installing the Connector Adapter

You can change the fiber module's input connector adapter to connect to SC, ST, LC, and FC fiber connectors (Figure 8-3). Additional adapter styles may be available. Check the Fluke Networks web site for updates.

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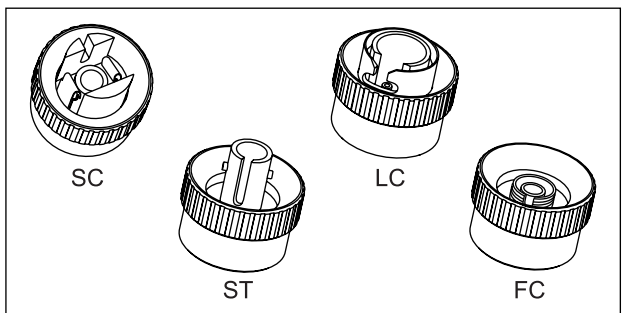
Figure 8-3. SC, ST, LC, and FC Connector Adapters

⚠ Caution

- **Cover all connectors with dust caps when not in use.**

- **Store the connector adapters for the fiber module in the canisters provided.**

- **Do not touch the photodiode lens (see Figure 8-4).**

- **Do not overtighten the adapter or use tools to tighten the adapter.**

To install a connector adapter, refer to Figure 8-4 and do the following:

1   Locate the slot in the fiber module connector and the key on the adapter ring.

2   Holding the adapter so it does not turn in the nut, align the adapter's key with the module connector's slot and slide the adapter onto the connector.

3   Screw the nut onto the module connector.

Threads not showing.
Connector not screwed
in all the way.

All threads showing.

⚠ **Caution**
Do not touch the
photodiode lens

Slide the key into the slot
before screwing the
adapter onto the module.

Slot

Key

Store extra adapters in the
cannisters provided
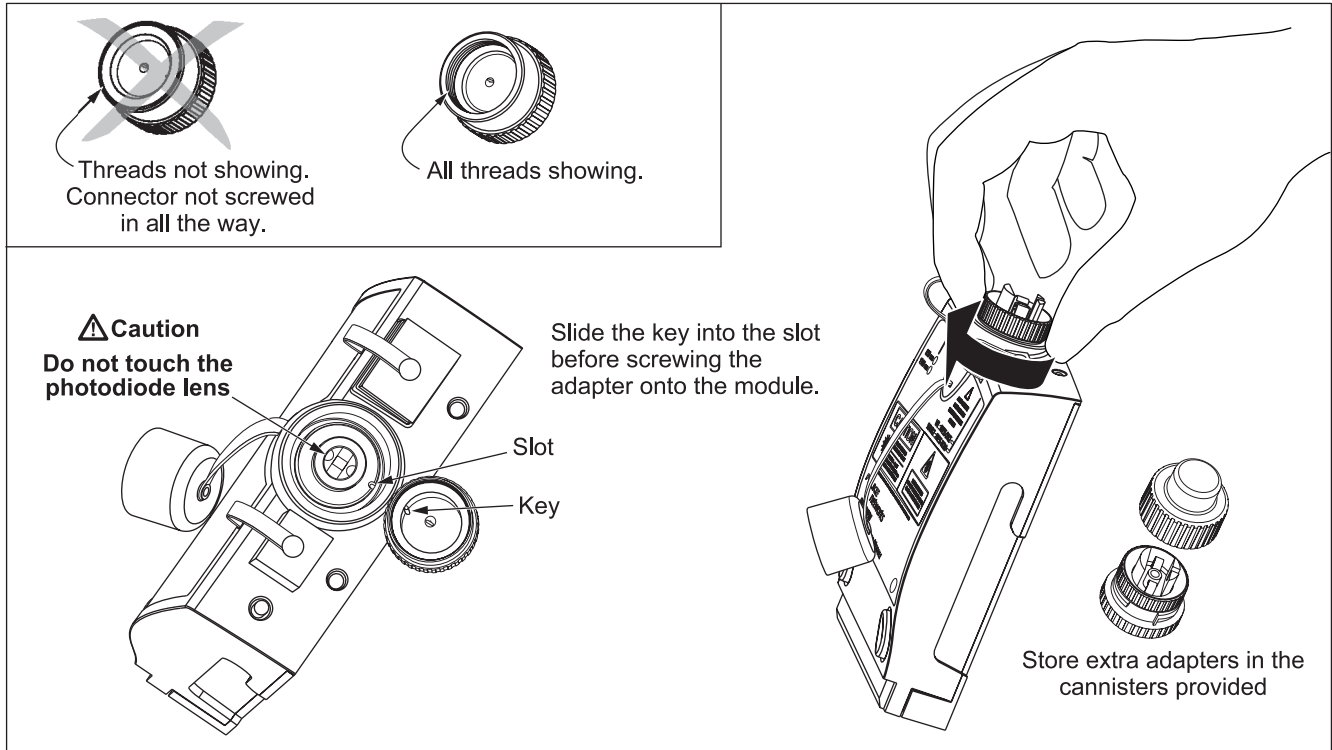
amd99f.eps

Figure 8-4. Installing the Connector Adapter

Verifying Operation

1 Clean the tester's connectors and the connectors on two SC/SC test reference cords.

2 Connect the tester and smart remote together, as shown in Figure 8-5.

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.

SC to SC test reference cords
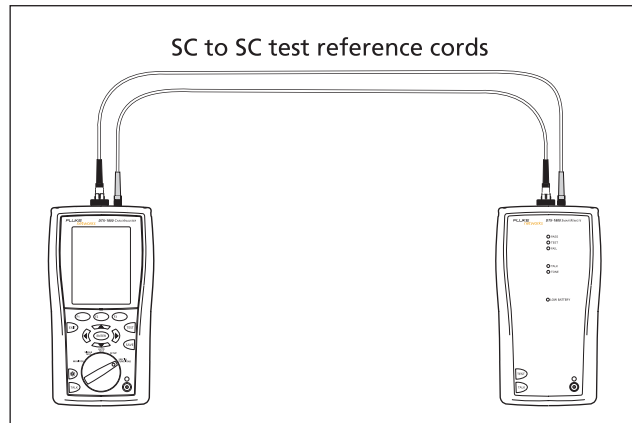
amd118f.eps

Figure 8-5. 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 fiber optic solvent and optical-grade wipes or swabs to clean connectors as follows:

Cleaning Bulkhead Connectors and the Fiber Module's Output Connector

Note

Use a 2.5 mm foam swab for cleaning the fiber module's output connector.

Cleaning Bulkhead Connectors

1   Touch the tip of a fiber optic solvent pen or swab soaked in solvent to a lint-free dry wipe or fiber cleaning card.

2   Touch a new, dry swab to the solvent spot on the wipe or card. Push the swab into the connector, twist it around 3 to 5 times against the end-face, then remove and dispose of the swab.

3   Dry the connector with a dry swab by twisting it around in the connector 3 to 5 times.

4   Inspect connectors with a fiber microscope, such as the Fluke Networks FiberInspector Video Microscope before making connections.

Cleaning the Fiber Module's Input Connector

1   Remove the connector adapter to expose the photodiode lens (see page 8-7).

2   Use the method described in steps 1 and 2 above to dampen a swab with fiber optic solvent.

3   Twist the damp swab around against the lens 3 to 5 times; then twist a dry swab around against the lens 3 to 5 times.

Cleaning Connector Adapters and Fiber Adapters

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

Cleaning Connector Ends

1 Touch the tip of a fiber optic solvent pen or swab soaked in solvent to a lint-free dry wipe or fiber cleaning card.

2 Wipe the connector end-face across the solvent spot, then back and forth once across the dry area of the wipe or card.

Note

Some connector styles, such as VF-45, may require a different cleaning method.

3 Inspect connectors with a fiber microscope, such as the Fluke Networks FiberInspector Video Microscope before making connections.

Always cover unused connectors with protective caps. Clean caps periodically with a swab or wipe and fiber optic solvent.

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 test reference 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 ambient temperature.

You should set the reference at these times:

- At the beginning of each day using the remote end setup (Figures 8-9, 8-14, or 8-19) you will use that day.

- Anytime you reconnect a test reference 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 page 10-3).

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.

⚠ Caution

Do not disconnect the test reference cords from the testers' output ports after setting the reference. Doing so may alter the amount of optical power launched into the fiber and invalidate the reference.

Reference values should not change by more than a few tenths of a dBm from day to day. Larger changes may indicate a problem with the test reference 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 test reference cords used for reference and test connections. The lengths are included with saved results to meet TIA reporting requirements for fiber test results.

Selecting Test Reference Cords

The DTX Fiber Modules come with high-quality test reference cords.

To ensure that your measurements are accurate and repeatable, use test reference cords provided by Fluke Networks or cords of the same quality. See "Replacing Fiber Test Reference Cords" on page 14-8.

⚠ Caution

When testing links with APC (angled physical contact) connectors, use only test reference cords with APC connectors on the ends connected to the link, and UPC connectors on the ends connected to the testers. Connecting non-APC connectors to the link will produce large reflections that affect loss measurements.

Testing Your Test Reference Cords

You must test your test reference cords at regular intervals. Use the procedure given in Appendix A to test the cords initially. After that, use the procedure given with the procedures for certifying cabling to monitor the condition of the cords.

Using Mandrels for Testing Multimode Fiber

You should use mandrels when testing multimode fiber with the DTX-MFM2 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.

⚠ Caution

Do not use mandrels when testing with the DTX-GFM2 fiber modules.

The gray mandrels included with the DTX-MFM2 are compliant with ANSI/TIA-568-C for 62.5 µm fiber with a 3 mm jacket.

The red mandrels included with the DTX-CLT CertiFiber multimode kits are compliant with ANSI/TIA-568-C for 50 µm fiber with a 3 mm jacket. These mandrels are also available from Fluke Networks. Refer to the appropriate standard for mandrel requirements if you follow other standards.

Table 8-1 shows a partial list of mandrel requirements for TIA standards.

Figure 8-6 shows how to wrap the fiber around a mandrel. Place mandrels on the tester's output fibers, as shown in the figures for reference and test connections.

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

Table 8-1. ANSI/TIA-568-C Mandrel Requirements

Fiber core size	Standard	Wraps Around Mandrel	Mandrel Diameter for 900 µm Buffered Fiber	Mandrel Diameter for 3 mm (0.12 in) Jacketed Cable
50 µm	ANSI/TIA-568-C.0 6.4.2.1	5	25 mm (1.0 in)	22 mm (0.9 in)
62.5 µm	ANSI/TIA-568-C.0 6.4.2.1	5	20 mm (0.8 in)	17 mm (0.7 in)

Place top wrap
in groove under
retainer

Wrap 5 times
in grooves

Right:
no bends
at retainer

Wrong:
bends at
retainer
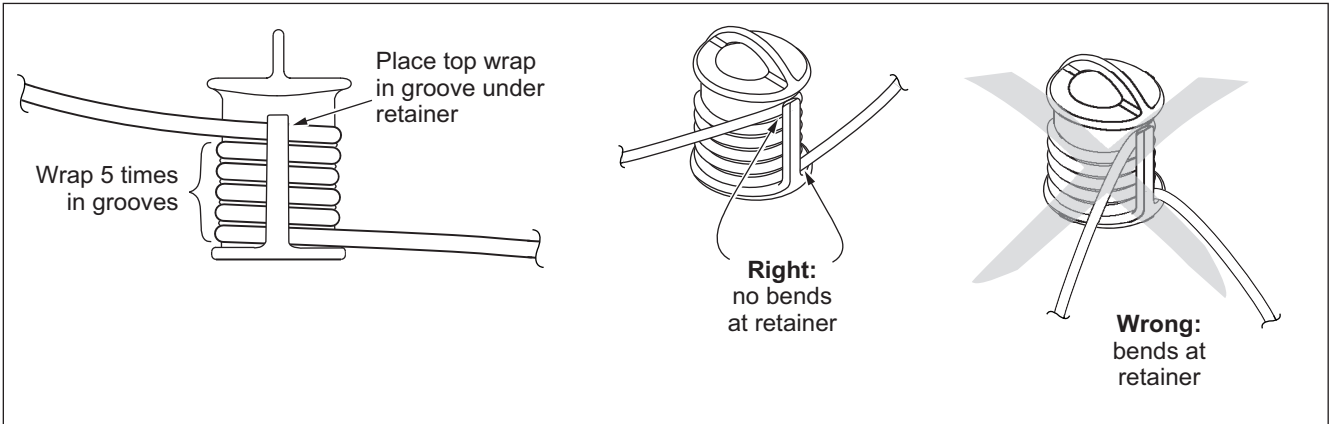
amd67f.eps

Figure 8-6. Wrapping a Test Reference Cord Around a Mandrel

Loss/Length Test Settings

Table 8-2 describes the test settings that apply to loss/length tests on fiber cabling.

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

Table 8-2. Loss/Length Test Settings

Setting	Description
SETUP > Fiber Loss > Fiber Type	Select a fiber type that is appropriate for the type you will test. Selecting **Custom** lets you create a fiber type. See page 12-2 for details.
SETUP > Fiber Loss > 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. Selecting **Custom** lets you create a test limit. See page 12-5 for details.
SETUP > Fiber Loss > Remote End Setup	Use **Smart Remote** mode for testing dual-fiber cabling. Use **Loopback** mode for testing test reference cords, patch cords, and cable spools. Use **Far End Source** mode with an optical source for testing individual fibers.
SETUP > Fiber Loss > 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, 850 nm/1310 nm, or 1310 nm/1550 nm).

Table 8-2. Loss/Length Test Settings (cont.)

Setting	Description
SETUP > Fiber Loss > Number of Adapters **SETUP > Fiber Loss > 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 8-7 shows an example of how to determine the **Number of Adapters** setting. 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 Loss > 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**.
SETUP > Fiber Loss > Test Method >	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: • **2 Jumper**: Loss results include one connection at one end of the link. • **1 Jumper**: Loss results include connections at both ends of the link. Select this method for connections shown in this manual. See "About 1 Jumper Connections" on page 8-18. • **3 Jumper**: Loss results exclude connections at the ends of the link. Only the fiber loss is measured. Different standards have different names for the three test methods. See Appendix B for details. The **Test Method** setting does affect the reference and test connection diagrams shown on the tester's display. The diagrams show connections for the method selected.

-continued-

Smart Remote mode reference connections

No adapters in the paths.

Tester

Smart remote

Example of Smart Remote mode test connections

Measurement includes loss of
2 adapters in each path.
NUMBER OF ADAPTERS setting = 2

ADAPTER = 1 connector pair

Tester

Smart remote
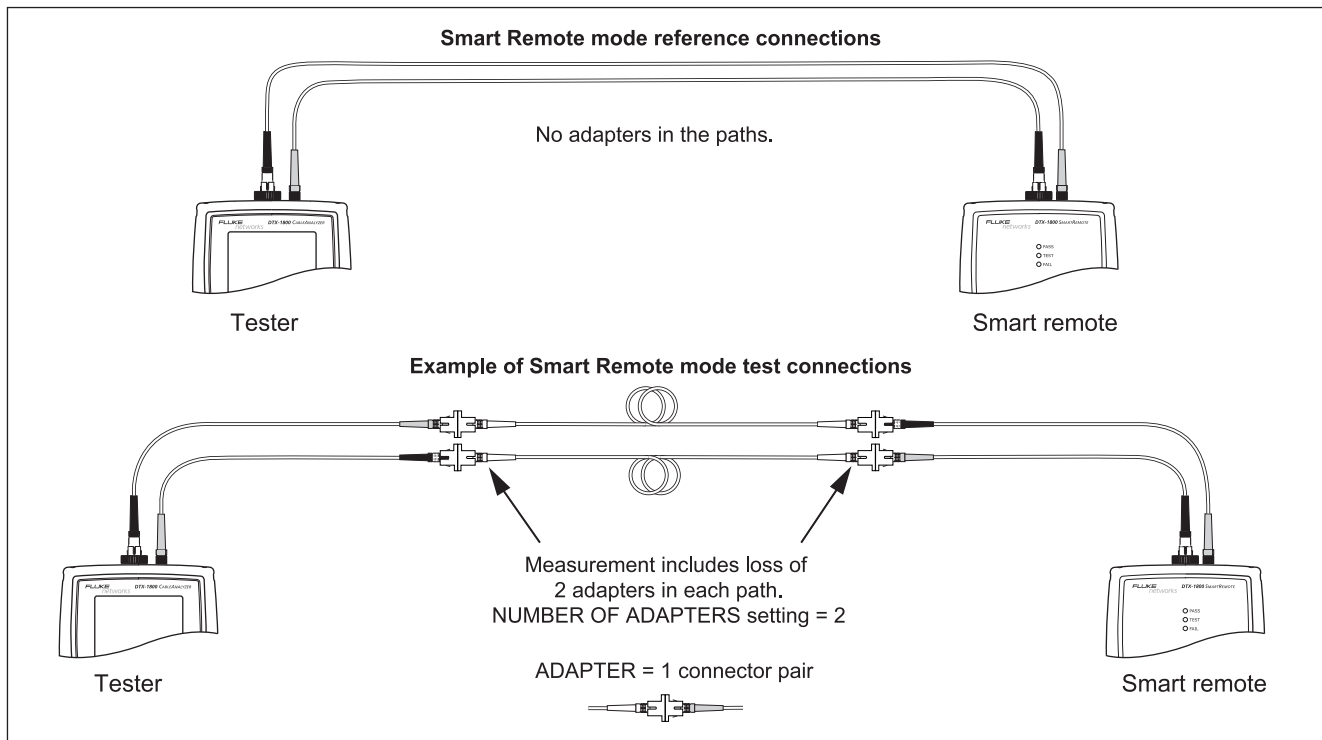
amd65f.eps

Figure 8-7. Example of How to Determine the Number of Adapters Setting (singlemode example; mandrels not used)

Table 8-2. Fiber Test Settings (cont.)

Setting	Description
SETUP > Fiber Loss > 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.
	Increasing the index of refraction decreases the reported length.
SPECIAL FUNCTIONS > Set Reference 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 8-10.
	After you set the reference, you can enter the lengths of the test reference cords used. The lengths you enter do not affect measurements. They are included with saved results to meet TIA reporting requirements.
SETUP > Instrument Settings Settings for saving tests	**Cable ID Source**, **Current Folder**, **Result Storage Location** (DTX-1800, DTX-1200), **Operator**, **Site**, **Company**, and **Auto Save Results** setting. See "Preparing to Save Tests" on page 2-1 and "Automatically Saving Results" on page 1-32.

About 1 Jumper Connections

The reference and test connections shown in this manual produce 1 Jumper results. 1 Jumper results include the loss of the fiber plus the loss of the connections at both ends of the link. To ensure accurate results, the connection to the fiber module's output port must not be disconnected after the reference is set. Using connector adapters that match the connectors in the fiber under test lets you connect to the fiber without disturbing the output port connection.

⚠Caution

If you disconnect the test reference cords from the tester's or smart remote's output port after setting the reference, you must set the reference again to ensure valid measurements.

If you do not have the correct connector adapters, see Appendix C for modified connections that produce 1 Jumper results.

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 8-8 shows the equipment required for testing fiber in Smart Remote mode.

amd46f.eps

① Tester and smart remote with fiber modules and connector adapters installed. Match connector adapters to the connectors in the link.

② Memory card (optional)

③ Two ac adapters with line cords (optional)

④ Test reference cords. Match the fiber to be tested. Long ends must have SC connectors. For the other connectors, match the connectors in the link.

⑤ Two singlemode adapters of the appropriate type

⑥ Two mandrels. Recommended when testing multimode fiber with DTX-MFM2 modules. See page 8-12.

⑦ Fiber cleaning supplies

⑧ A microscope for inspecting fiber connectors (the FT500 FiberInspector Mini Video Microscope is shown)

Figure 8-8. Equipment for Testing in Smart Remote Mode (1 Jumper Method)

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 ambient temperature.

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

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 a twisted pair or coaxial adapter are attached, select **Fiber Module** next.

5   Clean and inspect the connectors on the tester, smart remote, and test reference 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 Figure 8-9 shows connections for the 1 Jumper method.*

The test reference cords in the tester's diagrams are numbered. If you want to meet TIA reporting

requirements, you can enter lengths for each test reference cord number after setting the reference.

6   Press ⌧.

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

8   Press ⌧ **OK**.

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

10   To enter test reference cord lengths to meet TIA reporting requirements, press ⌧ **Patch Lengths**.

11   On the **Patch Lengths** screen, enter the lengths of the test reference cords. Press ⌧ when you are done.

⚠ Caution

Do not disconnect the test reference 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.
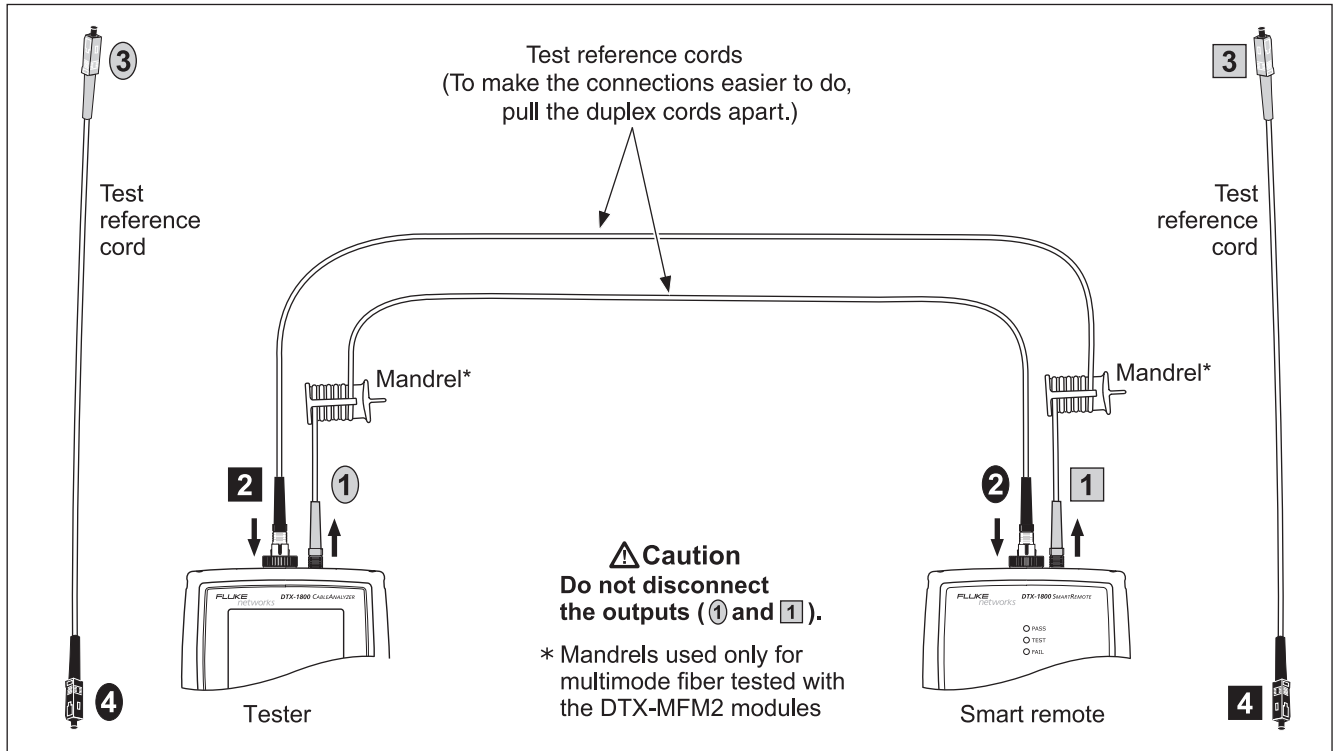
amd145f.eps

Figure 8-9. Setting the Reference in Smart Remote Mode (1 Jumper Method)

Testing the Test Reference Cords in Smart Remote Mode

⚠ Caution

If you disconnected the test reference cords from the tester's or smart remote's output, you must set the reference again to ensure valid measurements.

12   Disconnect the test reference cords from the INPUT ports on the tester and smart remote.

13   Make the connections shown in Figure 8-10.

14   Turn the rotary switch to **AUTOTEST**, then press ⒯ᴇˢᵀ.

15   Press ⒠ɴᴛᴇʀ to see the test results. The results for each fiber (**Input Fiber** and **Output Fiber**) must be no more than these limits:

⚠ Caution

An overall result of PASS does not show that the test reference cords are good. You must compare the loss to the limits given here to make sure the cords are good.

Multimode test reference cord:

850 nm: 0.11 dB or less
1300 nm: 0.10 dB or less

(The limits are different because fiber has more loss at 850 nm than at 1300 nm.)

Singlemode test reference cord:

0.20 dB or less for 1310 nm and 1550 nm

16   If a result is more than the limit shown above, use the procedure given in Appendix A to test the cords in the path that failed (**Input Fiber** or **Output Fiber**). When you have good test reference cords, set the reference and do these steps (12 through 16) again before you test a fiber link.

17   Save the test results to show that you used good test reference cords to test the link.

Note

Fluke Networks recommends that you use this procedure to make sure your test reference cords are good before you test each fiber link.

Test reference cords

Test reference cords

3 **2**

2 **3**

Singlemode adapters

Mandrel*

Mandrel*

4 **1**

4 **1**

⚠**Caution**
Do not disconnect
the outputs (1 and 1).

＊ Mandrels used only for
multimode fiber tested with
the DTX-MFM2 modules

Tester

Smart remote

amd175.eps

Figure 8-10. Testing the Test Reference Cords in Smart Remote Mode

8-23

Running the Autotest in Smart Remote Mode

⚠ Caution

If the test reference 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.

18 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 ambient temperature.

19 Verify that the settings described in Table 8-2 on page 8-14 are appropriate.

20 Clean and inspect the connectors on the cabling to be tested.

21 Connect the tester to the cabling. Figure 8-11 shows test connections for the 1 Jumper method.

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

23 Press (TEST).

24 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 8-50 for details on FindFiber messages.
- Use the visual fault locator to verify fiber continuity.

25 To save the results, press (SAVE); then do one of the following:

- To save the results in a new record, 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.
- To save the results with existing OTDR or network connectivity results for the same link, enter the ID of the existing results or select the ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press (SAVE). Repeat for the other fiber.

  IDs that already contain fiber results are preceded with a "$".

Test reference cords

Test reference cords

Fiber link

Mandrel*

Mandrel*

⚠Caution
Do not disconnect
the outputs (① and 1).

