FIBERTEK/TRACETEK

Fiber Optic Loss Measurement & Troubleshooting Accessory Kit

User's Guide

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Introduction

FIBERTEK™ allows you to perform optical power loss measurements for both Singlemode and Multimode fiber optic cables on either the LANTEK® 6 or 7 Cable Certifiers.

The fiber testing performed makes use of VCSEL or laser sources for all wavelengths, permitting certification of Gigabit Ethernet applications on the fiber optic cable.

Both Singlemode and Multimode kits are capable of:

- Length measurement
- Bi-directional testing
- Voice communications

TRACETEK™ is an advanced troubleshooting tool designed to quickly identify and provide assistance in diagnosing common cabling problems.

This product offers trace results:

- Showing single fiber length
- Showing optical return loss events such as connectors, breaks, and most other types of reflective events
- That can be stored and uploaded for viewing with LANTEK Reporter


IDEAL

FIBERTEK Basic Kit

Singlemode Kit Contents

- Singlemode 1310 nm Fabry-Perot Laser Test Adapter
- Singlemode 1550 nm Fabry-Perot Laser Test Adapter
- FC Launch Cables (2 Duplex)
- FC Mating Sleeves (6)
- Fiber Cleaning Starter Kit (Cleaning Swabs, Dry Cleaning Wipes, Wet Cleaning Wipes, Pouch)

Figure 1: Basic Singlemode Kit w/Fiber Cleaning Starter Kit

Multimode Kit Contents

- Multimode 850 nm VCSEL Test Adapter
- Multimode 1300 nm Fabry-Perot Laser Test Adapter
- ST* Launch Cables (2 x 50 µm Duplex Zip)
- ST Mating Sleeves (6)
- Fiber Cleaning Starter Kit (Cleaning Swabs, Dry Cleaning Wipes, Wet Cleaning Wipes, Pouch)

Figure 2: Basic Multimode Kit w/Fiber Cleaning Starter Kit

** ST is a trademark of AT&T.*

FIBERTEK Premium Kit

Singlemode Kit Contents

This kit includes the Basic Singlemode kit plus the following components:

- TRACETEK 1310 Singlemode Adapter
- Simplex FC-FC Cable
- Fiber Cleaning Starter Kit (Cleaning Swabs, Dry Cleaning Wipes, Wet Cleaning Wipes, Pouch)

Figure 3: Premium Singlemode Kit w/Fiber Cleaning Starter Kit

Multimode Kit Contents

This kit includes the Basic Multimode kit plus the following components:

- TRACETEK 1300 Multimode Adapter
- FC-ST Cable
- Fiber Cleaning Starter Kit (Cleaning Swabs, Dry Cleaning Wipes, Wet Cleaning Wipes, Pouch)

Figure 4: Premium Multimode Kit w/Fiber Cleaning Starter Kit

Specifications

FIBERTEK Detector Receiver Wavelengths	 MM: 850nm, 1300nm SM: 1310nm, 1550nm
FIBERTEK Transmitter Laser Type MM 850nm: MM 1300nm: SM 1310nm: SM 1550nm:	 VCSEL Fabry-Perot MCW (Grin Lens Focused) Fabry-Perot MCW (Grin Lens Focused) Fabry-Perot MCW (Grin Lens Focused)
FIBERTEK Measurement Accuracy Attenuation: Length:	 MM 850/1300nm: 0.25dB SM 1310/1550nm : 0.25dB (+/-3%) + 1 meter
FIBERTEK Display Resolution Attenuation: Length:	 MM850/1300nm: 0.1dB SM 1310/1550nm: 0.1dB 1 meter
Linearity	0.2dB
Length Range	MM 850nm: 3,000 meters MM 1300nm: 6,000 meters SM 1310nm: 10,000 meters SM 1550nm: 10,000 meters
Minimum Length	5 meters
Physical Operating Temperature: Ambient Airflow:	 10 to 30°C at specified accuracy 0.3Lf/s (linear feet/second) @ 20°C
Network Specifications	1000Base-SX/LX/F, IEEE 802.3z, 10Base-FL/FB, ATM 155/622

Specifications (Continued)

TRACETEK Detector	
Center Wavelength:	1300-1310nm
Detector Type:	INGaAs
Min. Refl. for Event Detection:	-40dB
Distances	
High Resolution:	800 meters
Medium Resolution:	850 meters
Low Resolution:	4,000 meters
Distance Accuracy:	(+/-3%) + 1 meter
Event Spatial Resolution:	2 meters – High Resolution Mode 8 meters – Medium and Low Resolution Modes
Display Resolution:	0.01 meters
TRACETEK Transmitters	
MM Power Output:	50mW (+16.5dBm) MAX
MM Source Type:	1300nm Fabry-Perot Laser
SM Power Output:	50mW (+16.5dBm) MAX
SM Source Type:	1310nm Fabry-Perot Laser

Note: Specifications are subject to change.

Fiber Autotest Settings

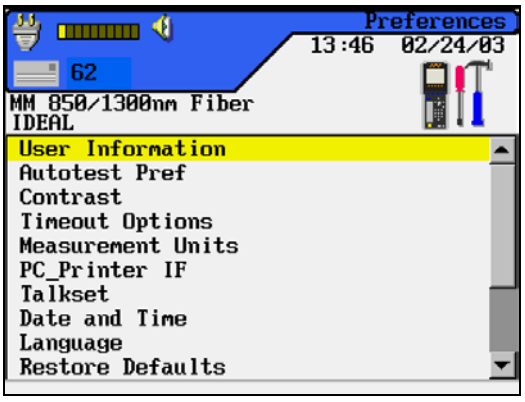
The FIBERTEK kit supports a wide range of networking, cable and connector certifications. Prior to testing, it is important that your fiber autotest settings match your certification requirements.

Setting Autotest Preferences

Autotest is the most frequently used test mode. A number of preferences can be selected for the Autotest function:

- Autosave
- Pass Fail Icon
- Disable Fiber Autotest Length

1. From the Display Handset **Tools** screen, select **Preferences**  .
2. Select **Autotest Preferences.**
3. From the open **Autotest Preferences** screen, set the preferences as required (refer to *LANTEK 6/7 User's Guide, Chapter 3, Set Autotest Preferences*).

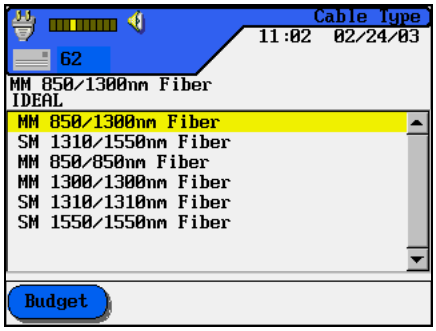


Specifying a Module (Fiber Type)

The LANTEK must be configured by selecting the fiber test mode that corresponds to the FIBERTEK module installed in the handset.

1. Select  on the Display Handset Ready screen. The Fiber Cable Type screen appears.

2. Highlight the option that corresponds to the installed FIBERTEK module.



3. If the loss budget has already been set press ENTER to continue with the previously set values.

   OR:

   Press the Budget key to enter the loss budget mode.

Loss Budget Description

The loss budget setting adjusts the pass/fail threshold for attenuation measurements made with FIBERTEK. Since the loss budget value does not effect the actual attenuation measurements, this function is for informative purposes only. When the measured attenuation is less than or equal to the loss budget, a ✓ is displayed. If the attenuation is greater than the loss budget, a ⊗ is displayed. The loss budget can be set in one of two ways, by manually entering a value or by using the loss budget calculator.

Manual Loss Budget configures a fixed loss limit value for each applicable wavelength. This mode is useful when the acceptable system loss has been specified or when testing to application specific limits such as those listed in Appendix A.

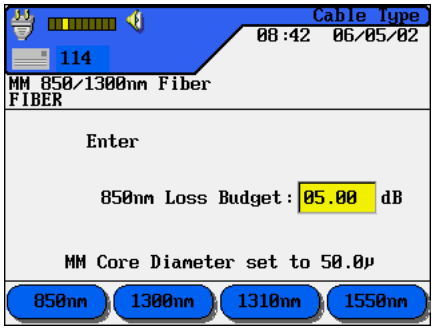
Calculated Loss Budget lets FIBERTEK calculate the limits for each wavelength based on parameters you specify. Fiber length, number of connectors and splices, and maximum attenuation for each of these are entered into the calculator to determine the proper loss budget.

Setting the Loss Budget

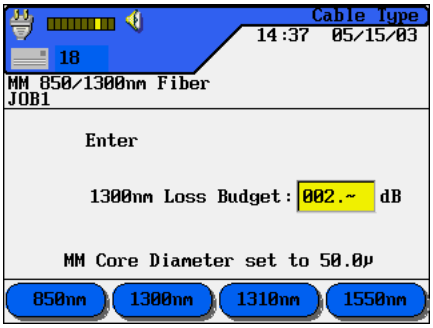
Manual Loss Budget (Skip to next page for calculated loss budget procedure)

1. Select a wavelength by pressing the **F1 – F4** keys.
2. Use the arrow keys and numeric keypad to enter a value into the Loss Budget field.

   Note: do not press ENTER until finished entering data for all fields. This will end the loss budget process.



3. Select another wavelength with the F1-F4 keys and enter the loss budget.

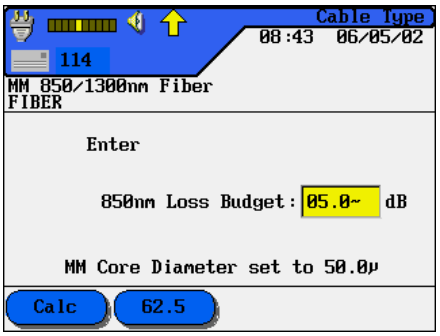


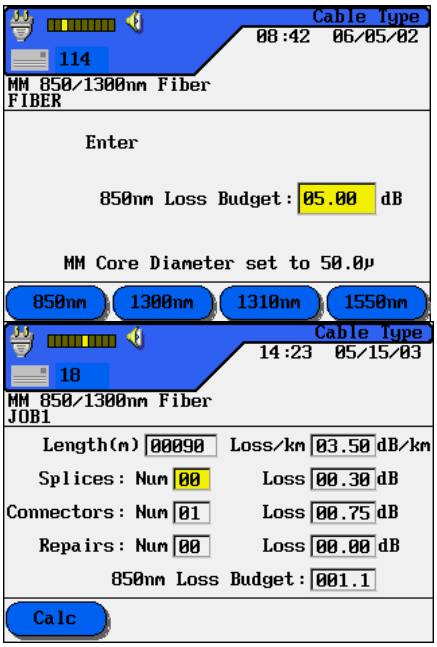
4. Press ENTER to complete the process.

Setting the Loss Budget (Continued)

Calculated Loss Budget

1. Choose a wavelength to adjust by pressing the **F1-F4** keys.
2. Press the SHIFT key, then select Calc to enter the Budget Loss Calculator.
3. Using the Up/Down arrow keys to move between fields, and the Left/Right arrow keys to scroll through a field, enter values with the numeric keypad for cable length, loss/km, splices, connectors and repair margin.
4. Press Calc to update the budget, then press ENTER to save. Repeat for each wavelength. Press again to store values and return to the READY screen.





Note: Where possible use manufacturer specifications for cable attenuation (loss/km), otherwise refer to Appendix A for default values.

When counting connectors, only count connector pairs, excluding any connections that are present during the field calibration process.

Field Calibration (General)

Field calibration is a process that allows the FIBERTEK to obtain a reference level for loss measurement. The accuracy of the field calibration depends on the amount of warm up time allowed prior to starting the calibration process. Refer to the accuracy specifications on page 7 for details.

