

TFS-3200™ Series Optical Spectrum Analyzers

TFS-3200C - C-Band (1530 to 1561 nm)

TFS-3200S - S-Band (1574 to 1608 nm)

TFS-3200L - L-Band (1460 to 1530 nm)

Operation Manual



think ahead.

Trilithic Company Profile

Trilithic is a privately held manufacturer founded in 1986 as an engineering and assembly company that built and designed customer-directed products for telecommunications, military, and industrial customers. From its modest beginnings as a two-man engineering team, Trilithic grew over the years and broadened its offerings of RF and microwave components by adding broadband solutions to its product line. This was accomplished with the acquisition of components manufacturer Cir-Q-Tel and instruments manufacturer Texscan.

Today, Trilithic is an industry leader providing telecommunications solutions for major broadband, RF, and microwave markets around the world. As an ISO 9000:2001 certified company with over 40 years of collective expertise in engineering and custom assembly, Trilithic is dedicated to providing quality products, services, and communications solutions that exceed customer expectations.

Trilithic is comprised of five major divisions:

- **Broadband Instruments and Systems**
Offers test, analysis, and quality management solutions for the major cable television systems worldwide.
- **RF Microwave Components**
Provides components and custom subsystems for companies specializing in cellular, military, and other wireless applications.
- **Emergency Alert Systems**
Leading supplier of government-mandated emergency alert systems used by broadcast TV, cable TV, IPTV, DBS, and radio stations.
- **XFTP**
Offers a specialty line of field technical products for cable operators and technicians, as well as a line of products for installing electronics in the home of the future.
- **Network Services**
Provides network data management and support services to safeguard and protect your network and data by employing certified, experienced, and dedicated network engineers.

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Chapter 1

General Information

Helpful Website

The following website contains general information which may be of interest to you:

<http://www.trilithic.com>

Trilithic's website contains product specifications and information, tips, release information, marketing information, Frequently Asked Questions (FAQs), bulletins and other technical information. You can also check this website for product updates.

Where to Get Technical Support

Trilithic technical support is available Monday through Friday from 8:00 AM to 5:00 PM EST. Callers in North America can dial 317-895-3600 or 800-344-2412 (toll free). International callers should dial 317-895-3600 or fax questions to 317-895-3613. You can also e-mail technical support at techsupport@trilithic.com.

For quicker support response when calling or sending e-mail, please provide the following information:

- Your name and your company name.
- The technical point of contact (name, phone number, e-mail).
- Product name, model number, and serial number.
- A detailed description of the problem you are having, including any error or information messages.

How this Manual is Organized

This manual is divided into the following chapters:

- Chapter 1, “General Information” provides information, technical support, how this manual is organized, conventions, and safety precautions relative to the TFS-3200 Series Optical Spectrum Analyzers.
- Chapter 2, “Introduction” describes the purpose, mechanical and physical features, package contents, display screen elements, and settings of the TFS-3200 Series Optical Spectrum Analyzers.
- Chapter 3, “Operation” describes the operation, settings, and controls of the Scan function for the TFS-3200 Series Optical Spectrum Analyzers.
- Chapter 4, “Video Scope” describes the operation of the Video Scope function.
- Chapter 5, “File Management” describes how to take screen captures, save and recall scan data, and how to transfer files to and from a PC or Flash Drive using the File Management function.
- Chapter 6, “Appendix” describes the troubleshooting, specifications, and warranty information for the TFS-3200 Series Optical Spectrum Analyzers.

Conventions Used in this Manual

This manual has several standard conventions for presenting information.

- Connections, menus, menu options, and user-entered text and commands appear in **bold**.
- Section names, web and e-mail addresses appear in *italics*.



A **WARNING** alerts you to any condition that could cause personal injury.



A **CAUTION** alerts you to any condition that could cause a mechanical failure or potential loss of data.



A **NOTE** is information that will be of assistance to you related to the current step or procedure.

Precautions



When working with any fiber optic test equipment or in an area with active fiber optic links, be aware there can be infrared optic energy present.



Never clean or look directly into the fiber optic connector or the end of the fiber attached to the optical spectrum analyzer or VFL unit while they are energized; to do so will expose the user to laser radiation and could result in personal injury or instrument damage.



To prevent fire or shock hazard: do not install other battery types; do not use the charger without the batteries installed; do not expose the battery charger to rain or excessive moisture; do not use the AC adapter when there are signs of damage to the enclosure or cord; ensure that you are using the correct charger for the local line voltage; do not use any other charger than the one provided with this instrument. Any other condition will void the warranty.



Before connecting to a patch cord or fiber under test, be certain the fiber has no active optical sources or instruments connected to the other end. Skin or eye damage could result from other high power sources e.g. EDFAs, or instrument damage could occur voiding the warranty.



Fiber-optic connectors are easily contaminated or damaged. The connection to the TFS-3200 Series is a physical contact type of connection and dirty or damaged connectors may impair the instruments capabilities at the minimum and at worst result in the need to return the TFS-3200 Series to the factory for expensive repairs. Prior to making any connection to the unit, ensure that all proper cleaning procedures have been followed.



This instrument is designed to test a total power of 23 dBm. The low power port is designed to measure up to -10 dBm per channel. If unsure of the power level, it is best to start in high power mode and use the high power port as designated by the TFS-3200 Series when setting the power level.

Chapter 2

Introduction

This chapter:

- Provides an overview of the TFS-3200 Series Optical Spectrum Analyzers
- Describes the mechanical and physical description
- Lists the display screen elements, features, and settings
- Describes the included equipment and identification of device software version number
- Describes how to charge the and replace the batteries of the device
- Identifies the controls and mechanical features of the device

Overview

Trilithic's TFS-3200 Series Optical Spectrum Analyzers offer full featured analysis of C-Band (1530 to 1561 nm), L-Band (1574 to 1608 nm), or S-Band (1460 to 1530 nm) fiber optic systems in a rugged hand-held package ideal for installation, maintenance and upgrades of fiber optic systems. With an extremely fast acquisition time of two seconds per scan, easy-to-use Pass/Fail and auto test features, and an easy-to-read color display.

The optical spectrum analyzers features solid state optics, with no fragile or moving parts, an internal memory to store up to 1000 tests and a USB port to transfer data to a portable flash drive. Trilithic includes Windows® based certification software for fast and easy reporting and Test information can be displayed in Table, Spectrum or Channel form.

Equipment Supplied with the TFS-3200

The TFS-3200 Series Optical Spectrum Analyzers include the following equipment:

- Trilithic TFS-3200 Series Optical Spectrum Analyzer, with protective boot and eight AA NiMH rechargeable batteries installed.
- Protective Carrying Case with Shoulder Strap
- AC to DC Universal Adapter/Charger with US, UK, European & Australian Plugs
- USB cable
- Set of interchangeable adapters, SC and FC adapters for each optical port
- CD with Windows® compatible ToolBox software
- Operation Manual on CD

Model and Configuration Information

The instrument's Model, Part Number, Serial Number, Date of Manufacture, and Configuration are indicated on a label located on the bottom plate of the unit. The instrument's history is filed at the factory by part number and serial number.



Software Version Number

The software version number is accessible at start up on the lower right hand corner of the display.

Recalibration and Verification

Periodic verification of the TFS-3200 calibration is recommended to ensure that your instrument remains within specification. Trilithic recommends a recalibration and verification once a year to make certain the instrument is functioning properly and performing to its rated specifications.

CAL

The calibration feature is only available to certified Trilithic repair facilities and is password protected to prevent unauthorized calibration changes from being made.



Battery Charging

The instrument is equipped with a 100-240 VAC, 0.4 A input, universal battery charger with 13.6 VDC, 0.75 A, center positive output with interchangeable plug adapters for US, Great Britain, Europe, and Australia. The charger is used to power the unit and recharges the unit's internal NiMH batteries (8 - AA, 2500 mAh). Depending on usage, a fully charged battery pack will typically enable 8 hours of use. Typically, fully discharged batteries require 6 to 8 hours of recharging.

Battery Level/Power Indicator

The bottom right hand corner of the screen shows the battery level and charge indicator. In the final hour of operation the battery charge indicator will change to red. A warning indicator will sound a few minutes before the instrument automatically turns off. Ensure the unit is turned off when plugging it into the battery charger.

Power Save



To toggle on and off the Power Save feature, press the **Menu** button to enter the Menu Display. Scroll to the **Power Save** icon. Press the **Select** button to toggle the power save on and off. Press the **Menu** button to exit the Menu Display.

When power save is active, the instrument will automatically turn off after 15 minutes of non use.