* Mandrels used only for
multimode fiber tested with
the DTX-MFM2 modules

Tester
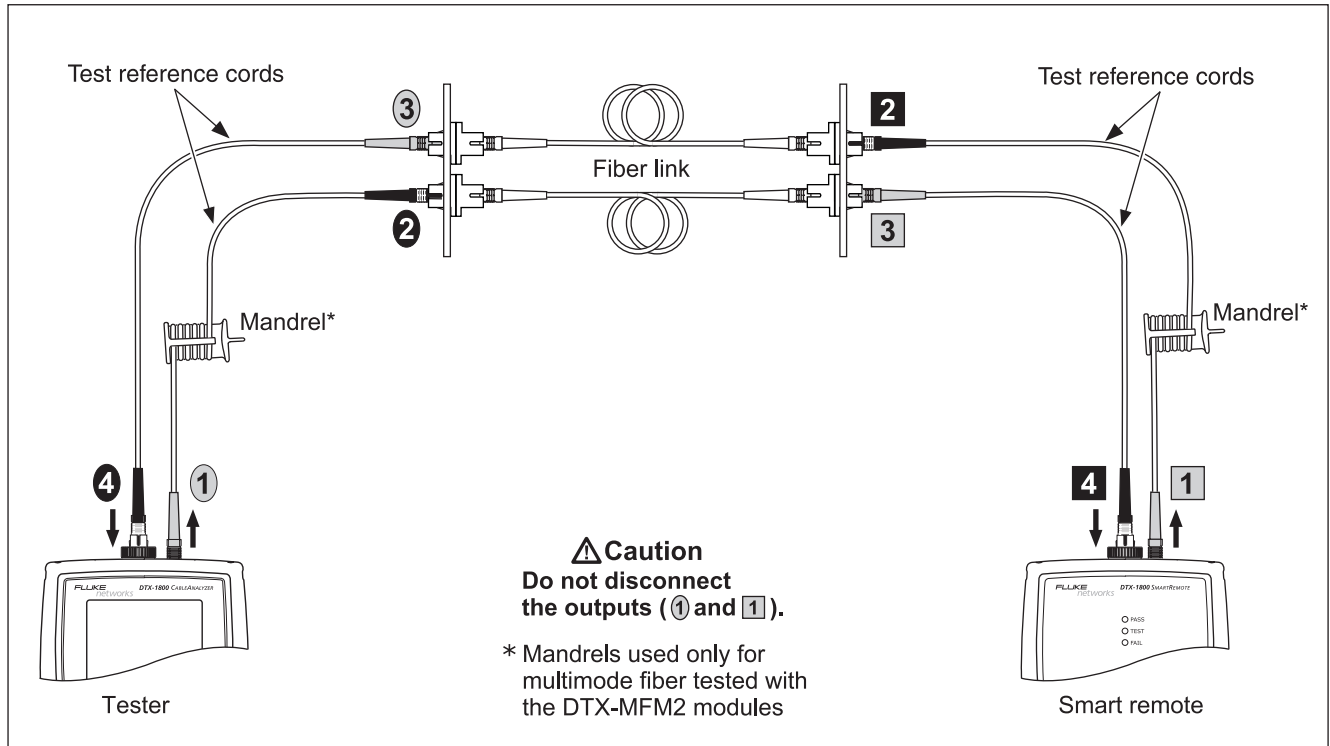
Smart remote

amd146f.eps

Figure 8-11. Testing a Fiber Link in Smart Remote Mode (1 Jumper Method)

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 8-12 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 8-48.
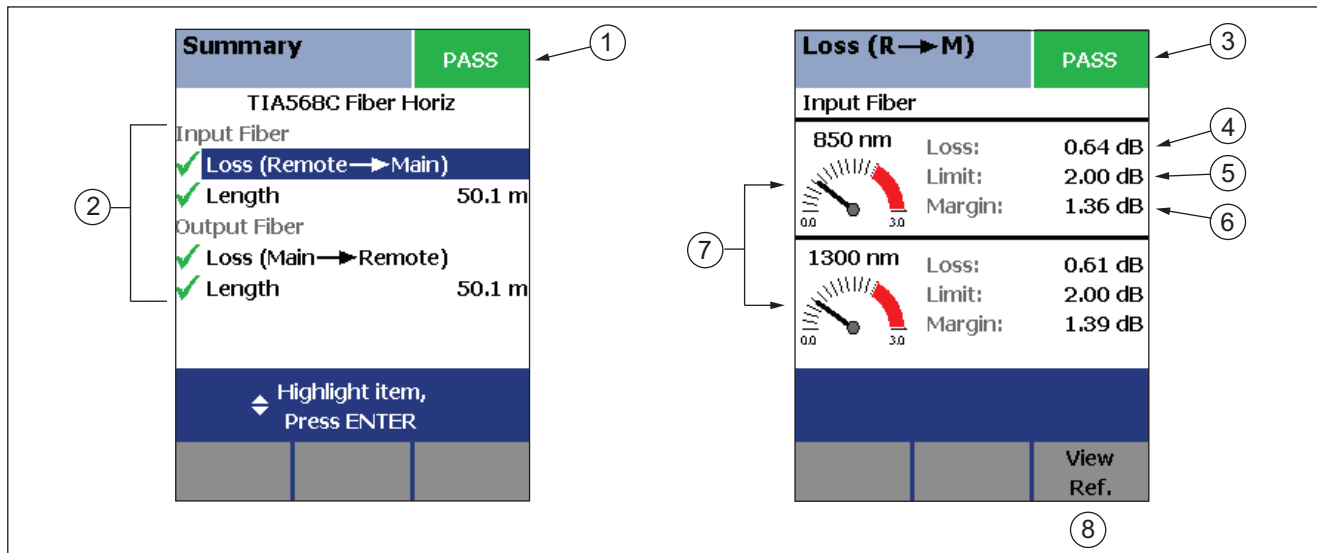
amd26f.eps

Figure 8-12. 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 page 10-3 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.

Autotest in Loopback Mode

Use Loopback mode to test spools of cable and segments of uninstalled cable. In this mode, the tester measures loss, length, and propagation delay at two wavelengths in one or both directions.

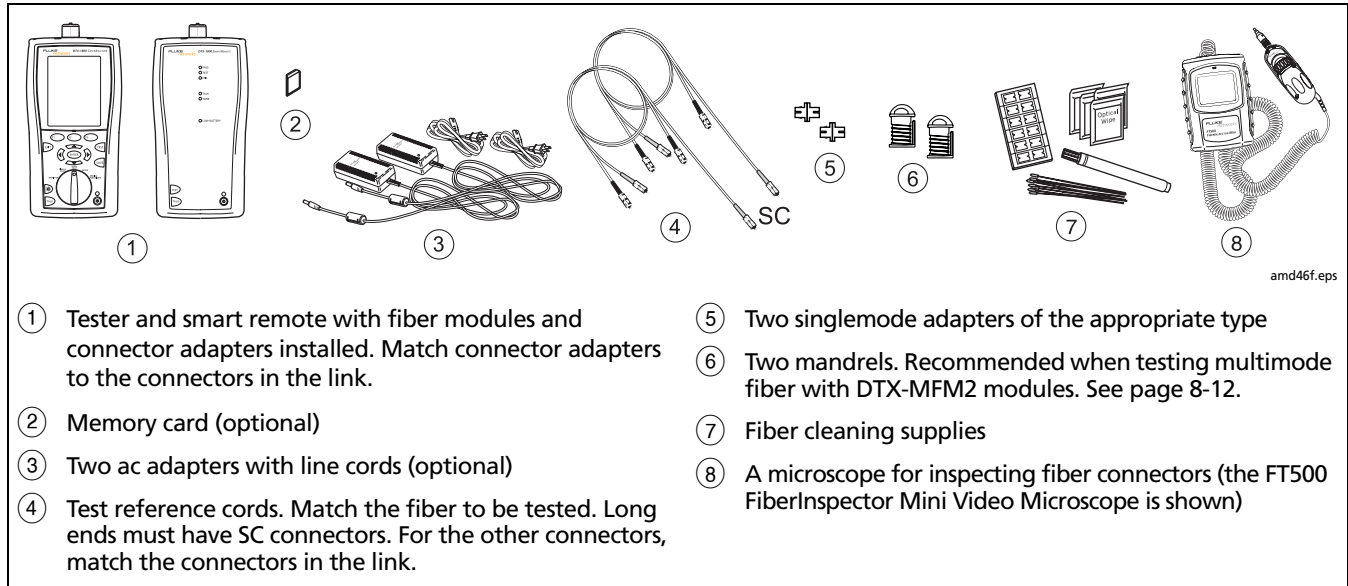Figure 8-13 shows the equipment required for testing fiber in Loopback mode.

amd49f.eps

① Tester with fiber module and connector adapter installed (match connector adapter to the connectors in the link)

② Memory card (optional)

③ AC adapter with line cord (optional)

④ Test reference cord. Match the fiber to be tested. Long end must have SC connector. For the other connectors, match the connectors in the link.

⑤ Two singlemode adapters of the appropriate type

⑥ Mandrel Recommended when testing multimode fiber with DTX-MFM2 modules. See page 8-12.

⑦ Fiber cleaning supplies

⑧ A microscope for inspecting fiber connectors (the FT500 FiberInspector Mini Video Microscope is shown)

Figure 8-13. Equipment for Testing in Loopback Mode (1 Jumper Method)

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 ambient temperature.

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

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

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

5 Clean and inspect the connectors on the tester and test reference cords. Connect the test reference cords as shown on the tester.

Notes

*The **Set Reference** screen shows reference connections for the selected test method. Figure 8-14 shows connections for the 1 Jumper method.*

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

6 Press ⒯ᴱˢᵀ.

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

8 Press ⒡₂ **OK**.

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

10 To enter test reference cord lengths to meet TIA reporting requirements, press ⒡₁ **Patch Lengths**.

11 On the **Patch Lengths** screen, enter the lengths of the test reference cords. Press Ⓢᴬⱽᴱ when you are done.

⚠ Caution

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

Test
reference
cord

Test reference cord
(To make the connections easier to do,
pull the duplex cords apart.)

Mandrel*

⚠ **Caution**
**Do not disconnect
the output (1).**

* Mandrel used only for
multimode fiber tested with
the DTX-MFM2 module
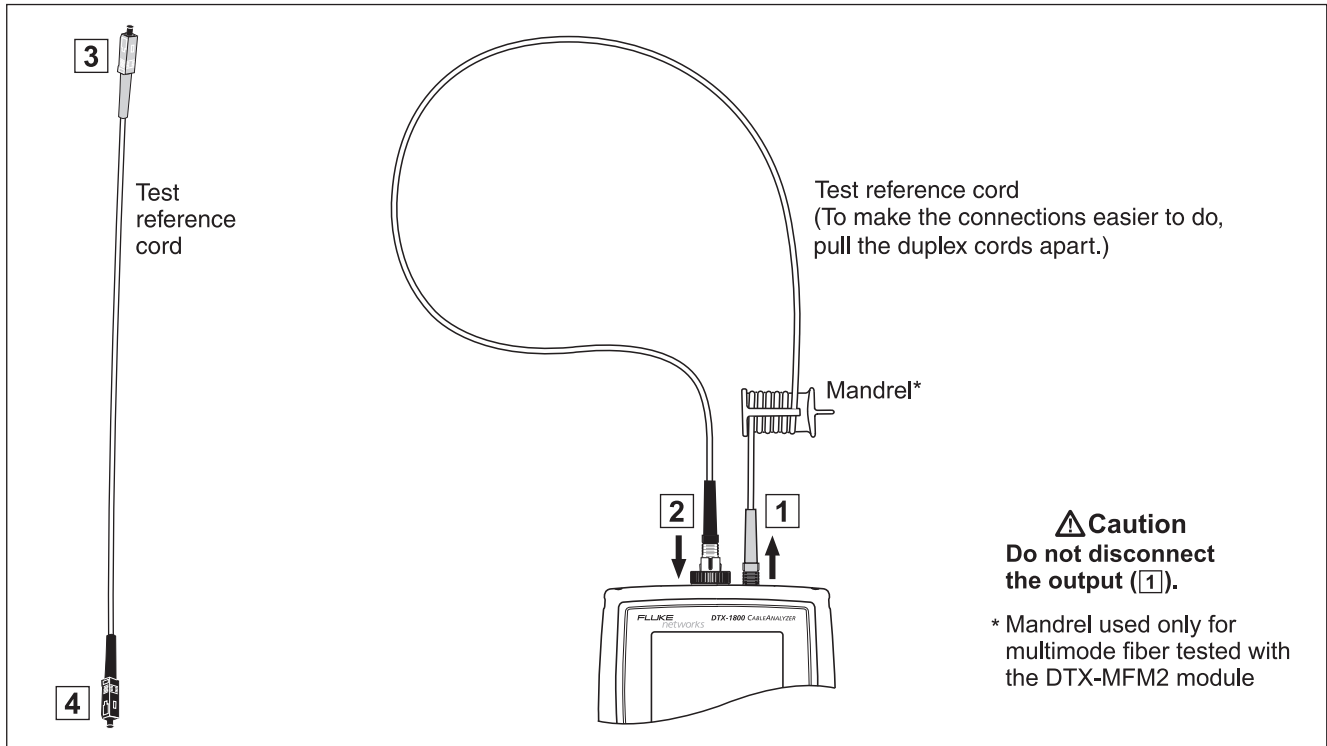
amd147f.eps

Figure 8-14. Setting the Reference in Loopback Mode (1 Jumper Method)

Testing Your Test Reference Cords in Loopback Mode

⚠ Caution

If you disconnected the test reference cord from the tester's output, you must set the reference again to ensure valid measurements.

12 Disconnect the test reference cord from the INPUT port on the tester.

13 Make the connections shown in Figure 8-15.

14 Turn the rotary switch to **AUTOTEST**, then press ⓉⒺⓈⓉ.

15 Press ⓔⓝⓣⓔⓡ to see the test result. The result must be no more than these limits:

⚠ Caution

An overall result of PASS does not show that the test reference cords are good. You must compare the loss to the limits given here to make sure the cords are good.

Multimode test reference cord:

850 nm: 0.11 dB or less
1300 nm: 0.10 dB or less

(The limits are different because fiber has more loss at 850 nm than at 1300 nm.)

Singlemode test reference cord:

0.20 dB or less for 1310 nm and 1550 nm

16 If a result is more than the limit shown above, use the procedure given in Appendix A to test the cords. When you have good test reference cords, set the reference and do these steps (12 through 16) again before you test a fiber link.

17 Save the test results to show that you used good test reference cords to test the link.

Note

Fluke Networks recommends that you use this procedure to make sure your test reference cords are good before you test each fiber link.
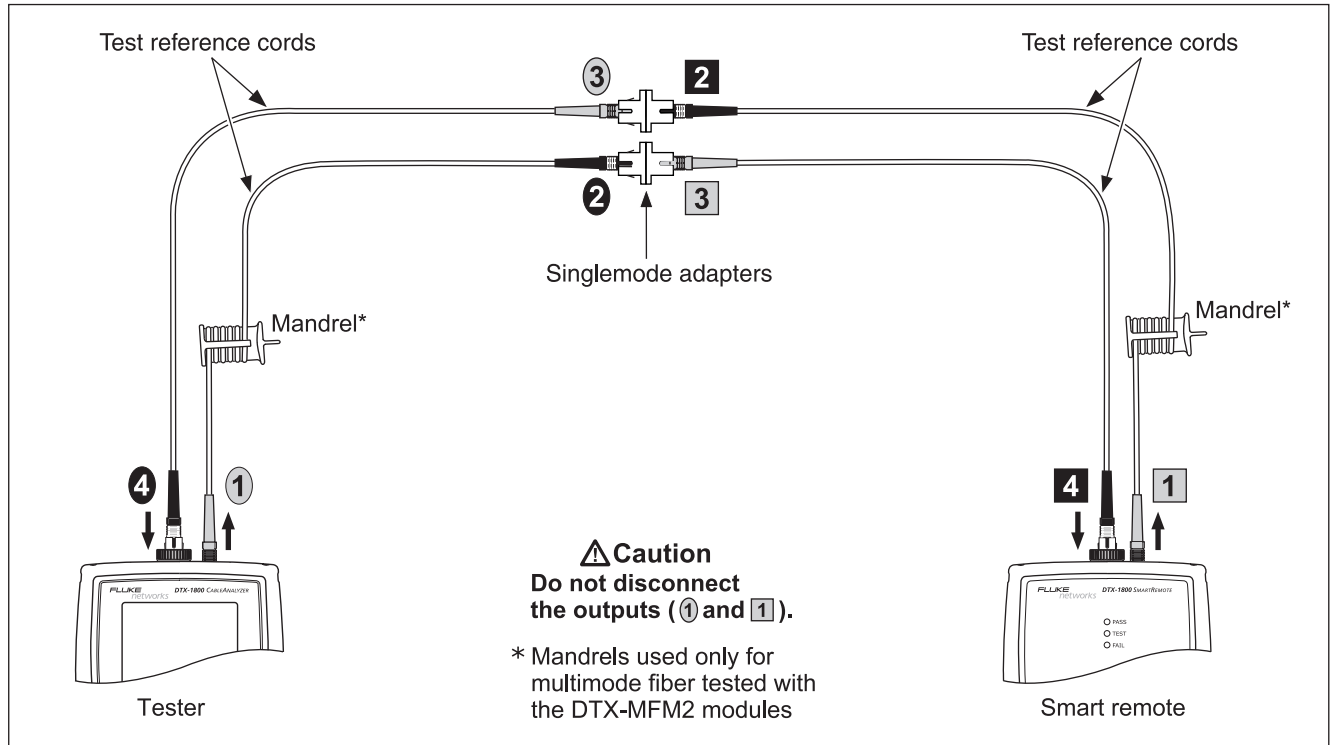
Singlemode adapter

3 2

Test reference cord

Test reference cord

Mandrel*

4 1

⚠ **Caution**
Do not disconnect the output (1).

* Mandrel used only for multimode fiber tested with the DTX-MFM2 module

amd176.eps

Figure 8-15. Testing the Test Reference Cords in Loopback Mode

Running the Autotest in Loopback Mode

⚠ Caution

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

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

19 Verify that the settings described in Table 8-2 on page 8-14 are appropriate.

20 Clean and inspect the connectors on the cabling to be tested.

21 Connect the tester to the cabling. Figure 8-16 shows connections for the 1 Jumper method.

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

23 Press ⬭ TEST.

24 To save the results, press ⬭ SAVE; then do one of the following:

- To save the results in a new record, select or create a fiber ID; then press ⬭ SAVE.

- To save the results with existing OTDR or network connectivity results for the same link, enter the ID of the existing results or select the ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press ⬭ SAVE.

  IDs that already contain fiber results are preceded with a "**$**".
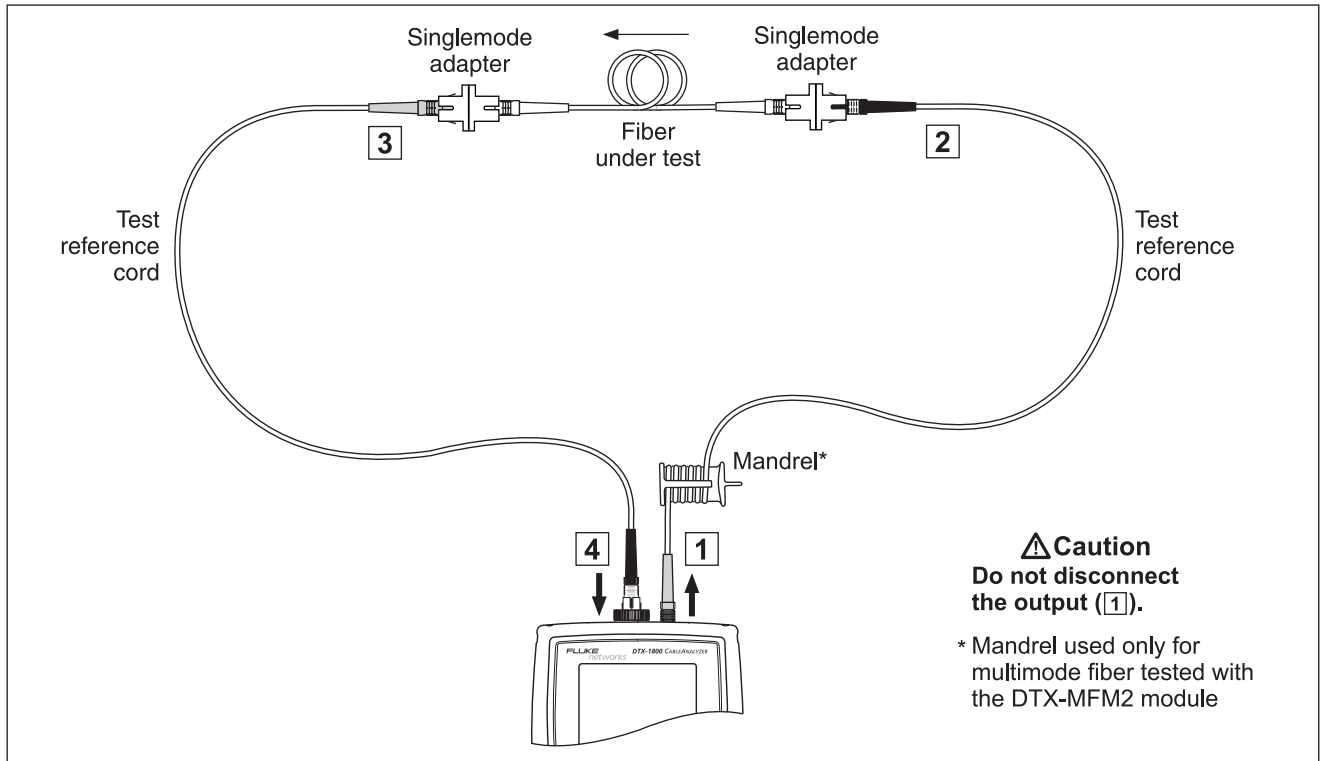
amd148f.eps

Figure 8-16. Testing a Fiber in Loopback Mode (1 Jumper Method)

Loopback Mode Autotest Results

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

To see more detailed results, use $\Leftrightarrow$ to highlight a measurement; then press (ENTER).

Figure 8-17 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 6-48.
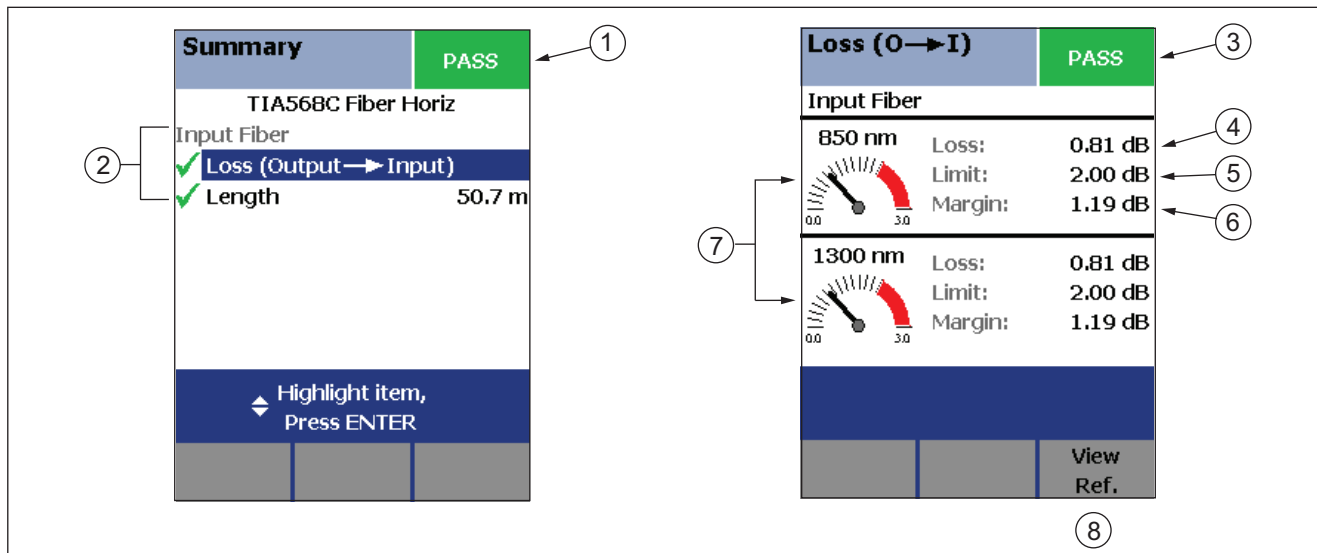
amd27f.eps

Figure 8-17. 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 page 10-3 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 ⓕ₃ **View Ref.** to view the reference information.

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® Pro source or LS-1310/1550 laser source.

Figure 8-18 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-568C Fiber Backbone limit. The tester does not measure length in Far End Source mode.

amd51f.eps

① Tester and smart remote with fiber modules and connector adapters installed (match connector adapters to the connectors in the link)

② Memory card (optional)

③ Two AC adapters with line cords (optional)

④ Test reference cord. Match the fiber to be tested. SC connector at one end. Match the link connectors at the other end.

⑤ Test reference cord. Match the fiber and connectors in the link.

⑥ Singlemode adapter of the appropriate type.

⑦ Mandrel. Recommended when testing multimode fiber with DTX-MFM2 modules. See page 8-12.

⑧ Fiber cleaning supplies

⑨ A microscope for inspecting fiber connectors (the FT500 FiberInspector Mini Video Microscope is shown)

Figure 8-18. Equipment for Testing in Far End Source Mode (1 Jumper Method)

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 ambient temperature. For other sources, warm up according to the manufacturer's recommendations.

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

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

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

5   Clean and inspect the connectors on the tester, source, and test reference 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 8-19 shows connections for the 1 Jumper method.*

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

6   Hold down the button on the smart remote's fiber module for 3 seconds to turn on the output port at 850 nm (DTX-MFM2/GFM2) or 1310 nm (DTX-SFM2). Press again to switch to 1300 nm (DTX-MFM2), 1310 nm (DTX-GFM2), or 1550 nm (DTX-SFM2).

The LED is red for the shorter wavelength and green for the longer wavelength.

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

7   Press ⓣₑₛₜ, highlight the appropriate wavelength; then press ⓣₑₛₜ again.

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

8   Press Ⓕ₂ **OK**.

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

9   To enter test reference cord lengths to meet TIA reporting requirements, press Ⓕ₁ **Patch Lengths**.

10 On the **Patch Lengths** screen, enter the lengths of the test reference cords. Press ⓢₐᵥₑ when you are done.

⚠ Caution

Do not disconnect the test reference cord from the smart remote's output after setting the reference.

If you do, you must set the reference again to ensure valid measurements.

Test reference cord

4

3

Mandrel*

Test reference cord

(To make the connections easier to do, pull the duplex cords apart.)

2

1

⚠ Caution
Do not disconnect the output (1).

* Mandrel used only for multimode fiber tested with the DTX-MFM2 module

The button activates the output. See page 8-40.