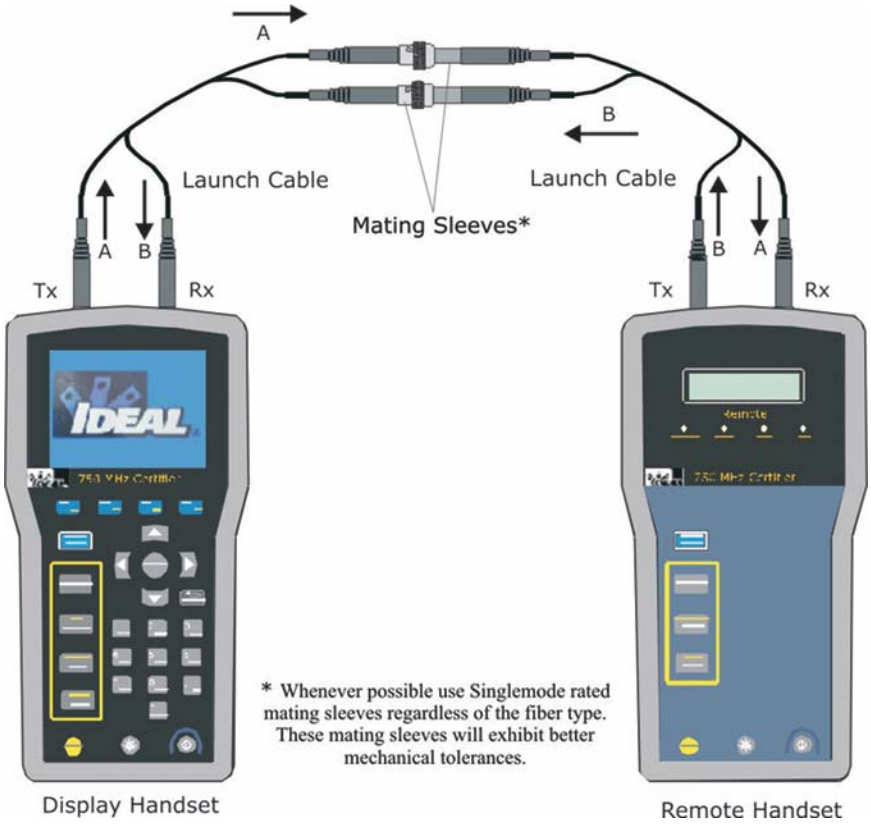


Figure 5: Preferred Setup for Field Calibration

Note: Allow the adapter a proper warm up time prior to field calibration. This will ensure specified accuracy. Be sure the launch cables are the same type of fiber as the cable being tested. (i.e. 50μm jumpers to test 50μm cabling)

The setup depicted on the previous page is the normal calibration configuration for all tests that use both handsets. This includes Autotest as well as the Attenuation and Length tests, which are accessed through the Analyze menu. Calibration configuration for Loopback Attenuation is described later in the manual.

Note: If the FIBERTEK unit has been stored in a location substantially colder than the area where measurements are to be taken, allow the unit to warm up to the ambient temperature with the protective dust caps in place to prevent condensation on the transmitter or receiver diode lenses.

Thoroughly clean the laser and receiver lenses prior to attaching the launch cables using the Fiber Cleaning package supplied with your Basic or Premium Kit which contains a high-quality cleaning solution and lint free wipes. Contact your local distributor for cleaning kit refills.

Replace dust caps immediately after launch cables are removed.

The calibration data is recorded and stored by the Display Handset. The loss effects of launch cables and couplers that were present during field calibration are subtracted from the attenuation results during testing. Care must always be taken to use launch cables of the same fiber type as the fiber to be tested.

When testing fiber optic cable, a field calibration is required every time any one or more of the following events occur:

- substantive physical movement or change to the launch cables
- change in fiber cable type
- change in the adapters
- power turned OFF or ON for either of the units
- when the test setup is moved.
- when a connector is disconnected from the “TX” port of a FIBERTEK module.

Note: It is absolutely critical to maintain accuracy after calibration that the connectors not be disconnected from the FIBERTEK modules.

Performing a Field Calibration

1. Connect the Display and Remote handsets as indicated in figure 5 above. Make certain that the patch cords connected are compatible with the fiber type under test (i.e. 50µm vs. 62.5µm).

2. Turn on both handsets. For best accuracy, wait 5 minutes to allow the lasers to warm-up and settle. During the warm-up time, clean all couplers and launch cables and check launch cables for dirt, scratches, and chips with a fiber optic inspection scope. Clean the connectors inside the FIBERTEK modules with optic cleaning swabs as well.

3. Select  from the Ready screen and press 

.

4. To start the field calibration process press the F1 key. Calibration takes about a minute after which you should see a ✓ icon indicating the calibration was successful. If the calibration fails check for the following conditions as they are the most common causes of failures:

    - Verify the polarity of the patch cords. The transmit port (Tx) of one module must be connected to the receive port (Rx) of the other module.

    - Dirty connectors on patch cords. Clean and inspect with a fiber inspection scope (IDEAL #45-332).

      Never look into a connector where the opposite end is connected to live equipment, including the FIBERTEK modules.

    - Clean the connectors on the FIBERTEK modules with cleaning swabs. Any dirt on patch cords will be transferred to the module connectors.

- Check for continuity of patch cords with a fiber continuity tester (IDEAL #VFF5).

Autotest Configuration

Having the correct test configuration is critical to achieving accurate test results. Since FIBERTEK is a dual fiber test system, the test configuration will vary slightly from the usual methods used with single fiber test systems.

There are two general methods used for calibration, and three methods used for testing with optical loss test sets such as FIBERTEK. These methods are described in TIA/EIA 526-7, and 525-14 standards. These methods are commonly described as Method A, Method B, and Method B Alternate.

Method ‘A’

Calibration Setup

The Method ‘A’ calibration uses two launch cables and a set of couplers. This is the recommended calibration procedure for FIBERTEK, as it does not require disconnecting of the launch cables from the modules.

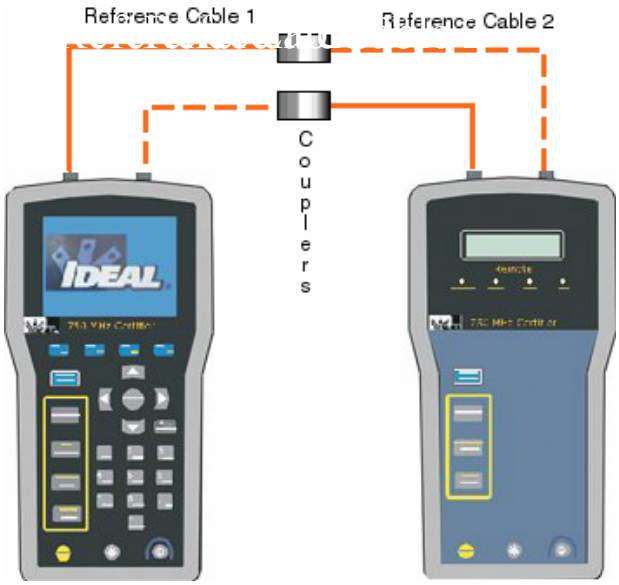


Figure 6: Method 'A' Calibration Setup

Test Setup

The Method ‘A’ test setup is best used for long fiber links where the majority of the attenuation is caused by the cable itself, not the connectors. With this configuration, the calibration reference plane is at the patch panel and work area outlet.

The measurement taken will include the loss of the fiber optic cable (including inline splices and couplers) and the individual connector at each end of the link (one pair). Since there is only one pair of connectors included in this measurement, the overall loss values may be lower than one would expect, particularly when this setup is used to test very short cables.

When used on long links of over 1km (multimode) or 4km (single mode) the loss of the connectors is small compared with the fiber making this an acceptable setup for longer links. Use this configuration when knowing the loss of the optical fiber is more important than the total link loss.

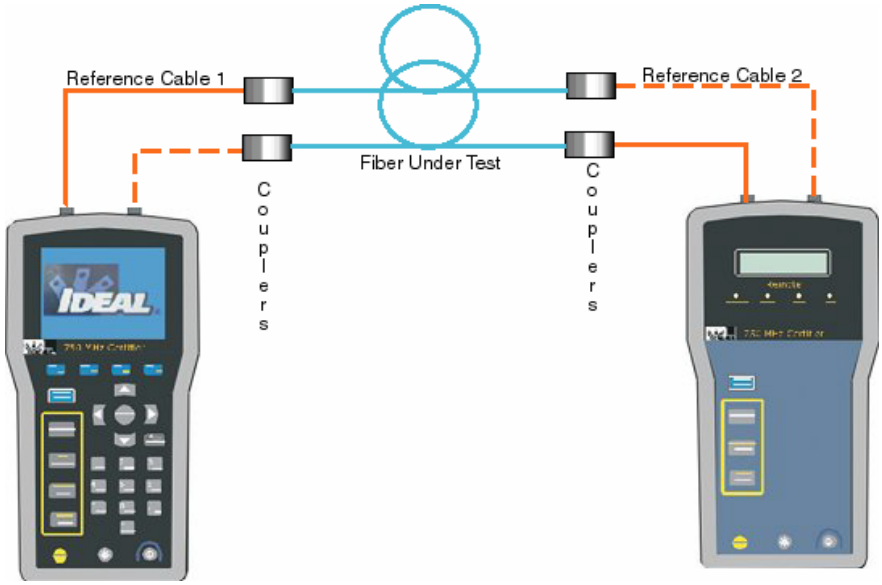


Figure 7: Method ‘A’ Test Setup

Method ‘B’

Calibration Setup

The calibration setup for Method ‘B’ is usually used for single fiber test systems. This method requires the user to disconnect the launch cable from the power meter after calibration, and then add a second launch cable for testing. This method cannot be used to calibrate FIBERTEK using the dual module setup, but is acceptable when using the single module loop back configuration.

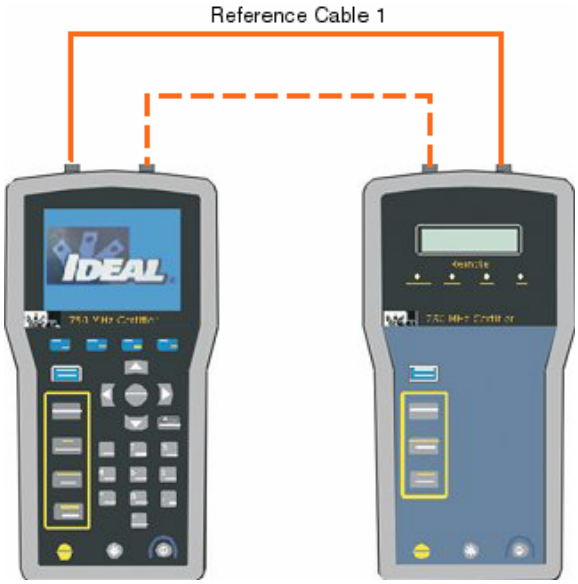


Figure 8: Method 'B' Calibration Setup

Test Setup

The test setup for method ‘B’ adds a second launch cable after calibration. This effectively adds another connector pair to make up for the pair that was factored out during calibration. By doing so, there are two connector pairs are measured during the test, which is the most accurate method for short fiber links.

Method ‘B’ most closely simulates the conditions that are present during normal network operations. The reason for this is during calibration, the loss of the connector pair is factored out of the attenuation measurements, but during actual network operations the loss of the patch cords affects the overall attenuation, making it important to know how the additional loss will affect the overall link. Method ‘B’ adds in another jumper after calibration to simulate the conditions of actual network operation.The problem with method ‘B’ in general is that when using dual fiber test systems it becomes difficult to add in a single jumper to the receiver at each side. To solve this problem, an alternate to Method ‘B’ test configuration is used in conjunction with the Method ‘A’ calibration routine.