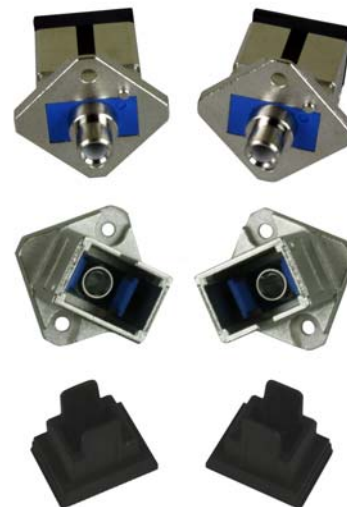


To prevent fire or shock hazard: do not open the unit to replace the batteries. Return the unit to Trilithic for battery replacement. DO NOT expose the battery charger to rain or excessive moisture, use the AC adapter when there are signs of damage to the enclosure or cord. Also, ensure that you are using the correct charger for the local line voltage. Do not use any other charger than the one provided with this instrument. Any other condition will void the warranty.

Adapter Replacement

The TFS-3200 Series is supplied with two easily interchangeable adapters per port, FC (Ferrule Connector) and SC (Square Connector). The FC connector is installed in the device at the factory, to change adapters, perform the following steps:

1. Remove the two screws that hold the adapter in place.
2. Pull the adapter straight up from the adapter receptacle.
3. Clean the exposed ferrule with an appropriate cleanser and a lint free wipe.
4. Insert the new adapter by gently pushing downward into the ferrule, being careful to properly orient the alignment pin in the adapter with the alignment hole of the adapter receptacle.
5. Replace the two screws that hold the adapter in place.



NOTE

When replacing the adapter with one that does not have a chained protective cap, use the small screw in place of the larger screw that retains the end of the chain to the adapter base.



NOTE

In order to maintain a low loss fiber connection, care should be taken to adequately clean the ferrule of any connector to be connected to the TFS-3200 Series. In the event that the port needs to be cleaned, the first step is to be certain the instrument is off. We suggest the use of isopropyl alcohol and foam swabs specifically designed for cleaning connectors accepting 2.5 mm ferrules.

Physical Features

Instrument Enclosure

The optical spectrum analyzer is packaged in a rugged aluminum housing which is further protected with a rubberized boot. Although the front panel is weather resistant, care must be taken to avoid liquids and contaminants around the fragile optical, electrical connectors, and the glass display. Use a mild cleaning agent and damp soft cloth to clean the panels and the outside case. Never open the instrument for cleaning. Return to the factory for servicing if necessary.

Front View

1. Charge Indicator
2. Display
3. Key Pad
4. Scroll Wheel
5. Power Button



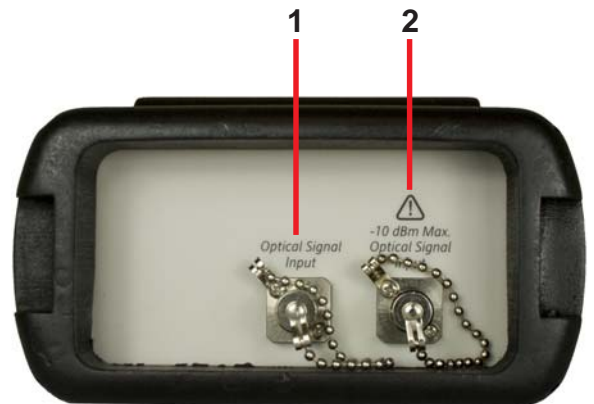
Bottom View

1. Power Input Port (13.6 VDC)
2. Video Probe Input Port
3. USB PC Port - Use this port to connect the optical spectrum analyzer to a Windows PC for data analysis using the supplied ToolBox software.
4. USB Flash Drive Port - Use this port to connect to a USB flash drive to the optical spectrum analyzer.



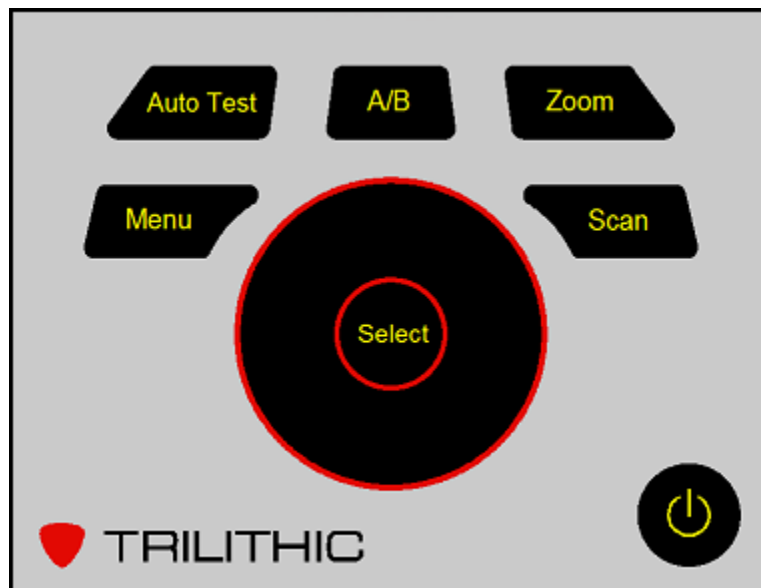
Top View

1. High Power Input (+10 dBm Max.)
2. Low Power Input (-10 dBm Max.)



Key Pad

The Key Pad is used to control the different functions of the optical spectrum analyzer. The following is a list of the buttons and what they control:



Power Button



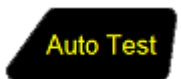
The **Power** button turns the device on and off. Press and hold the **Power** button for one second to turn the device on. Press the **Power** button again for one second to turn the device off.

Scan



The **Scan** button will start a scan or stop the current scan and reset the table of data.

Auto Test



The **Auto Test** button is used to automatically isolate the channels that are above the threshold set in the Menu Display with the **Auto Span Minimum** icon. Pressing this button will automatically zoom in and set the Span Start function to the first channel that meets the minimum and the Span End function to the last channel that meets the minimum. It will also zoom the display for easy viewing.

Menu



The **Menu** button toggles between the Scan Display where the focus of the scroll wheel and the **Select** button are on the active cursor and the Menu Display where the scroll wheel moves through the soft key menu and the Menu Bar.

A/B



The **A/B** button toggles between A and B as the active cursors.

Zoom



The **Zoom** button selects the zoom level. Each press increments through the levels of 1X, 2X, 4X, 8X, and 16X.

Select

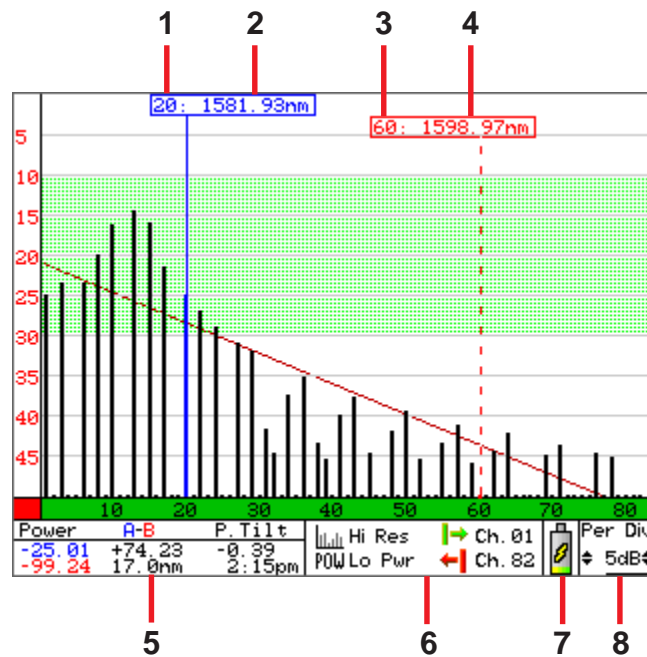


While in the Scan Display, the **Select** button will move the “Active” cursor to the next channel. While in the Menu Display, the **Select** button activates the highlighted item.