Tester

Smart remote

amd149b.eps
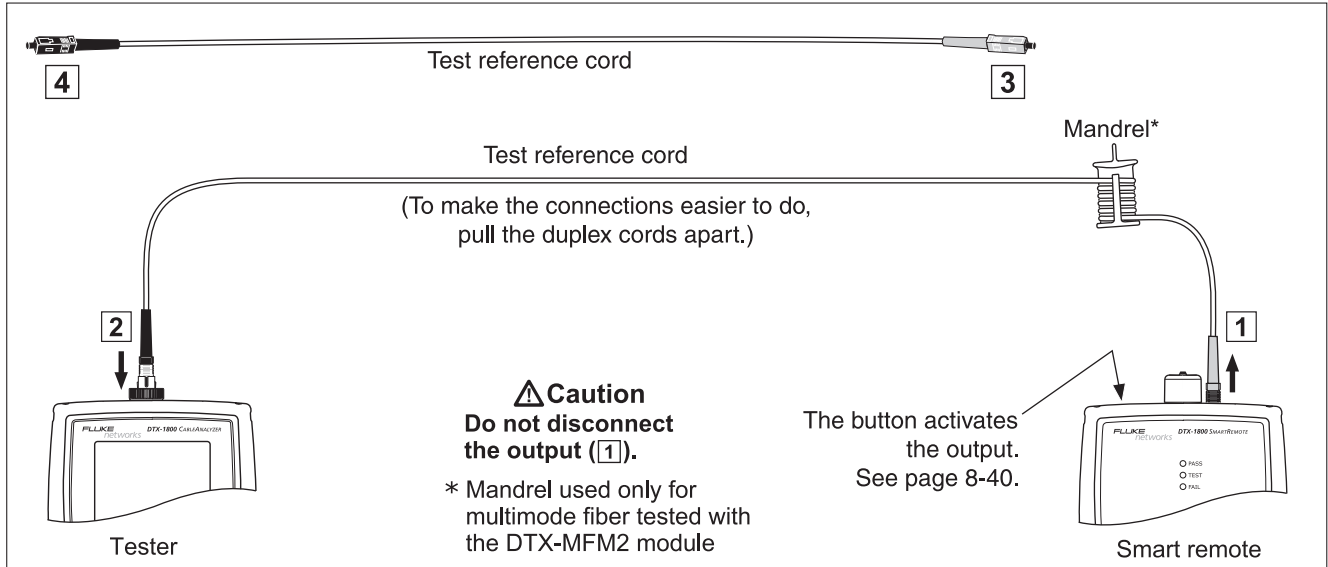
Figure 8-19. Setting the Reference in Far End Source Mode (1 Jumper Method)

Testing Your Test Reference Cords in Far End Source Mode

⚠ Caution

If you disconnected the test reference cord from the tester's output, you must set the reference again to ensure valid measurements.

11 Disconnect the test reference cord from the INPUT port on the tester.

12 Make the connections shown in Figure 8-20.

13 Turn the rotary switch to **AUTOTEST,** then press (TEST).

14 Press (ENTER) to see the test result. The result must be no more than these limits:

⚠ Caution

An overall result of PASS does not show that the test reference cords are good. You must compare the loss to the limits given here to make sure the cords are good.

Multimode test reference cord:

850 nm: 0.11 dB or less

1300 nm: 0.10 dB or less

(The limits are different because fiber has more loss at 850 nm than at 1300 nm.)

Singlemode test reference cord:

0.20 dB or less for 1310 nm and 1550 nm

15 If a result is more than the limit shown above, use the procedure given in Appendix A to test the cords. When you have good test reference cords, set the reference and do these steps (11 through 15) again before you test a fiber link.

16 Save the test results to show that you used good test reference cords to test the link.

Note

Fluke Networks recommends that you use this procedure to make sure your test reference cords are good before you test each fiber link.
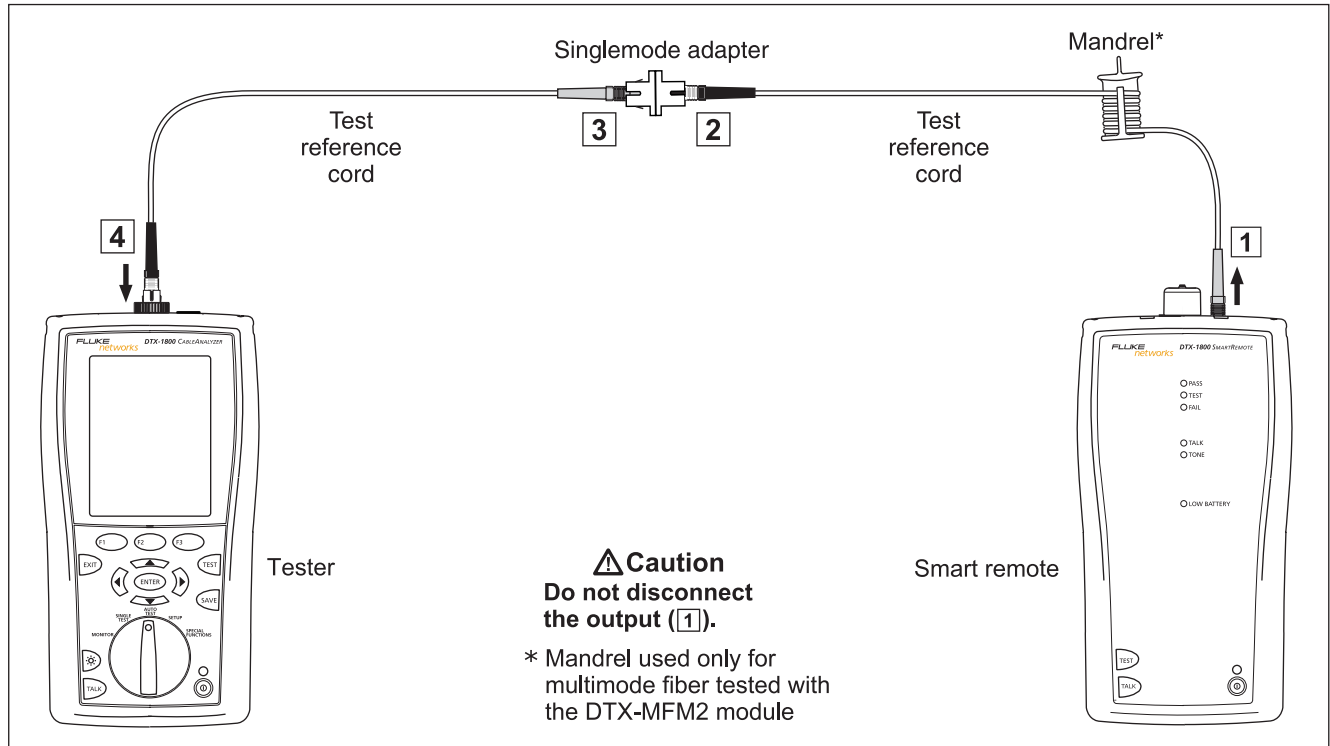
amd177.eps

Figure 8-20. Testing the Test Reference Cords in Far End Source Mode

Running the Autotest in Far End Source Mode

⚠ Caution

If the test reference 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.

17 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 ambient temperature. For other sources, warm up according to the manufacturer's recommendations.

18 Verify that the settings described in Table 8-2 on page 8-14 are appropriate. Clean and inspect the connectors on the cabling to be tested.

19 Connect the tester to the cabling as shown in Figure 8-21.

20 Verify the source is set to the correct wavelength.

To set the wavelength on a DTX 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-MFM2/GFM2) or 1310 nm (DTX-SFM2). Press again to switch to 1300 nm (DTX-MFM2), 1310 nm (DTX-GFM2), or 1550 nm (DTX-SFM2).

The LED is red for the shorter wavelength and green for the longer wavelength.

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

21 Turn the rotary switch to Autotest. Verify that the media type is set to **Fiber**. Press Ⓕ₁ ⬭ **Change Media** to change it if necessary.

22 Press ⧈, highlight the appropriate wavelength; then press ⧈ again.

23 To save the results, press ⧈; then do one of the following:

- To save the results in a new record, select or create a fiber ID; then press ⧈.

- To save the results with existing OTDR or network connectivity results for the same link, enter the ID of the existing results or select the ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press ⧈.

  IDs that already contain fiber results are preceded with a "$".
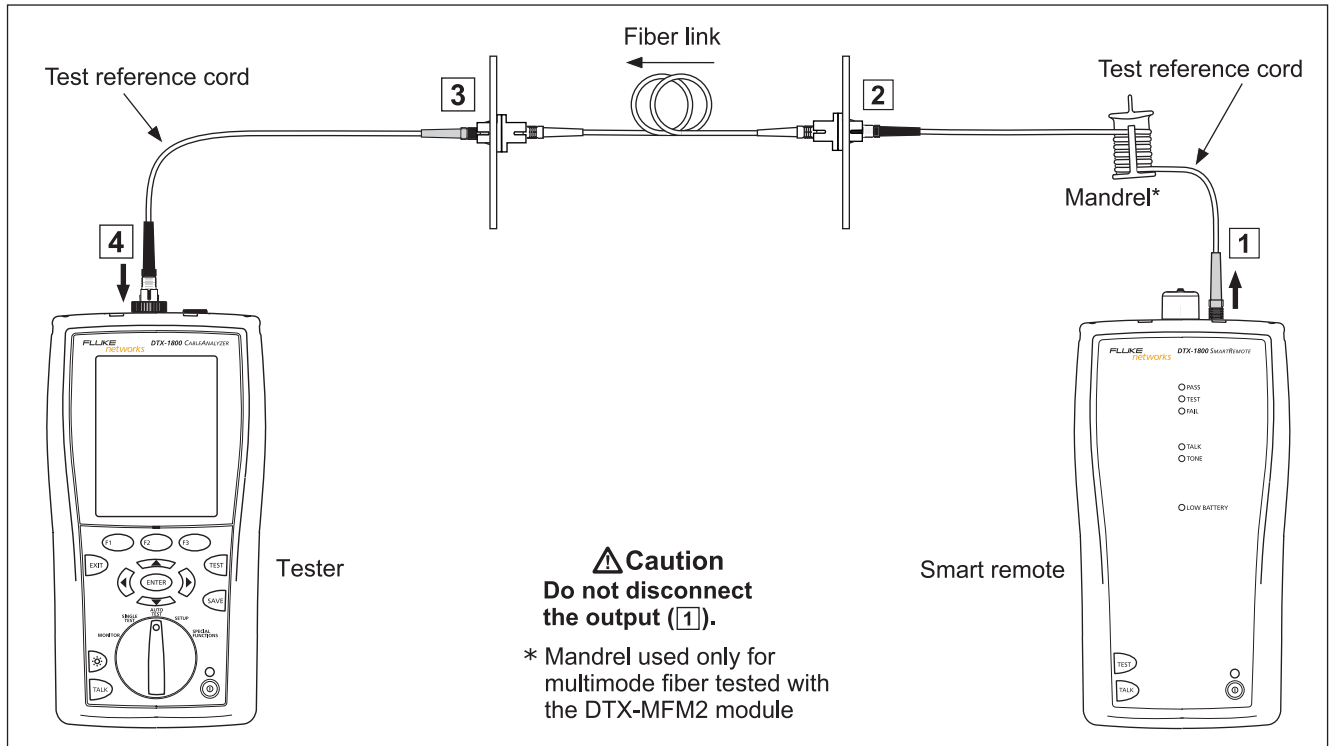
amd150f.eps

Figure 8-21. Testing a Fiber in Far End Source Mode (1 Jumper Method)

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 (ENTER).

Figure 8-22 describes the **Summary** screen loss results screen for an Autotest in Far End Source mode.
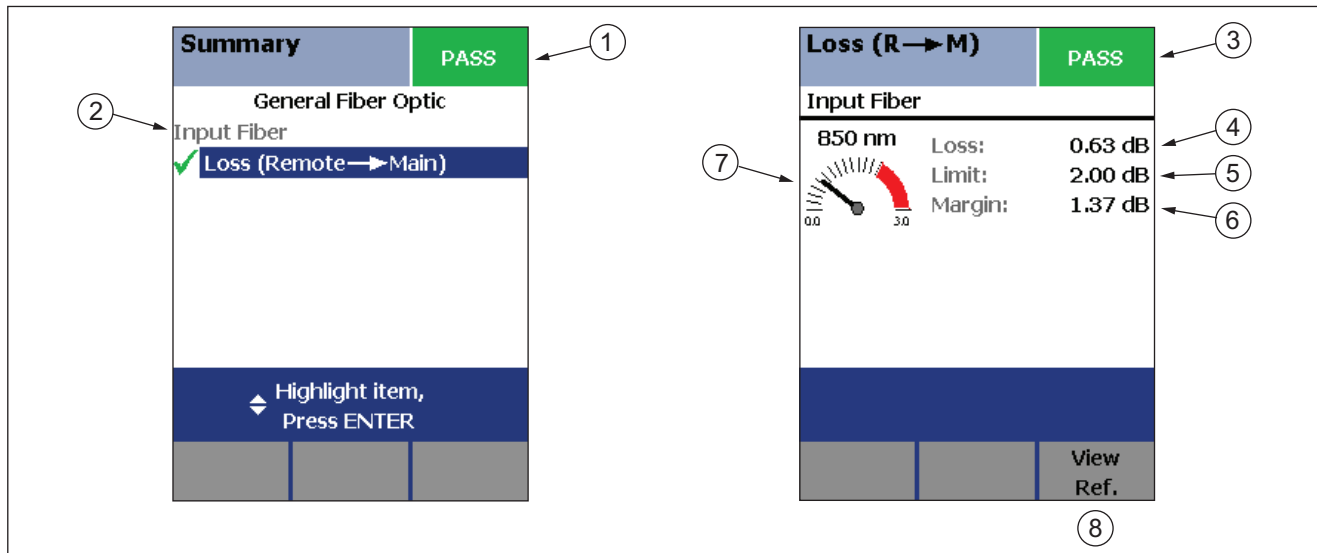
amd28f.eps

Figure 8-22. 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.

✔: **PASS**

✗: **FAIL**

i: Because the test limit uses length and an attenuation coefficient to calculate loss, the results do not show a **PASS** or **FAIL** result. This is because the tester must have a length measurement to calculate loss. The tester cannot measure length in Far End Source mode.

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 page 10-3 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

*If the test limit uses length and an attenuation coefficient to calculate loss, the results do not show a **PASS** or **FAIL** result, a limit, or a margin. This is because the tester must have a length measurement to calculate length in Far End Source mode.*

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 Loss**.

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 test reference cord from the tester's output port invalidates the reference.

5   When the test is complete, press ⒮ to save the results. Select or create a fiber ID for the fiber; then press ⒮ again.

In Smart Remote mode, you save two results, one for each fiber. See the next section.

Bi-Directional Results for Smart Remote Mode

Unsaved tests show the results for both fibers, as shown at the left of Figure 8-23. **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 ⒡₁ **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 8-23. 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.

Summary	PASS
TIA568C Fiber Horiz	
Input Fiber	
✓ Loss (Remote➤Main)	
✓ Loss (Main➤Remote)	
✓ Length	50.1 m
Output Fiber	
✓ Loss (Remote➤Main)	
✓ Loss (Main➤Remote)	
✓ Length	50.1 m

Highlight item, Press ENTER

Unsaved results show both the input and output fibers

Summary A5	PASS
TIA568C Fiber Horiz	
✓ Loss (Remote➤Main)	
✓ Loss (Main➤Remote)	
✓ Length	50.1 m

Highlight item, Press ENTER

First saved result is the input fiber

Summary A6	PASS
TIA568C Fiber Horiz	
✓ Loss (Remote➤Main)	
✓ Loss (Main➤Remote)	
✓ Length	50.1 m

Highlight item, Press ENTER

Second saved result is the output fiber

amd127f.eps

Figure 8-23. 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 8-24 shows the equipment needed for using FindFiber in Smart Remote mode.

amd53f.eps

① Tester and smart remote with fiber modules and connector adapters installed. Match connector adapters to the connectors in the link.

② Two ac adapters with line cords (optional)

③ Test reference cords. Match the fiber to be tested. One end of each must have an SC connector. For the other connectors, match the connectors in the link.
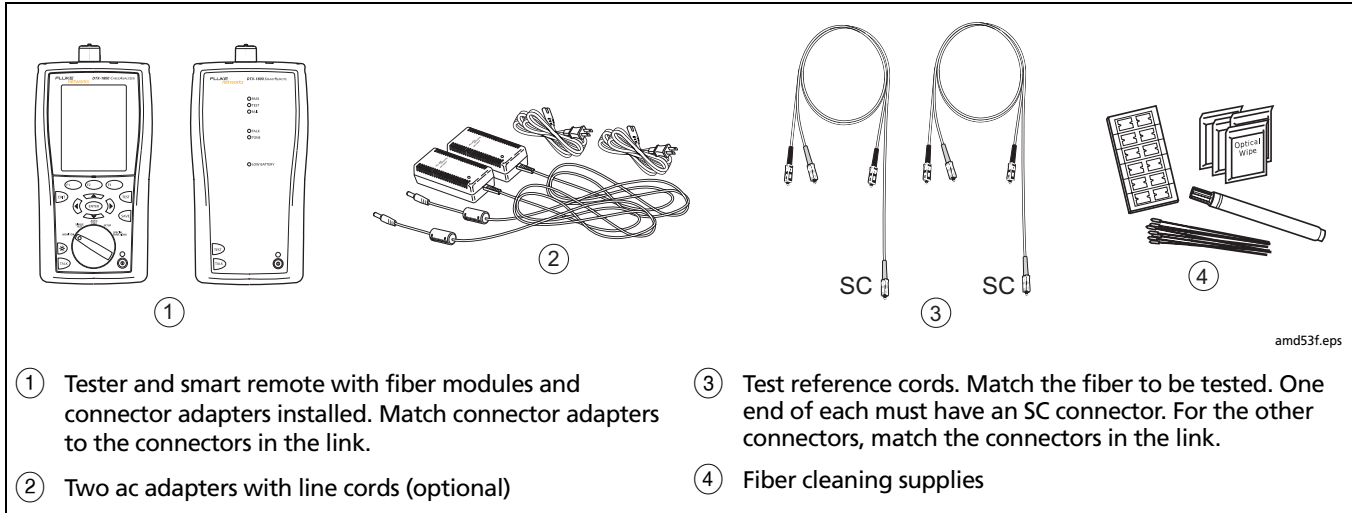
④ Fiber cleaning supplies

Figure 8-24. 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 Loss**.

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

3 Clean all connectors; then make the connections shown in Figure 8-25.

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 8-26 shows the main tester results for Smart Remote mode.
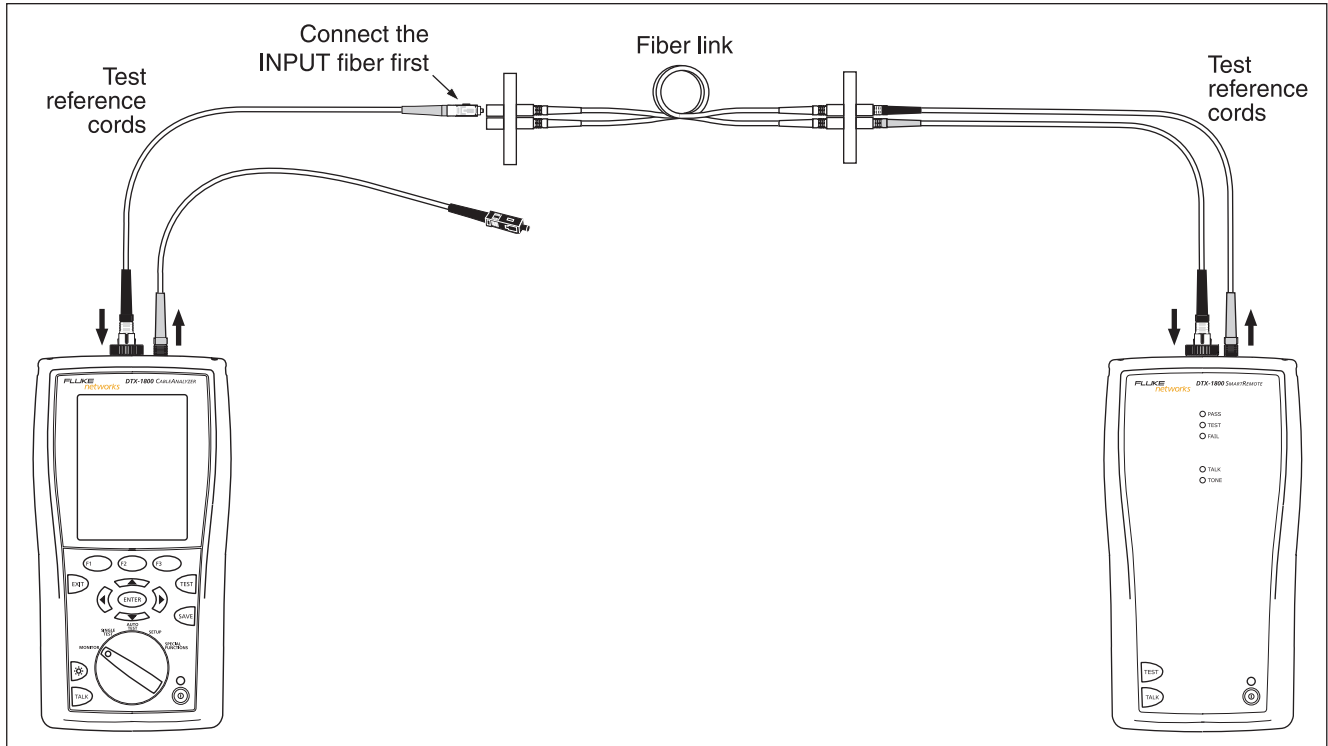
amd54f.eps

Figure 8-25. Using FindFiber in Smart Remote Mode

amd103f.eps

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

If the main tester's OUTPUT fiber is connected to the remote's INPUT port, the remote's TEST LED blinks.

amd104f.eps

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

amd105f.eps

Both fiber paths are complete.

On the remote, the TEST and PASS LEDs blink alternately.
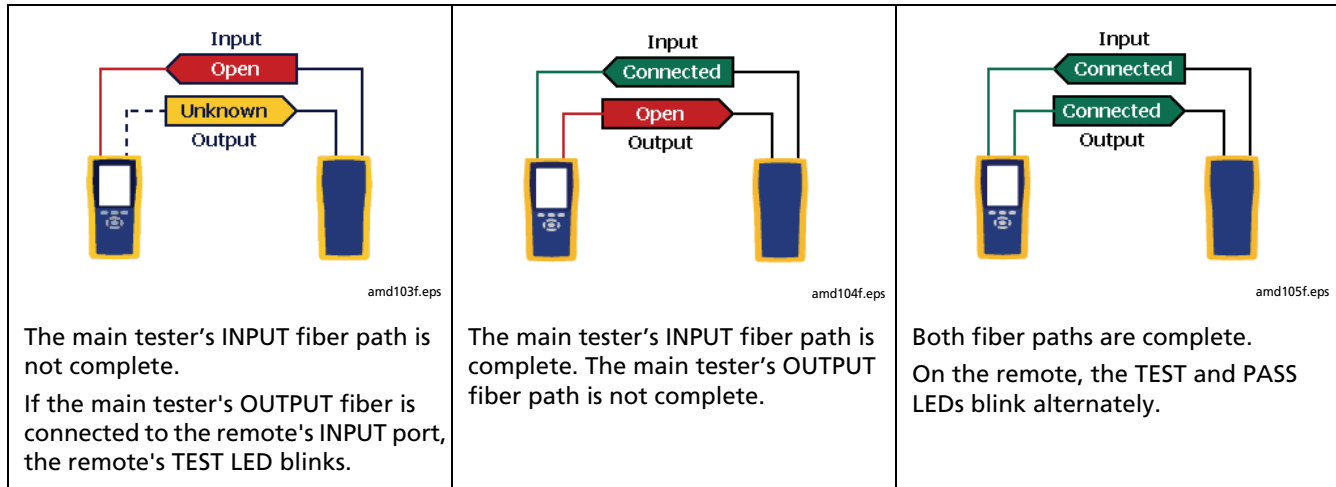
Figure 8-26. Main Tester Results for FindFiber Test (Smart Remote Mode)

Using FindFiber in Loopback Mode

Use FindFiber in Loopback mode to quickly check the continuity of patch cords and fiber spools. Figure 8-27 shows the equipment needed for using FindFiber in Loopback mode.

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

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 8-28.

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.

amd55f.eps

① Tester with fiber module and connector adapter installed. Match the connectors on the test reference cord (③) or use an SC adapter if the fiber under test has SC connectors. See Figure 8-28.

② AC adapters with line cord (optional)

③ Test reference cord (optional for checking a fiber with SC connectors)

④ Two adapters of the appropriate type (optional for checking a fiber with SC connectors)

⑤ Fiber cleaning supplies

Figure 8-27. Equipment for Using FindFiber in Loopback

Test reference cords

Patch cord or fiber spool

Note: If the fiber under test has SC connectors, you may plug it directly into the ports on the tester.
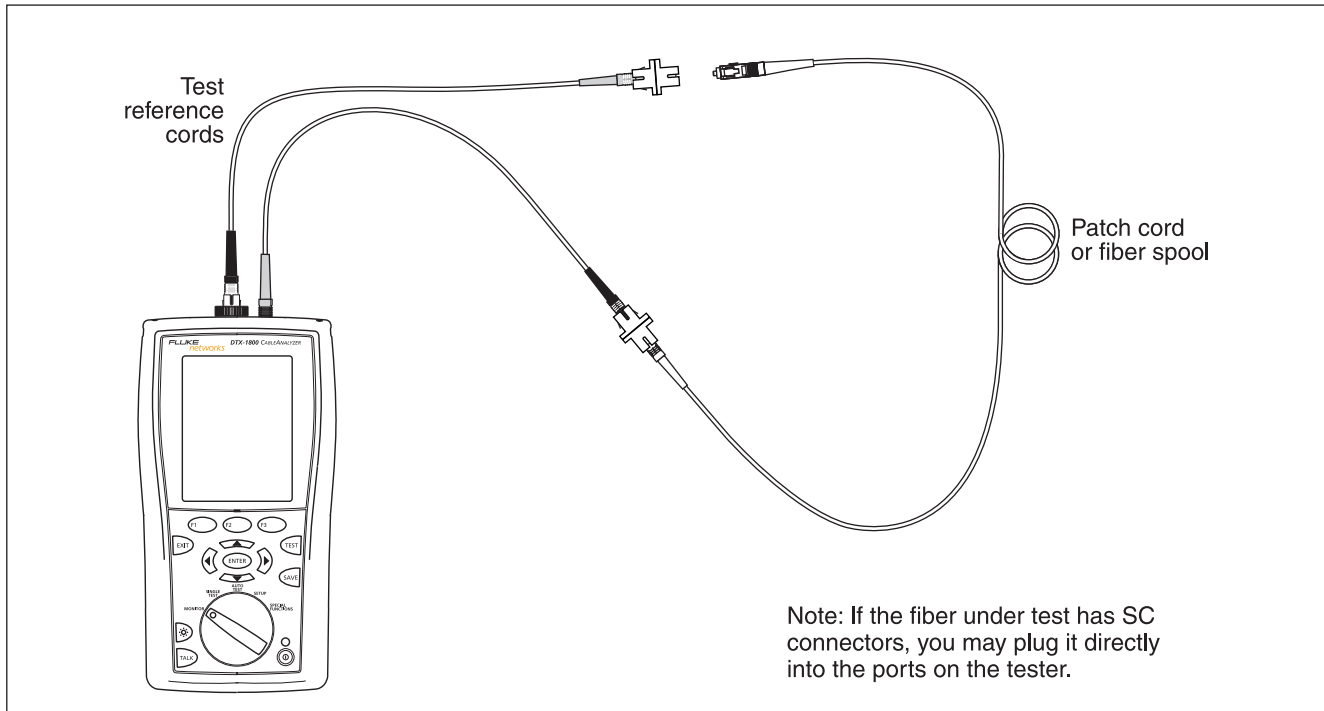
amd56f.eps

Figure 8-28. 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: Takes one power measurement at 850 nm and 1300 nm (DTX-MFM2), 850 nm and 1310 nm (DTX-GFM2), or 1310 nm and 1550 nm (DTX-SFM2). 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 8-29 shows the equipment required for using the power meter in **MONITOR** mode.

amd57f.eps

① Tester with fiber module and connector adapter installed. Match the connector adapter to the connector in the link or on the source. See Figure 8-30.