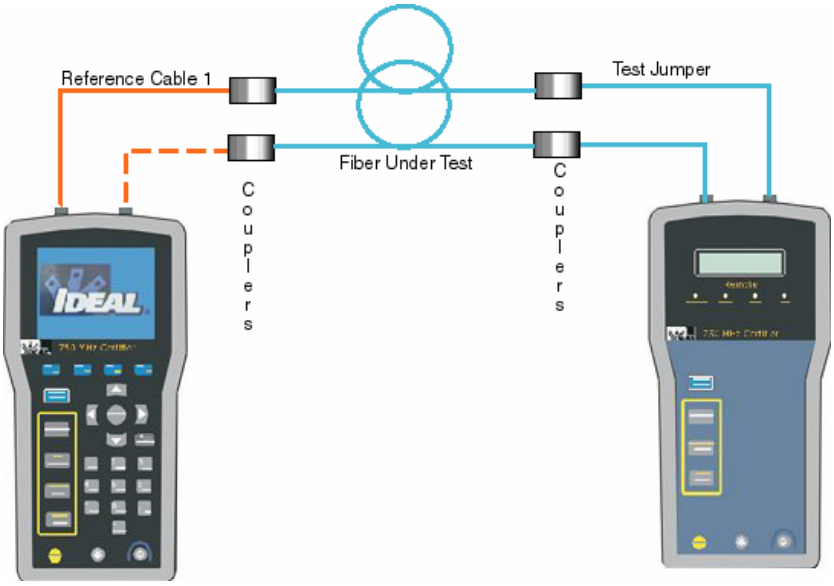


Figure 9: Method 'B' Test Setup

Method ‘B’ Alternate

Test Setup

The Method ‘B’ Alternate test configuration makes it possible to use a dual fiber test system while measuring the actual loss of all the connections and fiber optic cable. By using the ‘A’ Method for calibration and adding a new test jumper for testing, the Method ‘B’ Alternate is useful for testing short links where the connectors make up a large portion of the link attenuation.

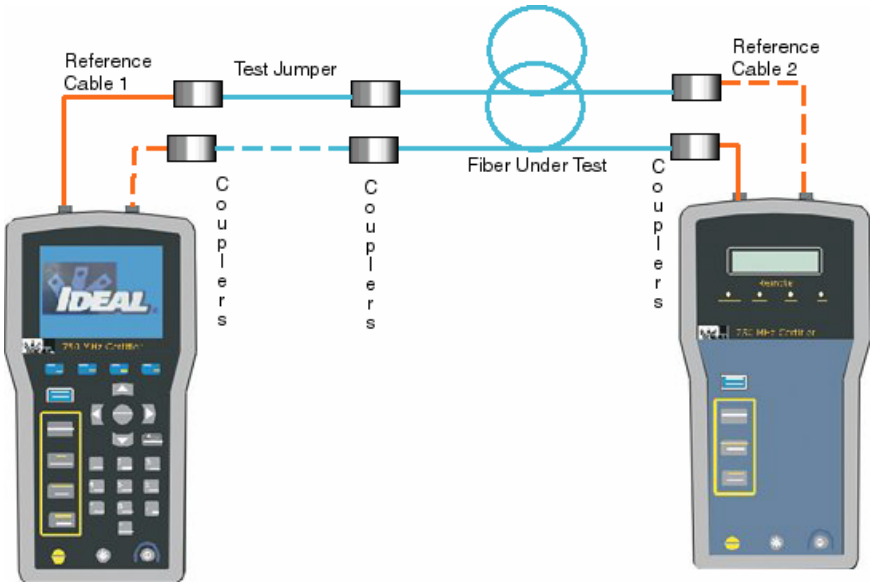


Figure 10: Method 'B' Alternate Test Setup

Recommended Setup

Calibration Method ‘A’ & Test Method ‘B’ Alternate

1. Following a successful field calibration as described in Method ‘A’, disconnect the Remote Handset launch cables from the couplers.

Note: Once calibration is complete, do not disconnect the cables from the FIBERTEK modules themselves.

2. Connect another set of launch cables to the Display Handset launch cables. You should have two sets of launch cabled connected to the Display Handset and one set connected to the Remote Handset.

Note: It is critical that the additional cable added during the test setup for the Method ‘B’ Alternate configuration must be known to be a high-quality, low loss cable without any defects. Use of a sub-standard cable will adversely affect the test results.

Performing a Fiber Autotest

Autotest performs comprehensive tests using programmed testing limits. An overall pass or fail is displayed along with individual test results.

Fiber autotesting can be performed in either Multimode (in accordance with the TIA/EIA-526-14A Standards) or Singlemode (in accordance with the TIA/EIA-526-7 Standards).

Fiber Testing (Singlemode and Multimode)

There are four types of test that can be performed: Duplex Length, Loopback Length, Loopback Attenuation * and Dual Fiber Attenuation.

Field calibration must be completed prior to performing tests. A field calibration is also required every time there is a change to the launch cables, fiber cable type, adapters, or when the power is turned OFF or ON for either of the units.

The attached adapters of the handset units should be allowed to warm up for a minimum of 5 minutes to ensure accuracy.

The launch cables of the same fiber type should be the same as the fiber to be tested. Position unattached launch cable leads on a flat surface. Allow the fiber to relax but not dangle in the air.

Note: During any calibration or testing procedure do not move the handsets, fiber, or leads. Altering their position will affect the accuracy of the measurement.

**Loopback attenuation supported in firmware version 2.000 and higher.*

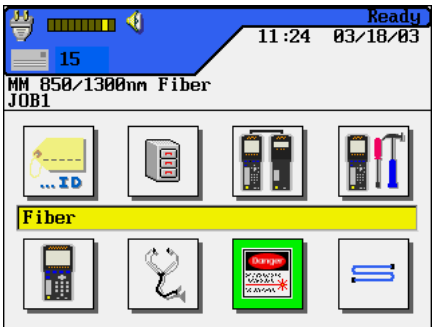
Loopback Testing (Single Handset)

Loopback testing allows testing fiber links using only the display handset. This type of test is convenient for testing short links or patch cords since the use of a single handset is less cumbersome than dual handsets. When loopback mode is used, only one wavelength is measured. Additionally, the length result is the round trip distance, remember that when testing a two fiber link, the actual length will be half the reported length.

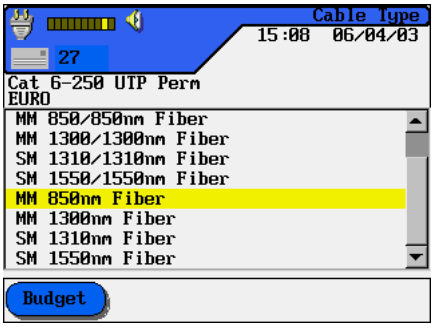
Setup & Field Calibration

Field calibration for loopback testing requires only the LANTEK display handset, and sets the reference power level for attenuation measurements.

1. Attach the desired module FIBERTEK module to the display handset. Choose fiber from the READY screen.

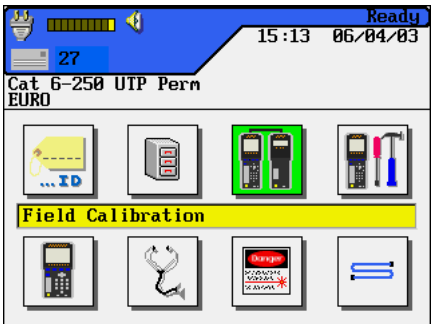


2. Select the single wavelength test that matches the module attached to the handset.



3. Select a loss budget according as described earlier in the manual.

4. Select the Field Calibration option from the Ready Screen.



5. Connect one end of the reference cord to the display handset. Connect the opposite ends together with a coupler and begin the calibration by pressing the F1 softkey.

Figure 11: Loop Calibration Setup

Loopback Testing

Loopback testing can be performed by using either the Autotest function by pressing the AUTO TEST button, or through the Analyze menu by selecting the  icon from the Ready Screen. Autotest test the attenuation and round trip length, while the Analyze modes test wither attenuation or length.

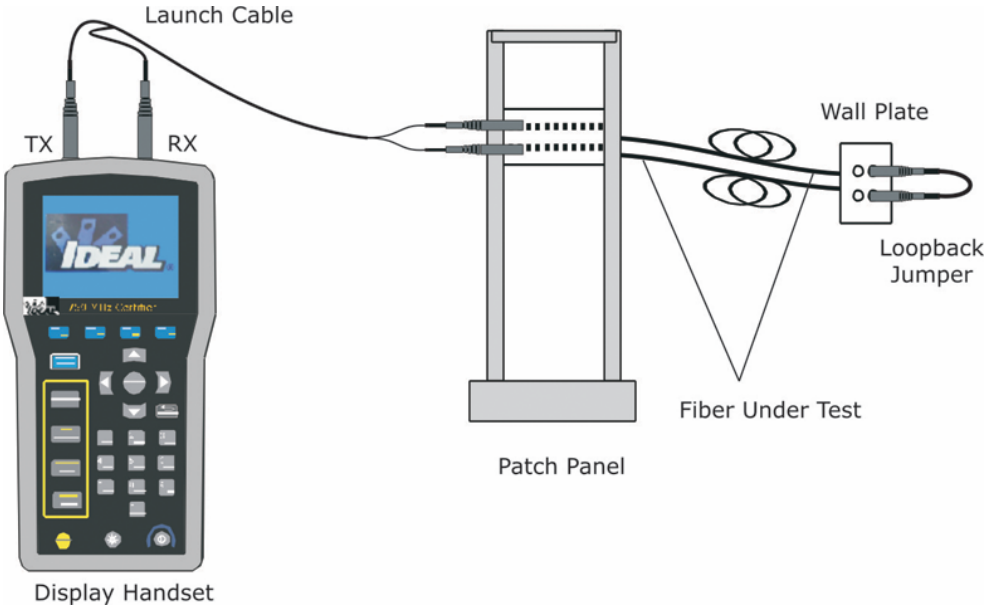
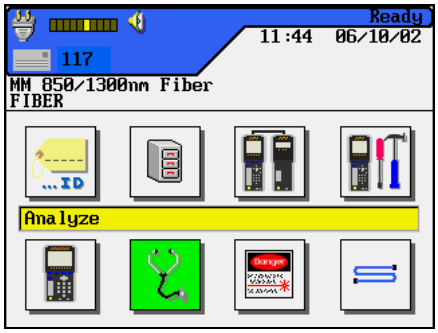
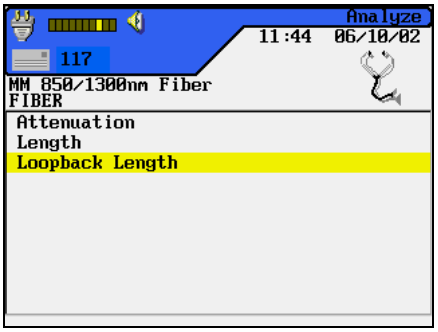
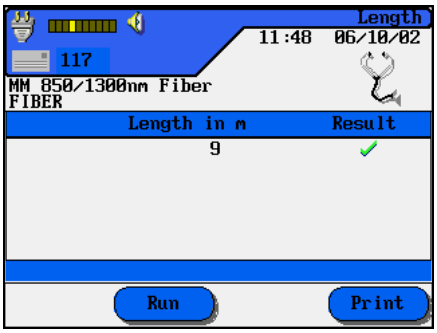


Figure 12: Configuration for Loopback Testing





At the completion of the test procedure, a test result screen will appear.



Length Test (Dual Handset)

Configuration Setup for Length Testing

1. With the appropriate test adapter on the Display Handset and the appropriate test adapter on the Remote Handset, connect one end of the near end launch cable leads to the TX and RX connectors on the Display Handset adapter.