Display Features

Scan Display

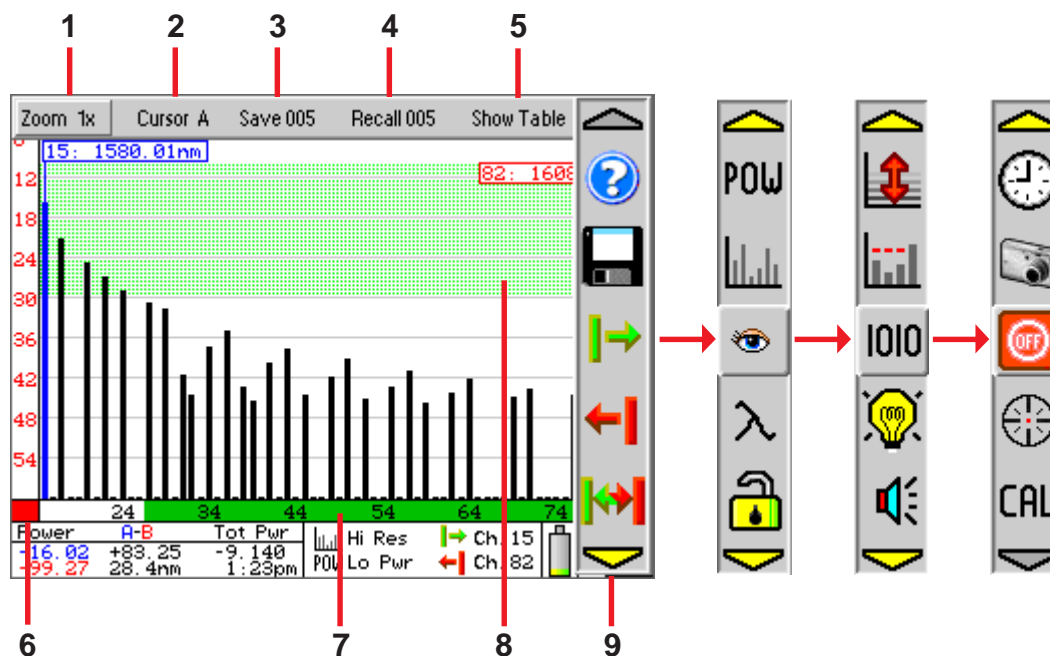
The optical spectrum analyzer displays the following screen when it is turned on:



1. **Cursor A Channel Number** - Displays the channel number at the location of Cursor A.
2. **Cursor A Wavelength/Frequency** - Displays the wavelength/frequency at the location of Cursor A.
3. **Cursor B Channel Number** - Displays the channel number at the location of Cursor B.
4. **Cursor B Wavelength/Frequency** - Displays the wavelength/frequency at the location of Cursor B.
5. **Scan Measurements** - Displays the scan measurement results between Cursor A and Cursor B.
6. **Scan Parameters** - Displays the Power Level, Resolution, Start Span, and End Span values for the scan measurement.
7. **Battery Indicator** - Displays the battery level and charge indicator.
8. **Vertical Resolution** - Displays the vertical resolution in dB/div that is currently selected. This value is changed by selecting the **Zoom** button or the **Zoom** soft key from the Menu Display.

Menu Display

The optical spectrum analyzer displays the following screen when the **Menu** button is pressed:



1. **Zoom Soft key** - Select this soft key to zoom in on the display, the soft key will also display the current zoom level. The zoom level can also be changed by selecting the **Zoom** button.
2. **Active Cursor Soft key** - Select this soft key to switch between Cursor A and Cursor B, the soft key will also display the name of the active cursor.
3. **Quick Save Soft key** - Select this soft key to save the currently displayed trace.
4. **Quick Recall Soft key** - Select this soft key to recall previously saved traces.
5. **Table Display Soft key** - Select this soft key to display a table view of the measurement data shown in the currently displayed trace.
6. **Activity Indicator** - Displays whether the unit is ready to perform a scan. When this field displays yellow the unit is warming up and not ready to perform a scan. When this field displays red, the unit is ready to perform a scan.
7. **Span Indicator Bar** - Displays the span scale corresponding to the currently selected scan resolution.
8. **Pass/Fail Threshold Zone** - Displays the area between the minimum and maximum pass/fail thresholds for Auto-Testing.
9. **Menu Bar** - Displays the icons used for setup, testing, and measurement.

Table Display

The Table Display shows each channel and its current power. To view the Table Display, press the **Menu** button, scroll to the **Show Table** soft key, and then press the **Select** button. The Table of the current scan will be displayed. Scanning will be halted while the Table is displayed and the power levels in the Table are those levels at the time the Table Mode was entered.

The screenshot shows a table with columns for Channel (Ch) and Power. The table is divided into five sections. At the top, there are three soft keys: 'Return', 'Min=-30.00dBm', and 'Max=-10.00dBm'. Below the table, there are three summary statistics: 'Max: -25.14', 'Min: <-50.00', and 'Avg: -36.66'. A red line highlights the 15th channel, and a red box highlights the power value for that channel (-45.22). Red callout numbers 1 through 8 point to the following elements:

- 1: Return soft key
- 2: Min soft key
- 3: Max soft key
- 4: Channel number (15)
- 5: Maximum Power (-45.22)
- 6: Minimum Power (<-50.00)
- 7: Channel Power (-43.91)
- 8: Average Power (-36.66)

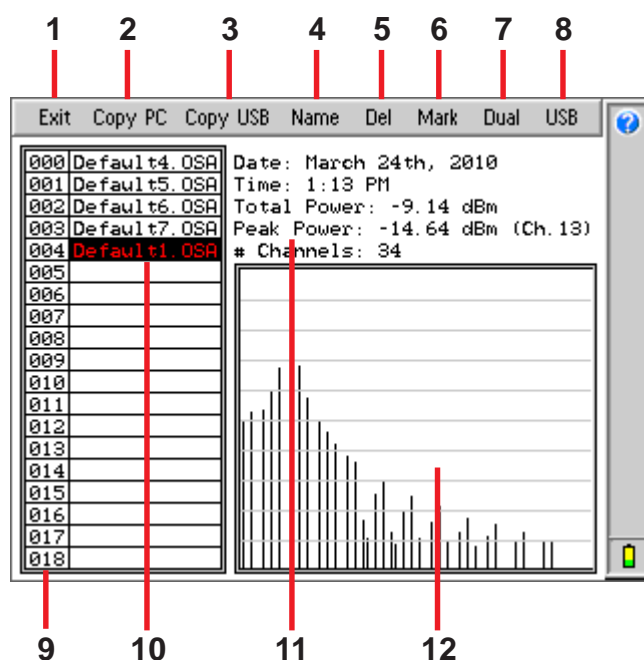
Ch	Power	Ch	Power	Ch	Power	Ch	Power	Ch	Power
01	-25.19	19		37		55	-43.63	73	
02		20	-25.01	38	-43.67	56		74	
03	-23.67	21		39	-45.68	57	-41.37	75	
04		22	-27.12	40		58		76	-44.97
05		23		41	-40.11	59	-46.19	77	
06	-23.61	24	-29.17	42		60		78	-45.35
07		25		43	-37.83	61		79	
08	-20.08	26		44		62	-44.60	80	
09		27	-31.01	45	-44.84	63		81	
10	-16.41	28		46		64	-42.39	82	
11		29	-32.06	47		65		83	
12		30		48	-42.11	66		84	
13	-14.64	31	-41.87	49		67		85	
14		32	-44.81	50	-39.57	68		86	
15	-16.02	33		51		69	-45.22	87	
16		34	-37.58	52	-45.54	70		88	
17	-21.58	35		53		71	-43.91	89	
18		36	-35.35	54		72		90	

1. **Return Soft key** - Select this soft key to return to the Scan Display.
2. **Min Soft key** - Select this soft key to change the value of the minimum pass/fail threshold.
3. **Max Soft key** - Select this soft key to change the value of the maximum pass/fail threshold.
4. **Channel** - Displays the channel number.
5. **Maximum Power** - Displays the maximum power of the highlighted channel.
6. **Minimum Power** - Displays the minimum power of the highlighted channel.
7. **Channel Power** - Displays the power of the corresponding channel.
8. **Average Power** - Displays the average power of the highlighted channel.

File Management Display



The File Management Display shows the files stored in the internal memory of the device or on a connected Flash Drive. To view the File Management Display, press the **Menu** button, scroll to the **File** icon, and then press the **Select** button. The following screen will be displayed.



1. **Exit Soft key** - Select this soft key to return to the Scan Display.
2. **Copy PC Soft key** - Select this soft key to copy the selected files to a PC via a USB connection.
3. **Copy USB Soft key** - Select this soft key to copy the selected files to a connected Flash Drive.
4. **Name Soft key** - Select this soft key to change the name of the highlighted file.
5. **Delete Soft key** - Select this soft key to deleted the selected files.
6. **Mark Soft key** - Select this soft key to select multiple files.
7. **Dual Soft key** - Select this soft key to view more than one trace at a time.
8. **USB Soft key** - Select this soft key to display the contents of a connected Flash Drive.
9. **File Storage Position** - Displays the file storage position of the corresponding files.

10. **File Name** - Displays the file name of the corresponding file storage position.
11. **Scan Information** - Displays a summary of the highlighted scan.
12. **Scan Preview Window** - Display a preview of the highlighted scan.