② Memory card (optional for **SINGLE TEST** mode)

③ AC adapter with line cord (optional)

④ One test reference cord. Match the fiber used in the installation, with SC at tester end. See Figure 8-30.

⑤ Fiber cleaning supplies
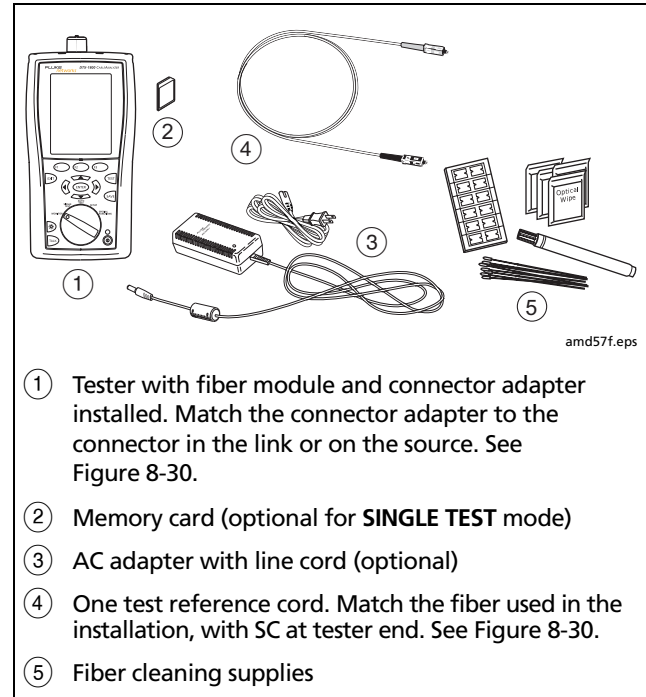
Figure 8-29. Equipment for Using the Power Meter in MONITOR Mode

To use the power meter in **MONITOR** mode:

Note

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

1 Clean the tester's input port, the test reference cord connectors, and the source connector.

2 Use the test reference cord to connect the source to the tester's input port, as shown in Figure 8-30.

3 Turn on the source.

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

5 Press ⓣ.

6 Select the appropriate wavelength; then press ⓣ. The power meter in **MONITOR** mode runs continuously until you press ⓔ.

Figure 8-31 describes the power meter screens for **SINGLE TEST** and **MONITOR** modes.
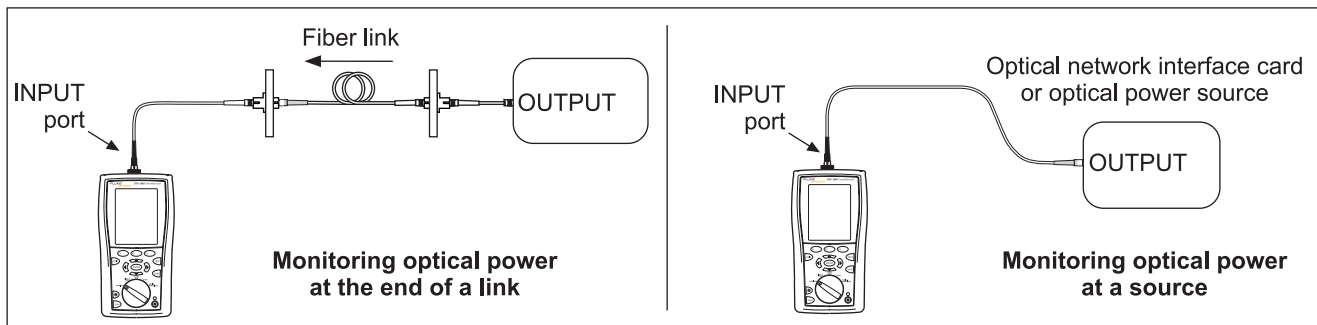
amd126f.eps

Figure 8-30. Connections for Monitoring Optical Power (MONITOR mode)

To use the power meter in **SINGLE TEST** mode:

Note

Refer to previous sections on the Autotest in Smart Remote, Loopback, or Far End Source modes for details on selecting these modes and making test connections.

1   In **SETUP**, set the tester to Smart Remote, Loopback, or Far End Source mode.

2   Connect the tester to the cabling for Smart Remote, Loopback, or Far End Source mode.

3   Clean the tester's input port, the test reference cord connectors, and the source connector(s).

4   Use the test reference cord(s) to connect to the cabling.

5   Turn on the source.

6   Turn the rotary switch to **SINGLE TEST**, select **Power**; then press ⒯ᴇˢᵀ.

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

In Smart Remote mode you will save two power meter results, one for each fiber. In the saved results, **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.

Figure 8-31 describes the power meter screens for **SINGLE TEST** and **MONITOR** modes.

Unsaved results for SINGLE TEST mode with Smart
remote configuration (Input Fiber shown)

amd106f.eps

Results for MONITOR Mode

amd107f.eps

① Meters showing the power readings taken at each wavelength. The tester takes one measurement for each wavelength.

② Power readings in decibels relative to 1 mW (dBm) or microwatts (μw).

③ To switch between decibels and microwatts, press (F1).

① Meter showing the power reading. The reading updates continuously until you press (EXIT).

② To switch between dBm and μw, press (F1).

③ To switch wavelengths, press (F3) **Change** λ.

Figure 8-31. 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 DTX-MFM2 or DTX-SFM2 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 9: Locating Fibers and Faults with the Visual Fault Locator

Visual Fault Locator Applications

The DTX-MFM2, DTX-SFM2, DTX-GFM2, and DTX Compact OTDR modules include 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.)

Using the Visual Fault Locator

Figure 9-1 shows the equipment needed for 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 test reference cord with the appropriate connector at one end and a SC, ST, or FC connector at the tester end.

amd61f.eps

① Tester or smart remote with DTX-MFM2, DTX-SFM2, or DTX-GFM2 fiber module or tester with DTX Compact OTDR module

② AC adapter with line cord (optional)

③ One test reference cord. Match fiber and connectors to be tested; SC, ST, or FC at tester end (optional)
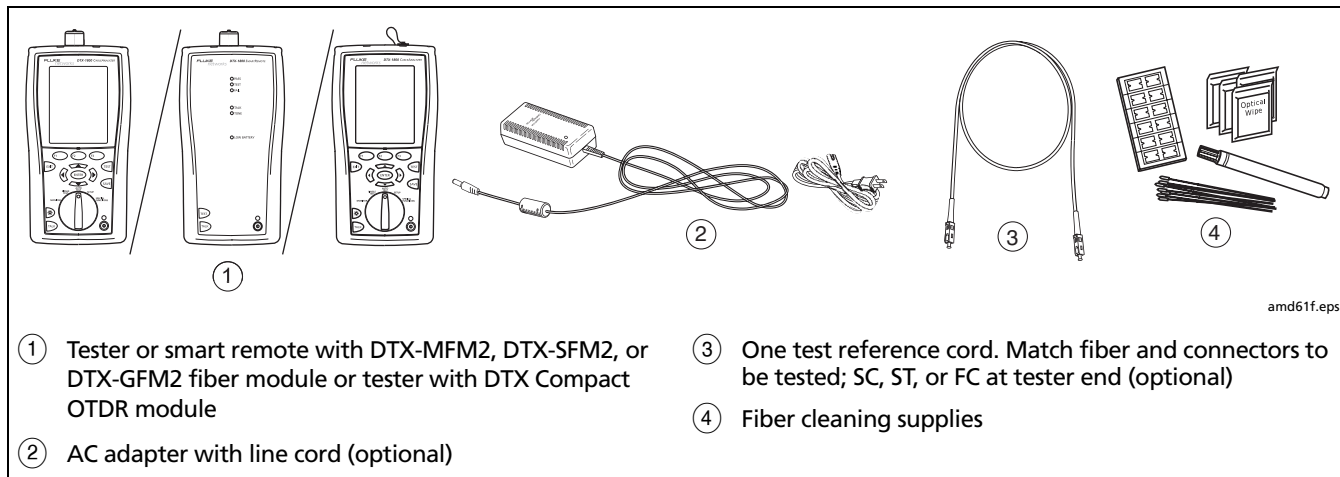
④ Fiber cleaning supplies

Figure 9-1. Equipment for Using the Visual Fault Locator

To use the visual fault locator:

1 Clean the connectors on the test reference cord, if used, and the fiber to be tested.

2 Connect the fiber directly to the tester's VFL port or connect using the test reference cord.

3 Turn on the visual fault locator (refer to Figure 9-2):

- DTX-MFM2/SFM2/GFM2 module: press the button near the VFL connector. Press again to switch to flashing mode. Press again to turn off the locator.

- DTX Compact OTDR module: Turn the rotary switch to **SINGLE TEST**. If necessary, press (F1) **Change Media** then set the media type to **Fiber OTDR**. Use the softkeys to start the VFL, switch to pulse mode, and stop the VFL.

4 Look for the red light to locate fibers or faults, as shown in Figure 9-2.

5 View the VFL's light indirectly by holding a white card or paper in front of the fiber connector emitting the light.

Note

The locator's light may not be visible through dark-colored fiber jackets.

Press once:
ON

Press again:
Blinking

Press again
OFF

VFL
connector

Tester or smart remote with
DTX-MFM2/GFM2/SFM2
fiber module

Continuity check/tracing fibers

Microbend or
broken fiber

Broken fiber
in connector

VFL
connector

Tester with DTX Compact
OTDR module

Turn the rotary switch
to **SINGLE TEST**. Use
the softkeys to control
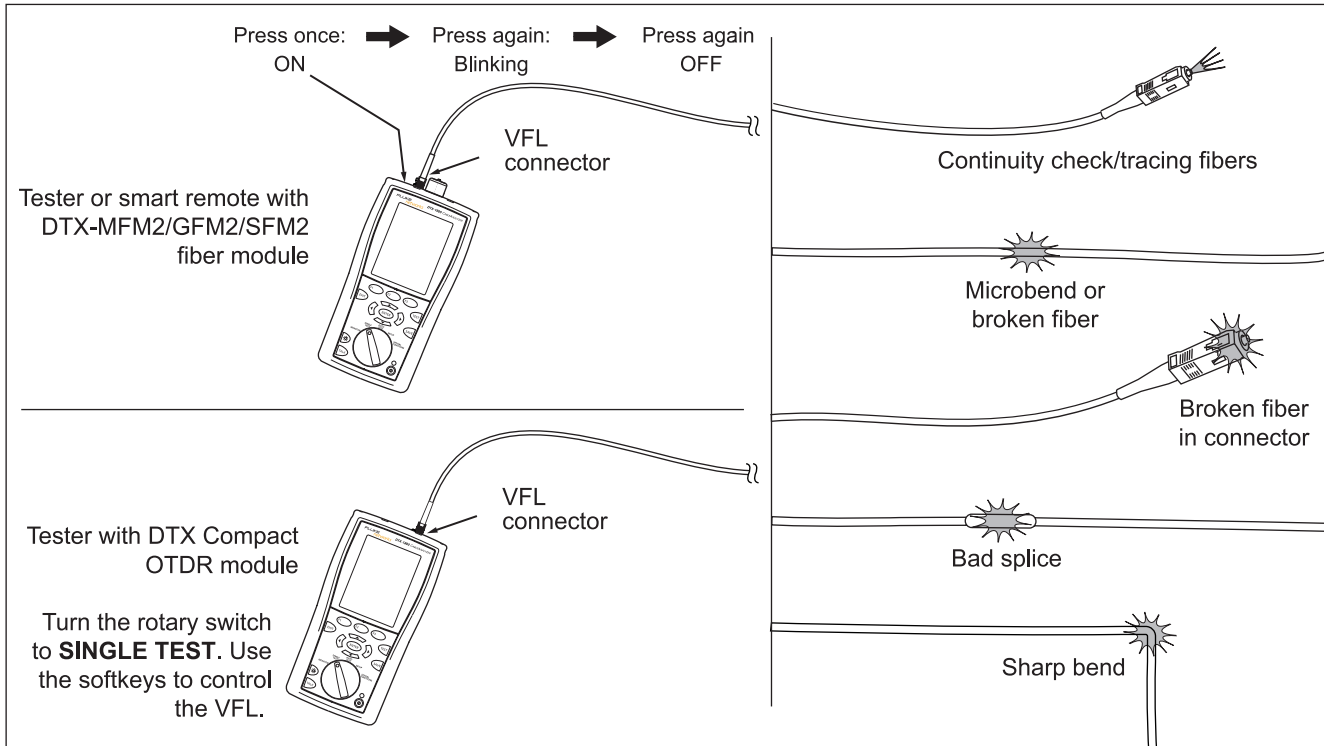the VFL.

Bad splice

Sharp bend

amd23f.eps

Figure 9-2. Using the Visual Fault Locator

Chapter 10: 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 10-1.

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 10-1. 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 Loss/Length Test Failures

Table 10-2 describes some typical causes of fiber test
failures.

Table 10-2. Diagnosing Loss/Length 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 VFL can reveal damaged connectors and other faults. See Chapter 8 for details. An OTDR, such as the Fluke Networks OF-500 OptiFiber® Certifying OTDR, can help you locate faults not revealed with the VFL.

- There is a kink or sharp bend in a test reference cord or the fiber under test. Use the VFL to reveal these faults.

- A test reference 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 test reference 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 test reference cord or fiber segment has the wrong core size. An OTDR is useful for locating mismatched fibers.

- The cabling has a bad fusion or mechanical splice or a sharp bend. Use the visual fault locator to reveal these faults.

- The test reference cords have PC or UPC connectors, but the link being tested has APC connectors.

- The fibers are connected to the wrong ports on the tester, or are swapped at one end of the cabling.

Table 10-2. Diagnosing Fiber Test Failures (cont.)

Loss is negative.
• The fiber ends were dirty during referencing.
• The connections to the tester were disturbed after referencing.
• There was a kink in a test reference cord during referencing.
• The connectors were not properly aligned during referencing.
• The testers were much colder during referencing than during testing.
• Some other problem caused a bad reference value.
• If loss is negative, set the reference again and retest the cabling. See Chapter 8.
A known length of cable measures too long or too short.
• The wrong fiber type is selected on the **Fiber Setup menu**
• The index of refraction needs adjustment. Change n on the **Fiber Setup menu**

Table 10-2. Diagnosing Fiber Test Failures (cont.)

Power meter measurement is too low
• Fiber endface is dirty or damaged.
• Test reference cord not connected to tester's INPUT port, or a connection is loose.
• Wavelength selected on tester doesn't match source wavelength.
• Source set to modulated output.
• Test reference cord or adapter is the wrong type (SM or MM) or test reference cord has the wrong core size.
• Cabling is cracked or broken.
Power meter measurement is too high
Tester is connected to an active CATV fiber.
No FindFiber connection in Smart Remote or Loopback mode when fiber paths are complete
The remote tester is in Far End Source mode, indicated by a solid red or green LED below the OUTPUT port. To exit Far End Source mode, press the button on the module until the LED blinks green.

Diagnosing OTDR Test Failures

Table 10-3 describes some typical causes of fiber test failures.

Table 10-3. Diagnosing OTDR Test Failures

Overall Loss fails

- There is one or more dirty or damaged connections in the cabling. Check the OTDR trace or event table for high-loss reflective events.

- The wrong fiber type is selected on the OTDR tab in Setup.

- A patch cord, launch fiber, or fiber segment has the wrong core size, backscatter coefficient, or mode field diameter. If the patch cords and launch fiber are the correct type, check the OTDR trace for mismatched cable in the cabling.

- The cabling has a bad fusion or mechanical splice or a sharp bend. Use the OTDR trace or event table to locate these faults.

- The launch fibers have PC or UPC connectors, but the link being tested has APC connectors.

Note

*OVERALL LOSS may show a **WARNING** if the first or last event is hidden. If launch compensation was used, a **WARNING** occurs if the launch event is hidden or if the event after the receive event is hidden.*

Table 10-3. Diagnosing OTDR Test Failures (cont.)

| |
|---|
| **Largest Event fails** |
| • The event is a dirty or damaged connector. Check the OTDR trace or event table for high-loss reflective events. |
| • A patch cord, launch fiber, or fiber segment has the wrong core size, backscatter coefficient, or mode field diameter. If the patch cords and launch fiber are the correct type, check the OTDR trace for mismatched cable in the cabling. |
| • The event is a bad fusion or mechanical splice or a sharp bend. Use the OTDR trace or event table to locate these faults. |
| • The launch fibers have PC or UPC connectors, but the link being tested has APC connectors. |
| **Fiber Length fails, a known length of cabling measures too long or too short, or the distance to an event is wrong.** |
| • The fiber is broken or there is an open connection where the trace shows the fiber end. |
| • The wrong fiber type is selected on the **Cable** tab in Setup. |
| • The index of refraction needs adjustment. Change n on the **Cable** tab in Setup. |
| • The wrong test limit is selected on the **OTDR** tab in Setup. |
| **An event shows a FAIL result, but the event does not exceed any limit.** |
| The segment before the event exceeds a limit. To see results for the segment, ⓕ₃ **View Details** from the **Event Table** or the **OTDR Results** screen |

**Table 10-3. Diagnosing OTDR Test Failures (cont.)**
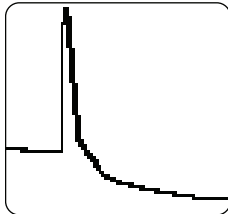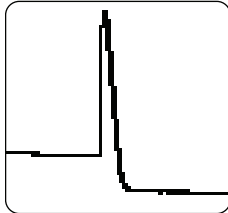
amd160.eps

Large reflective event with high loss (top) or excessive tailing (bottom). May be identified as an end event though it occurs before the end of the cabling. May be caused by the following:

- A dirty, scratched, cracked, misaligned, or unseated connector. Misaligned or unseated connectors can also cause large reflections that produce ghosts. Bad connectors should be cleaned, repolished, or replaced.

- A good connector with a sharp bend or crack within its deadzone. If the cable is tightly bent the tester may indicate a break, especially at longer wavelengths or in Manual OTDR mode with smaller resolution settings. Use a visual fault locator to precisely locate the fault.

- A crack in the fiber. Use a visual fault locator to precisely locate the fault.

- A connection between mismatched fibers (different backscatter coefficients, core sizes, numerical apertures, or other parameters). The top example could be caused by a larger core (on the left) connected to a smaller core.

-continued-

Table 10-3. Diagnosing OTDR Test Failures (cont.)
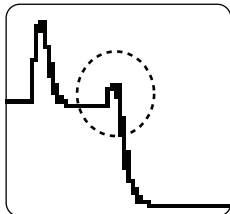
|	
amd161.eps	**Small reflective event with high loss. May be identified as an end event though it occurs before the end of the cabling.** May be caused by very sharp bend, a crack, or a mechanical splice with high loss. If the event is a bend, it may show higher loss at a longer wavelength. Use a visual fault locator to verify the problem. Bad mechanical splices should be reworked.
amd162.eps	**Large reflective event with gain (a "gainer").** A connector between mismatched fibers (different backscatter coefficients, core sizes, numerical apertures, or other parameters). This example shows a smaller core size connected to a larger core size. Testing from the other end would show a large reflective event with more loss than a connector should have.
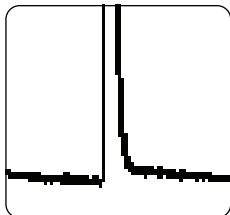
Table 10-4. Diagnosing Faults on OTDR Traces (cont.)
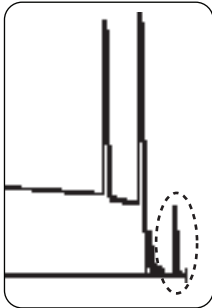
Top figure: Ghost after the cabling end

These are not listed in the event table and generally do not indicate a fault in the cabling.

Bottom figure: Ghosts in the middle of the cabling

Ghosts occurring in the middle of the cabling are listed in the event table, along with the source of the ghosts. These can be caused by the following:

- A dirty connector
- A highly-reflective connector
- A UP or UPC connector mated to an APC connector
- A connector that is not seated properly.
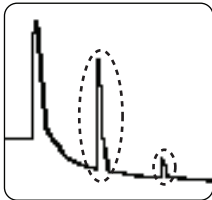
A poorly-seated connector usually shows significant loss, as shown in the example. A connector with the wrong type of polish can also cause strong reflections that result in ghosts.

Ghosts caused by hidden events may not be identified as ghosts in the event table.

Tip: On traces with multiple ghosts, only the first ghost may be identified in the event table. You can usually determine that other reflections are ghosts because they occur at multiples of distances to connectors and they show almost no loss. Multiple ghosts from the same source are spaced equally apart.

amd163.eps

Chapter 11: Verifying Network Service

Overview of Features

The optional DTX-NSM Network Service Module lets you do the following on twisted pair or fiber links:

- Verify connection to the network, including connection speed, duplex configuration, link wiring, and PoE service (wiring and PoE functions for twisted pair only)

- Ping IP addresses

- Monitor network traffic for utilization, collisions, errors, and broadcast packets

- Blink a port's activity LED

- Use Fluke Networks LinkRunner™ Cable ID locators (optional) to identify link connections at a patch panel (twisted pair only)

Figure 11-1 describes the network module's features.

Software Requirements

The following software supports the DTX-NSM module. Software upgrades are available on the Fluke Networks website.

- DTX software: version 1.3 or later

- LinkWare software: version 2.5 or later

amd38f.eps

① The link LED is green when the tester is receiving link pulses from the network.

② 8-pin module jack (RJ45) for connecting to twisted pair networks.

③ Port for inserting an optional small form pluggable (SFP) optical module for testing fiber links.
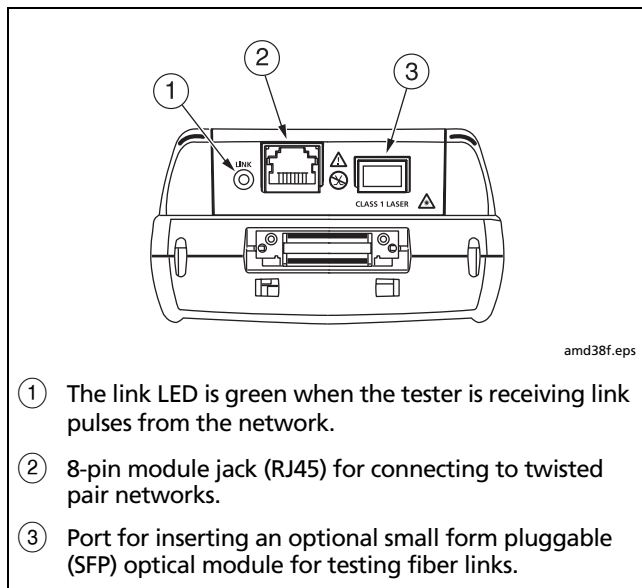
Figure 11-1. Network Module Features

Installing and Removing the Network Module and Optional SFP Module

See Figure 11-2.

Install the network module only in the main tester.

Install an optional SFP (small form pluggable) module to test fiber links.

⚠ Caution

Leave the module bay cover in place when a module is not installed.

Put the dust cap on the SFP port when an optical module is not installed. Put the dust cap on the optical module when not connected to a fiber.

Caution

Turn off the tester before attaching or removing the DTX-NSM module

Top of SFP module (LC shown)

Pull bail or tab, if available, to remove the SFP module (modules vary)
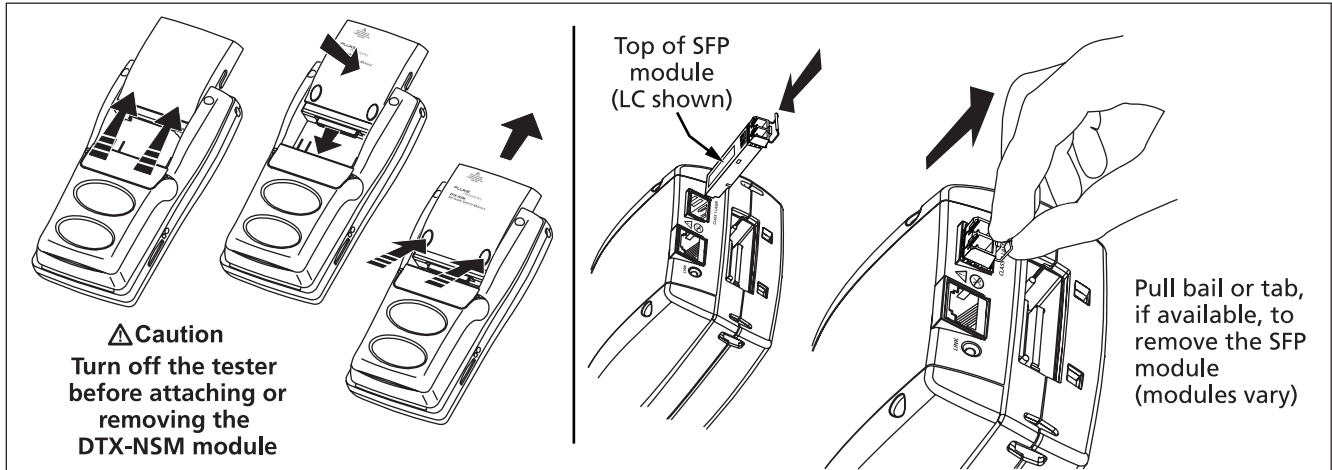
amd39f.eps

Figure 11-2. Installing and Removing the Network and SFP Modules

Verifying Network Connectivity

The network connectivity test lets you verify that a twisted pair or fiber link is connected to a network. The test provides details about the link's configuration and includes a ping function for verifying connectivity to stations on the network.

Network Connectivity Test Settings

The tester needs various addresses to test a network connection, as described in Table 11-1. To access these settings, turn the rotary switch to **SETUP**; then select **Network Settings**.

Entering Ping Addresses

You can use LinkWare software to create and download ping addresses to the tester, or you can enter and edit addresses directly on the tester.

To use LinkWare to enter ping addresses:

1   Install the latest version of LinkWare software on your PC.

2   Select **Utilities** > **DTX Utilities** > **Ping Target List** on the LinkWare menu.

3   Create an address list; then download it to the tester. See the LinkWare online help for details.

To enter or edit ping addresses on the tester:

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

2   Select **Target Addresses**; then do one of the following:

   •   To add an address, press 〈F1〉 **Create**. Enter a device **Name** and **IP Address**. Press 〈SAVE〉 when you are finished.

   •   To edit an address, highlight the address name; then press 〈F3〉 **Edit**. Select **Name** or **IP Address** for editing. Press 〈SAVE〉 when you are finished.

   •   To delete an address, highlight the address name, press 〈F2〉 **Delete**; then press 〈F3〉 **Yes**.

Table 11-1. Network Connectivity Test Settings

Setting	Description
SETUP > Network Settings > IP Address Assignment	Select **DHCP** (Dynamic Host Configuration Protocol) to have the network's server assign the tester's address, gateway address, and DHCP and DNS (Domain Name System) server addresses. Most networks support DHCP. Select **Static** to enter the tester's address, subnet mask, gateway address, and DNS server address manually. Enter the addresses on the second tab that appears after you select **Static**. These addresses are typically available from a network installer, administrator, technician, or from network documentation. ⚠ **Caution** **In Static mode, verify that the DTX Address is not used by another network device. Using a duplicate address can cause the other device to malfunction.**
SETUP > Network Settings > Number of Pings	Optional. Enter a different **Number of Pings** (3 to 50) for the network connectivity test and optional ping tests.
SETUP > Network Settings > Target Addresses	Optional. Enter one or more addresses for ping tests. You may enter addresses manually, or download them from LinkWare software. See "Entering Ping Addresses" on page 11-4 for details.