2. Connect the other end of the launch cable leads to patch panel that connects to the fiber under test.

3. Connect one end of the far end launch cable leads to the TX and RX connectors on the Remote Handset adapter.

4. Connect the other end of the far end to the wall plate (fiber cable under test).

5. Check all connections to ensure proper contact. Upon completion, you are ready to perform a fiber test.

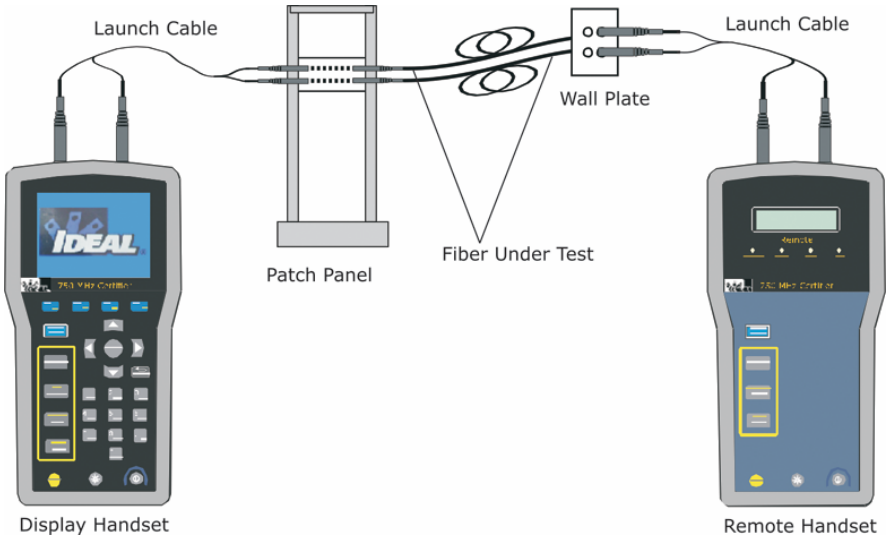
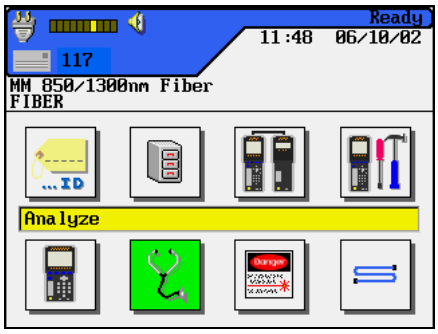
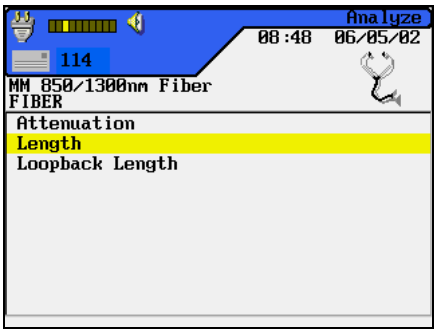


Figure 13: Configuration for Dual Handset Testing

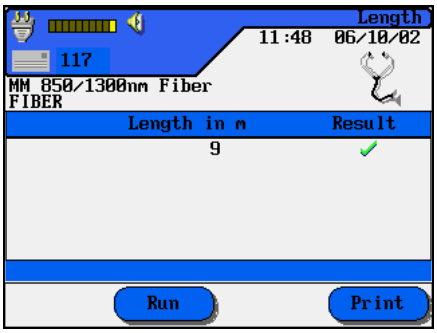
Press the **Length** key on the Display Handset or on the screen, select  and press ENTER.

Then, select **Length,** and press ENTER.





At the completion of the test procedure, a test result screen will appear.



Dual Wavelength Attenuation Test Setup

1. With the appropriate test adapter on the Display Handset and the appropriate test adapter on the Remote Handset, connect one end of the near end launch cable leads to the TX and RX connectors on the Display Handset adapter.

2. Connect the other end of the launch cable leads to patch panel that connects to the fiber under test.

3. Connect one end of the far end launch cable leads to the TX and RX connectors on the Remote Handset adapter.

4. Connect the other end of the far end to the wall plate (fiber cable under test).

5. Check all connections to ensure proper contact. Upon completion, you are ready to perform a fiber test.

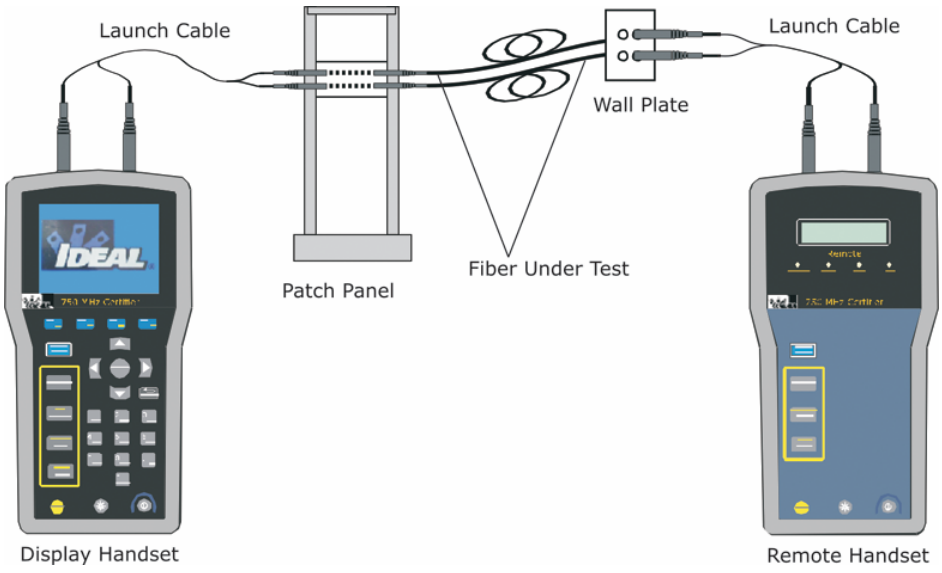
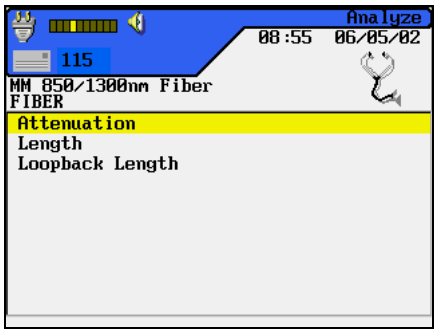


Figure 14: Dual Wavelength Attenuation Testing Configuration

Dual Wavelength Attenuation Testing

Press **Autotest** 

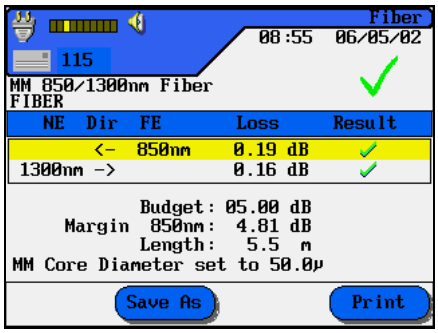
on the Display Handset or Remote Handset to begin the test, or select  on the Display Handset Ready Screen and select **Attenuation** in the Analyze screen.



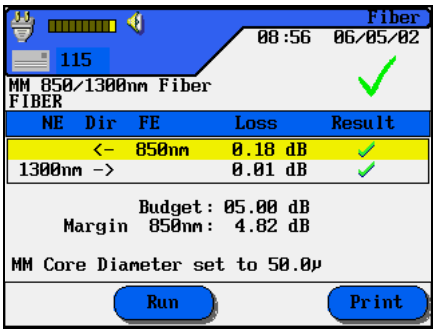
Note: Press 

to cancel the test and return to the Ready screen.

When the Autotest is completed, the results of the test are displayed.



Screen Results thru Autotest process or

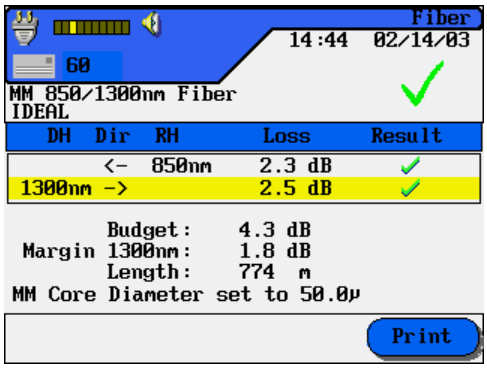


Screen Results thru Analyze process

Interpreting Autotest Results

Pass/Fail Reporting

The overall Autotest result is displayed at the top right of the Autotest display screen. Individual Autotest results are displayed to the right of each test.



Overall Test Result Symbols

Symbol	Overall Autotest Result
✓	Overall test result is a *pass* if each individual test is a *pass*.
⊗	Overall test result is a *fail* if one or more individual test is a *fail*.

Individual Autotest Reports

Symbol	Individual Autotest Result
✓	*Pass* - All values pass with sufficient margin.
✗	*Fail* - One or more values fail by a margin of failure greater than the instrument's specified accuracy.

Saving Current Autotest Results

Autotest results can be stored in the LANTEK internal tester memory or Compact Flash memory card and accessed later using the Stored Results feature. Autotest results can be saved immediately following the test.

- Only overall passed Autotests can be saved using the Autosave feature. Failed test can be saved manually.
- Test results are automatically saved if the AutoSave preference is enabled. Refer to *Setting Autotest Preferences* in the LANTEK 6/7 User's Guide.
- Test names are automatically assigned to completed tests when the Auto Increment feature is enabled. If a different name is desired, a test can be named manually using Save As.

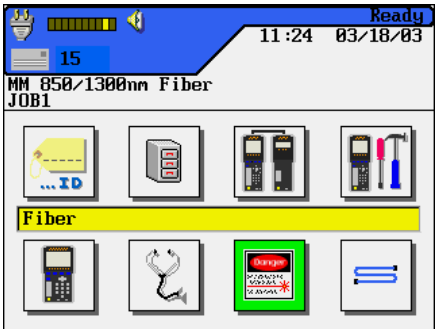
Manually Saving Autotest Results (AutoSave Disabled):

1. To manually save an Autotest, select Save, located at the bottom of the screen.
2. The Test Saved screen will be displayed for a brief period, showing the name the test is saved under.
3. If the current name already exists, a warning screen appears asking you to overwrite the currently existing file or enter a new file name.
4. Press Escape to exit and return to the previous screen without performing a save operation, or select Save to overwrite the existing file.

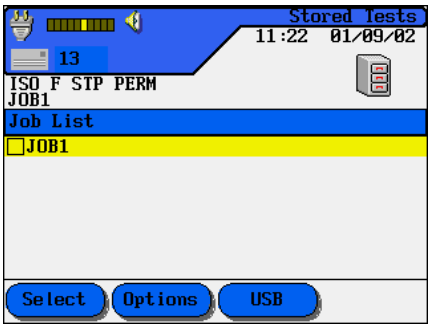
Manipulating Job Folders

When an Autotest is saved, the data is stored with a unique name. Test results can be viewed, printed, or deleted from the Stored Tests screen.

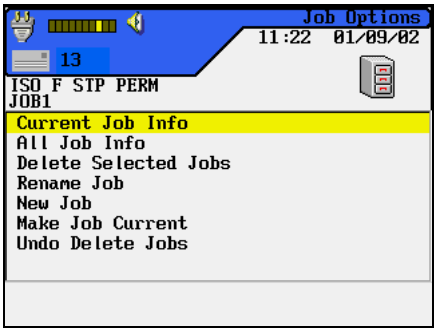
1. On the Ready screen, select **Stored Tests**  to open the **Job List** screen.



2. Highlight the desired Job.
3. Press the Options Soft key to view the folder options list.



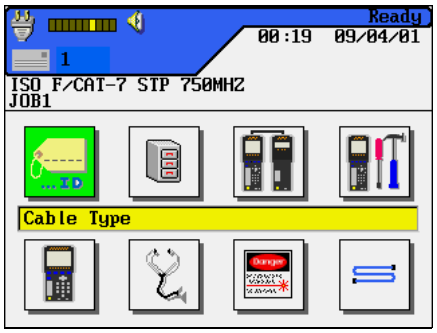
4. Highlight desired function and Press  to select.



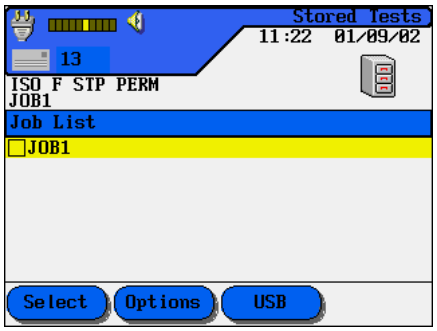
Viewing Result Details

When an Autotest is saved, the data is stored with a unique name. Test results can be viewed, printed, or deleted from the Stored Tests screen.