NOTE

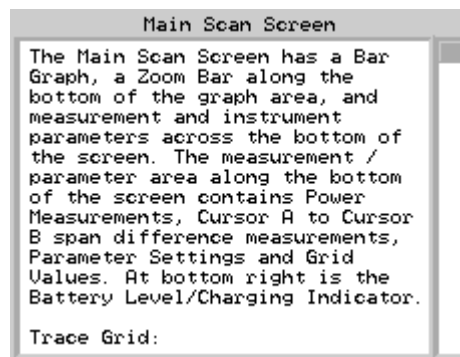
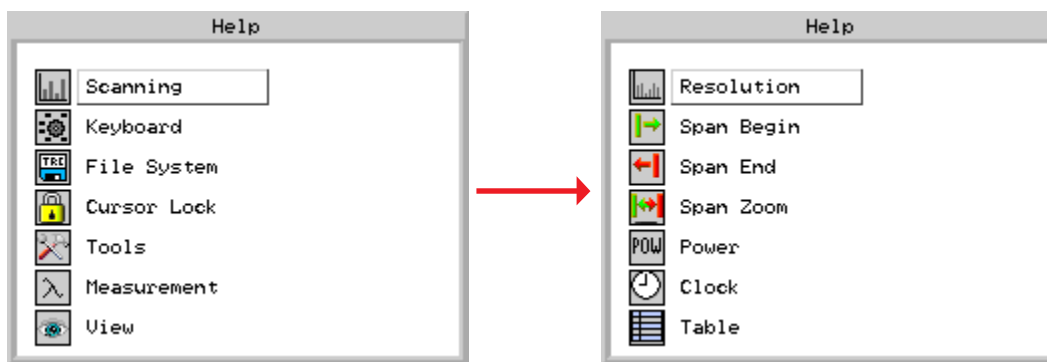
For more detailed information on how to save, recall, delete, and transfer files using the File Management Display, see Chapter 5: File Management.

Onboard Help



The device has an onboard help feature. To access the help feature, press the **Menu** button, use the scroll wheel to highlight the **Help** icon, and then press the **Select** button.

The **Help** dialog box will be displayed. Use the scroll wheel to move up and down through the list of help topics and then press the **Select** button. Press the **Menu** button again to exit the help feature.



General Setup and Preferences

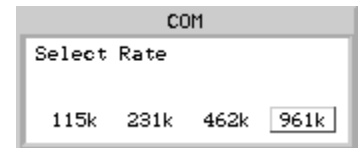
To access these features and preferences, press the **Menu** button, use the scroll wheel to highlight the desired icon, and press the **Select** button.

Baud Rate



It is necessary to set a COM port speed for communication with a computer. To set the baud rate, highlight the **Baud Rate** icon, press the **Select** button.

The **COM** dialog box will be displayed. Use the scroll wheel to select baud rates from 115 k to 961 k. Press the **Select** button again to select the baud rate and close the dialog.



Back Light



To set the Back Light press the **Menu** button, use the scroll wheel to scroll to the **Back Light** icon, and press the **Select** button to toggle the back light to either bright or dim.

Sound



Button press and scroll sounds may be turned on or off as desired. To toggle sound on and off, highlight the **Sound** icon and use the **Select** button to switch the sound on and off.

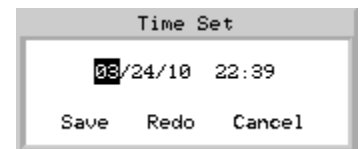
Date and Time



The TFS-3200 Series applies a time/date stamp to the saved scans. The time and date are set at the factory with a MM/DD/YY date and 24-hour format, Eastern time zone clock. This setting has a memory of approximately one month of no instrument activity. To refresh the memory, turn the instrument on for five minutes. To change the date and time, press the **Menu** button, scroll to the **Clock** icon and press the **Select** button.

The **Time Set** dialog box will be displayed.

- Use the scroll wheel to adjust the value of each segment.
- Press the **Select** button to move between segments.
- Press the **Select** button again to move to the **Save/Redo/Cancel** Option.
- Use the scroll wheel to select from **Save**, **Redo**, or **Cancel** and then press the **Select** button again to complete setting the date and time.



Pass/Fail Threshold Setup

The thresholds for the Pass/Fail feature are set in the Table Display. To view the Table Display, press the **Menu** button, scroll to the **Show Table** soft key, and then press the **Select** button.

The pass/fail thresholds are indicated in the following ways:

- The green area on the Scan Display represents the Pass/Fail zone and will reflect any changes made to the thresholds in the Table Display.
- Channels that pass the established thresholds will be displayed in black on the Table Display.
- Channels that fail to meet the established thresholds will be displayed in red on the Table Display.

Setting the Minimum Threshold Value

Perform the following steps to set the minimum threshold value:

1. Once in the Table Display, press the **Menu** Button.
2. Use the scroll wheel to highlight the **Min** soft key and then press the **Select** button.
3. Use the scroll wheel to adjust the minimum dBm threshold and then press the **Select** button to set the minimum threshold value.

Setting the Maximum Threshold Value

Perform the following steps to set the maximum threshold value:

1. Once in the Table Display, press the **Menu** Button.
2. Use the scroll wheel to highlight the **Max** soft key and then press the **Select** button.
3. Use the scroll wheel to adjust the maximum dBm threshold and then press the **Select** button to set the maximum threshold value.

Chapter 3

Operation

This chapter:

- Describes the operation and control of the Scan Feature of the TFS-3200 Series Optical Spectrum Analyzers
- Discusses how to save screen shots
- Discusses how to quickly save and recall measurement data

Precautions



Before connecting to a patch cord or fiber under test, be certain the fiber has no active optical sources or instruments connected to the other end. Skin or eye damage could result from other high power sources e.g. EDFAs, or instrument damage could occur voiding the warranty.



Fiber-optic connectors are easily contaminated or damaged. The connection to the TFS-3200 Series is a physical contact type of connection and dirty or damaged connectors may impair the instruments capabilities at the minimum and at worst result in the need to return the TFS-3200 Series to the factory for repairs. Prior to making any connection to the unit, ensure that all proper cleaning procedures have been followed.



This instrument is designed to test a total power of 23 dBm. The low power port is designed to measure up to -10 dBm per channel. If unsure of the power level, it is best to start in high power mode and use the high power port as designated by the TFS-3200 Series when setting the power level.

Quick Start Guide



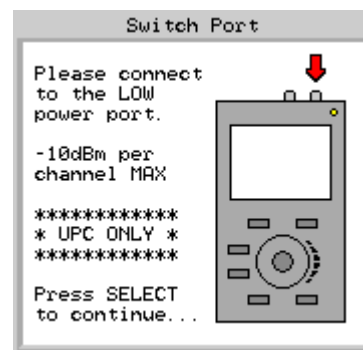
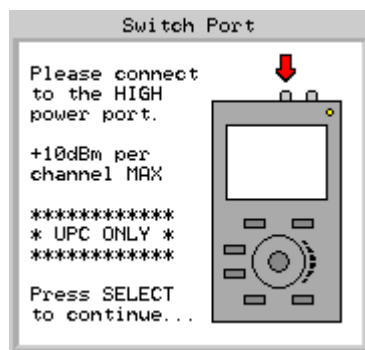
Read all the Precautions listed in Chapter 1 before using this equipment. Failure to do so could result in injury or equipment damage.

Perform the following steps to perform a quick scan measurement:

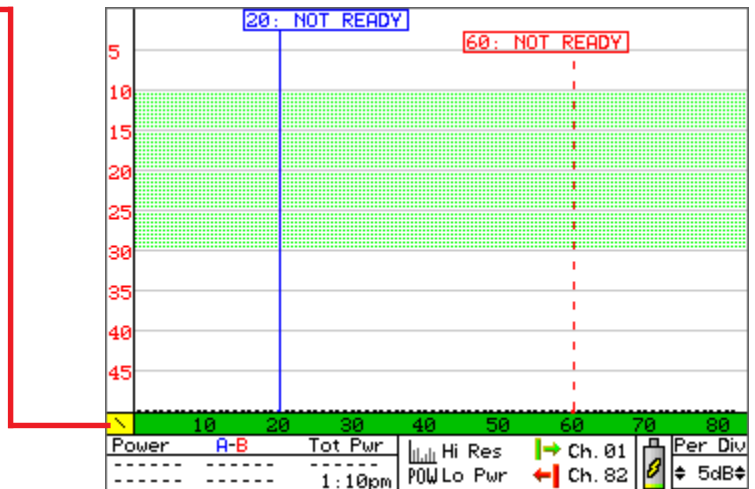
1. Press the **Power** button to turn on the TFS-3200 Series Optical Spectrum Analyzer.
2. The Switch Port dialog box will be shown on the display to indicate the input power setting. Perform one of the following actions to proceed:
 - a. If the desired power level is **NOT** indicated, press the **Select** button to clear the dialog box and proceed to Step 3.