Running the Connectivity Test

To test for network connectivity:

Note

The network connectivity test will not run on links with ground loops, analog telephone voltages, ISDN voltages, or other voltages (except PoE voltage). The tester warns you if it detects these conditions.

1 Select **DHCP** or **Static** mode and enter ping addresses in Setup, as described on pages 11-5 and 11-4.

2 Connect to the network as shown in Figure 11-3.

3 Turn the rotary switch to **MONITOR**; then select **Network Connectivity** or **Network Connectivity w/PoE**.

4 Press ⓉⒺⓈⓉ. Figure 11-4 describes the network connectivity results.

5 To save the results, press Ⓢᴬⱽᴱ; then do one of the following:

- To save the results in a new record, create an ID or select an unused ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press Ⓢᴬⱽᴱ.

  IDs that already contain network connectivity results are preceded with a "$".

- To save the results with existing cable test results for the same link, enter the ID of the existing results or select the ID from the **Auto Sequence** ID list or the **List** of downloaded IDs; then press Ⓢᴬⱽᴱ.

About Testing for PoE (Power Over Ethernet)

Select **Network Connectivity w/ PoE** from the **MONITOR** menu to check a link for PoE devices when testing network connectivity.

If you are sure no PoE device is connected, select **Network Connectivity** for faster testing that does not check for PoE devices.

Select **PoE Only** to test a mid-span PoE device when there is no switch connected to the link or when you want to check only for PoE capability.
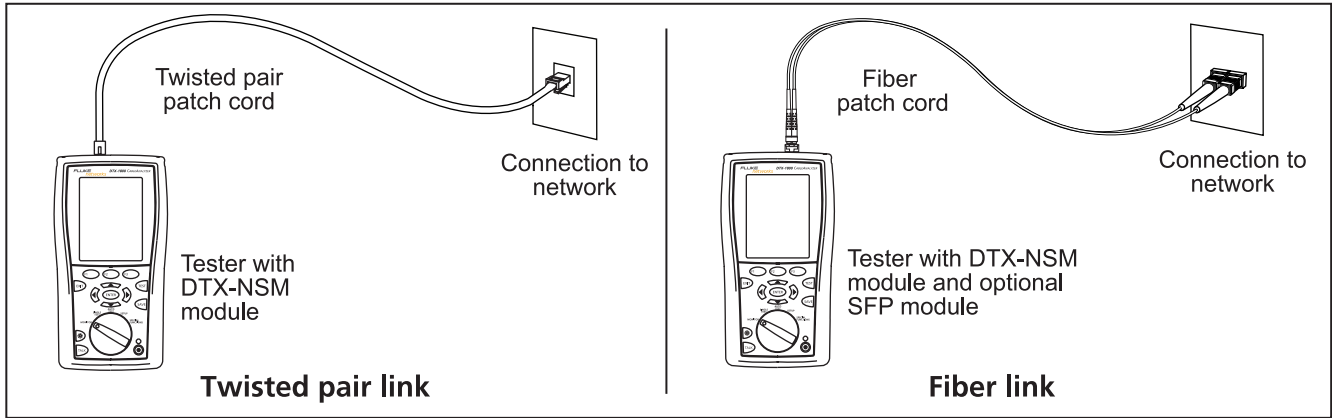
Figure 11-3. Network Test Connections

amd17f.eps
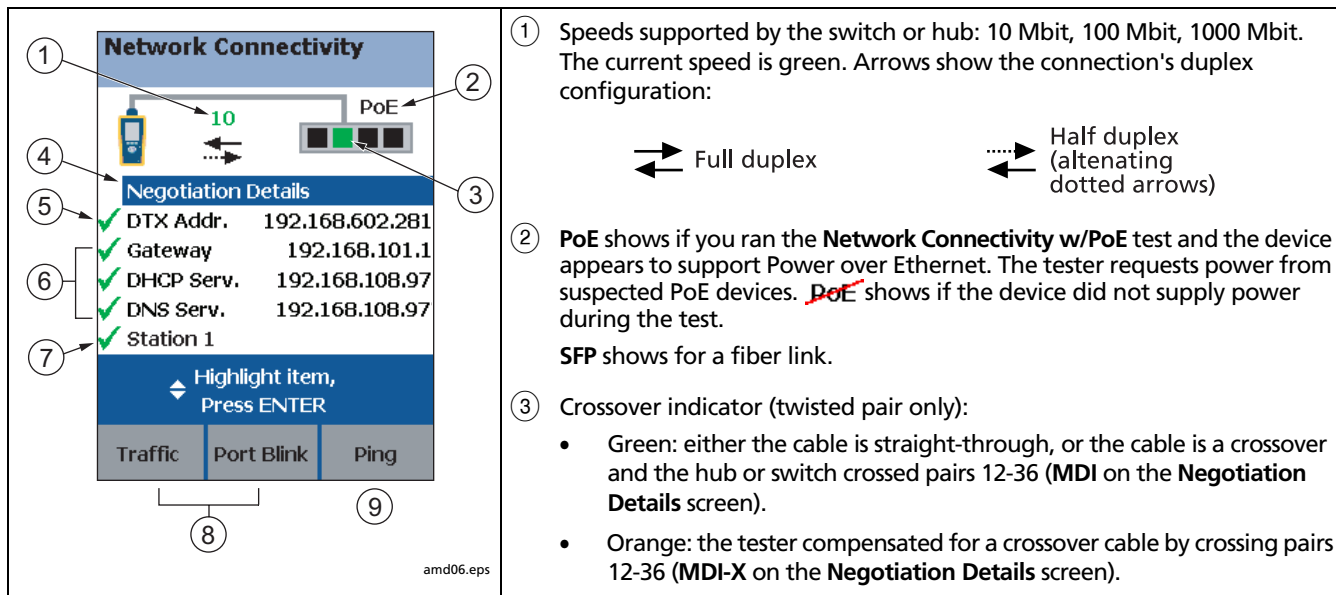
① Speeds supported by the switch or hub: 10 Mbit, 100 Mbit, 1000 Mbit. The current speed is green. Arrows show the connection's duplex configuration:

Full duplex   Half duplex (altenating dotted arrows)

② **PoE** shows if you ran the **Network Connectivity w/PoE** test and the device appears to support Power over Ethernet. The tester requests power from suspected PoE devices. ~~PoE~~ shows if the device did not supply power during the test.

SFP shows for a fiber link.

③ Crossover indicator (twisted pair only):

- Green: either the cable is straight-through, or the cable is a crossover and the hub or switch crossed pairs 12-36 (**MDI** on the **Negotiation Details** screen).

- Orange: the tester compensated for a crossover cable by crossing pairs 12-36 (**MDI-X** on the **Negotiation Details** screen).

Figure 11-4. Network Connectivity Results Screen (DHCP example for twisted pair)

④ Select **Negotiation Details** to see details. See Figure 11-5.

On the **Negotiation Details** screen, **Yes** for **Pin Reversal** indicates a reversed pair on the link, (such as wires 1 and 2 crossed). Run a wire map test on the link to check the wiring.

⑤ Select **DTX Address** to see details, including the subnet mask.

⑥ Network addresses used during the test:

- **Gateway:** Address of the network device that joins networks using different protocols or passes data between networks.

- **DHCP Server:** Dynamic Host Configuration Protocol server address. Shown only in **DHCP** mode.

- **DNS Server:** Domain Name System server address.

- In DHCP mode, the addresses above show as 0.0.0.0 if the DHCP server does not provide them.

- To see ping results for the above devices, highlight a device; then press (ENTER). See Figure 11-6.

The checkmarks and Xs indicate how many replies the tester received to its three pings:

✔ Green: Ping replies received for all requests.

✔ Orange: At least one ping reply received.

✖ No ping replies received, indicating a problem with the connection.

⑦ **<Target Address** name**>:** appears if you use (F3) **Ping** to ping a device. See "Pinging Network Devices" on page 11-11.

⑧ See "Monitoring Network Traffic" on page 11-13 and "Blinking a Port Light" on page 11-15.

⑨ Press (F3) **Ping** to ping devices. See "Entering Ping Addresses" on page 11-11- and "Pinging Network Devices" on page 11-11-.

① The speed negotiated for the connection.

② The connection's duplex configuration:

- **Half Duplex**: data travels in one direction at a time.

- **Full Duplex**: data travels in both directions at the same time (as with Gigabit Ethernet).

③ Twisted pair links only:

MDI-X (medium-dependent interface crossover): The tester compensated for a crossover cable by crossing pairs 12-36.

MDI: The tester did not compensate for a crossover cable. Either the cable is straight-through, or the cable is a crossover and the hub or switch crossed pairs 12-36.

④ Twisted pair links only. **Yes** indicates a reversed pair on the link, (such as wires 1 and 2 crossed). Run a wire map test on the link to check the wiring.

⑤ The speeds supported by the hub or switch.

⑥ The pairs that supply Ethernet power and an "adequate/inadequate" rating for the power. PoE results are shown only if the **Network Connectivity w/PoE** test was selected.

Figure 11-5. Negotiation Details (twisted pair results shown)

Pinging Network Devices

The ping test verifies connectivity to devices on the network.

To ping a network device:

1 Enter ping addresses in Setup. See page 11-4.

2 Connect to the network as shown on page 11-7.

3 Turn the rotary switch to **MONITOR**, select **Network Connectivity**; then press (TEST).

4 When the network connectivity test is complete, press (F3) **Ping**.

5 Do one of the following:

- To ping one device, highlight the device; then press (TEST).

- To ping all devices in the list, press (F1) **Ping All**.

The overall ping result appears on the **Network Connectivity** screen. A scroll bar appears if you pinged multiple devices

6 To see ping details (Figure 11-6), highlight a device; then press (ENTER).

7 To save the ping results, press (SAVE). Ping results are saved as part of the connectivity results. You can save the network connectivity results in a separate record or with an existing cable test record. See page 11-6.

① The name and IP address of the device that was pinged.

② Number of pings sent and received.

③ The minimum, average, and maximum times taken for the ping requests to travel to the target address and back to the tester (**R**ound **T**rip **R**eturn **T**ime).

RTT Std Dev. is the standard deviation of the RTTs. This tells, on average, how far RTT values are from the average RTT value.
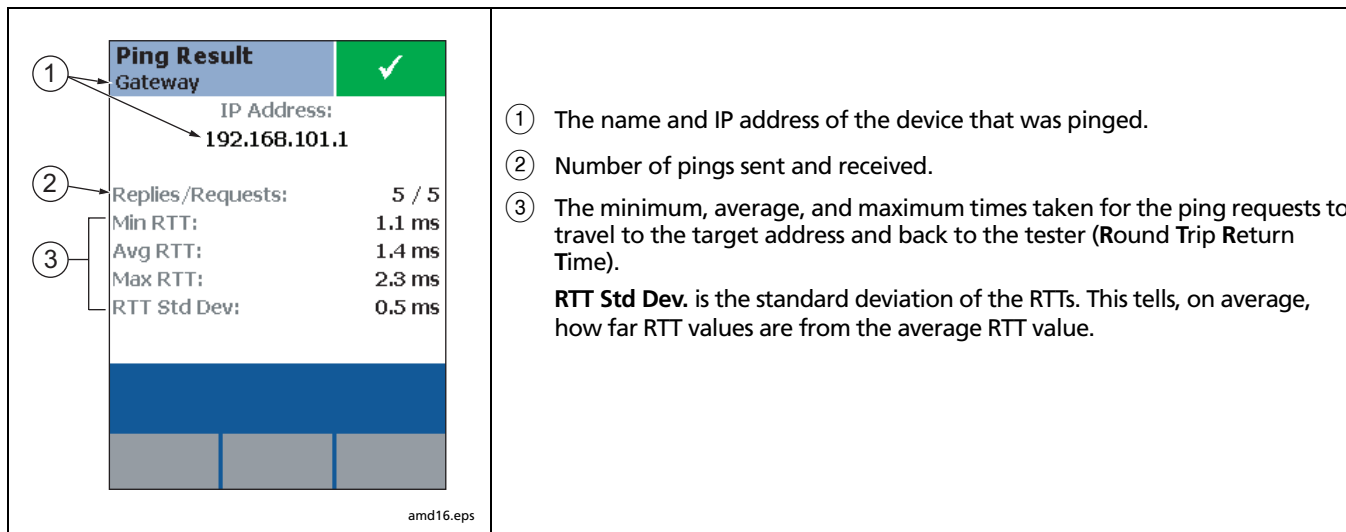
Figure 11-6. Ping Results Screen

Monitoring Network Traffic

The traffic monitor lets you identify active cables and check
a network's basic health.

Note

Traffic monitor results cannot be saved.

To monitor network traffic:

1 Turn on the tester; then connect to the network as
   shown on page 11-7.

2 Turn the rotary switch to **MONITOR**; then run the
   Network Connectivity test.

3 When the test is complete, press (F1) **Traffic**. Figure
   11-7 describes the traffic monitor screen.

① The time the test has been running.

② Traffic characteristics for the last 1 second, and the average and peak values since the test began:

- **Utilization:** Percentage of the network's bandwidth used. This indicates the traffic density on the network. Utilization averaging over 40 % may indicate a problem.

- **Collisions:** The percentage of collision frames as compared to the total number of frames detected in the last 1 second. Collisions occur when two devices attempt to transmit at the same time. A collision rate averaging over 5 % may indicate a problem. A full-duplex link should show 0 % collisions.

- **Errors:** Includes short frames, bad FCS (frame check sequence), late collisions, and jabber. An error rate above 0 % indicates a problem.

- **Broadcasts:** Percentage of frames addressed to all devices. Acceptable broadcast rates vary among networks.

③ Toggles a sound that indicates the utilization level.

④ Stops the test.

⑤ Resets all statistics to zero.

Figure 11-7. Traffic Monitor Screen

Blinking a Port Light

The **Port Blink** function helps you quickly locate a link's port at a switch or hub. This function generates a link pulse on pairs 12 and 36 to blink the port's activity LED.

To blink a port light:

1 Connect to the network as shown on page 11-7.

2 Turn the rotary switch to **MONITOR**, select **Network Connectivity**; then press ⌧.

3 When the test is complete, press ⌧ **Port Blink**. A square on the hub/switch icon on the **Network Connectivity** screen blinks when the port blink function is active.

4 Look for a blinking activity LED on the hub or switch.

Identifying Links (twisted pair only)

The **ID Locator** function helps you quickly identify link connections at a patch panel. This function requires one or more optional Fluke Networks LinkRunner™ Cable ID locators.

Note

ID locator results cannot be saved.

To identify a link:

1 Connect the tester and ID locator(s) as shown in Figure 11-8.

2 Turn the rotary switch to **MONITOR**, select **ID Locator**; then press ⌧.

3 Connect the tester to different jacks, pressing ⌧ to rescan each time, until **Found Cable ID** and the identifier's number appears.

Note

Wiring faults may cause the tester to misidentify the ID locator's number, or prevent the tester from detecting the locator.

Patch panel

Locator #1

Locator #2

Locator #3

Note: positions of cable ID locators
and DTX tester may be swapped.

Tester with
DTX-NSM module

Locator #4
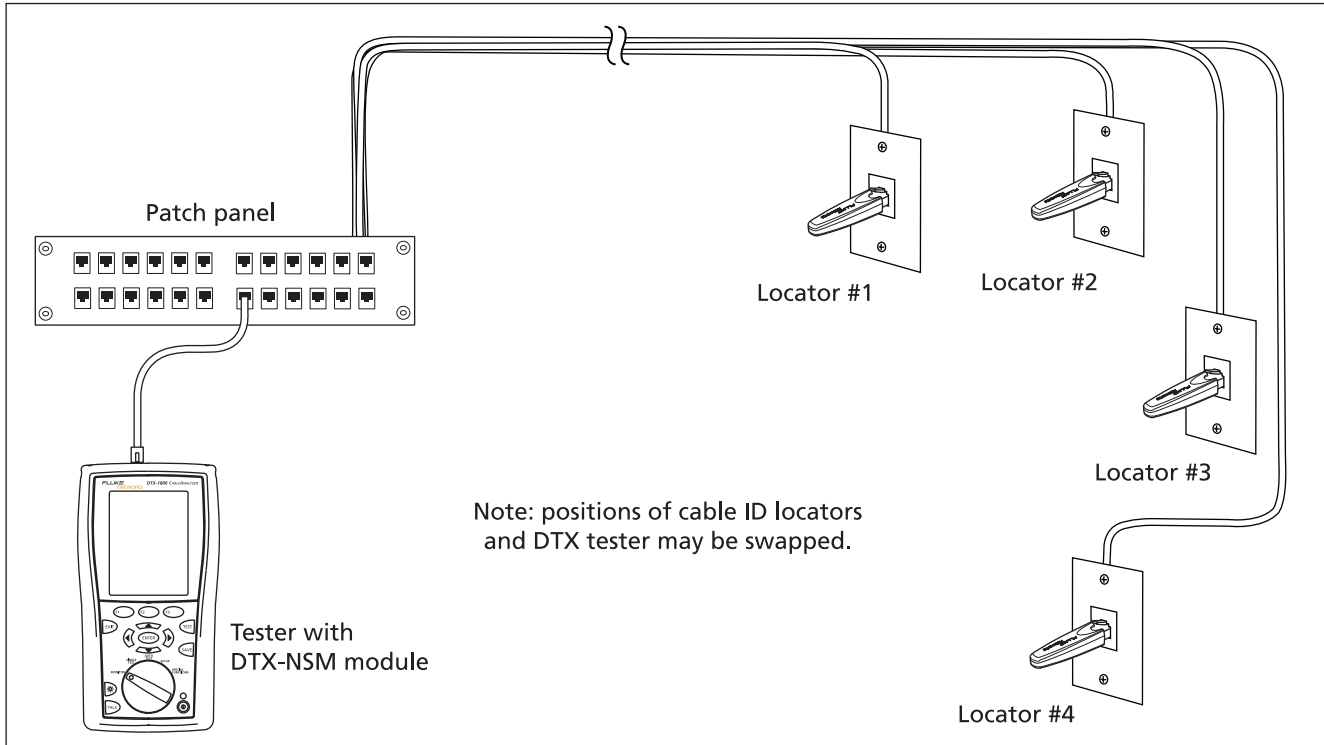
amd20f.eps

Figure 11-8. Identifying Links with Optional LinkRunner Cable ID Locators

Diagnosing Low-Level Network Problems

The DTX-NSM module helps you troubleshoot links and diagnose network problems up through layer 3 of the OSI (Open Systems Interconnect) 7-layer model. It can also indicate problems at higher levels. Higher-level problems are usually addressed by a network technician or administrator using a network tester or analyzer.

Table 11-2 lists common causes of symptoms you can detect with the DTX-NSM module.

Table 11-2. Diagnosing Low-Level Network Problems

No ping response, limited responses, or ping times seem high
Note *To evaluate ping times, you should compare current results with results taken when the network was operating normally.*
• Wiring fault on the link. • Device is turned off. • For static IP address assignment, incorrect address or subnet mask in Setup. • A network fault, condition (such as network congestion), or security setting is preventing the device from answering. • Since ping requests are low-priority traffic, devices may not respond to all requests.

-continued-

11-17

Table 11-2. Diagnosing Low-Level Network Problems (cont.)

Wire pairs 12 and 36 are reversed

- Mix of 568A and 568B wiring standards.

- Crossover cables used where not needed. They are typically used only between two switches or hubs.

- Tester is connected to a NIC (network interface card) with a straight-through cable. The reversed result is normal in this situation, since a NIC transmits on pair 12 while a switch or hub transmits on 36.

Note

The utilization, collision, and error percentages given below are only guidelines. Acceptable percentages can vary among networks.

Utilization averaging above 40 %

Too many stations on the network.

Utilization spikes above 40 %

Broadcast storms.

Table 11-2. Diagnosing Low-Level Network Problems (cont.)

Collision rate averaging above 5 %
• Duplex mismatch on the network.
• Too many stations within the collision domain.
• Faulty hub, switch, NIC, or other device.
• Cabling is too long.
Errors detected (any rate above 0 %)
• Cabling is too long.
• Faulty cabling (such as intermittent wiring faults, cabling of the wrong category, or poor quality cabling)
• Faulty or marginal network interface card (NIC).
• Faulty or misconfigured hardware or software.
• Electrical noise source near cabling. Use the impulse noise test to check for noise. See page 3-34.
• Duplex mismatch on the network.
• Bad grounding for network components.
Broadcast rate too high (acceptable rates vary among networks)
Faulty or misconfigured hardware or software.

Chapter 12: Custom Test Settings

Note

The DTX-ELT does not support custom test settings.

On models DTX-1800, DTX-1200, and DTX-LT, you can customize the following test settings:

- Twisted pair cable types
- Fiber optic cable types
- Twisted pair test limits
- Fiber optic test limits
- Outlet configurations for twisted pair cable
- NVP for twisted pair or coaxial cable

Creating a Custom Twisted Pair Cable Type

You can create up to nine custom twisted pair cable types. A custom twisted pair cable type includes the following settings:

- Custom cable name
- Baseline cable type for default values
- Nominal velocity of propagation (NVP)

To create a custom twisted pair cable type:

Turn the rotary switch to **SETUP**; then select **Twisted Pair**.

1 Select **Cable Type**; then select **Custom**.

2 Press (F1) **Create**.

3 On the **Custom** screen, select **Name**; then use the text editing screen to enter a name for your custom cable type. Press (SAVE) when you are done.

4 On the **Custom** screen, select **Use Default Values From**, select a cable group; then select a cable type as a baseline for your custom cable type.

5 To change the NVP for your custom cable, select **NVP** on the **Custom** screen. You may set the NVP to a specified value, or determine the actual NVP of a sample of cable. See "Changing the NVP" on page 12-10.

6 From the **Custom** screen, press ⌷SAVE⌷ when you are done creating the cable type.

The tester saves the custom cable type in the **Custom** list, with asterisks (*) before and after the name.

Creating a Custom Twisted Pair Test Limit

You can create up to nine custom twisted pair test limits. A custom twisted pair test limit includes the following settings:

- Custom limit name

- Baseline limit for default settings

- Maximum length

- Resistance test enabled or disabled

- Insertion loss test enabled or disabled

- NEXT test enabled or disabled

- PS NEXT test enabled or disabled

- ACR-F test enabled or disabled

- PS ACR-F test enabled or disabled

- ACR-N test enabled or disabled

- PSACR test enabled or disabled

- Return loss test enabled or disabled

To create a custom twisted pair limit:

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

2 Select **Test Limit**, press Ⓕ₁ ⃝ **More**; then select **Custom**.

3 Press Ⓕ₁ ⃝ **Create**.

4 On the **Custom** screen, select **Name**; then use the text editing screen to enter a name for your custom limit. Press Ⓢᴬᵛᴱ when you are done.

5 On the **Custom** screen, select **Use Default Values From**, select a test limit group; then select a limit as a baseline for your custom limit.

6 The **Custom** screen shows other settings on multiple tabs for the twisted pair limit. Use ⬥⬆⬥ ⬥⬇⬥ and Ⓔⁿᵗᵉʳ to select settings to change. Use ◀ ▶ to move among the tabs.

See page 3-3 for details on twisted pair test settings.

7 From the **Custom** screen, press Ⓢᴬᵛᴱ when you are done creating the limit. The tester saves the custom limit in the **Custom** list, with asterisks (*) before and after the name.

Creating a Custom Outlet Configuration

You can create up to nine custom outlet configurations. A custom outlet configuration includes the following settings:

- Custom outlet name
- Baseline outlet configuration for default settings
- Testing enabled or disabled for each wire pair

To create a custom outlet configuration:

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

2 Select **Outlet Configuration**; then select **Custom**.

3 Press Ⓕ₁ ⃝ **Create**.

4 On the **Custom** screen, select **Name**; then use the text editing screen to enter a name for your custom configuration. Press Ⓢᴬᵛᴱ when you are done.

5 On the **Custom** screen, select **Use Default Values From**; then select an outlet configuration as a baseline for your custom configuration.

6 On the **Custom** screen use ⬆⬇ and (ENTER) to select wire pairs to enable or disable.

7 If the baseline configuration has additional wire pairs, use ◁▷ to move among the tabs.

8 From the **Custom** screen, press (SAVE) when you are done creating the outlet configuration.

The tester saves the custom configuration in the **Custom** list, with asterisks (*) before and after the name.

Creating a Custom Fiber Type for Loss/Length Tests

You can create up to nine custom fiber types for loss/length tests. A custom fiber type includes the following settings:

- Custom fiber name
- Baseline limit for default settings
- Index of refraction (n)

To create a custom fiber type for loss/length tests:

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

2 Select **Fiber Type**; then select **Custom**.

3 Press (F1) **Create**.

4 On the **Custom** screen, select **Name**; then use the text editing screen to enter a name for your custom fiber type. Press (SAVE) when you are done.

5 On the **Custom** screen, select **Use Default Values From**, select a fiber group; then select a fiber type as a baseline for your custom fiber type.

6 To change the index of refraction (n) for your custom fiber, select n for a wavelength; then use the editing screen to enter a value for n. Press (SAVE) when you are done. Repeat as necessary for other wavelengths.

7 From the **Custom** screen, press (SAVE) when you are done creating the fiber type.
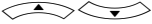
The tester saves the custom fiber type in the **Custom** list, with asterisks (*) before and after the name.

Creating a Custom Limit for Loss/Length Tests

You can create up to nine custom fiber limits for loss/length tests.

A custom fiber limit for loss/length tests includes the following settings:

• Custom limit name

• Baseline limit for default values

• Maximum fiber length

• Maximum loss at the wavelengths required by the baseline limit.

To create a custom fiber limit:

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

2 Select **Test Limit**, press F1 **More**; then select **Custom**.

3 Press F1 **Create**.

4 On the **Custom** screen, select **Name**; then use the text editing screen to enter a name for your custom fiber limit. Press SAVE when you are done.

5 On the **Custom** screen, select **Use Default Values From**, select a limit group; then select a fiber limit as a baseline for your custom limit.

6 The **Custom** screen shows other settings on multiple tabs for the fiber test limit. Use △ ▽ and ENTER to select settings to change. Use ◁ ▷ to move among the tabs.

See page 8-14 for details on loss/length test settings.

7 From the **Custom** screen, press SAVE when you are done creating the limit.

The tester saves the custom limit in the **Custom** list, with asterisks (*) before and after the name.

Creating a Custom Fiber Type for OTDR Tests

You can create up to nine custom fiber types for OTDR tests.

To create a custom fiber type for OTDR tests:

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

2   Select **Fiber Type**; then select **Custom**.

3   Press F1 **Create**.

4   On the **Custom** screen, select **Name**; then use the text editing screen to enter a name for your custom fiber type. Press SAVE when you are done.

5   On the **Custom** screen, select **Use Default Values From**, select a fiber group; then select a fiber type as a baseline for your custom fiber type.