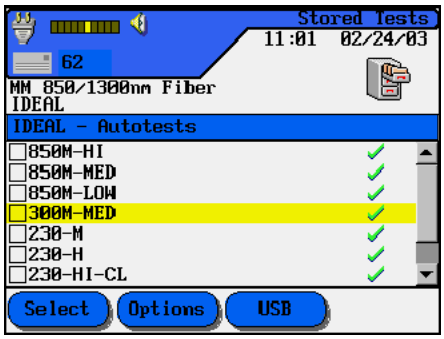
1. On the Ready screen, select **Stored Tests**  to open the **Job List** screen.



2. Highlight the desired Job.
3. Press ENTER to open the job.



4. Press the **Arrow** keys to highlight the desired test record.
5. Press ENTER to open the record.
6. Press Escape at any time to return to the previous screen.



CHAPTER 3
TRACETEK
Reference Guide

TRACETEK™ Reflective Anomaly Detection (RAD) System

TRACETEK is a Reflective Anomaly Detection (RAD) system composed of two parts:

- LANTEK® 6/7 Cable Certifiers (Display Handset only)
- TRACETEK™ Optical Transceiver Module

The LANTEK Display Handset provides power, user interface, storage and signal processing abilities to the TRACETEK module. The TRACETEK module converts the LANTEK electronic TDR signals to optical, and optical back to electronic.

The primary use of this system is to locate optical reflections from cable discontinuities such as connectors, splices, fractures (i.e. cracked or broken strands) or other anomalies occurring within an optical fiber network.

Warning: The TRACETEK adapter generates light pulses up to 50 mW in power. DO NOT look into the adapter or the fiber under test as serious eye injury may occur.

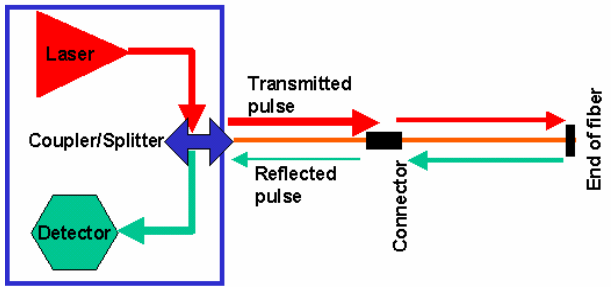
TRACETEK is an alternative to using an OTDR and functions in a similar manner. Both methods will produce traces of optical back reflection for analysis by technicians. However, the Rayliegh scatter measurement used by the OTDR to infer fiber loss is not used in TRACETEK.

Note: True loss measurements can only be made with an Optical Loss Test Set such as TRACETEK's companion product, FIBERTEK.

TRACETEK vs. OTDR

OTDR Operating Principles

The OTDR (Optical Time Domain Reflectometer) is a device that is able to "look" at a fiber optic cable and display a graphical representation of the events that occur on the cable. The basic concept is that a high-speed laser fires a precise pulse of light into the fiber after which the device monitors the same fiber for reflections. The time between the launched pulse and reflected pulses is computed to represent the distance to the events that caused the pulses. This gives the OTDR the ability to not only measure the length of the fiber but also measure the distance to each event on the fiber. This function allows the OTDR to be used as a trouble-shooting tool to find breaks in the fiber and to identify the location of individual connectors and splices.



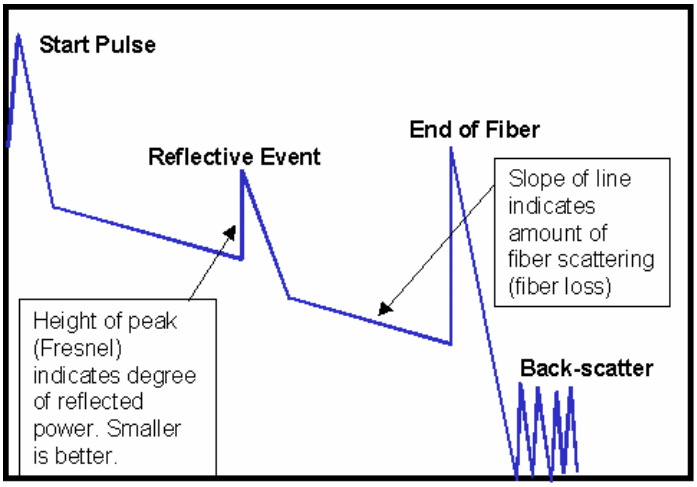
OTDR Block Diagram

The second feature of an OTDR is its ability to measure the tiny amounts of light that are reflected back by the fiber optic cable itself. This phenomena is known as Rayleigh scattering and is caused by light reflecting off of molecules in the glass whose diameter is 1/10 the wavelength of the light. This is the same phenomenon that makes the sky appear blue. When the OTDR is able to detect this these tiny reflections it can calculate the loss of the cable as well as the insertion loss of connectors and splices on the fiber cable. This technology does not come cheap, in fact the high-sensitivity detector and the supporting electronics required to "see" these tiny reflections are responsible for most of the cost of the OTDR itself.

OTDR History

OTDRs were first used in long distance outside plant fiber optic installations such as telecom or CATV to help document and troubleshoot fiber networks. The first generations of OTDRs were massive, complex and very expensive. Most models required the use of a cart or dolly of some type to be moved, as they were heavy and bulky. These early machines did not offer any of the automatic setup features we are used to seeing today, meaning that the operator had to have a very thorough understanding of the operation of the equipment to properly configure it. Lastly, many of the first field-OTDRs cost upward of $60,000 putting them out of reach of everyone except large service providers.

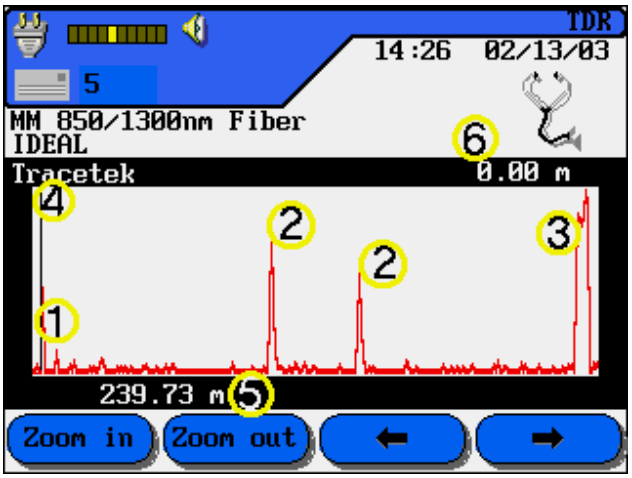
Today, OTDRs are smaller, less expensive and easier to use. But that still does not mean that the average installer can pick one up and begin using it. The technician still needs to understand the complex relationship between pulse width, dynamic range, acquisition time, Rayleigh scattering, and a myriad of other factors that determine what type of picture the technician will get from and OTDR. But nonetheless, the improved functionality smaller size and lower cost have brought the OTDR into the realm of short-haul LANs. Whereas an OTDR was once only used to find problems in short-haul networks, they are now being used as documentation tools to help map out fiber links, showing the location of connections and precise length of each link.



Typical OTDR Trace

TRACETEK Operating Principles

TRACETEK is able to provide most of the troubleshooting functions of an OTDR at a fraction of the cost with a simple, easy-to-use interface that requires almost no training. Like and OTDR, TRACETEK fires a precise laser pulse into a fiber and monitors the fiber for return pulses. This means that like an OTDR, TRACETEK can measure the overall length of a fiber, as well as measure the distance to reflective events within the fiber. Unlike fiber test kits that also measure overall length, TRACETEK only needs to be connected to one side of the fiber to make its measurements. Traditional fiber test kits need to either have hardware connected at both ends of the fiber, or a loop-back cable installed at the far end to make its length measurement. This means that two technicians are required to test the length, or one technician can perform the test by walking back and forth to test each strand, taking twice as long to finish the job.



TRACETEK Display

Key Elements of TRACETEK Display

1) Start pulse (first connector)
2) Reflective events
3) End of fiber (last connector or break in cable)
4) Moveable Cursor
5) Total length of fiber
6) Cursor position

TRACETEK displays its measurement data in a graphical format similar to that of an ODTR, with the X-axis representing the distance from the handset and the Y-axis displaying the relative reflection (Return Loss) of each event. TRACETEK instantly displays the overall length to the end of the fiber and allows the operator to scroll a cursor to find the distance to any event on the screen. This functionality allows the operator to quickly measure overall fiber length, locate breaks in the fiber, locate individual reflective events, and check the relative reflection of events to identify defective connections.

Unlike an OTDR, TRACETEK is exceptionally easy to use. The only setup consists of choosing from one of three operating modes (High, Medium, or Low Resolution). The lightweight module is small enough that it can be carried in the installers test equipment case making it available in any situation that requires fiber troubleshooting. Since TRACETEK does not measure fiber scattering it cannot measure the insertion loss of the link or individual connectors like an OTDR can. But at ¼ or less than the cost of a traditional OTDR, and with the most important trouble shooting features of an OTDR, TRACETEK is the best choice for impromptu fiber troubleshooting tasks.

Using TRACETEK

The TRACETEK system is simple to use and requires no warm up time.

1. Insert the TRACETEK adapter into the LANTEK Cable Certifier.

2. Clean the launch cable and attach it to the adapter.

3. Using a Good Quality mating adapter, attach the launch cable to the fiber to be tested. Clean all connections. Make sure the launch cable connector is aligned with the TRACETEK connector slot to assure proper mating of the connector.

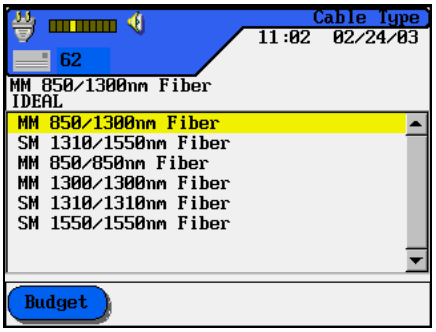
Figure 15: LANTEK /TRACETEK Configuration on a Fiber

4. Select a Fiber Cable Type from the LANTEK display menu.

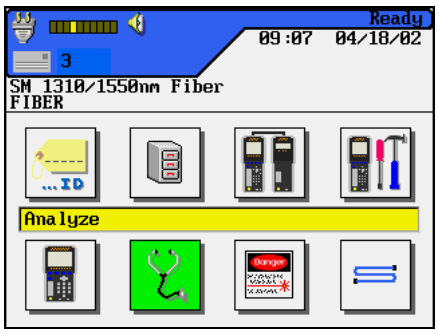
   Select  on the Display Handset Ready screen. The Fiber Cable Type screen appears.

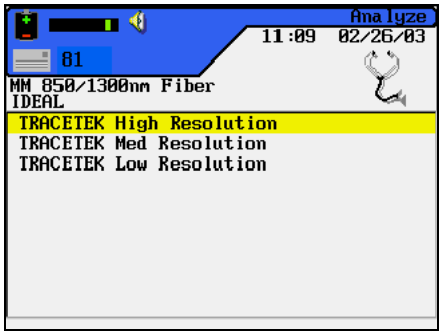
Highlight the desired fiber type and press ENTER to accept the new fiber type.

Note: TRACETEK will function properly as long as any fiber type is actively selected.



5. From the Ready screen of the LANTEK main unit, Press AUTO TEST or select Analyze to open the Analyze menu screen.





6. In the Analyze menu there are three choices of resolution: High, Medium, and Low. The default resolution is High.

   High Resolution provides accurate back reflection measurement for up to 800 meters of fiber and will resolve individual events as close as 2 meters apart at rated accuracy.