OR

- b. If the desired power level is indicated, connect the fiber to be tested to the corresponding input port, press the **Select** button to clear the dialog box, and then proceed to Step 4.

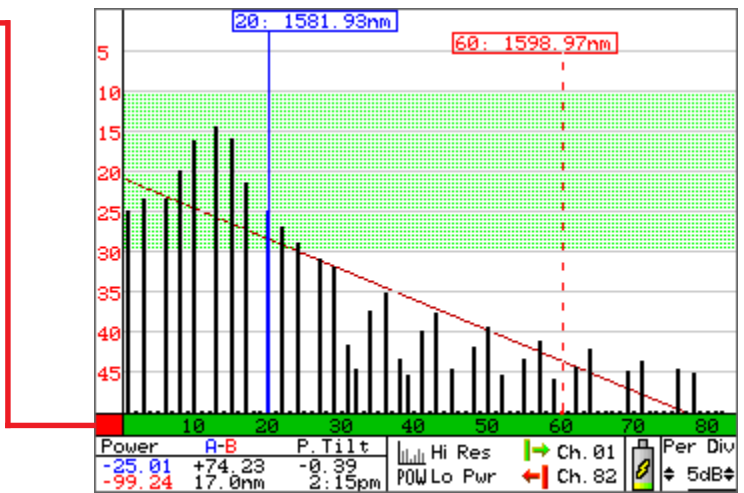


3. If the desired power level is **NOT** indicated, perform the following steps before connecting the fiber to be tested:
 - a. To change the input power level press the **Menu** button and use the scroll wheel to highlight the **POW** icon.
 - b. Press the **Select** button and the Switch Port dialog box will be displayed. This dialog box will show the change in power level and which port should be used.
 - c. Press the **Select** button again to clear the dialog and then press the **Menu** button to exit the Menu Display.
 - d. Connect the fiber to be tested to the corresponding input port
4. An activity indicator is located in the bottom left corner of the display. The scan can not be started until the color turns from yellow (warm-up) to red (standby).



 **NOTE** *If the Scan button is pressed while the indicator is yellow, the scan will start immediately upon completion of warm-up period.*

5. When the activity indicator turns from yellow to red, the unit is ready to scan. To start scanning, press the **Scan** button.
6. A full scan of the selected wavelengths will be shown on the display.
7. Use the Span Start, Span End, or Span Zoom features to adjust the display to view specific areas of the scan. The channels displayed may also be limited by power using the Scale Minimum or Auto Span Minimum power features.
8. Once the desired span and scale are set, the scan may be saved by pressing the **Menu** button, scrolling to the **Save** soft key, and pressing the **Select** button.



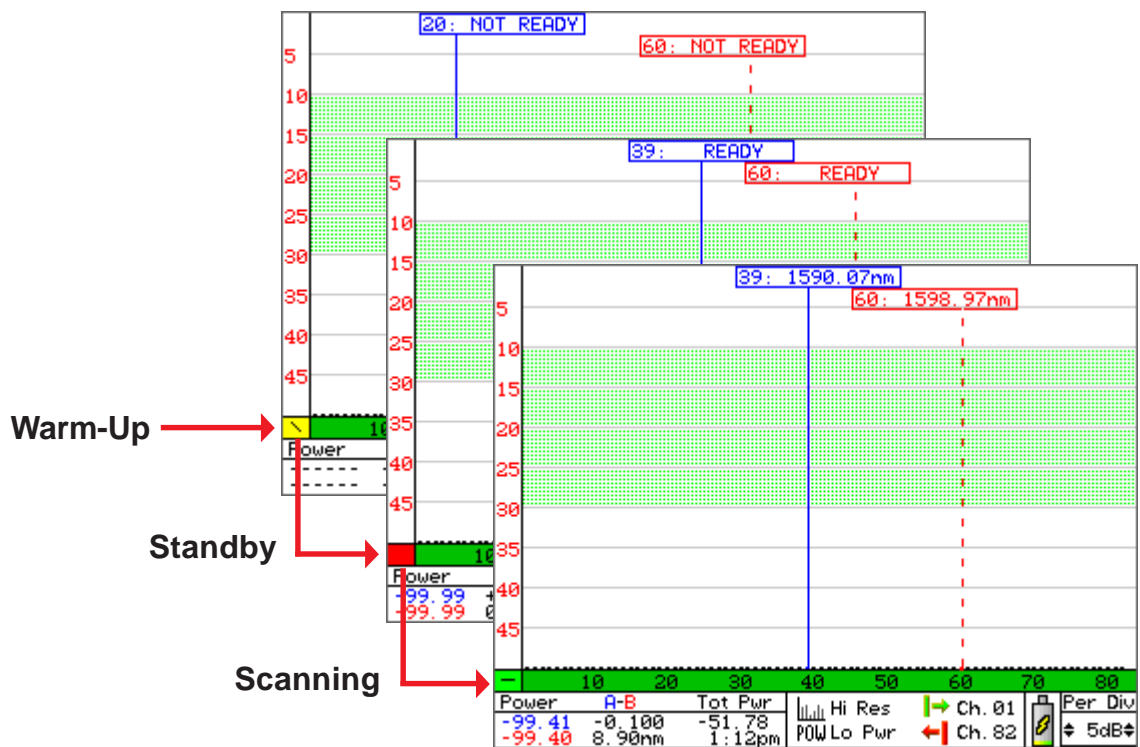
Scan Display Features

Activity Indicator

There is an activity indicator in the bottom left of the display. If the indicator is yellow, the unit is in the warm-up stage (~1 minute). The activity indicator will go to standby mode (red indicator) immediately after the warm-up period.

To start the scan process, press the **Scan** button. If the **Scan** button is pressed during the warm-up period, the unit will start scanning immediately after warm-up and the activity indicator will change to green which indicates the unit is scanning.

To stop the scanning process, press the **Scan** button a second time and the unit will go into standby and show a red activity indicator.

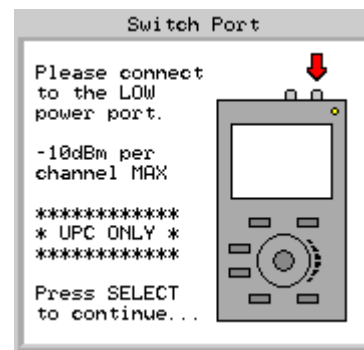
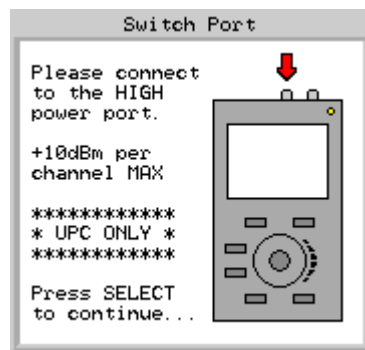


Input Power Level



There are two ports on the TFS-3200 Series. A Low Power port and a High Power port. The Low Power port is designed for maximum power of -10 dBm with a total maximum safe power input of 23 dBm. Upon starting the TFS-3200 Series, the Switch Port dialog box will be displayed. The Switch Port dialog box indicates the power setting. If the desired power level is indicated, connect the fiber to be tested to the port shown and press the **Select** button to clear the dialog box.

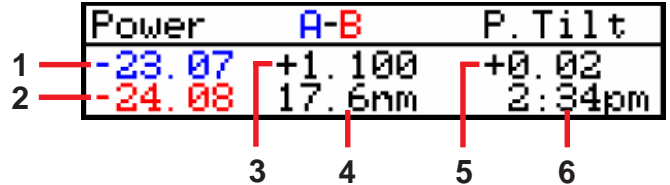
If the wrong power level is indicated upon startup, press the **Select** button to clear the dialog box, press the **Menu** button, and use the scroll wheel to highlight the **POW** icon. Press the **Select** button and the Switch Port dialog box will be displayed to show the change in power level and which port should be used. Press the **Select** button again to clear the dialog and the **Menu** button to exit the Menu Display.