6   To change the index of refraction (n) for your custom fiber, select **n** for a wavelength; then use the editing screen to enter a value for n. Press SAVE when you are done. Repeat as necessary for other wavelengths.

7   To change the backscatter coefficient, press ⊙ to go to the next tab on the **Custom** screen, select **Backscatter** for a wavelength; then use the editing screen to enter a value. Press SAVE when you are done. Repeat as necessary for other wavelengths.

8   From the **Custom** screen, press SAVE when you are done creating the fiber type.

The tester saves the custom fiber type in the **Custom** list, with asterisks (*) before and after the name.

Creating Custom Limits for OTDR Tests

You can create up to nine custom limits for OTDR tests. Each limit can include multiple fiber types.

Table 12-1 describes the settings used in custom OTDR limits.

To create a custom fiber limit for OTDR tests:

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

2 Select **Test Limit**; then select **Custom**. If **Custom** is not in the list, press ⒡ **More** to see more test limits.

3 Press ⒡ **Create** to create a new limit.

4 On the **Custom Limit** screen, select **Name**; then use the text editing screen to enter a name for your custom OTDR limit. Press ⃞ˢᴬᵛᴱ when you are done.

5 On the **Custom Limit** screen, select **Use Default Values From,** select a limit group; then select a fiber limit as a baseline for your custom limit.

6 On the **Custom Limit** screen, press ⒡ **Select Fiber**; then do one of the following:

- Highlight a fiber type for the custom limit.

- To add a fiber to the list, press ⒡² **Add Fiber,** select a fiber group, select a fiber type; then highlight the added fiber on the **Custom** screen.

7 With the desired fiber type highlighted on the **Custom Limit** screen, press ⒡ **Edit Limit**.

8 The **Custom Limit** screen shows other settings on multiple tabs for the OTDR test limit. Use ⬆⬇ and Ⓔⁿᵗᵉʳ to select settings to change. Use ◀▶ to move among the tabs.

See Table 12-1 for details on custom OTDR test settings.

9 From the **Custom Limit** screen, press ⃞ˢᴬᵛᴱ when you are done creating the limit.

The tester saves the custom limit in the **Custom** list, with asterisks (*) before and after the name.

Table 12-1. Settings for Custom OTDR Limits

Setting	Description
Length	Enter a maximum length for the cabling.
Reflective Event Loss	Enter a maximum value for connector loss. A typical value is 0.75 dB.
Non-reflective Event Loss	Enter a maximum value for splice loss. A typical value is 0.3 dB.
Event Reflectance	Enter a maximum reflection value for a single event.
Overall Loss	Enter a maximum value for the loss of all components and fiber in the cabling at each wavelength tested.
Overall Attenuation Coefficient	Enter a maximum value of attenuation per kilometer for the entire length of the cabling at each wavelength tested.
Segment Attenuation Coefficient	Enter a maximum value of attenuation per kilometer for a fiber segment in the cabling at each wavelength tested. *Note* *The segment attenuation coefficient for shorter segments (50 m to 500 m, depending on wavelength and fiber characteristics) may not be measurable.*

Editing Custom Settings

The editing function lets you change values in existing custom settings.

To edit an existing custom cable, fiber type, test limit, or outlet configuration:

1   Turn the rotary switch to **SETUP**; then select **Twisted Pair**, **Fiber Loss**, or **Fiber OTDR**.

2   On the **Twisted Pair**, **Fiber Loss**, or **Fiber OTDR** menu, select the item that includes the custom settings you want to edit (**Cable Type**, **Fiber Type**, **Test Limit**, **Outlet Configuration**).

3   If you selected **Test Limit**, press ⓕ₁ ⟩ **More**.

4   Select **Custom**.

5   Use ◁△▷◁▽▷ to highlight a custom setting; then press ⓕ₃ ⟩ **Edit**.

6   Make your changes on the **Custom** screen; then press ⟨SAVE⟩.

Deleting Custom Settings

To delete a custom cable, fiber type, test limit, or outlet configuration:

1   Turn the rotary switch to **SETUP**; then select **Twisted Pair**, **Fiber Loss**, or **Fiber OTDR**.

2   On the **Twisted Pair**, **Fiber Loss**, or **Fiber OTDR** menu, select the item that includes the custom settings you want to delete (**Cable Type**, **Fiber Type**, **Test Limit**, or **Outlet Configuration**).

3   If you selected **Test Limit**, press ⓕ₁ ⟩ **More**.

4   Select **Custom**.

5   Use ◁△▷◁▽▷ to highlight a custom setting.

6   Press ⓕ₂ ⟩ **Delete**; then press ⓕ₃ ⟩ **Yes**.

Changing the NVP

The tester uses an NVP value (nominal velocity of propagation) and the signal delay through cable to calculate the length of twisted pair and coaxial cabling.

The default value defined by the selected cable type represents the typical NVP for that cable type. These values are usually accurate enough for certifying cable; however, you can increase the accuracy of length measurements by adjusting the NVP to a specified or actual value.

Note

NVP values can vary among cable types, lots, and manufacturers. In most cases, these differences are minor and may be disregarded.

Setting the NVP to a Specified Value

This procedure lets you set the NVP to a specified value, such as the value specified by the manufacturer. The NVP value applies to the selected cable type.

To enter a specified NVP value:

1   If you are in the middle of creating a custom cable type, go to step 4.

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

3   Select **Twisted Pair** or **Coax**.

4   Do one of the following:

5   To change the NVP for the selected cable type, select **NVP** on the **Twisted Pair** or **Coax** menu.

6   To change the NVP for a custom twisted pair cable type, create a custom cable type or select one for editing; then select **NVP** on the **Custom** screen. See page 12-1 for details on creating custom cable types.

7   Use ◁▲▷ ◁▼▷ to change the NVP value; then press (SAVE).

Determining a Cable's Actual NVP

You can determine a cable's actual NVP by adjusting the measured length to match a known length of cable. The NVP value applies to the selected cable type.

To determine a cable's NVP:

1   If you are in the middle of creating a custom cable type, and a twisted pair or coaxial adapter is already attached to the tester, go to step 5.

2   Attach a twisted pair or coaxial adapter to the tester.

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

4 Select **Twisted Pair** or **Coax**.

5 Do one of the following:

6 To change the NVP for the selected cable type, select **NVP** on the **Twisted Pair** or **Coax** menu.

7 To change the NVP for a custom twisted pair cable type, create a custom cable type or select one for editing; then select **NVP** on the **Custom** screen. See page 12-1 for details on creating custom cable types.

8 Connect a known length of twisted pair or coaxial cable to the tester. The cable should be at least 30 m (100 ft) long.

9 Press ⬡TEST⬡.

10 Use ◁▲▷◁▼▷ to change the NVP until the measured length matches the known length of the cable; then press ⬡SAVE⬡ .

Resetting the NVP to the Default Value

You can reset the NVP to the default value defined by the selected cable type by re-selecting the cable type in **SETUP**.

To reset the NVP to the default value:

1 Turn the rotary switch to **SETUP**; then select **Twisted Pair** or **Coax**.

2 On the **Twisted Pair** or **Coax** menu, select **Cable Type.**

3 If you selected **Twisted Pair,** select the cable group that contains the desired cable type.

4 Select a cable type on the **Cable Type** menu. The NVP value on the **Twisted Pair** or **Coax** screen returns to the value defined by the cable type.

Transferring Custom Settings Between Testers

To transfer custom limits, cable types, outlet configurations, and fiber types between testers, use the **Modify DTX Test Limits** utility in LinkWare software. This utility lets you upload custom settings from a tester to a PC, then download the settings to other testers. See the LinkWare online help for details.

Chapter 13: 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 4,000 Autotest results, including graphical data, on a 128 MB removable memory card.

The DTX-1800 and DTX-1200 testers can use Multi Media Card (MMC) or Secure Digital memory cards (SD).

⚠ Caution

Memory cards may be lost, damaged, or accidentally formatted, resulting in data loss. Therefore, Fluke Networks recommends saving no more than one day's worth of test results on a memory card.

Checking the Memory Status

To check the memory status, turn the rotary switch to **SPECIAL FUNCTIONS**, use ⌄ to highlight **Memory Status**; then press ⏎ (ENTER).

Or, press (F3) **Memory** from the main Autotest screen.

Figure 13-1 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 Ⓕ₁ 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 Ⓕ₁ to switch between the memory card and internal memory status.

⑥ DTX-1800/DTX-1200: Press Ⓕ₂ to format the memory card, if present.

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Figure 13-1. 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.*

Automatically Saving Results (DTX-1800, DTX-1200, DTX-LT, DTX-CLT, DTX-CLT CertiFiber)

When **Auto Save Results** is set to **Yes**, the tester automatically saves Autotests using the next ID available from the **Cable ID Source**. The main Autotest screen shows the next ID. If **Cable ID Source** is set to **None** or all the IDs have been used, **Next ID** is blank and you enter IDs manually after each Autotest.

Selecting **No** lets you enter or select IDs manually after each Autotest.

To change the **Auto Save Results** setting:

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

2 Use ⬗ to highlight **Instrument Settings**; then press (ENTER).

3 Press ⟩ to go to the tab with the **Auto Save Results** setting.

4 Press (ENTER) to select **Auto Save Results**.

5 Use ⬗ to highlight **No** or **Yes**; then press

13-3

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 DTX-1800, DTX1200: Verify that the **Result Storage Location** shows the location where you want the new folder. Change the location if necessary.

4 On the **Instrument Settings** screen, use ⌄ to highlight **Current Folder**; then press ⟨ENTER⟩.

5 Press ⟨F1⟩ **Create Folder**.

6 Use the softkeys, ⟨◁⟩⟨▷⟩ ⌃ ⌄, and ⟨ENTER⟩ to enter a folder name. Press ⟨SAVE⟩ when you are finished.

Changing Folders

To change the current folder:

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

2 Use ⌄ to highlight **Instrument Settings**; then press ⟨ENTER⟩.

3 DTX-1800, DTX1200: Verify that the **Result Storage Location** shows the correct location. Change the location if necessary.

4 On the **Instrument Settings** screen, use ⌄ to highlight **Current Folder**; then press ⟨ENTER⟩.

5 Use ⌃ ⌄ to highlight a folder name; then press ⟨ENTER⟩.

Note

*Changing folders from the **View Results** screen in **SPECIAL FUNCTIONS** does not change the current folder in **SETUP**.*

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**.
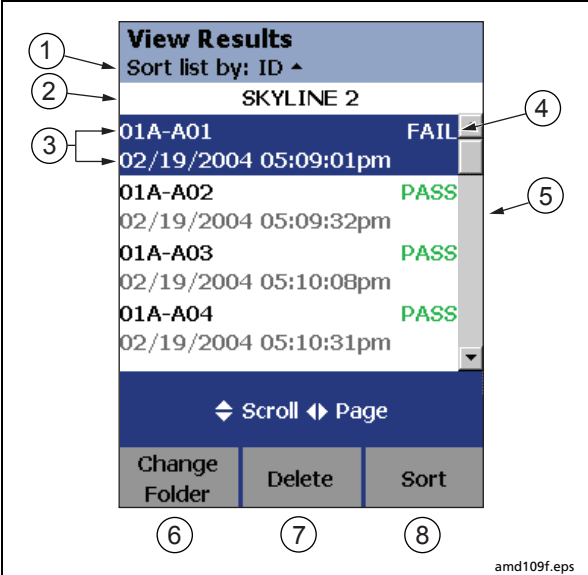
Viewing and Managing Saved Results

To view and manage saved results, turn the rotary switch to **SPECIAL FUNCTIONS**, use ⟨▼⟩ to highlight **View/Delete Results**; then press (ENTER).

Figure 13-2 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 page 3-12 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 13-2. 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.

- **Current Folder:** Deletes the current folder and all its contents.

5 Press (F3) **Delete**; then press (F3) **Yes**.

Renaming Results

To rename saved results:

1 On the **View Results** screen, select the result you want to rename.

2 On the **Summary** screen, press ⌷SAVE⌷.

3 Enter an new ID for the result; then press ⌷SAVE⌷.

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 13-2 on page 13-6.

The default order is descending by date. The sorting order reverts to the default when you turn off the tester.

Formatting a Memory Card (DTX-1800, DTX-1200) or Internal Memory

Formatting erases all contents of the memory card or internal memory.

To format a memory card or internal memory:

1 For a memory card, 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 For a DTX-1800 or DTX-1200 with a memory card installed, press (F1) to select the memory card or internal memory.

5 Press (F2) **Format**; then press (F3) **Yes**.

You can also format a memory card or internal memory in **SPECIAL FUNCTIONS** mode:

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

2 Use ⬇ to highlight **Memory Status**; then press (ENTER).

For a DTX-1800 or DTX-1200 with a memory card installed, press (F1) to select the memory card or internal memory.

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.

Click **Import** ⬇ on the LinkWare toolbar. Select the tester's model from the list.

or

Select **Memory card or folder on PC**.

5 Select the records you want to import; then click **OK**.

See the LinkWare online help for details on creating reports with LinkWare.

Chapter 14: 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 various 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" on pages 3-1 for twisted pair cable and 5-1 for coaxial cable.

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. Save the file to your hard drive.

3   Make the connections shown in Figure 14-1 or 14-2. Use the USB or DTX serial cable to connect to the PC. (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 14-3 on page
14-38 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.**

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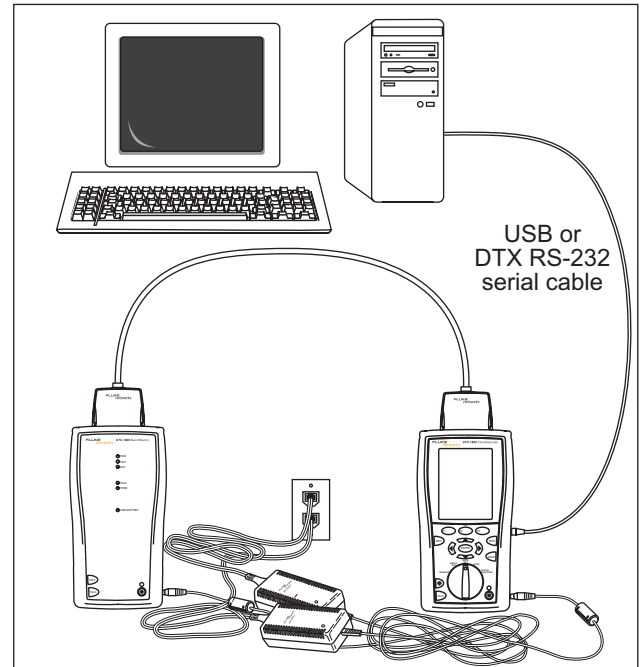
**Figure 14-1. Twisted Pair Connections for Updating the
Software with a PC**
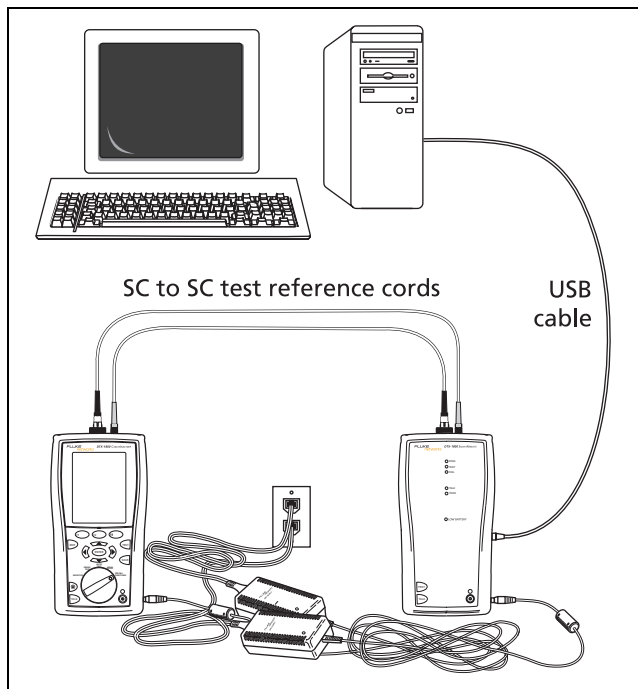
amd178.eps

**Figure 14-2. Fiber Connections for 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   Connect an updated tester or smart remote to a tester
or smart remote that needs updating, as shown in
Figure 14-3 or 14-4.

Note

One of the units must be a main tester.

2   Turn on both units; then press ⒯ on either.

3   The testers compare software versions. If one has more
recent software, the main tester prompts you about
updating the older software.

4   Press ⒡ **OK** to start the update process.

5   To verify the update, turn the rotary switch to **SPECIAL
FUNCTIONS**; then select **Version Information.**
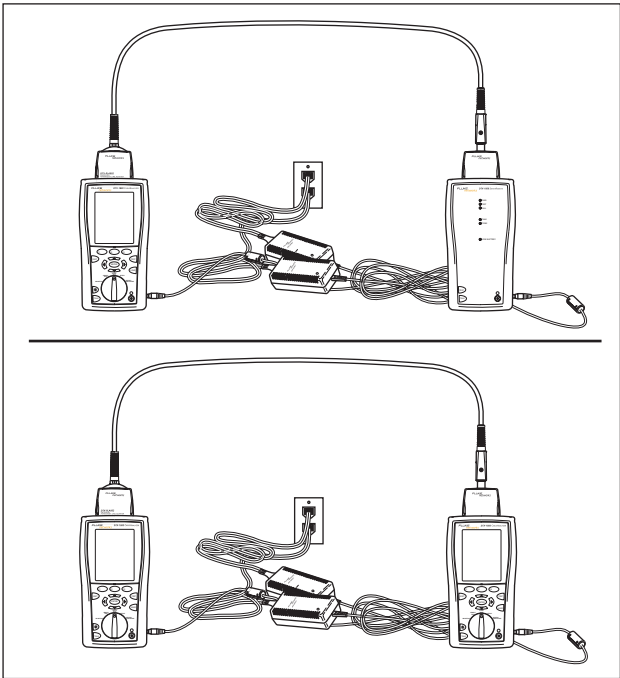
amd73f.eps

Figure 14-3. Twisted Pair Connections for Updating the Software with an Updated Tester
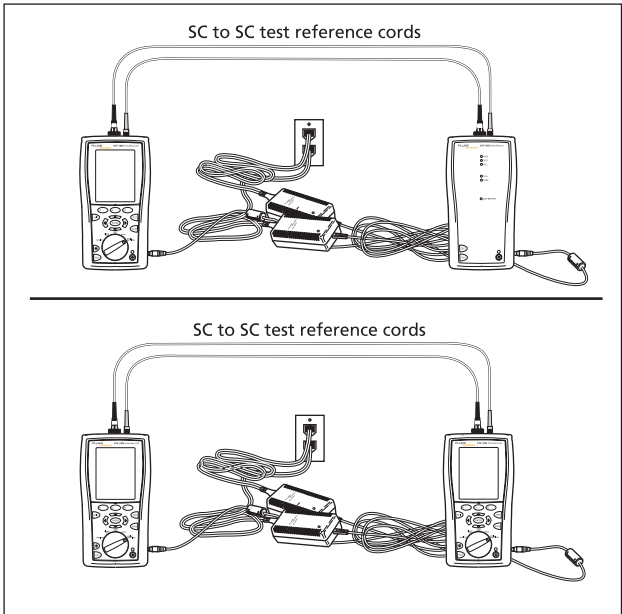
amd179.eps

Figure 14-4. Fiber Connections for Updating the Software with an Updated Tester

14-5

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. 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**.

Updating the Limits or Cable Types Database

Fluke Networks may release a test limits or cable types database that is not part of a software update. To install a new database in your tester, use the **Modify DTX Test Limits** utility in LinkWare software. See the LinkWare online help for details.

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.

For information on cleaning fiber connectors, see page 8-9.

Retraining the Battery Gauge

The accuracy of the battery gauge may drift over time if the battery is frequently recharged before being fully discharged. Retraining the battery gauge restores its accuracy.

Retraining can take 17 to 30 hours. The time is shorter if you start with the batteries discharged and modules (such as the fiber module) installed in the main and remote testers.

To retrain the battery gauge:

1 Connect the main and remote testers together using a permanent link adapter and a channel adapter, two channel adapters or two coaxial adapters and a patch cord, or two fiber modules and a test reference cord.

2 Connect the ac adapters to the main and remote testers. Turn on both testers.

3 Turn the rotary switch to **SPECIAL FUNCTIONS**; then select **Battery Status**. Verify that both the main and remote battery gauges are shown. If the remote gauge is missing, check the connections between the two units.

4 Press Ⓕ¹ **Train Battery**.

5 To abort the retraining, hold down the power key (◎) on the main and remote testers until they turn off.

Retraining is complete when the testers have turned off and the LED by the ac adapter connection is green.

Replacing the Battery Pack

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.

Replacing the Internal Battery

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 and OTDR Module Maintenance

The following sections apply to the optional DTX-MFM2, DTX-GFM2, and DTX-SFM2 fiber modules and the DTX Compact OTDR modules.

Optical Connector and Adapter Care

Periodically clean and inspect the module's optical connectors as described on pages 7-9 for the OTDR module and 8-9 for the fiber modules.

Replacing Fiber Test Reference Cords (DTX-XFM2 modules)

Choose replacement test reference cords that meet the following requirements:

- Core and cladding size: match the fiber to be tested

- Connector polish: PC or UPC (see the Caution below)

- Test reference cord length: minimum 2 m; maximum 5 m

- To ensure optimum performance from your tester, get replacement cords from Fluke Networks.

⚠ Caution

When testing links with APC (angled physical contact) connectors, use only test reference cords with APC connectors on the ends connected to the link, and UPC connectors on the ends connected to the testers. Connecting non-APC connectors to the link will produce large reflections that affect loss measurements.

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 14-12 for storage temperatures.

Options and Accessories

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**.

To order options and accessories, contact Fluke Networks as described on page 1-3.

Note

Some modules are not compatible with the DTX-ELT, DTX-CLT, or DTX-CLT CertiFiber. See page 14-11.

If Something Seems Wrong

If something seems wrong with the tester, refer to Table 14-1.

If Table 14-1 does not help you solve a problem with the tester, contact Fluke Networks for additional help. See page 1-3 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 14-1. Troubleshooting the Tester

The keypad does not respond.
Press and hold ⓪ 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 ⑫ **OK**. If the tester does not recover, press and hold ⓪ 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, retrain the battery gauge. See page 14-6

-continued-

Table 14-1. Troubleshooting the Tester (cont.)

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.
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 or n value may be incorrect.
The tester may need referencing.
See Chapter 3 for twisted pair test settings, Chapter 5 for coaxial test settings, Chapter 7 for OTDR test settings, or Chapter 8 for fiber loss/length test settings.
The test reference 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 8 for details.

Specifications

Feature Comparison of DTX Models

Feature	DTX-1800	DTX-1200	DTX-LT	DTX-ELT	DTX-CLT	DTX-CLT CertiFiber
Maximum Category/Class	7/F	6/E	6/E	6/E	5e/D	NA
Maximum Frequency (normal, extended)	600 MHz, 800 MHz (RL, NEXT) 900 MHz (IL, NEXT)	250 MHz, 350 MHz	250 MHz, 350 MHz	250 MHz, 350 MHz	100 MHz, 155 MHz	NA
Class F Autotest Time	Less than 25 s	NA	NA	NA	NA	NA
Cat 6 Autotest Time (Cat 5e for the DTX-CLT)	Less than 10 s	Less than 10 s	Less than 25 s	Less than 25 s	Less than 25 s	NA
Supports Fiber Modules	●	●	●		●	●
Supports OTDR Module	●	●	●			
Supports DTX-NSM Module	●	●	●		●	
Supports Coaxial Adapters	●	●	●	●		
Includes AC Wire Map Test	●	●	●		●	
Supports Custom Limits	●	●	●		●	●
Includes Autosave Function	●	●	●		●	●
Includes Patch Cord Test Limits (for use with DTX-PCU6S)	●	●	●		●	
Supports Memory Cards	●	●				
Supports Alien Crosstalk Module	●					

Environmental and Regulatory Specifications

Operating temperature[1]	32 °F to 113 °F (0 °C to 45 °C)
Storage temperature	-4 °F to +140 °F (-20 °C to +60 °C)
Operating relative humidity[2] **(% RH without condensation)**	32 °F to 95 °F (0 °C to 35 °C): 0 % to 90 % 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 EN 61010-1 1st Edition + Amendments 1, 2
Pollution degree	2
Altitude[3]	Operating: 4000 m; Storage:12000 m
EMC	EN 61326-1
Laser safety (for fiber test module)	Class I CDRH. Complies to EN 60825-2

1. DTX-MFM2/GFM2/SFM2 Modules and DTX Compact OTDR Modules: 32 °F to 104 °F (0 °C to 40 °C)

2. DTX Compact OTDR Module: 50 °F to 95 °F (10 °C to 35 °C): 0 % to 95 %; 95 °F to 104 °F (35 °C to 40 °C): 0 % to 75 %; uncontrolled: < 50 °F (10 °C)

3. DTX Compact OTDR Module: Operating: 3000 m

⚠️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 6A/Class E_A permanent link adapters (except DTX-ELT and DTX-CLT)

- Plug type and life: shielded 8-pin modular (RJ45); >5000 insertions

- Tests supported: shielded and unshielded cable, TIA Cat 3, 4, 5, 5e, 6, and 6A and ISO/IEC Class C and D, E, and E_A permanent link

6A/Class E_A 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, 6, 6A and ISO/IEC Class C, D, E, and E_A channels

Cable Types Tested

- Shielded and unshielded twisted pair (STP, FTP, SSTP, and UTP) LAN cabling:

- TIA Category 3, 4, 5, 5e, 6, and 6A: 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

Time for a full, 2-way Autotest of Category 6 UTP cable (Cat 5e for the DTX-CLT):

- DTX-1800 and DTX-1200: 10 seconds or less

- DTX-LT, DTX-ELT, and DTX-CLT: 28 seconds or less

Tone Generator Specifications

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

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-568-C.2-1 and IEC 61935-2.

For Class F test modes, the DTX-1800 is compliant with Level IV requirements as in the draft 2nd edition of IEC 61935-2.

Length

Note

Length specifications do not include the uncertainty of the cable's NVP value.

Parameter	Twisted Pair Cabling	
	Without Remote	**With Remote**
Range	800 m (2600 ft)	150 m (490 ft)
Resolution	0.1 m or 1 ft	0.1 m or 1 ft
Accuracy	± (0.3 m + 2 %); 0 m to 150 m ± (0.3 m + 4 %); 150 m to 800 m	± (0.3 m + 2 %)

Propagation Delay

Parameter	Twisted pair cabling	
	Without Remote	**With Remote**
Range	4000 ns	750 ns
Resolution	1 ns	1 ns
Accuracy	$\pm$ (2 ns + 2 %); 0 ns to 750 ns $\pm$ (2 ns + 4 %); 750 ns to 4000 ns	$\pm$ (2 ns + 2 %)

Delay Skew

Parameter	Twisted Pair Cabling
Range	0 ns to 100 ns
Resolution	1 ns
Accuracy	$\pm$ 10 ns

DC Loop Resistance Test

Parameter	Twisted pair cabling
Range	0 Ω to 530 Ω
Resolution	0.1 Ω
Accuracy	$\pm$ (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 14-2. 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 PPNEXT and FEXT 65 dB PS NEXT and FEXT 62 dB		
Amplitude resolution	0.1 dB		
Frequency range and resolution	1 MHz to 31.25 MHz: 125 kHz 31.25 MHz to 100 MHz: 250 kHz 100 MHz to 250 MHz: 500 kHz 250 MHz to 600 MHz: 1 MHz		
Dynamic Accuracy NEXT	± 0.75 dB		
Dynamic Accuracy ACR-F	± 1.0 dB (FEXT dynamic accuracy is tested to ± 0.75 dB)		
* DTX-1800 up to 900 MHz. DTX-1200, DTX-LT, and DTX-ELT up to 350 MHz. DTX-CLT up to 100 MHz.			