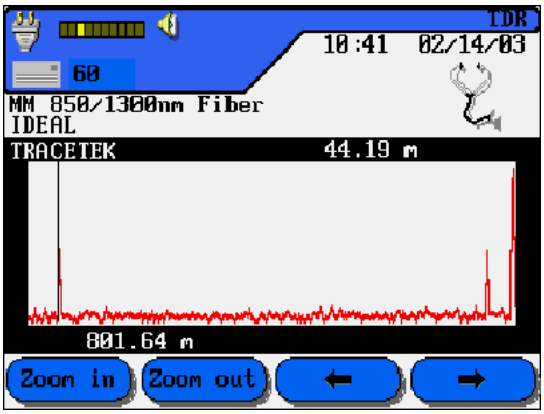
Medium Resolution provides accurate back reflection measurement for lengths over 250 meters and will resolve and measure events 8 meters and up at distances of up to 850 meters.

Low Resolution provides accurate back reflection measurements for lengths of 500m to 4km.

7. Highlight the desired resolution and press ENTER. The LANTEK Cable Certifiers will conduct the measurement.

8. When the test is complete, the results are displayed on screen, left to right, with the last event usually taking place at the end of the fiber.

Note: Sometimes the end of the fiber (EOF) is not where it is expected due to poor splices or cuts. EOF is the point where TRACETEK detects a large reflection (about –14dB) which can be the actual EOF, a bad connector, or break in the fiber.

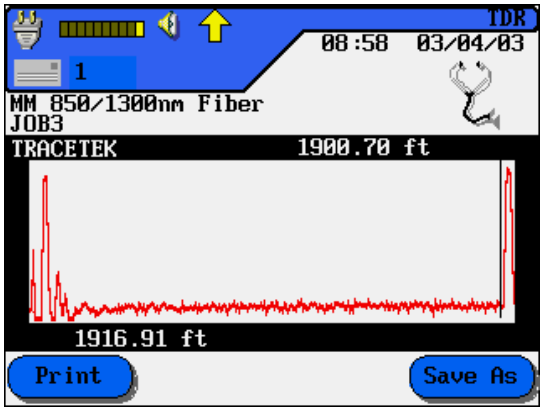


The distance to the end of the fiber is displayed on the screen in the lower left-hand corner of the display. The vertical cursor can be used to find the distance to an event by moving it along the trace where the event is indicated. The distance to this point appears on the screen in the upper right-hand corner of the display.

Saving TRACETEK Results

Like other tests, the resultant plot from TRACETEK can be stored in the LANTEK handset and recalled or uploaded to a PC using the LANTEK Reporter software.

1. From the TRACETEK display, press the SHIFT key, then the Save As key.
2. Enter a test record name and press ENTER to save the record.




IDEAL

Appendix A
Fiber Optic Cabling Standards & Application Requirements

Summary of Fiber Optic Cabling Standards & Application Requirements

Standards Organization	Classification or Application	Fiber Type	Core size (um) / wavelength (nm)	Max Link Channel Loss (dB)	Max Connector Insertion Loss (dB)	Max Splice Insertion Loss (dB)	Min Connector Return Loss (dB)	Maximum Distance (m)	Min Operating Distance (m) (50um/62.5um)	Max Fiber Attenuation (dB/km)	Min Fiber Bandwidth (MHz-km)
TIA 568-B.3 Generic Cabling	Horizontal link	Multimode	62.5/850	n/s	0.75	0.3	>20	90	n/s	3.5	160
	Horizontal link	Multimode	50/850	n/s	0.75	0.3	>20	90	n/s	3.5	500
	Horizontal link	Multimode	62.5/1300	n/s	0.75	0.3	>20	90	n/s	1.5	500
	Horizontal link	Multimode	50/1300	n/s	0.75	0.3	>20	90	n/s	1.5	500
	Backbone	Multimode	62.5/850	n/s	0.75	0.3	>20	2km	n/s	3.5	160
	Backbone	Multimode	50/850	n/s	0.75	0.3	>20	2km	n/s	3.5	500
	Backbone	Multimode	62.5/1300	n/s	0.75	0.3	>20	2km	n/s	1.5	500
	Backbone	Multimode	50/1300	n/s	0.75	0.3	>20	2km	n/s	1.5	500
	Horizontal link	Single mode	9/1310	n/s	0.75	0.3	>26	90	n/s	1.0	n/a
	Horizontal link	Single mode	9/1550	n/s	0.75	0.3	>26	90	n/s	1.0	n/a
	Backbone (ISP)	Single mode	9/1310	n/s	0.75	0.3	>26	3km	n/s	1.0	n/a
	Backbone (ISP)	Single mode	9/1550	n/s	0.75	0.3	>26	3km	n/s	1.0	n/a
	Backbone - (OSP)	Single mode	9/1310	n/s	0.75	0.3	>26	3km	n/s	0.5	n/a
	Backbone - (OSP)	Single mode	9/1550	n/s	0.75	0.3	>26	3km	n/s	0.5	n/a
ISO 11801 Generic Cabling	OF-300	OM1	50 or 62.5/1300	1.95	0.75 ea/ 1.5 total	0.3	>20	n/s	300	1.5	500
	OF-300	OM2	50 or 62.5/850	2.55	0.75 ea/ 1.5 total	0.3	>20	n/s	300	3.5	500
	OF-300	OM2	50 or 62.5/1300	1.95	0.75 ea/ 1.5 total	0.3	>20	n/s	300	1.5	500

Standards Organization	Classification or Application	Fiber Type	Core size (um) / wavelength (nm)	Max Link Channel Loss (dB)	Max Connector Insertion Loss (dB)	Max Splice Insertion Loss (dB)	Min Connector Return Loss (dB)	Maximum Distance (m)	Min Operating Distance (m) (50um/62.5um)	Max Fiber Attenuation (dB/km)	Min Fiber Bandwidth (MHz-km)
ISO 11801 Generic Cabling	OF-300	OM3	50/850	2.55	0.75 ea/ 1.5 total	0.3	>20	n/s	300	3.5	1500
	OF-300	OM3	50/1300	1.95	0.75 ea/ 1.5 total	0.3	>20	n/s	300	1.5	500
	OF-300	OS1	9/1310 or 1550	1.80	0.75 ea/ 1.5 total	0.3	>35	n/s	300	1.0	n/s
	OF-500	OM1	50 or 62.5/850	3.25	0.75 ea/ 1.5 total	0.3	>20	n/s	500	3.5	200
	OF-500	OM1	50 or 62.5/1300	2.25	0.75 ea/ 1.5 total	0.3	>20	n/s	500	1.5	500
	OF-500	OM2	50 or 62.5/850	3.25	0.75 ea/ 1.5 total	0.3	>20	n/s	500	3.5	500
	OF-500	OM2	50 or 62.5/1300	2.25	0.75 ea/ 1.5 total	0.3	>20	n/s	500	3.5	500
	OF-500	OM3	50/850	3.25	0.75 ea/ 1.5 total	0.3	>20	n/s	500	3.5	1500
	OF-500	OM3	50/130	2.25	0.75 ea/ 1.5 total	0.3	>20	n/s	500	1.5	500
	OF-500	OS1	9/1310 or 1550	2.00	0.75 ea/ 1.5 total	0.3	>35	n/s	500	1.0	n/a
	OF-2000	OM1	50 or 62.5/850	8.50	0.75 ea/ 1.5 total	0.3	>20	n/s	2km	3.5	200
	OF-2000	OM1	50 or 62.5/1300	4.50	0.75 ea/ 1.5 total	0.3	>20	n/s	2km	1.5	500
	OF-2000	OM2	50 or 62.5/850	8.50	0.75 ea/ 1.5 total	0.3	>20	n/s	2km	3.5	500
	OF-2000	OM2	50 or 62.5/1300	4.50	0.75 ea/ 1.5 total	0.3	>20	n/s	2km	1.5	500
	OF-2000	OM3	50/850	8.50	0.75 ea/ 1.5 total	0.3	>20	n/s	2km	3.5	1500

Standards Organization	Classification or Application	Fiber Type	Core size (um) / wavelength (nm)	Max Link Channel Loss (dB)	Max Connector Insertion Loss (dB)	Max Splice Insertion Loss (dB)	Min Connector Return Loss (dB)	Maximum Distance (m)	Min Operating Distance (m) (50um/62.5um)	Max Fiber Attenuation (dB/km)	Min Fiber Bandwidth (MHz-km)
ISO 11801 Generic Cabling	OF-2000	OM3	50/130	4.50	0.75 ea/ 1.5 total	0.3	>20	n/s	2km	1.5	500
	OF-2000	OS1	9/1310 or 1550	3.50	0.75 ea/ 1.5 total	0.3	>35	n/s	2km	1.0	n/a
IEEE 802.3	10Base-FL	Multimode/ OM1-OM2	62.5/850	12.50	0.75 ea/ 1.5 total	n/s	>20	2km	0	3.75	160
	10Base-FL	Multimode/ OM1-OM3	50/850	12.50	0.75 ea/ 1.5 total	n/s	>20	1.5km	0	3.75	160
	100Base-FX	Multimode/ OM1-OM3	62.5 or 50/1300	11.00	0.75 ea/ 1.5 total	n/s	n/s	2km	0	3.75	500
	1000Base-SX	Multimode/ OM1-OM2	62.5/850	2.33	0.75 ea/ 1.5 total	n/s	>20	n/s	220	3.75	160
	1000Base-SX	Multimode/ OM2-OM3	62.5/850	2.53	0.75 ea/ 1.5 total	n/s	>20	n/s	275	3.75	200
	1000Base-SX	Multimode/ OM1-OM3	50/850	3.25	0.75 ea/ 1.5 total	n/s	>20	n/s	500	3.5	400
	1000Base-SX	Multimode/ OM2-OM3	50/850	3.43	0.75 ea/ 1.5 total	n/s	>20	n/s	550	3.5	500
	1000Base-LX	Multimode/ OM1-OM2	62.5/1300	2.32	0.75 ea/ 1.5 total	n/s	>20	n/s	550	1.5	500
	1000Base-LX	Multimode/ OM1-OM2	50/1300	2.32	0.75 ea/ 1.5 total	n/s	>20	n/s	550	1.5	400/500
	1000Base-LX	Singlemode/ OS1	9/1310	4.50	0.75 ea/ 1.5 total	n/s	>26	n/s	5km	0.5	n/a
	10GBase-SR	Multimode- OM1	62.5/850	2.60	0.75 ea/ 1.5 total	n/s	>20	n/s	26	3.5	160
	10GBase-SR	Multimode- OM1	62.5/805	2.50	0.75 ea/ 1.5 total	n/s	>20	n/s	33	3.5	200
	10GBase-SR	Multimode/ OM2-OM3	50/850	2.20	0.75 ea/ 1.5 total	n/s	>20	n/s	66	3.5	400

Standards Organization	Classification or Application	Fiber Type	Core size (um) / wavelength (nm)	Max Link Channel Loss (dB)	Max Connector Insertion Loss (dB)	Max Splice Insertion Loss (dB)	Min Connector Return Loss (dB)	Maximum Distance (m)	Min Operating Distance (m) (50um/62.5um)	Max Fiber Attenuation (dB/km)	Min Fiber Bandwidth (MHz-km)
IEEE 802.3	10GBase-SR	Multimode/ OM2-OM3	50/850	2.30	0.75 ea/ 1.5 total	n/s	>20	n/s	82	3.5	500
	10GBase-SR	Multimode/ OM3	50/850	2.60	0.75 ea/ 1.5 total	n/s	>20	n/s	300	3.5	2000
	10GBase-LR	Singlemode/ OS1	9/1310	6.00	0.75 ea/ 1.5 total	n/s	>26	n/s	10km	0.5	n/a
	10GBase-EW	Singlemode/ OS1	9/1550	5>11	0.75 ea/ 1.5 total	n/s	>26	n/s	30-40km	n/s	n/a
ISO/IEC 14165	133MbB/s Fibre Channel	Multimode/ OM1-OM3	62.5/1300	6.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	1500	n/s	500
	266Mb/s Fibre Channel	Multimode/ OM1-OM3	50 or 62.5/850	12.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	2000/700	n/s	500
	266Mb/s Fibre Channel	Multimode/ OM1-OM3	62.5/1300	6.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	330	n/s	500
	266Mb/s Fibre Channel	Multimode/ OM1-OM3	50/1300	5.50	0.75 ea/ 1.5 total	n/s	n/s	n/s	500	n/s	500
	266Mb/s Fibre Channel	Singlemode/ OS1	9/1310	6.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	2000	n/s	n/a
	531Mb/s Fibre Channel	Multimode/ OM1-OM3	50 or 62.5/850	8.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	1000/350	n/s	500/160
	531Mb/s Fibre Channel	Singlemode/ OS1	9/1310	14.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	2000	n/s	n/a
	1062Mb/s Fibre Channel	Multimode/ OM1-OM3	50 or 62.5/850	4.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	1000/350	1.5/3.5	500/200
	1062Mb/s Fibre Channel	Singlemode/ OS1	9/1310	6.00	0.75 ea/ 1.5 total	n/s	n/s	n/s	2000	0.5	n/a

Definitions

Link channel loss - The maximum allowable loss measured with a power meter/light source kit
Minimum operating distance - Most standards do not limit the length, instead require operation to a minimum lentgh
Max fiber attenuation - Indicates max allowable loss per km. Verify from mfg that your cable is less than spec'd limit
Connector return loss - Indicate reflected power from connectors. Failures indicate polishing or cleaning problems.