Scan Measurements

The scan measurements are located in the lower left corner of the display as follows:

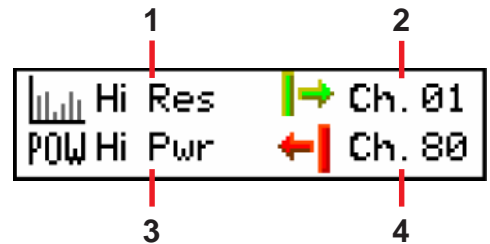
1. **Cursor A Level** - This field indicates the power level in dBm at the location of Cursor A.
2. **Cursor B Level** - This field indicates the power level in dBm at the location of Cursor B.
3. **Power Difference** - This field indicates the power difference in dBm between Cursor A and Cursor B.
4. **Channel Separation** - This field indicates the wavelength (nm) or frequency (THz) between Cursor A and Cursor B.
5. **Power & Tilt** - This field indicates either the Total Power, Power Tilt, or Gain Tilt measurement.
6. **Clock** - This field displays the real time clock.



Scan Parameters

The scan parameters are located to the right of the Scan Measurements as follows:

1. **Resolution** - This field indicates the current horizontal resolution of the scan.
2. **Span Start** - This field indicates the channel number at the beginning of the span for the scan measurement.
3. **Power** - This field indicates whether the High or Low power level is selected.
4. **Span End** - This field indicates the channel number at the end of the span for the scan measurement.



Basic Scan Tools

Unit of Measure



The units of measure are wavelength or frequency. The **Wavelength** icon indicates that the unit of measure is wavelengths in nanometers. The **THZ** icon indicates that the unit of measure is frequency in terahertz. These measurements are displayed in the labels associated with the A and B cursors and also the A-B channel separation measurement at the bottom of the screen. To change this unit of measure, press the **Menu** button, highlight the present unit of measure icon (**Wavelength** or **THZ**) in the menu bar, and press the **Select** button to toggle to the desired measurement unit.

Span Start



The Span Start feature allows the user to set the first channel to be displayed. To set the Span Start, press the **Menu** button, and scroll to the **Span Start** icon, press the **Select** button, and use the scroll wheel to change the starting channel. Press the **Select** button a second time to return to the Menu Display. Press the **Menu** button to exit the Menu Display. Using this in combination with the Span End function allows the user to display only the channels of interest. Making changes with the Span Start function will position the cursors to the first and last channels on the display.

Span End



The Span End feature allows the user to set the last channel to be displayed. To set the Span End, press the **Menu** button, scroll to the **Span End** icon, press the **Select** button, and use the scroll wheel to change the ending channel. Press the **Select** button a second time to return to the Menu Display. Press the **Menu** button to exit the Menu Display. Using this in combination with the Span Start function allows the user to display only the channels of interest. Making changes with the Span End function will position the cursors to the first and last channels on the display.

Span Zoom



The Span Zoom feature allows the user to zoom in or out around the active cursor. Press the **Menu** button and scroll to the **Span Zoom** icon. Press the **Select** button and advance the scroll wheel clockwise to zoom in or counterclockwise to zoom out of the active cursor. Zooming in will automatically and simultaneously adjust both the Span Start and Span End points. Press the **Select** button a second time to return to the Menu Display. Press the **Menu** button to exit the Menu Display.

Resolution



There is a low and high resolution setting on the TFS-3200 Series. Low resolution uses 100 GHz channel spacing to display 40/44 channels. High resolution uses 50 GHz channel spacing to display 80/88 channels in the same range. To change the resolution, press the **Menu** button, scroll to the **Resolution** icon, and press the **Select** button to toggle between low and high resolution. Press the **Menu** button to exit the Menu Display.

Setting Scale Limits



The **Scale Minimum Power** icon allows you to adjust the minimum dBm value shown on the graph. Values from -30 dBm to -60 dBm (Low Power Mode) are supported. In High Power Mode, the minimum scale value is adjusted accordingly, preserving the calibrated offset between Low and High Power Input Modes (approximately 20 dBm). Therefore, the minimum value of the graph in High Power Mode will be approximately 20 dBm higher than the minimum value in Low Power Mode. To set the Scale, press the **Menu** button, scroll to the **Scale Limits** icon, and press the **Select** button. The setting will be displayed at the top of the screen. Use the scroll wheel to change to the desired level. Press the **Select** button a second time to return to the Menu Display. Press the **Menu** button to exit the Menu Display.

Advanced Scan Tools

Once you have performed a scan, it may be necessary to maneuver within the scan to gain the information required. There are a number of tools that can be used to accomplish this.

Cursor Movement and Measurements

The A and B cursors are moved with the scroll wheel while in the Scan Mode. There are two methods to switch between active cursors.

1. Press the **Menu** button, scroll to the **Cursor** soft key, and then press the **Select** button to toggle the focus from one cursor to the other. Press the **Menu** button again to exit the Menu Display.
2. Press the **A/B** button to quickly toggle between the two cursors.

The position of each cursor is indicated at the top of each cursor in a callout box that moves with the cursor. The first number is the channel and the second is the wavelength or frequency depending on the unit of measure.

The power level of the displayed channel is shown in the bottom left corner of the display in blue and red. Blue is the dBm of the channel identified by the A cursor and red is for the B cursor. Just to the right of the power reading is the deviation in power between the channels. This is represented by the two cursors and the channel spacing in THz or nm, depending on the selected unit of measure.

Cursor Lock



The cursors may be locked at a specified distance from each other by using the Cursor Lock function. The **Cursor Lock** icon toggles this function on and off.

When locked, moving the A cursor results in the same movement of the B cursor, maintaining the channel spacing between them. The B cursor can be moved independently from the A cursor in order to set a new spacing between the two cursors. When the cursors are not locked they can both be moved independently. To lock the cursors, press the **Menu** button, use the scroll wheel to highlight the **Cursor Lock** icon, and press the **Select** button to toggle the lock on and off. Press the **Menu** button again to exit the Menu Display.

Broadband Measurements

There are three broadband measurements that may be displayed with the TFS-3200 Series. These are Total Power, Power Tilt, and Gain Tilt.



To select the desired broadband measurement, press the **Menu** button and scroll to the **View** icon. Press the **Select** button to toggle between Total Power and Power Tilt or Gain Tilt. Gain Tilt is only available when two graphs are displayed. If there is only one graph, the measurement defaults to Power Tilt.

Total Power

Total Power is the power that is present on the fiber. The total power measurement is displayed in dBm and is the integrated power of all the channels measured.

Power Tilt

Power Tilt is displayed as a linear regression line overlaid on the graph and the slope of that line represents a power per channel deviation in dB. This reading only factors in the channels that are greater than the minimum power level of the scale.

Gain Tilt

Gain Tilt will only be available if there are two scans displayed. Gain Tilt shows a tilt line representing the linear regression analysis of change in power between the overlapping channels of the scans being compared. This is also represented by a power per channel deviation in dB.

There are two methods to display two scans for a Gain Tilt comparison:

1. While scanning a fiber, press the **Menu** button and scroll to the **File Management** icon. Within the File Management Display, scroll to highlight the desired stored scan, press the **Menu** button, scroll to the **Dual** soft key, and press the **Select** button. The unit will then revert to the Scan Display with the selected (secondary) scan displayed in gray behind the active scan. Gain Tilt only measures those channels that meet the minimum value of the displayed scale.
2. The second method to measure Gain Tilt is to use two scans from memory. Load the primary scan by entering File Management, highlighting the primary scan, and pressing the **Select** button. This will display the scan in black. To load the secondary scan, reenter the File Management Display and highlight the desired scan. Press the **Menu** button, scroll to the **Dual** soft key, and press the **Select** button. This will display the secondary scan in gray. The measurements shown will be those of the primary scan. It does not matter which order the scans are recalled. Whichever scan is recalled using the **Dual** soft key will be the secondary scan.

Zoom

Vertically zooming in on a scan may be accomplished in two ways.

1. Press the **Menu** button, scroll to the **Zoom** soft key, and press the **Select** button to cycle through the five zoom levels.
2. Press the **Zoom** button on the front panel.

Zooming in vertically reduces the dBm scale and centers it on the peak of the channel selected by the active cursor.

This should not be confused with the ability to limit the horizontal scale with the Zoom Scale feature activated using the **Auto Test** button described below. The **Span Zoom** button changes the horizontal scale and selects the total number of channels displayed on the screen.

Auto Test

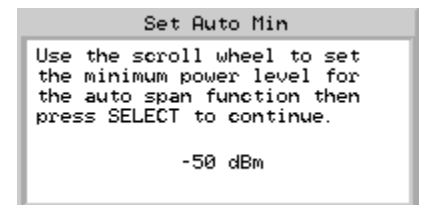
The Auto Test feature allows for a quick/automatic view of the scan while zooming in around a desired power level. Pressing the **Auto Test** button will now zoom in horizontally to display all the channels that fall between the first and last channels that meet the established minimum power threshold. To zoom back out, press the **Auto Test** button again.