Table 14-2. 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 300 MHz to 600 MHz: 14 dB	1- 300 MHz: 18 – 12.5 log(f/100), 20 dB maximum 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, DTX-LT, and DTX-ELT up to 350 MHz. DTX-CLT up to 100 MHz.			

-continued-

Table 14-2. 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) (measured to 60 dB maximum)	37 - 20 log(f/100) (measured to 60 dB maximum)	
Tracking	$\pm$ 0.5 dB (applicable when IL > 3 dB)		
Directivity	(applicable when IL > 3 dB) 1 MHz to 300 MHz: 27 - 7log(f/100), 30 dB maximum 300 MHz to 600 MHz: 23.7 dB	1 MHz to 300 MHz: 25 - 7log(f/100), 25 dB maximum 300 MHz to 600 MHz: 21.7 dB (applicable when IL > 3 dB)	
Source Match	20 dB (applicable when IL > 3dB)		
Return loss of Termination	(applicable when IL > 3 dB) 1 MHz to 250 MHz: 20 - 15log(f/100), 25 dB maximum 250 MHz to 600 MHz: 14 dB	1 MHz to 250 MHz: 18 - 15log(f/100), 25 dB maximum 250 MHz to 600 MHz: 12 dB (applicable when IL > 3dB)	
* DTX-1800 up to 900 MHz. DTX-1200, DTX-LT, and DTX-ELT up to 350 MHz. DTX-CLT up to 100 MHz.			

Measurement Accuracy

The 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, DTX-LT, and DTX-ELT measure up to 350 MHz with accuracy Level IV performance. The DTX-CLT measures up to 100 MHz with accuracy Level IV.

Worst case 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 14-2 are shown in Figures 14-5 through 14-8.
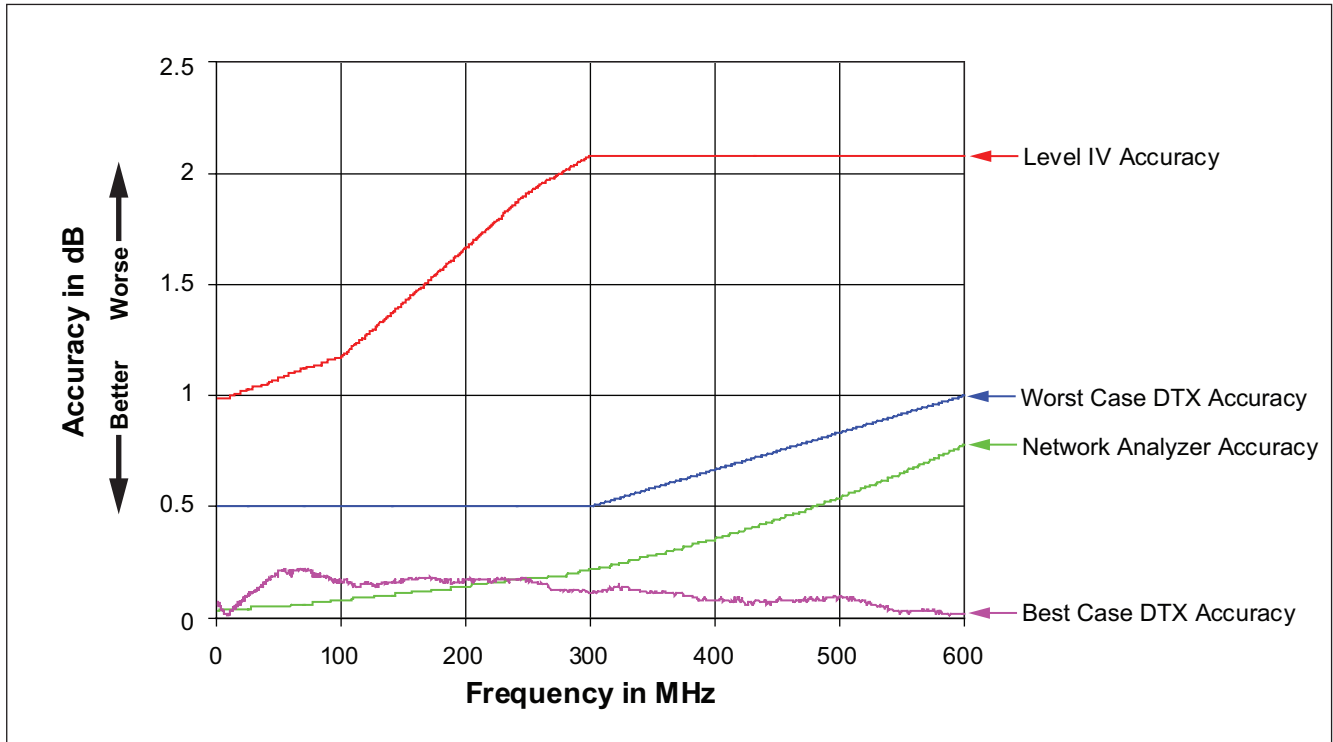
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Figure 14-5. Baseline Insertion Loss Measurement Accuracy
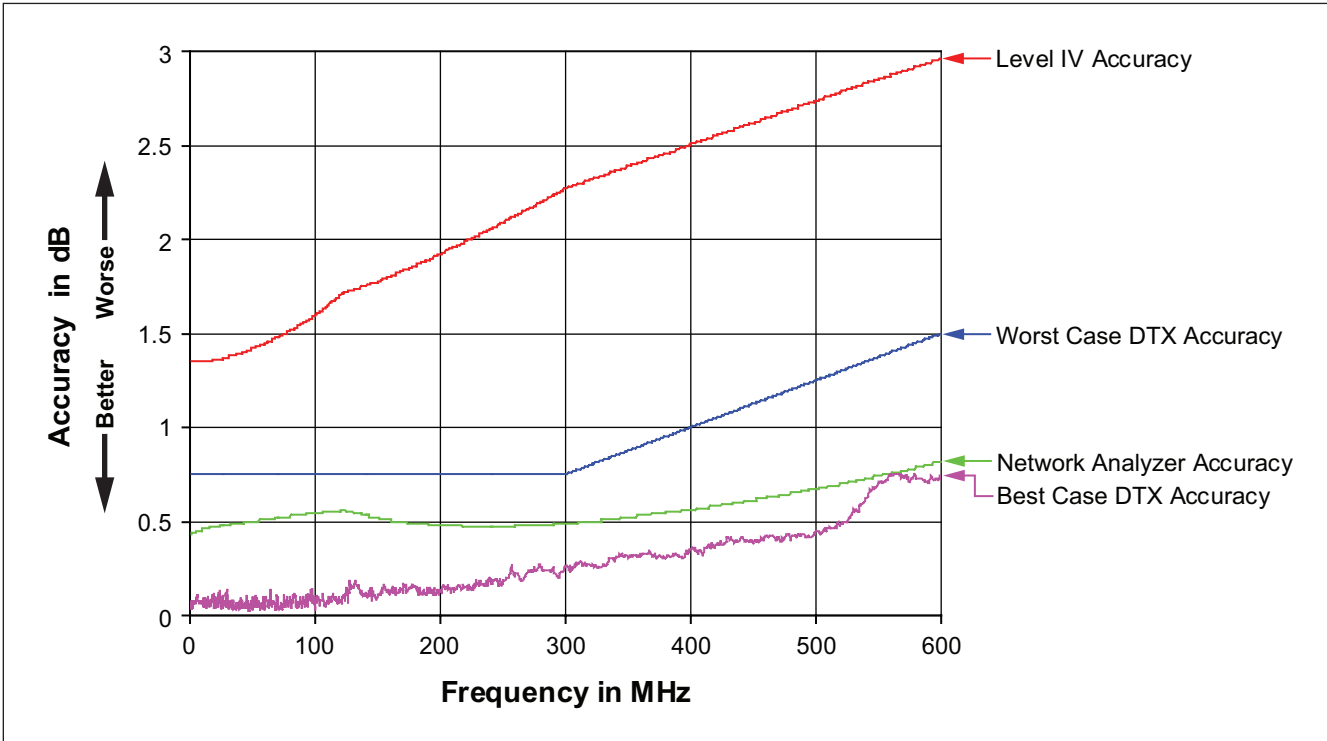
amd111f.eps

Figure 14-6. Baseline NEXT Loss Measurement Accuracy
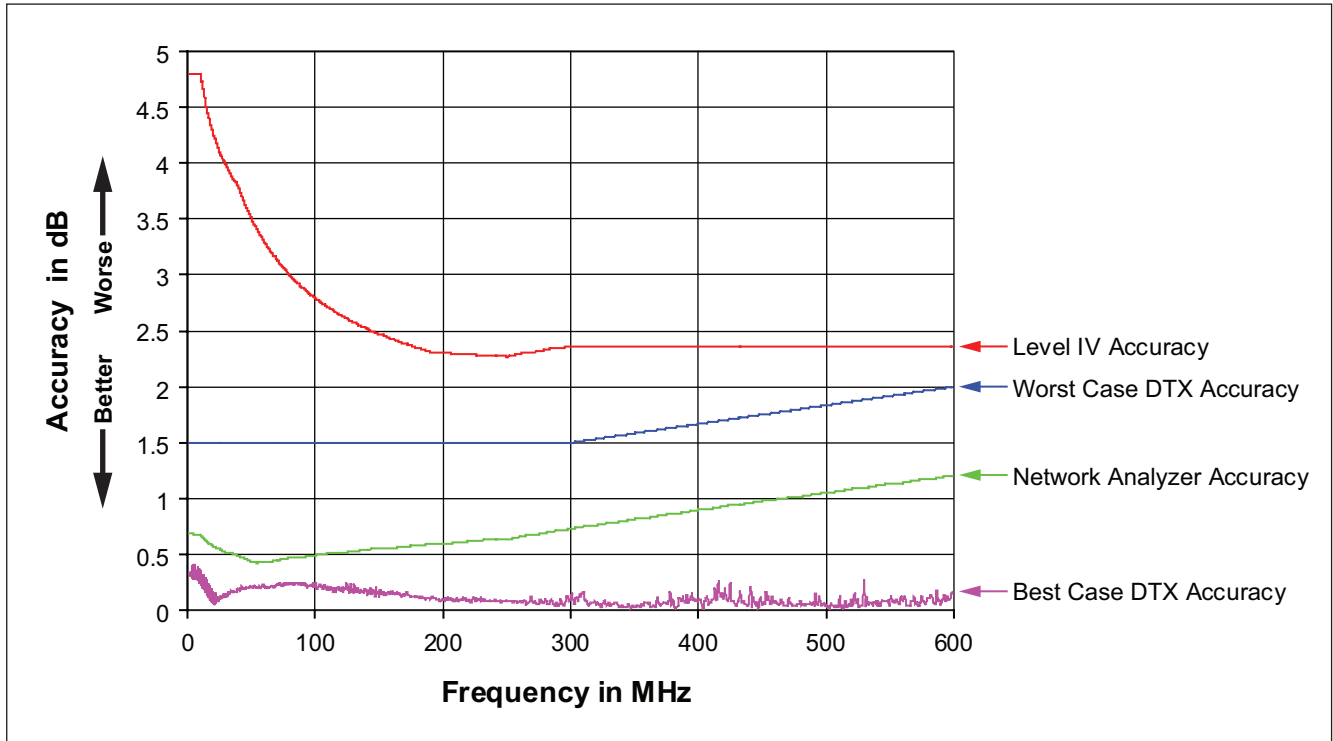
amd112f.eps

Figure 14-7. Baseline Return Loss Measurement Accuracy
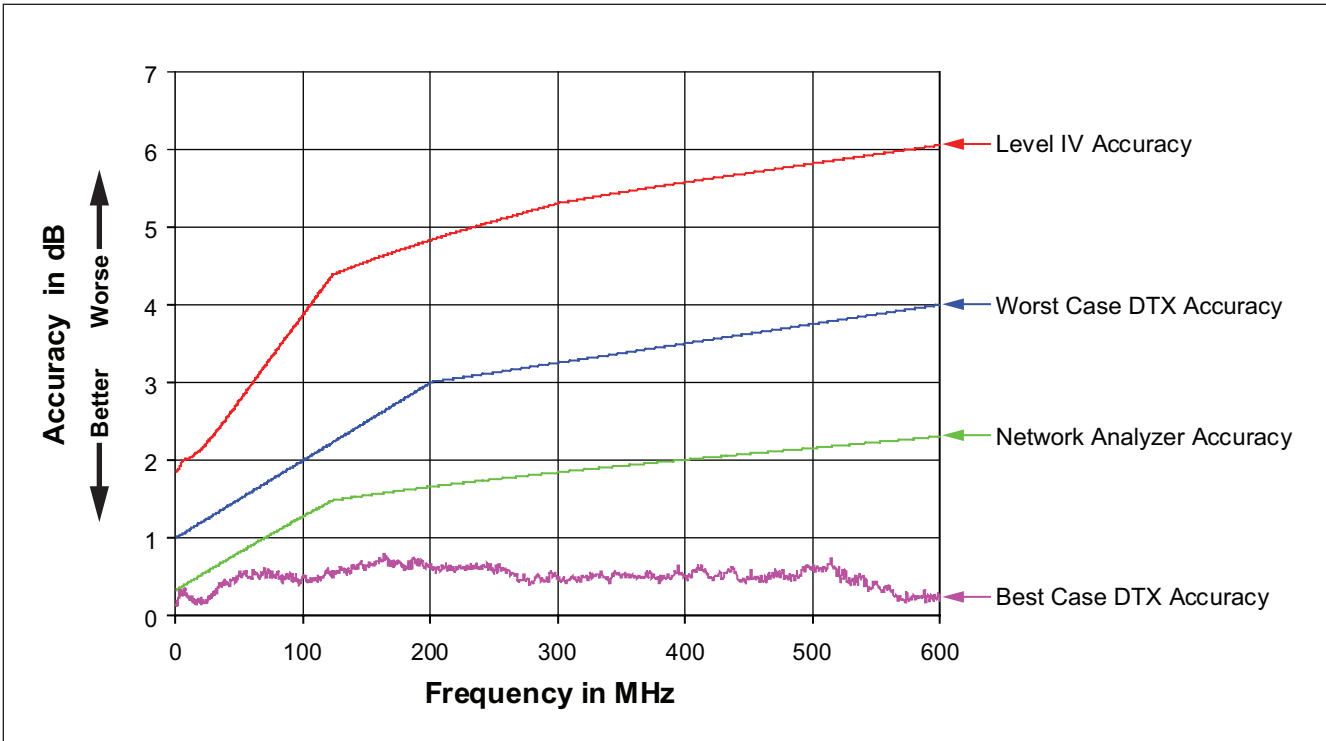
amd113f.eps

Figure 14-8. Baseline ACR-F 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 % of $\vert$ 100 Ω – Measured $\vert$)
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-COAX Coaxial Adapter Specifications

Input connector	Male F-connector. BNC adapter allows connection to coaxial network cabling
Cable types tested	Coaxial video and network cabling
Length	Range: 800 m (2625 ft) with or without remote Resolution: 0.1 m or 1 ft Accuracy: 0 m to 150 m (0 ft to 492 ft): ±(0.3 m + 2 %) 150 m to 800 m (492 ft to 2625 ft): ±(0.3 m + 4 %)
Propagation delay	Range: 4000 ns with or without remote Resolution: 1 ns Accuracy: 0 ns to 750 ns: ±(2 ns + 2%); 750 ns to 4000 ns: ±(2 ns + 4%)
Loop resistance	Range: 0 Ω to 530 Ω Resolution: 0.1 Ω Accuracy: ±(1 Ω + 1 %)

DTX-COAX Coaxial Adapter Specifications (cont.)

Insertion loss	Frequency range and resolution:	1 MHz to 31.25 MHz: 125 kHz 31.5 MHz to 100 MHz: 250 kHz 100.5 MHz to 250 MHz: 500 kHz 251 MHz to 900 MHz: 1 MHz
	Source/load return loss (typical): (75 Ω reference impedance)	1 MHz to 300 MHz: 20 – 12.5 log(f/100), 20 dB maximum 300 MHz to 900 MHz: 14 dB
	Random noise floor (typical):	90 dB
Characteristic impedance	Range: 45 Ω to 110 Ω Resolution: 1 Ω Accuracy: ± (5 Ω + 5 % of ⎮75 Ω – Measured⎮)	
HDTDR	Range: 350 m (1148 ft) with or without remote Resolution: 0.1 m or 1 ft Accuracy: 0 m to 150 m (0 ft to 492 ft): ±(0.3 m + 2 %) 150 m to 350 m (492 ft to 1148 ft): ±(0.3 m + 4 %)	

DTX-NSM Module Specifications

Input connectors	Twisted pair cable: 8-pin modular jack (RJ45) Fiber optic cable: SFP port (small form pluggable)
Indicator	Green LED indicates link activity
Functions	Verifies link connectivity and network service availability, checks link utilization and error conditions, verifies the presence of PoE (Power over Ethernet), blinks a hub/switch activity LED, detects LinkRunner™ cable ID locators
Protocol	Complies with IEEE 802.3 (Ethernet) specifications

DTX Compact OTDR Module Specifications

Specification	Multimode	Singlemode
Wavelengths	850 nm ±20 nm; 1300 nm +35 nm, -15 nm	1310 nm ±25 nm, 1550 nm ±30 nm
Fiber Under Test	62.5/125 µm or 50/125 µm	9/125 µm
OTDR Port Connector	Cleanable ferrule, UPC polish, with removable SC adapter	Cleanable ferrule, UPC polish, with removable SC adapter
Max Distance Range[1, 2, 3]	850 nm: 6 km, 1300 nm: 20 km	1310 nm: 20 km, 1550 nm: 20 km
Pulse Width (nominal)	850 nm: 20 ns, 40 ns, 100 ns, 200 ns 1300 nm: 20 ns, 40 ns, 100 ns, 300 ns, 1 µs	1310 nm: 20 ns, 40 ns, 100 ns, 300 ns, 1 µs, 3 µs, 10 µs 1550 nm: 20 ns, 40 ns, 100 ns, 300 ns, 1 µs, 3 µs, 10 µs
Dynamic Range[2, 4]	850 nm: 24 dB typical with 200 ns pulse 1300 nm: 26 dB typical with 1 µs pulse	1310 nm: 26 dB typical with 10 µs pulse 1550 nm: 24 dB typical with 10 µs pulse

1. Typical fiber attenuation (<2.4 dB/km at 850 nm, <0.7 dB/km at 1300 nm for 50/125 µm fiber; <2.9 dB/km at 850 nm, <0.6 dB/km at 1300 nm for 62.5/125 µm fiber; <0.35 dB/km at 1310 nm and <0.20 dB/km at 1550 nm for singlemode fiber), with no significant event losses.

2. Typical backscatter coefficients (-68 dB at 850 nm, -76 dB at 1300 nm for 50/125 µm fiber; -67 dB at 850 nm, -74 dB at 1300 nm for 62.5/125 µm fiber; -77 dB at 1310 nm,-82 dB at 1550 nm for singlemode fiber).

3. End of fiber is greater than 3 dB above the noise floor.

4. SNR=1 method; 3 minute averaging. Subtract 1.56 dB to compare to Telcordia 98% method. Subtract 3 dB when testing 50/125 µm fiber. Refer to the plot to the right.
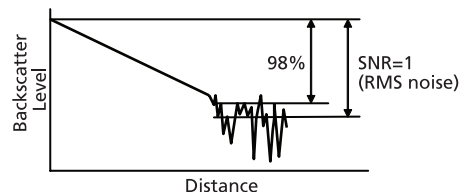
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DTX Compact OTDR Module Specifications (cont.)

Specification	Multimode	Singlemode
Event Deadzone[5]	850 nm: 3.7 m typical 1300 nm: 3.5 m typical	1310 nm: 3.5 m typical 1550 nm: 3.5 m typical
Attenuation Deadzone[6]	850 nm: 10 m typical 1300 nm: 13 m typical	1310 nm: 10 m typical 1550 nm: 12 m typical
Testing Speed per Wavelength	Auto OTDR mode: 15 seconds typical Manual OTDR mode: user-selectable from 15 seconds to 3 minutes. Auto, Auto Test Time, and Auto Deadzone settings: 5 seconds to 3 minutes	Auto OTDR mode: 15 seconds typical Manual OTDR mode: user-selectable from 15 seconds to 3 minutes. Auto, Auto Test Time, and Auto Deadzone settings: 5 seconds to 3 minutes
Sample Resolution	3 cm to 400 cm	3 cm to 400 cm

5. Measured at 1.5 dB below non-saturating reflection peak for typical UPC connector (<-40 dB multimode and < -50 dB singlemode using 20 ns pulse width). Not including dispersion. Refer to the plot to the right.

6. Measured at ±0.5 dB beyond backscatter for typical UPC connector (<-40 dB multimode and < -50 dB singlemode using 20 ns pulse width), not including dispersion. Refer to the plot to the right.

1.5 dB

EDZ

Note: EDZ valid for non-saturating reflection peaks.

0.5 dB

ADZ

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DTX Compact OTDR Module Specifications (cont.)

Specification	Multimode	Singlemode
Distance Accuracy	±1 m ± 0.005 % of distance ± 50 % of resolution ± index of refraction error ± event location error	±1 m ± 0.005 % of distance ± 50 % of resolution ± index of refraction error ± event location error
Linearity[7]	±0.05 dB/dB	±0.05 dB/dB
Reflectance Accuracy[8]	±4 dB	±4 dB
Loss Threshold	0.01 dB to 1.5 dB settable in 0.01 dB increments	0.01 dB to 1.5 dB settable in 0.01 dB increments
Laser Classification	Class 1 CDRH Complies to EN 60825-2	Class 1 CDRH Complies to EN 60825-2
7. Applies to the expected backscatter region (over the range 0.1 dB to 20 dB below saturation).		
8. Does not include error due to backscatter coefficient. Not applicable for hidden events or saturating reflection peaks.		

DTX-MFM2/SFM2/GFM2 Fiber Module Specifications

Power Meter Specifications

Input connector	Interchangeable connector adapter (SC standard)
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) 0 dBm to -52 dBm (850 nm)
Display resolution	dB, dBm: 0.01 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 **(18 °C to 28 °C constant temperature)**	1300/1310 nm and 1550 nm: ± 0.1 dB[2] 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-MFM2 Multimode Modules	DTX-GFM2 Gigabit Modules	DTX-SFM2 Singlemode Modules
Testing speeds (excluding referencing times)	Far End Source mode (1 wavelength): ≤ 4.5 s Loopback mode (2 wavelengths, one direction): ≤ 5 s Smart Remote mode (2 wavelengths, one direction): ≤ 15 s		
Output connector	SC		
Input connector	Interchangeable connector adapter (SC standard)		
Fiber types tested	50/125 μm to 62.5/125 μm multimode	50/125 μm to 62.5/125 μm multimode	9/125 μm singlemode
Source type and wavelengths	Multimode LED source 850 nm ± 30 nm 1300 nm ± 20 nm	VCSEL diode: 850 nm ± 20 nm Fabry-Perot laser diode: 1310 nm ± 20 nm	Fabry-Perot laser diode 1310 nm ± 20 nm 1550 nm ± 30 nm
Maximum length measurement	5 km of 50 μm or 62.5 μm multimode fiber	5 km of 50 μm or 62.5 μm multimode fiber	10 km of 9 μm singlemode fiber

Loss/Length Specifications (cont.)

Specification	DTX-MFM2 Multimode Modules	DTX-GFM2 Gigabit Modules	DTX-SFM2 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	≥ -9 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	± 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 1300/1310 nm, 1550 nm: 0 dBm to -60 dBm		
Display Resolution	dB, dBm: 0.01 Linear (µW): >400, >40, >4, >0.4, ≤0.4: 1, 0.1, 0.01, 0.001, 0.0001		

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Loss/Length Specifications (cont.)

Specification	DTX-MFM2 Multimode Modules	DTX-GFM2 Gigabit Modules	DTX-SFM2 Singlemode Modules
Power measurement uncertainty (accuracy)	$\pm$ 0.25 dB[1]		
Measurement linearity (18 $^\circ$C to 28 $^\circ$C constant temperature)	1300/1310 nm and 1550 nm: $\pm$0.1 dB[2] 850 nm: $\pm$0.2 dB[3]		
Dynamic Range for main-remote communication and nominal length measurement	$\geq$ 12 dB	$\geq$ 22 dB	$\geq$ 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 $^\circ$C $\pm$5 $^\circ$C

2. Linearity for 1310 nm and 1550 nm:
   - Between 0 dBm and -55 dBm: $\pm$ 0.1 dB
   - < -55 dBm: $\pm$ 0.2 dB
3. Linearity for 850 dBm:
   - Between 0 dBm and -45 dBm: $\pm$ 0.2 dB
   - < -45 dBm: $\pm$ 0.25 dB

Visual Fault Locator Specifications

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.	

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. At least 8 hours with the DTX compact OTDR module.

- 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: EN 61326-1, Class A

Immunity: EN 61326-1

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.

CSA   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-MFM2, DTX-GFM2, and DTX-SFM2 Fiber Modules

OUTPUT port: Class 1

VFL port: Class 2

Complies with EN60825-1 and EN61010-1 (CE) and CFR21

Regulatory Information

This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15, Subpart J of the FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of the equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Memory for Test Results

Internal memory stores up to 250 Cat 6 Autotest results, including graphical data.

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 Multi Media Card (MMC) or Secure Digital memory cards (SD).

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 14-3 shows the pin connections for the DTX serial cable.

Table 14-3. 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.

Appendix A: How to Test Your Test Reference Cords

Why You Must Do this Test

To get accurate measurements of loss, you must use high-quality test reference cords that are in good condition and comply with ISO/IEC 14763-3. Measurements of optical power loss are very much affected by the condition of the endfaces on the fiber connectors. Dirty endfaces and endfaces with damage are the most common causes of problems in fiber links.

When You Must Do this Test

Test your test reference cords at these times:

- At the start of each day
- When you move your equipment to a different area
- When you change your equipment to test links that have a different type of connector

After you do the test given in this Appendix, use the procedure given with the procedures for certifying cabling to monitor the condition of the cords.

Equipment You Must Have

Figure A-1 shows the equipment you must have to test your test reference cords.

⚠ Caution

To do this procedure, you must have a fiber microscope. You cannot be sure that your cords are good unless you can examine the endfaces on the connectors. An endface that is dirty or has damage can give a good loss measurement, but can cause problems later. See Figure A-2.

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① Tester with a fiber module and a connector adapter installed. Use the connector adapter that connects to the cords you will test.

② Fiber cleaning supplies

③ A microscope for inspecting fiber connectors (the FT500 FiberInspector Mini Video Microscope is shown)

④ A test reference cord that you are sure is good. One connector is SC. The other connector is the same as on the cords you will test.