Appendix B
TRACETEK
Application Notes

TRACETEK - Fiber-Optic Troubleshooting Module for IDEAL LANTEK 6/7 Series

Product Overview

High-bandwidth optical networks have become increasingly sensitive to signal transmission problems. In many cases the channel insertion loss is the only parameter that is measured to make a determination that a link's performance is satisfactory. Channel insertion loss only measures the weakening of the signal from one end of a fiber optic link to the other, making sure that enough optical power is present at the receiver to ensure the optical transceivers can "see" each other.

FIBERTEK is an exceptional tool to certify proper link channel loss. However, in a situation when a certification test fails or there are unusual network performance problems, another tool can help isolate cabling problems.

TRACETEK is a unique tool that provides many of the useful features of an OTDR without the high cost or complex parameters to set up. An easy to use diagnostic tool, TRACETEK allows the user to measure the total length of a link, measure the distance to a reflective event such as a connector, and most importantly, identify faulty connections.

TRACETEK works by launching a high-power laser pulse down the fiber and monitoring reflections returned by the end of the cable, connectors, mechanical splices, and cable breaks. This important functionality will help locate sources of excessive reflection in the cabling system. Excessive reflection in an optical system leads to high bit error rates, preventing the network from operating at its full capability.

One of the most common sources of excessive return loss is dirty or poorly polished connectors. When there is too much reflection in a system, the reflected power can interact with the downstream signal, either increasing or decreasing the amplitude of the transmitted signal. Additionally, if the reflection is strong enough it can interfere with the feedback circuit on the laser transmitter causing fluctuations in output power. Unlike a power meter, which measures the loss across a link, TRACETEK displays the relative reflection of events in a link allowing the user to isolate and remedy problems.

Measuring Return Loss

Simply stated, return loss is the ratio of power reflected by a connector or other event compared to the power that arrived at the event. The scale of measure for return loss is dB (decibel). Because the scale of return loss is by definition a negative value, a larger (negative) number is better.

However, by convention, most people usually omit the negative sign and use it as a positive value. For example, a return loss measurement of 0 dB means that 100% of the power arriving at the connector was reflected back to the transmitter.

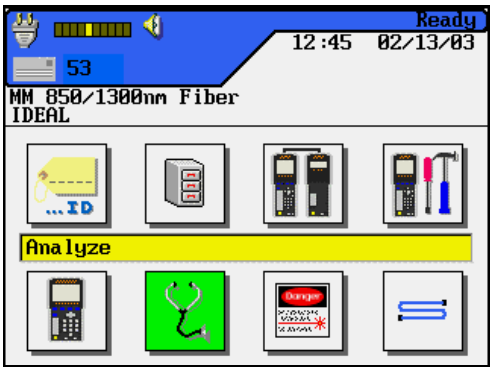
In reality a 0 dB measurement is impossible in fiber-optic systems; the worst reflection possible is about –14 dB which would be created by a perfect glass-to-air interface. In most cases a field polished connector will yield a return loss of approximately -30 to –40 dB, meaning .1% to .01% of the power was reflected upstream. Factory terminated Ultra Physical Contact (UPC) connectors usually perform to –50 dB or better (.001% reflection).

Using TRACETEK

The TRACETEK module uses a very high-power infrared laser for both multimode and single mode testing. The light emitted from TRACETEK is invisible, so take care when using TRACETEK or examining connectors not to look directly into the connector or examine it with an inspection scope unless you are certain the module is powered off or disconnected.

1. With the TRACETEK module attached to the LANTEK 6/7, connect the module to the fiber under test with the included FC-ST (FC-FC for single mode) launch cable. Unlike an OTDR, TRACETEK does not require the use of long launch cables; its dead-zone is short enough that any jumper of 2 m (6 ft) or more can be used.

2. Turn on the power to the LANTEK. Choose the Analyze icon, then press the ENTER key.



3. In the TRACETEK Analyze menu there are three options to choose from: High Resolution, Medium Resolution and Low Resolution. This setting will change the pulse with "laser power" that is fired into the cable. In this case resolution is the opposite of distance, meaning that the short cables are better tested with High Resolution and long cables are better tested with Low Resolution.

Table 1: Resolution Settings and Recommendations

Resolution Setting	Power	Distance Scale	Distance Recommendation
High	Low	Short	0-800 m (0-2625 ft)
Med	High	Short	250-850 m (820-2790 ft)
Low	High	Long	500-4000 m (1640-13120 ft)

Note: The recommendations for distance do not reflect the absolute minimum or maximum distance capabilities of TRACETEK. These are recommendations that will yield the best results in most cases. You should feel free to experiment and determine the setting that gives the best result for a particular test configuration.

High Resolution

This mode is optimized for short-distance cables with lengths of no more than 800 m. Use the High Resolution mode for most horizontal links and shorter backbone cables. The low power setting used in the High Resolution mode will minimize screen clutter caused by receiver saturation and will keep the dead-zone between connectors to a minimum, allowing the tester to identify individual connectors in close proximity to each other, in situations such as cross-connect cabinets.

Use this setting to check for connector quality. Connectors with a good finish should not rise above half scale on the TRACETEK display.

Medium (Med) Resolution

Medium resolution combines the short-distance setting with a high-power laser pulse. By using a longer launch pulse, the Medium Resolution mode will identify events that are not visible in the High Resolution mode (low power). The long laser pulse will cause the receiver to saturate if it is not used on a cable that is long enough to absorb some of the reflected energy. It is recommended that Medium Resolution mode be used either on cables between 250-850 m in length or when trying to locate low-reflection events such as mechanical splices or connectors where the polish is so good that they do not reflect enough light in the low power mode to be detected.

This setting is not necessary for troubleshooting. Its primary function is to locate high quality connections for documentation purposes.

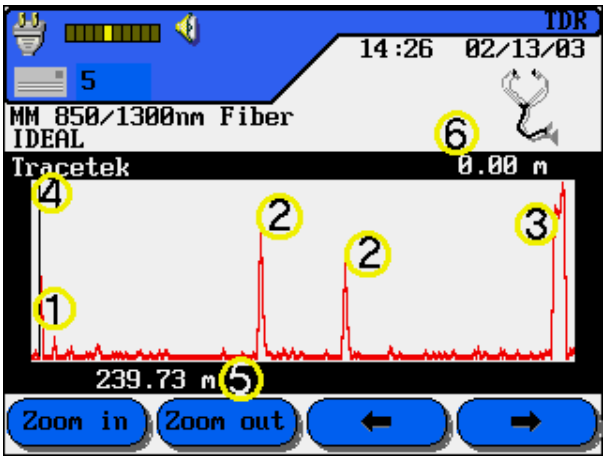
Low Resolution

The Low Resolution mode combines the high power/long pulse of the Medium Resolution mode with long-distance scaling. Use this mode only on cables that are over 500 m in length. Use of this mode on short cables will saturate the display, making event identification difficult.

This setting is best for testing cables between 500 and 4000 m. Most connectors and mechanical splices will be visible in the Low Resolution mode.

The TRACETEK Display

After deciding which setting is best for your situation, select the appropriate mode and press the ENTER key. TRACETEK will sample the fiber for about 30 seconds before displaying the acquired trace data.



Key Elements of TRACETEK Display

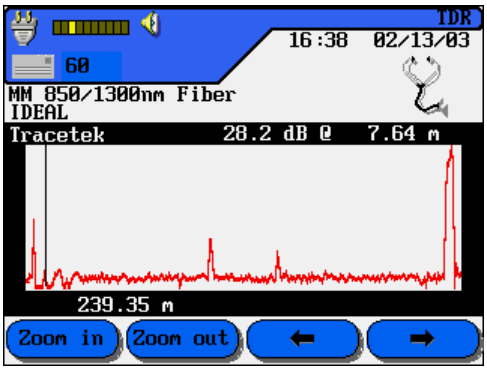
1) Start pulse (first connector)
2) Reflective events
3) End of fiber (last connector or break in cable)
4) Cursor
5) Total length of fiber
6) Cursor position

The TRACETEK display provides a “roadmap” of the fiber at a glance. The number at the bottom of the screen, marker 5, indicates the measured distance to the end of the fiber. As with an OTDR, TRACETEK does not require a piece of equipment or a person at the opposite end of the fiber under test. For this reason, TRACETEK cannot differentiate between the expected end of the fiber or a break in the cable. If there is a break in the cable this reading will tell you how far down to look for the break.

Marker 1 indicates the first connector attached to your launch jumper. Marker 2 indicates the two connectors in the middle of the fiber under test. The height of the reflected pulse (called a Fresnel) indicates the relative reflection of each event. In the High-Resolution mode, a good connector should not go much above the halfway point on the display. In this example, the two connectors should be cleaned, and the first appears to be a bit worse than the second. Marker 3 is at the end of fiber. This reflection is expected to be quite large since it is at the end of the cable and represents a glass-to-air interface.

Markers 1 and 6 indicate the user-moveable cursor and its position respectively. The cursor can be move by three methods: in very fine steps using the left and right arrow keys on the keypad, in medium size steps using the  and  soft-keys, or in large steps by holding the

button while pressing the left and right arrow keys on the keypad.

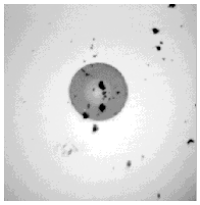


In the figure above, the display shows a trace of the same fiber as before, but the two connectors in the middle were cleaned using the IDEAL Starter Cleaning Kit included with your TRACETEK module. It is clearly evident that a dirty connector, even one that appears clean to the naked eye, can cause significant return loss problems in the link. After being cleaned, both connectors are well below half scale and should present no problems with network operation.

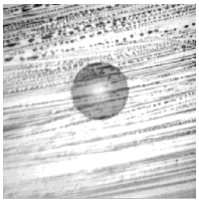
Cleaning connectors with any fiber-optic system is of utmost importance. Whenever there is any doubt about a test result, the first action is to clean the suspect connectors and retest the link.

There are many creative ways to clean connectors, and we've seen quite a few of these methods used in the field. It's also common that test technicians do not take the time to visually inspect or clean connectors before testing the link. Some technicians will check for cleanliness with their naked eyes, but the human eye cannot possibly see the type of contaminants that affect fiber-optic connectors. Cleaning is a mundane but very important task.

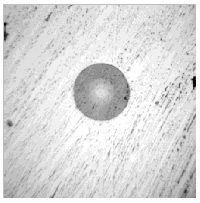
To illustrate this point, we have provided some magnified images of connectors cleaned with various methods.