Auto Span Minimum (Auto Test)



For use with the Auto Test feature, the auto span minimum power setting determines the required power level for a channel to be included in the scan when the **Auto Test** button is pressed. Auto span sets the beginning of the span to the first channel to meet this value and the end of the span to the last channel to meet this value.

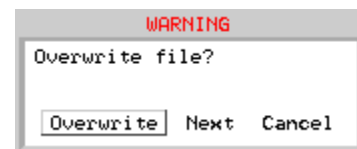
To set the Auto Span Minimum value, press the **Menu** button and scroll to the **Auto Span Min** icon. Press the **Select** button and the **Set Auto Min** dialog box will display the current value. Use the **Scroll Wheel** to change the setting. Press the **Select** button again to return to the Scan Display.



Quick Save of Scan and Measurement Data

A scan may be easily stored to memory by using the **Save ###** soft key. To quickly save measurement data, perform the following steps:

1. Press the **Menu** button and use the scroll wheel to highlight the **Save ###** soft key.
2. Press the **Select** button. The scan will be saved to the location indicated.
3. If that storage position is full, a dialog will be displayed with the options of overwriting the file, storing to the next available location, or canceling the command.
4. Use the scroll wheel to highlight the desired action and then press the **Select** button. The action will be complete and the display will return to the Scan Mode.



NOTE

Each time a file is saved with this method, the file name will default to a base file name of the last manually entered file. Each subsequent file will then assume the base file name and increment the file suffix by one.

Quick Recall of Scan and Measurement Data

A scan may be easily recalled from memory by using the **Recall ###** soft key. To quickly recall measurement data, perform the following steps:

1. Press the **Menu** button and use the scroll wheel to highlight the **Recall ###** soft key.
2. Press the **Select** button. The scan that is stored in the indicated storage location will be displayed.
3. Continue to press the **Select** button to cycle through any stored scans.

Saving Screen Shots



The TFS-3200 Series is equipped with a Screen Shot feature. A bitmap image of the current scan screen may be saved directly to the USB Flash Drive with a file name of hmmmss.bmp, where h = hour, m = minute and s = second.

To use the Screen Shot feature, perform the following steps:

1. Insert a Flash Drive into the USB Flash Drive Port.
2. Press the **Menu** button and use the scroll wheel to highlight the camera icon.
3. Press the **Select** button. The display will show the progress of the screen capture by displaying the inverse color pattern of the image while progressing from the bottom to the top of the screen.
4. When the screen shot storage is complete, the display returns to the normal color screen.



NOTE

Do not remove the USB Flash Drive while it is accessing. To do so could corrupt the data being stored or accessed.

Chapter 4

Video Scope

This chapter:

- Describes the Video Scope feature

Video Scope Overview

The TFS-3200 Series can accommodate the Trilithic Video Probe (Optional) that connects to an 8-pin DIN connector labeled “Vid Probe” on the bottom panel of the device. The TFS-3200 Series can be used to view a connector endface to look for contamination and damage.

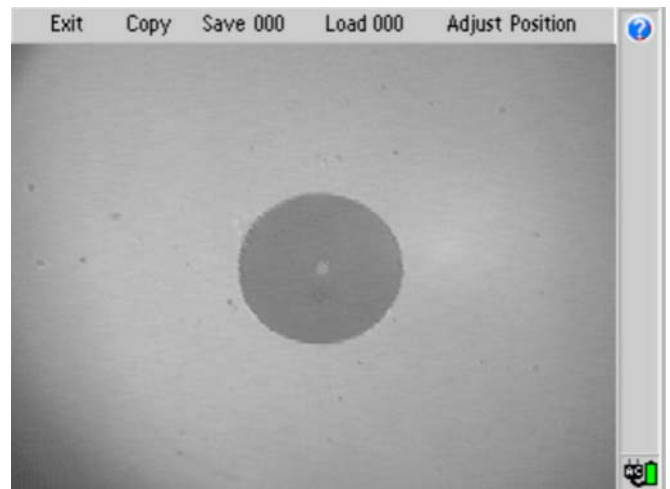
Video Scope Operation



This Video Scope feature is accessed from the Scan Display. Press the **Menu** button, scroll to the **Video Probe** icon, and press the **Select** button. To exit the Video Scope function, press the **Menu** button, scroll to the **Exit** soft key, and press the **Select** button.

Perform the following steps to use the video probe:

1. Connect the video probe to the connector labeled “Vid Probe”.
2. Turn on the probe light by moving the switch on the probe to the on position. The LED will illuminate indicating the probe light is on.
3. Insert a connector into the probe or insert the probe into a fiber adapter.
4. Use the thumb wheel to focus the image.



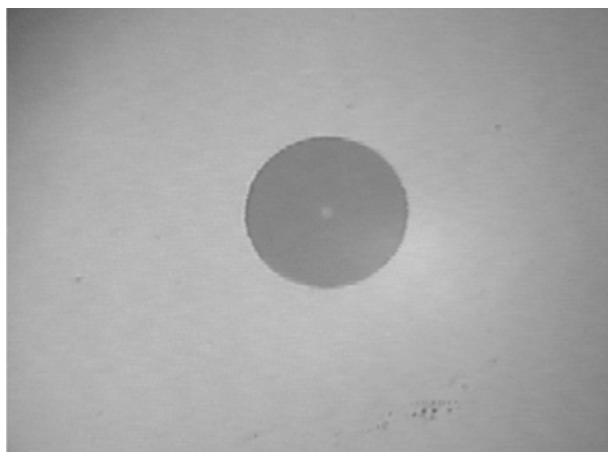
Only the soft keys and the Help icon are accessible on the Video Scope display.

NOTE

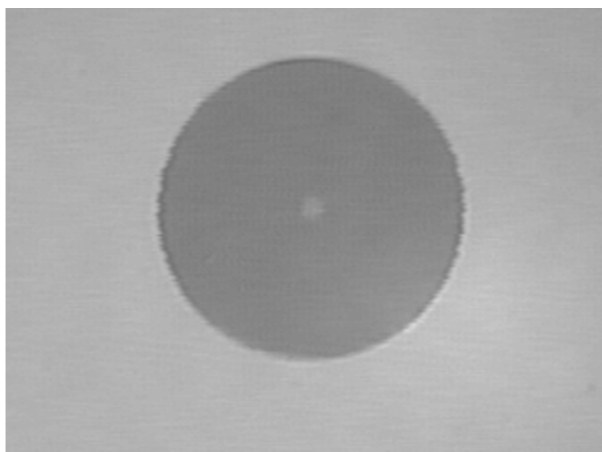
Adjusting the Video Scope Image

Zoom

To adjust the zoom from 200X to 400X, press the **Zoom** button. Pressing the **Zoom** button again will revert back to 200X.



Zoom 200X



Zoom 400X

Position

To adjust the position on the display, the image must be in 400X zoom mode and the soft key located in the top right corner of the display must indicate Adjust Position. Pressing the **Select** button will auto center the image if there is sufficient contrast. The image may be manually centered by pressing and holding the scroll wheel in the direction of the desired movement.

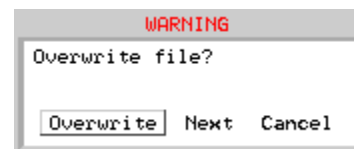
Contrast

To adjust the contrast of the image, the soft key located in the top right corner of the display must be set to Adjust Contrast. If it is not, and Adjust Position is displayed, press the **Menu** button and scroll to the **Adjust Position** soft key. Press the **Select** button to toggle to the **Adjust Contrast** soft key. With **Adjust Contrast** displayed, use the scroll wheel to increase or decrease the contrast of the image.

Quick Save of Scope Image

A scope image may be easily stored as a BMP image to memory by using the **Save ###** soft key. To quickly save scope images, perform the following steps:

1. Press the **Menu** button and use the scroll wheel to highlight the **Save ###** soft key.
2. Press the **Select** button. The scan will be saved to the location indicated.
3. If that storage position is full, a dialog will be displayed with the options of overwriting the file, storing to the next available location, or canceling the command.
4. Use the scroll wheel to highlight the desired action and then press the **Select** button. The action will be complete and the display will return to the Video Scope Display.



Each time a file is saved with this method, the file name will default to a base file name of the last manually entered file. Each subsequent file will then assume the base file name and increment the file suffix by one.

Quick Recall of Scope Images

A scope image may be easily recalled from memory by using the **Load ###** soft key. To quickly recall scope images, perform the following steps:

1. Press the **Menu** button and use the scroll wheel to highlight the **Load ###** soft key.
2. Press the **Select** button. The image that is stored in the indicated storage location will be displayed.
3. Continue to press the **Select** button to cycle through any stored images.