⑤ Singlemode adapter for the connectors on the cords you will test

⑥ You must use a mandrel when you test multimode fiber. Select the correct size for the fiber you will test.

Figure A-1. Equipment for Testing the Test Reference Cords

1. Set Up the Tester

1-1 Turn on the tester. Wait for a minimum of 5 minutes for the tester to become stable. Wait for a longer time if the tester is much colder or hotter than the work area.

1-2 Turn the rotary switch to **SETUP,** then make these settings:

- **Test Limit**: Select the applicable limit:

Standard	Test Limit for Multimode	Test Limit for Singlemode
ANSI/TIA-568-C	TIA-568-C Multimode	TIA-568-C Singlemode ISP
ISO/IEC 14763-3	ISO/IEC 14763-3	ISO/IEC 14763-3

- **Fiber Type**: Select the type of cable you will test. This sets the index of refraction (n). The test limits shown above use n to calculate the length of the fiber, then they use the length to calculate the limit for loss. Thus, you must use the correct value of n to get an accurate measurement of loss. If you cannot find the correct fiber type, you can enter the value of n for your fiber on tab 3 of the setup menus. Get the value of n from the cable vendor.

- **Remote End Setup: Loopback**

- **Bi-Directional: Yes**

- **Number of Adapters**: **1**

- **Connector Type**: Select the type of connector that is on the cords you will test

- **Test Method**: **1 Jumper**

2. Clean and Inspect the Connectors

2-1 Test reference cords must have endfaces that are clean and have no damage. Always use correct procedures to clean endfaces. See page 8-9 or use the procedures given with your cleaning supplies.

2-2 After you clean an endface, use a fiber microscope to examine the endface. Figure A-2 shows examples of what you can see with a fiber microscope.

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① A clean endface that has no damage. This is the only condition that you can accept for a test reference cord.

② Dirt that is not on the core does not change the loss measurement, but the dirt can move when you connect the fiber.

③ Dirt is on the core. Also, there are scratches that were caused by incorrect procedures for cleaning.

④ The cladding has damage. This does not change the loss measurement, but can cause damage to other endfaces.

Figure A-2. Examples of Fiber Endfaces

3. Set the Reference

3-1 Make the connections shown in Figure A-3.

3-2 Turn the rotary switch to **SPECIAL FUNCTIONS**, then select **Set Reference.** If both a fiber module and a twisted pair or coaxial adapter are attached, select **Fiber Module** next.

3-3 Make sure that the reference value is good:

- For 50/125 μm fiber, the reference value must be better than -24.50 dBm (for example, -23.50 dBm is a better value)

- For 62.5/125 μm fiber, the reference value must be better than -20.00 dBm (for example, -19.50 dBm is a better value)

- For 9/125 μm fiber, the reference value must be better than -8.00 dBm (for example, -7.50 dBm is a better value)

If the value is not good, do the reference procedure again with a different test reference cord.

Mandrel used only for multimode fiber tested with the DTX-MFM2 modules.

amd174.eps
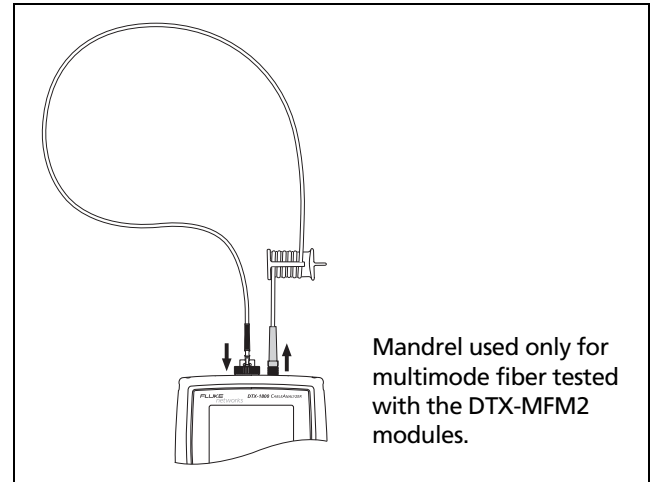
Figure A-3. Reference Connections

4. Test the Cord in Both Directions

4-1 Disconnect the test reference cord from the INPUT port of the tester (Figure A-4, ①).

4-2 Connect the cord you want test (Figure A-4, ②).

4-3 Turn the rotary switch to **AUTOTEST**, then press ⓣ. This test measures the loss of connector Ⓐ shown in Figure A-4.

4-4 When the first part of the test is completed, connect the cord in the opposite direction (Figure A-4, ③).

4-5 Press ⓕ² **OK**. This test measures the loss of connector Ⓑ shown in Figure A-4.

5. Read the Loss Measurements

Compare the loss measurement for each direction to these limits:

• Multimode test reference cord: 0.10 dB or less

• Singlemode test reference cord: 0.20 dB or less

If the connectors show no contamination or damage, but the loss is higher than these limits, the cord does not comply with ISO/IEC 14763-3. Do not use the cord as a test reference cord.
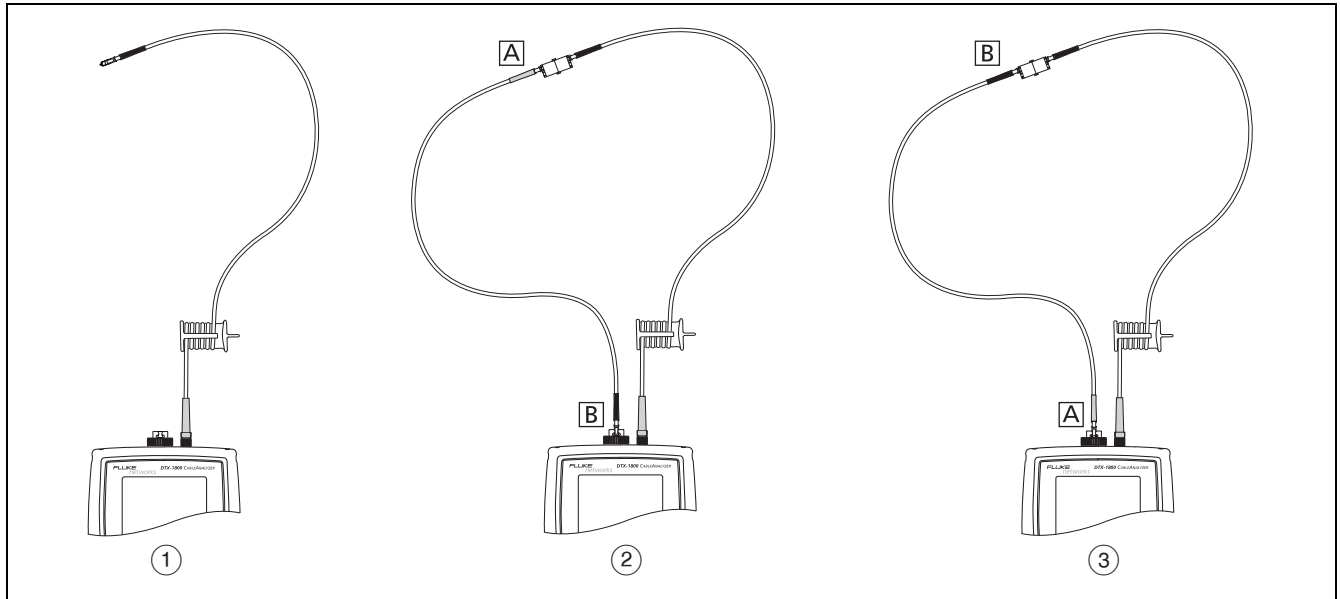
amd171.eps

Figure A-4. Connections for Testing a Test Reference Cord

Appendix B: Fiber Test Method Names

Industry standards use different names for equivalent fiber test methods. Table B-1 shows the names used in this manual and by four common industry standards for the three fiber test methods.

Table B-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	2 Jumper	Method A	Method A.2	Method 1	Method A2
2 connections	1 Jumper	Method B	Method A.1	Method 2	Method A1
None	3 Jumper	Method C	Method A.3	Method 3	Method A3

Appendix C: Loss Test Methods for Fiber Cabling

Introduction

> *Notes*
>
> *The following discussion uses the 1, 2, and 3 jumper terminology for the names of the three common test methods. See Appendix B for a cross-reference of the method names in various standards.*
>
> *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. Both are 1 Jumper methods.*

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, 1, 2, and 3 jumper.

To test links with different connectors at each end, visit the Fluke Networks Knowledge Base for suggestions.

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.

1 Jumper Method

Results from the 1 Jumper method 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. Appendix B shows the names of the standards that define the 1 Jumper method.

Reference connections for the 1 Jumper method cancel out the effects of the test reference cords, as shown in Figure C-1.

Loss results for the 1 Jumper method therefore represent both connections plus the fiber in the link. Industry standards specify the 1 Jumper method for testing multimode and singlemode premises fiber, where connector loss is a significant portion of the total loss.

Note

Other methods are available for getting 1 Jumper results when you do not have the correct connector adapters for the tester. See "Modified 1 Jumper Method" on page C-8. For additional methods, see the Fluke Networks Knowledge Base.
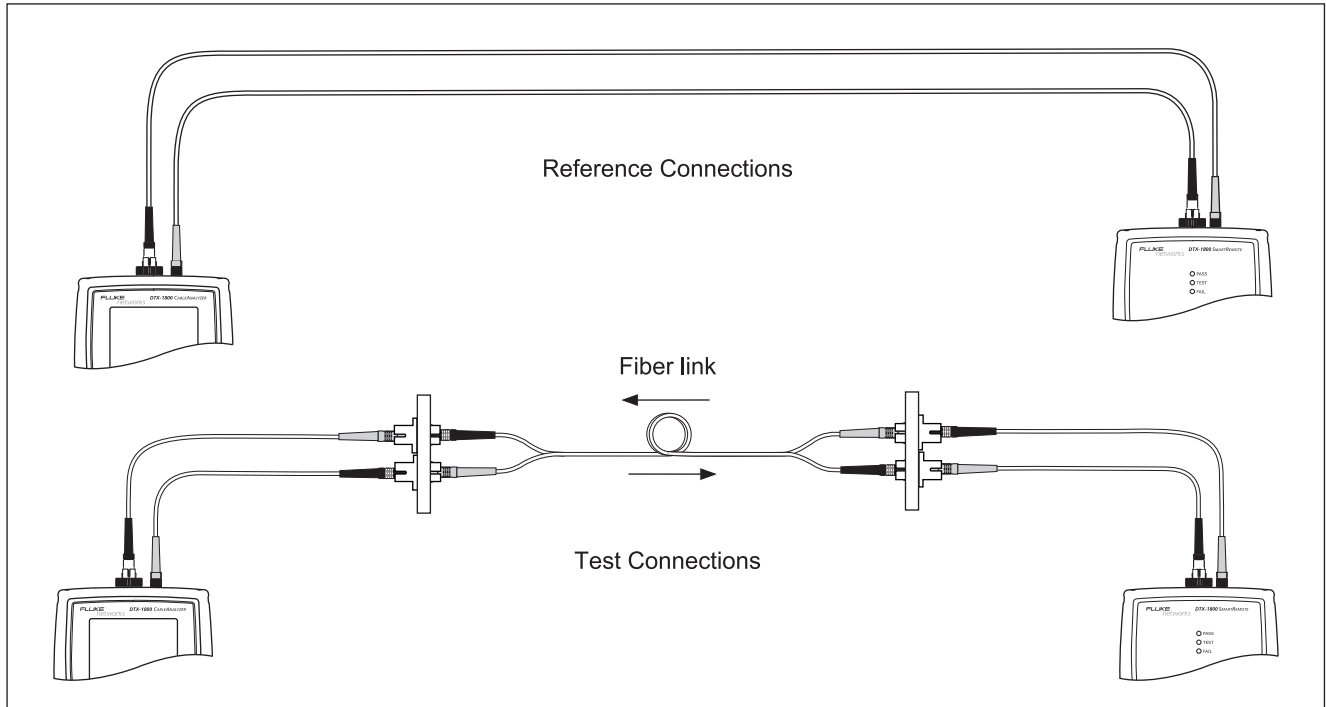
amd70f.eps

Figure C-1. 1 Jumper Reference and Test Connections (singlemode shown)

2 Jumper Method

Results from the 2 Jumper method 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. Appendix B shows the names of the standards that define the 2 Jumper method.

Reference connections for the 2 Jumper method cancel out the effects of the test reference cords and one connection in each fiber path, as shown in Figure C-2.

The test connections add one connection, plus the fiber in the link, to each path. Loss results for the 2 Jumper method therefore represent only one connection plus the fiber in the link. Because the results omit one connection, industry standards do not recommend the 2 Jumper method 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.
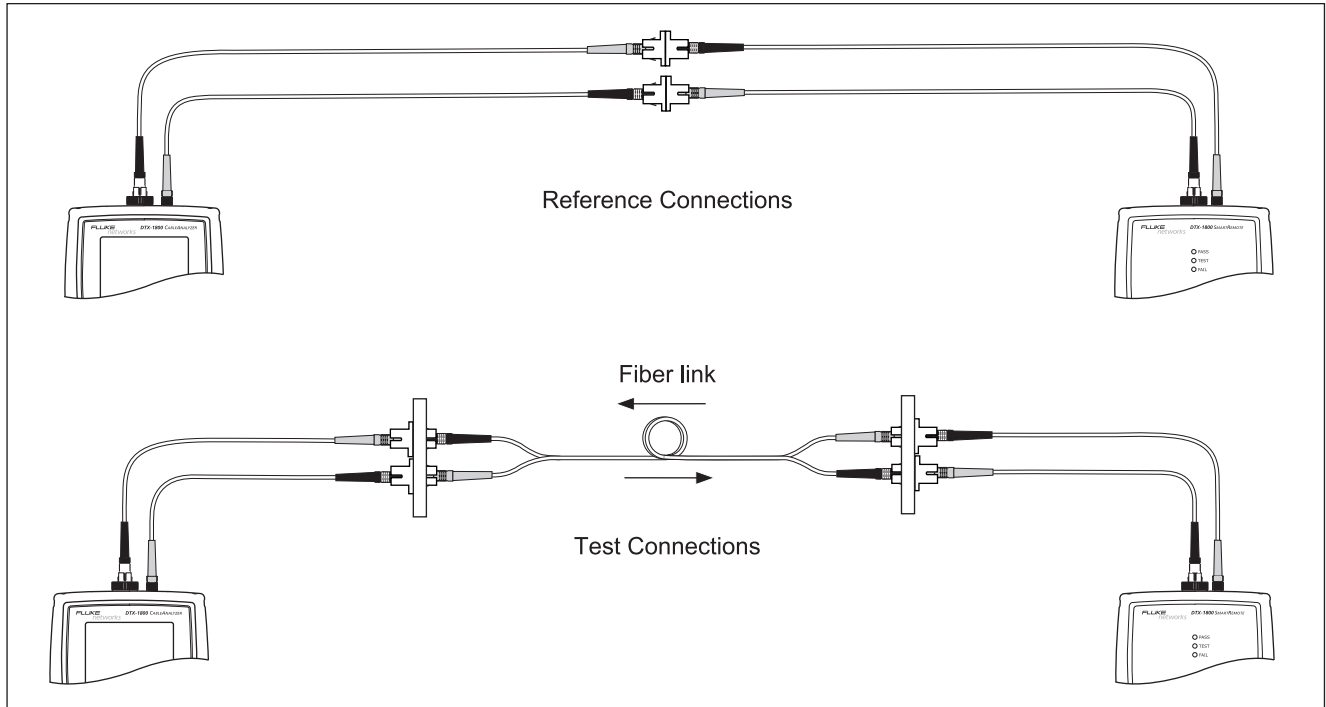
amd69f.eps

Figure C-2. 2 Jumper Reference and Test Connections (singlemode shown)

3 Jumper Method

Results from the 3 Jumper method account for the loss of only the fiber in the link. This method 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. Appendix B shows the names of the standards that define the 3 Jumper method.

Reference connections for the 3 Jumper method cancel out the effects of both test reference cords and two connectors in each fiber path, as shown in Figure C-3.

The test connections add only the fiber in link to each path. Loss results for 3 Jumper method therefore represent only the fiber in the link.

Because the results omit both connections in the link, industry standards do not recommend the 3 Jumper method 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.
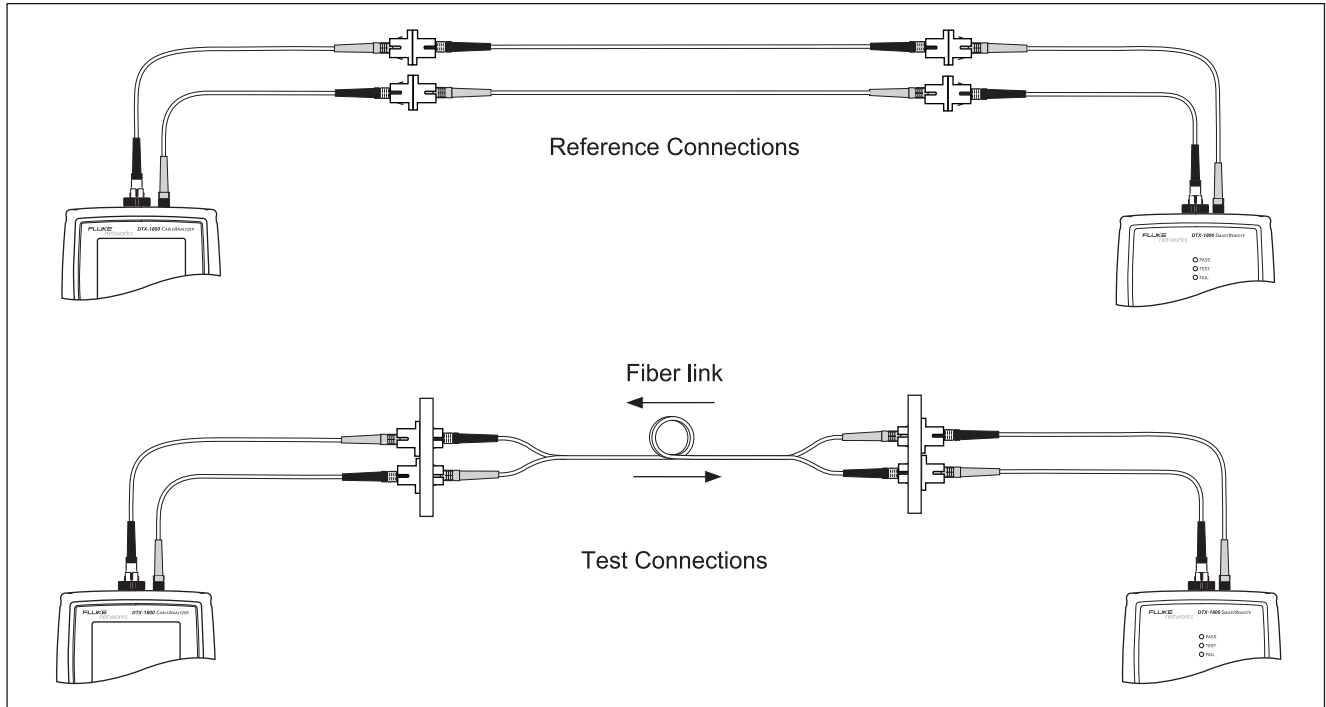
amd71f.eps

Figure C-3. 3 Jumper Method Reference and Test Connections (singlemode shown)

Modified 1 Jumper Method

This section shows modified reference and test connections that produce 1 Jumper results. Use these connections if you need 1 Jumper results but do not have connector adapters that match the connectors on the fiber under test. This method lets you connect to the fiber without disturbing the fiber modules' output connections after setting the reference.

Figures C-4 and C-5 show reference and test connections for a fiber with MT-RJ connectors.

On the tester select **1 Jumper** as the **Test Method** when using modified 1 Jumper connections.

Test reference cord:
SC to MT-RJ (pinned)

MT-RJ to MT-RJ adapter

Mandrel*

③ ③

Test reference cord:
SC to MT-RJ (no pins)

② ①

Mandrel*

② ①

Tester

Smart remote

⚠Caution
Do not disconnect
the outputs (① and ①).

＊ Mandrels used only for
multimode fiber tested with
the DTX-MFM2 modules
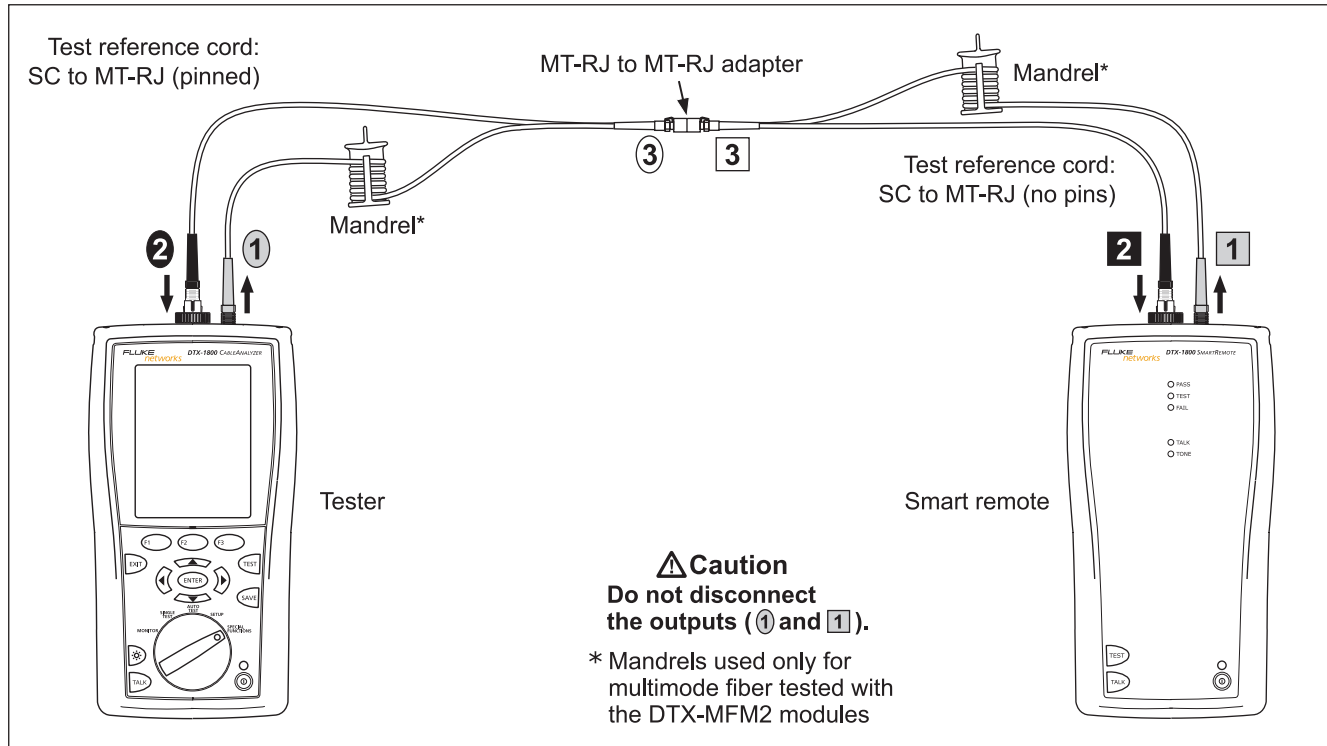
amd47f.eps

Figure C-4. Modified 1 Jumper Method: Smart Remote Mode Reference Connections

Fiber link
or spool

Test reference cord:
SC to MT-RJ (pinned)

MT-RJ to MT-RJ adapter

Mandrel*

3

3

Mandrel*

Short MT-RJ to
MT-RJ (no pins)
test reference cord.
(0.3 m or less.
Added after referencing.)

Test reference cord:
SC to MT-RJ (no pins)

2

1

2

1

Tester

Smart remote

⚠ **Caution**
Do not disconnect
the outputs (1 and 1).

✱ Mandrels used only for
multimode fiber tested with
the DTX-MFM2 modules
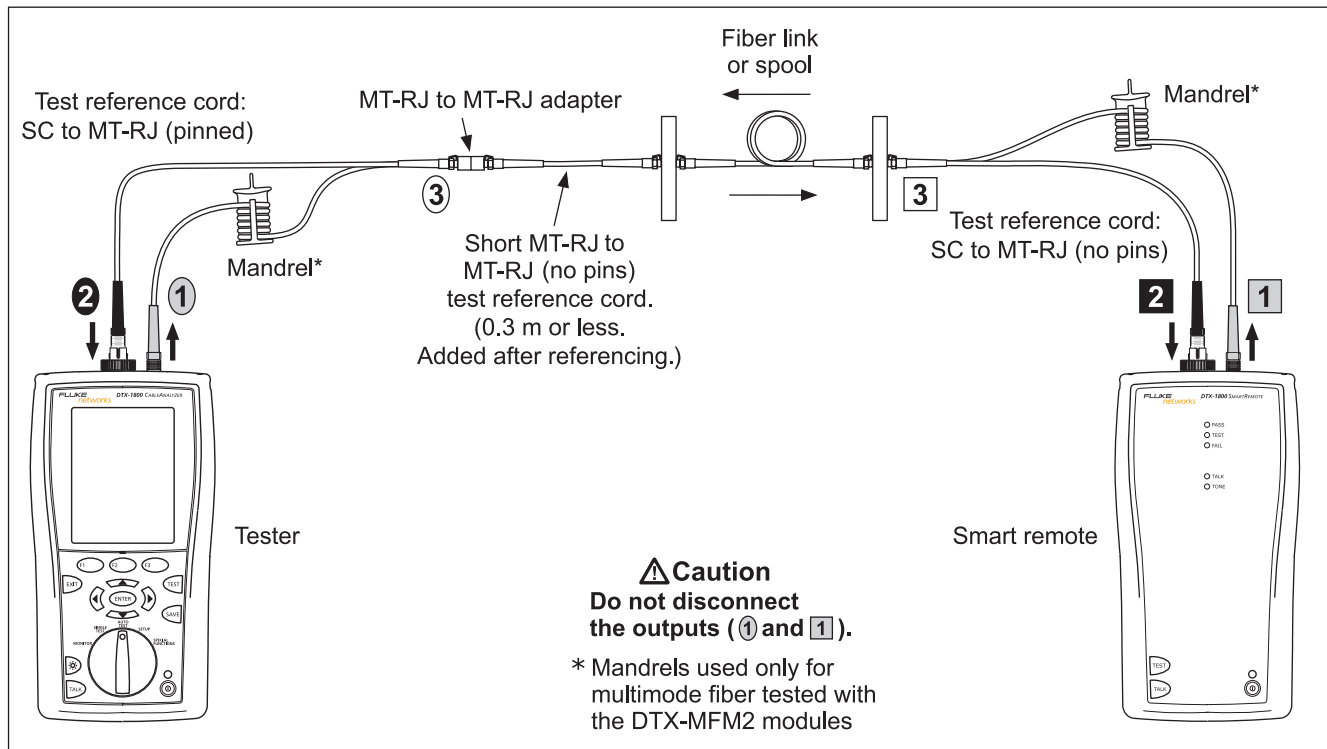
amd48f.eps

Figure C-5. Modified 1 Jumper Method: Smart Remote Mode Test Connections

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–S–