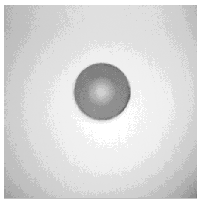
Dirty connector



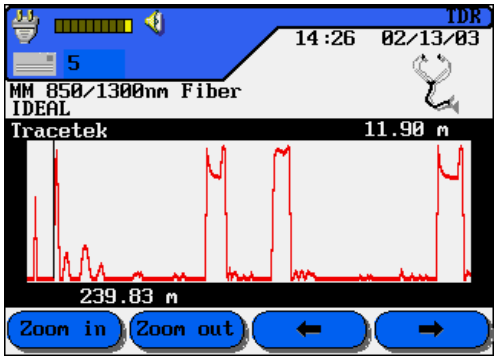
Wiped "clean" with finger



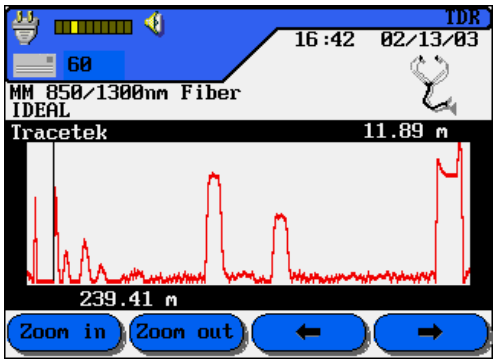
"Cleaned" on shirt



Cleaned w/IDEAL cleaning kit



Again, using the same fiber, but before the connectors were cleaned, the figure above displays the results when the optimal TRACETEK resolution mode is *not* selected. In this case the Medium Resolution mode was used. The resulting Fresnels are much higher than before and the "Batman ears" are caused by the saturation of the receiver. This is due to excessive reflection.



After cleaning the two center connectors, shown in the figure above, it is apparent there is some improvement in return loss. However, in this case we expect the Fresnel to be larger than before because of the higher launch power TRACETEK uses in the Medium Resolution mode. Also notice that the Fresnels are wider than before. This width is known as the dead-zone, which is the distance that the receiver is blinded by the reflection of each event. High output power and dirty or poorly polished connectors will lead to an increased dead zone.

In its High Resolution mode with clean connectors, TRACETEK will have a dead zone of 2 m, while in the Medium and Low Resolution Modes the dead-zones will be about 8 m. When testing through patch panels or other cross-connect devices best results will be achieved with the High-Resolution mode. Refer to Table 1 when deciding which of the three resolution modes is best for your application.

Troubleshooting with TRACETEK

TRACETEK can be an invaluable tool for troubleshooting a variety of network problems. One application is to locate a break in a cable. In a new installation, TRACETEK can be used with a power meter / light source test kit such as FIBERTEK to characterize a link and map the distance to known events.

In this example we're testing a backbone link consisting of 44 m of cross-connect cable to a 717 m backbone, followed by another 40 m of cross-connect. Figure 1 is the FIBERTEK (power meter / light source) result from the link indicating a passing result.

In Figure 2, we see the connectors at 40 m and 760 m, as well as the end of the fiber at 801m. The connectors at 40 m and 760 m appear to be in good condition with a reflection that is just below half scale.

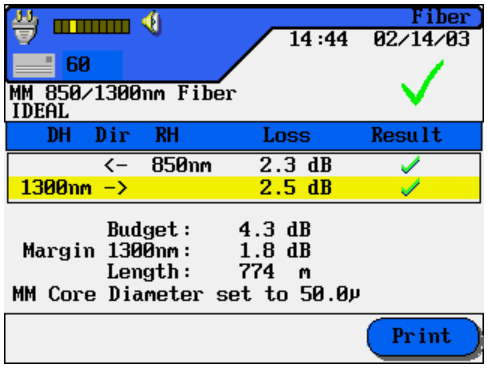


Figure 1

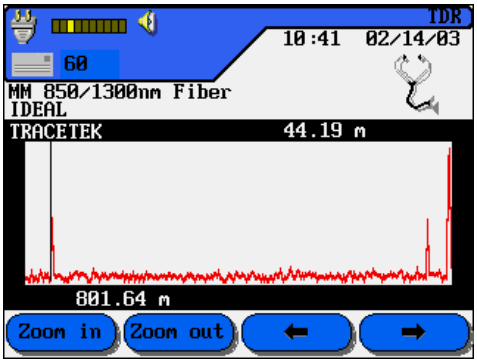


Figure 2

Figures 3 and 4 show the same link now failing. The FIBERTEK screen tells the degree of link failure but it does not help isolate the problem. The TRACETEK test shows the connector at 761 m is nearly full scale, an indication that it has become dirty or damaged.

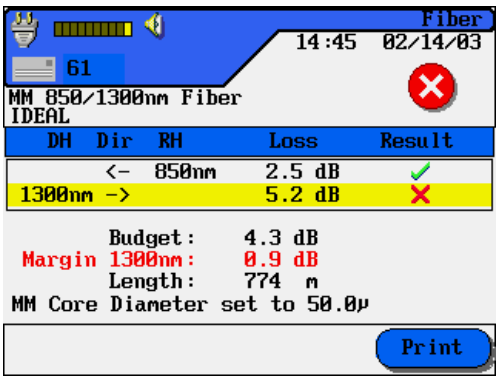


Figure 3

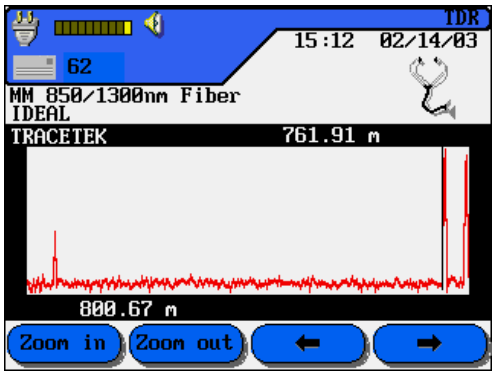


Figure 4

In this situation, the best course of action is to clean the connection at 760 m and check it with a microscope (IDEAL P/N 45-332) before re-testing. Consult the instructions included with the IDEAL Starter Cleaning Kit for the best methods to clean connectors and couplers.

Q&A: Identifying TRACETEK Configuration Problems

Q1: Why is it so important that my launch cable connectors are kept so clean?

A1: Unlike a traditional light source, the most high-powered of which have output levels significantly less than 1mW, TRACETEK's high-power laser source launches up to 50 mW of power. When dealing with return loss measurements, more power out means more power back. With the levels that TRACETEK operates at, a dirty launch cable will immediately reflect a large amount of power back at the detector, essentially causing temporary blindness of the detector. Keep your connectors clean!

Q2: What will happen if I set the Resolution incorrectly?

A2: Incorrectly setting the Resolution of TRACETEK will not cause any damage to the tester or cable. It will usually result in a garbled display that is a result of too much power being injected into a short cable, leading to very high reflections since the cable itself cannot attenuate the return pulse. Or, in the case of a very long cable, there will not be enough power for TRACETEK to see the end, meaning it will be unable to properly scale the screen. Here are a few images that result when the Resolution setting is not optimally set for the fiber being tested (Figures 5-8).

In this example a 1000 m cable was tested with the Resolution set to MED. The result is that the ramp time, which adjusts the scaling, is too short. The recommended maximum distance for MED mode is 850 m. Change to LOW Resolution and try again.

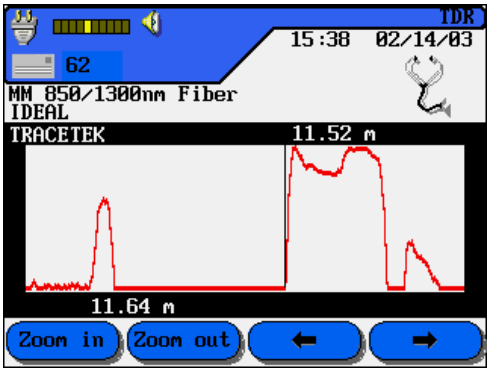


Figure 5

With the Resolution now set to LOW, the end of the 1000 m fiber is clearly visible.

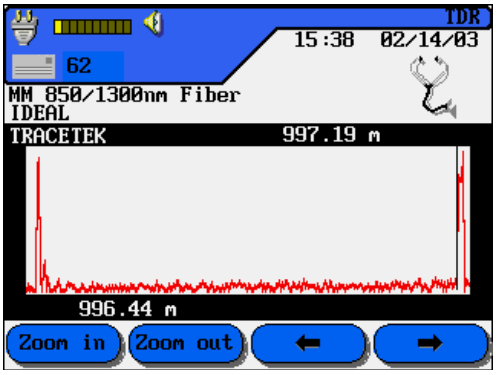


Figure 6

Here, a 45 m cable is tested with the MED Resolution mode. Although the length of the cable is correctly identified, there is so much power that the receiver is detecting echoes in the cable. Choosing the HIGH-Resolution mode should help.

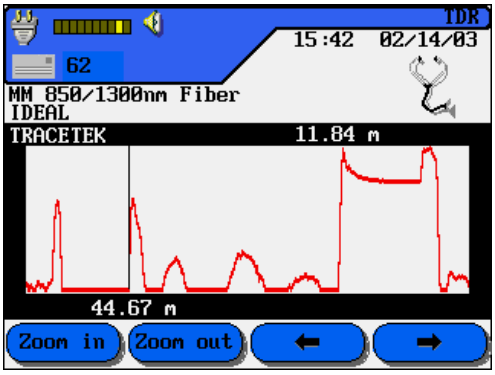


Figure 7

In the HIGH-Resolution mode the power output is decreased and the echoes are eliminated. Also that notice the dead-zones of the first and last events are noticeably narrower.

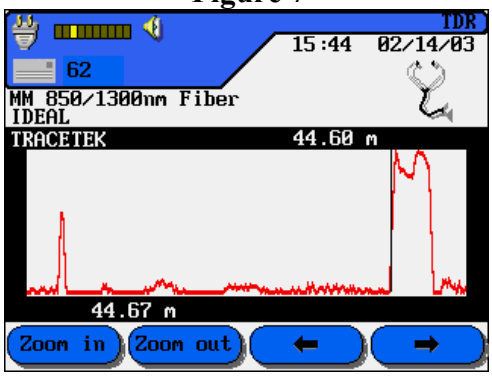


Figure 8

Q3: Why is TRACETEK only available in 1300 nm modules?

A3: Since TRACETEK does not make attenuation measurements, the reason for choosing a 1300 nm laser is based purely on performance. Multimode fiber has less than half the attenuation at 1300nm than it does at 850 nm. By using the 1300 nm laser, TRACETEK can be used to test much longer cables than it could with an 850 nm laser whose power attenuates very rapidly.

Q4: Does TRACETEK support single mode testing?

A4: Yes. TRACETEK is also available in a single mode kit with a 1310 nm laser. For single mode fibers the attenuation difference between 1310 nm and 1550 nm is small enough that there is no major performance gain obtained by operating at 1550 nm. In this case the 1310 nm laser helps make TRACETEK the most affordable solution for reflectance testing of single mode fiber.

Q5: If I lose my TRACETEK launch cable, do I need to replace it with a special one?

A5: No, the included launch cable with TRACETEK is an ordinary FC-ST multimode or FC-FC single mode jumper. Any high-quality replacement jumper will work, and there is no calibration necessary. The length of the launch cable is only important in that its length is added to your distance measurements and keeping a conveniently short cable will minimize any offset in length measurements. TRACETEK utilizes a special technology that allows the use of very short launch cables, unlike an OTDR whose front-end dead zone may be 20-100 m long and require the use of very long launch cables.

To maximize the performance of your IDEAL fiber-optic testing and troubleshooting tools, it is vital to have them factory calibrated annually.

For technical assistance, service, calibration or questions about TRACETEK, please contact IDEAL INDUSTRIES at the following locations:

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