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Chapter 5

File Management

This chapter:

- Discusses the File Management function

File Management Overview

The TFS-3200 Series has the capability to store up to 1000 scans. Once stored, these files may be copied to a PC via a USB cable or copied to a USB Flash Drive. The files are listed in order of file storage position with the xxxxxxxx.yyy (8.3) naming convention.



To enter the File Management Display, press the **Menu** button, scroll to the **File Management** icon, and press the **Select** button. Use the scroll wheel to move from one stored scan to another. As a file is highlighted the time and date stamp are displayed with total and peak power information and the number of channels measured. There is also a preview image of the scan that is displayed.

There are two methods to return to the Scan Display from the File Management Display. The first method is to enter the Menu Display, scroll to the **Exit** soft key, and press the **Select** button. The second method is to press the **Select** button while a file is highlighted, this will open the Scan Display with the highlighted file displayed.

Viewing a Stored Scan

To view a scan that has been stored in the onboard file management system, simply press the **Select** button while the desired file is highlighted and the file will open in the Scan Display.

Viewing Scans from a USB Flash Drive

The TFS-3200 Series can view files from a USB Flash Drive. Insert the USB Flash Drive into the proper port and enter the Menu Display. Scroll to highlight the **USB** soft key and press the **Select** button. The TFS-3200 Series will read any .OSA files in the root directory of the Flash Drive. Highlight the file to be viewed and press the **Select** button.

To exit the Flash Drive directory, press the **Select** button a second time while the **USB** soft key is highlighted and the focus will revert back to the onboard file management system.



NOTE

Do not remove the USB Flash Drive while it is accessing. To do so could corrupt the data being stored or accessed.

File Naming Convention

The file name is formatted as xxxxxxxx.OSA (8.3) style. The file storage system uses the eighth, seventh, then the sixth position to make the file name unique with an identifier digit. Therefore, depending on how many files need to be saved for the group of tests, it may be best to only use 5, 6, or 7 characters for the file name.

For example: If a file name of bbbbbb.OSA was given to the first scan, when the following scans are saved they will be named: bbbbbb0.OSA, bbbbbb1.OSA, bbbbbb2.OSA, and so on. In this case if there were more than eleven scans, the next name would be bbbbbb10.OSA. The name would be adjusted to accommodate the two digit identifier. With the storage capability of up to 1000 scans, the identifier could possibly use up to three positions. It is suggested that this be taken into consideration when creating the base file name.

Naming a File

The **Name** soft key is used to name a file for a new scan or to rename a currently stored file. Files stored with the **Save** soft key will take the base name of the last stored file.

To start a new set of scans with a new base file name, perform the following steps:

1. Enter the Menu Display while the first scan is displayed.
2. Scroll to the desired storage location for the first scan of the project.
3. Press the **Menu** button, scroll to the **Name** soft key, and press the **Select** button.
4. The storage location will display a black box with a .OSA extension.
5. Use the **Scroll Wheel** to cycle through the available characters. The available characters are (space), 0-9, A-Z, and a-z.
6. Press the **Select** button to enter the character and move to the next character.
7. Once the desired file name is in place, press the **Menu** button and **Save Changes** or **Discard Changes** will be displayed in the soft key bar. Scroll to highlight Save or Discard and press the **Select** button to complete the action.

Renaming a File

To rename a file, highlight the file to be renamed, press the **Menu** button, and scroll to the **Name** soft key. Press the **Select** button and the first character of the file name will be highlighted. Continue to name the file as described earlier. Press the **Menu** button when done to either save changes or discard changes.

Copying and Deleting Files

Marking Files

Mass copying and deleting can be accomplished with the **Mark** soft key. Highlight the first file to be copied or deleted, press the **Menu** button, scroll to the **Mark** soft key and press the **Select** button. Use the scroll wheel to move through the files. Moving clockwise marks any files that are passed and move counterclockwise unmarks any files that are passed. Marked files will be displayed in red. Press the **Menu** button again and select the desired soft key function to be completed.

Copying to a Personal Computer

With the use of the supplied ToolBox software and the USB cable, the stored files may be copied directly to a PC. Highlight or mark the desired file(s) to be copied and scroll to the **Copy PC** soft key. Press the **Select** button to move the files to the computer when directed in the ToolBox software.

Copying to Flash Drive

To copy files to a Flash Drive, insert a Flash Drive (not to exceed 4 gigabits in capacity) into the Flash Drive port. Highlight or mark the desired file(s) to be copied and scroll to the **Copy USB** soft key. Press the **Select** button to copy the files to the root directory of the Flash Drive.

Delete Files

Highlight or mark the desired file(s) to be deleted, press the **Menu** button and scroll to the **Del** soft key. Press the **Select** button and **Cancel** or **Confirm Delete** will be displayed in the soft key bar. Use the scroll wheel to highlight the desired action and press the **Select** button.

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Troubleshooting

Before You Begin Troubleshooting

- A low battery may cause the detector to not turn on or operate incorrectly. Make sure you have properly charged NiMH batteries installed before troubleshooting the unit.

LCD is Dark

- The **Power** button has not been pressed to turn the unit on. Press the **Power** button.
- The batteries are drained. Recharge the batteries.
- The batteries are missing, in backwards, or need replacing. Check the installation of the batteries and make sure they are correctly installed. Contact Trilithic for servicing requirements.

LCD is White

- The power was cycled too quickly. Turn off the unit and wait five seconds and then turn the unit back on.

Instrument is Locked Up

- Unexpected Operational Mode; turn the unit off (hold the **Power** button in for one second) and wait for five seconds, then press the **Power** button again to turn the unit back on.

Low or No Power is Being Displayed

- The cord is defective. Replace the cord.
- A connector is dirty. Clean or replace the connector.
- The fiber optic port requires cleaning. Clean and inspect the port.
- Angle polish is mated with UPC polish. Examine the connector ends.

USB to PC Communication Interface is Not Functioning Properly

- The USB baud rate is not set properly or is too quick for the computer. Set the port baud rate properly or decrease the baud rate in the instrument and ToolBox software.
- The PC drivers are not set properly. Uninstall and reinstall the ToolBox software and drivers.

USB Flash Drive is Not Functioning Properly

- The USB Flash Drive is full. Remove all unnecessary files from the Flash Drive or use a different Flash Drive that has sufficient storage space.

Specifications

Optical

Power Meter Detector Type	InGaAs
• Wavelength Range	TFS-3200C: 1530 to 1561 nm TFS-3200L: 1574 to 1608 nm TFS-3200S: 1460 to 1530 nm
• Wavelength Accuracy	+/- 0.1 nm
• Channel Spacing	50 GHz, 100 GHz
• Channel Power Range	+10 dBm to -50 dBm
• Absolute Accuracy	+/- 1 dB
• Readout Resolution	0.01 dB
• Polarization Dependent Loss	+/- 0.15 dB
• Measurement Time	< 1/2 second
• Optical Rejection Ratio	40 dBc (@ 50 GHz)
• Return Loss	> 40 dB
• Optical Interface	Universal UPC (FC/SC)

General

• Graphical Display	Bar Graph, Spectrum, and Tables
• Display	4" color TFT
• Dimensions	7.75" x 4.5" x 2.25" (19.68 cm x 11.43 cm x 5.72 cm)
• Weight	2 lbs (0.91 kg)
• Battery	Rechargeable NiMH - 8 hours operating time
• Power	100-240 universal US, GB, EU, AU Adapter Plugs
• Environmental	Operation -10°C to +50°C

Warranty Information

Trilithic, Inc. warrants that each part of this product will be free from defects in materials and workmanship, under normal use, operating conditions and service for a period of one (1) year from date of delivery. Trilithic, Inc.'s obligation under this Warranty shall be limited, at Trilithic, Inc.'s sole option, to replacing the product, or to replacing or repairing any defective part, F.O.B. Indianapolis, Indiana; provided that the Buyer shall give Trilithic, Inc. written notice.

Batteries are not included or covered by this Warranty.

The remedy set forth herein shall be the only remedy available to the Buyer under this Warranty and in no event shall Trilithic, Inc. be liable for incidental or consequential damages for any alleged breach of this Warranty. This Warranty shall not apply to any part of the product which, without fault of Trilithic, Inc., has been subject to alteration, failure caused by a part not supplied by Trilithic, Inc., accident, fire or other casualty, negligence or misuse, or to any cause whatsoever other than as a result of a defect.

Except for the warranty and exclusions set forth above, and the warranties, if any, available to the Buyer from those who supply Trilithic, Inc., there are no warranties, expressed or implied (including without limitation, any implied warranties of merchantability or fitness), with respect to the condition of the product or its suitability for any use intended for it by the Buyer or by the purchaser from the Buyer.



TRILITHIC

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