

TFS-201™ Optical Light Source

Operation Manual



think ahead.

 TRILITHIC

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.
- **Telecom Solutions**
Offers affordable, easy-to-use instruments for testing and measurement of Telecom networks.
- **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.

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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 Trilithic contact information and describes how this operation manual is structured.
- Chapter 2, “Introduction” describes the purpose and lists the features of the TFS-201™ Optical Light Source.
- Chapter 3, “Operation” describes how to setup, test, and operate the TFS-201™ Optical Light Source.
- Chapter 4, “Appendix” describes the troubleshooting procedures and technical specifications of the TFS-201™ Optical Light Source.

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.



Use only NiMH rechargeable batteries ONLY with the same mAh rating otherwise damage to the product may occur.



Do not look into output ports when the source is turned on! Although the TFS-201™ Optical Light Sources were designed to emit only eye safe infrared radiation, Trilithic recommends a safety first approach whenever working with fiber optics. Keep in mind that infrared light is invisible to the naked eye.



Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



When cleaning the output ports or using the bare fiber adapters, be careful not to scratch or otherwise contaminate the port optics. They are highly polished glass and can be damaged.



Do not remove the top bumper or otherwise remove the source circuitry from its enclosure. Doing so will not only alter unit calibration and void the warranty, but may permanently damage the unit.



The TFS-201™ Optical Light Sources are precision instruments. Clean all connectors before engagement to the source. Any contamination on the fiber endface will degrade or damage the output port optics. Use alcohol preps or swabs which are dust and lint free.

Chapter 2

Introduction

This chapter:

- Describes the TFS-201™ Optical Light Source's purpose
- Lists the TFS-201™ Optical Light Source's features

Purpose

When performing attenuation tests on fiber links, it is necessary to have a stable source of light on which to base measurements. The TFS-201™ Optical Light Source from Trilithic provides the stability needed to allow accurate testing.

As a perfect complement to the TFS-FS1™ Optical Leakage Detector, the source provides measurement quality and extreme durability. The full featured sources incorporate impact absorbing bumpers, weather resistant membrane switches, and a durable powder coat finish. The source is available in Laser form and dual wavelength design. Additionally, the unit includes an emergency quick charge mode, CW and three modulation modes for use with fiber identifiers, and an efficient two-port design.

Features

- 1310 nm / 1550 nm Operation with SC, FC, or ST Style Ports
- CW, 30 Hz, 500 Hz, or 2 kHz Modulation
- Simultaneous Outputs
- Temperature Stabilized Outputs
- Rugged Construction
- Long Battery Life with Quick-Charge Mode

Equipment Supplied with the TFS-201

- **TFS-201™ Optical Light Source** - Portable source used to measure fiber optic system source energy.
- **Rechargeable Batteries** - Four (4) "AA" NiMH.
- **AC to DC Power Adapter/Charger** - Power adapter and battery charger for the TFS-201™ Optical Light Source.
- **Operation Manual** - Full Operation Manual on CD.

Related Products

TFS-301 Optical Power Meter

Alone, the TFS-301™ Optical Power Meter is ideal for absolute measurements. When the optical power meter is used in conjunction with the TFS-201™ Optical Light Source relative measurements can be made to accurately determine fiber loss.

Trilithic's new TFS-301 Optical Power Meter features NIST traceable calibration at 4 wavelengths: 850 nm, 1300 nm, 1310 nm, and 1550 nm for accurate power level measurements.

TFS-FS1 Optical Leakage Detector

The TFS-FS1™ Optical Leakage Detector is designed to locate energy leaks in fiberoptic systems due to splice loss, connector loss, breakage, or bending and to identify fibers over long distances.

This optical leakage detector is the most sensitive fiber light finding instruments on the market today. By simply sweeping over a fiber, the leak detector will give an audio and visual indication whenever it encounters a light loss point. Often performing the same function as a visible laser source, this product is used in OTDR dead zone areas or splice enclosures where exact pinpointing of a fault is critical.

The major advantage of the TFS-FS1 over a visible laser however is that it can “see” cable faults in bright room light and in many blue, green, and black coated fibers. Find light reflected from connectors mated in bulkhead adapters and even through some dust caps. Locate fibers at distances up to 186 miles (300 Km), not just a few miles.

Chapter 3

Operation

This chapter:

- Provides information on the TFS-201™ Optical Light Source's general use, testing, and operation

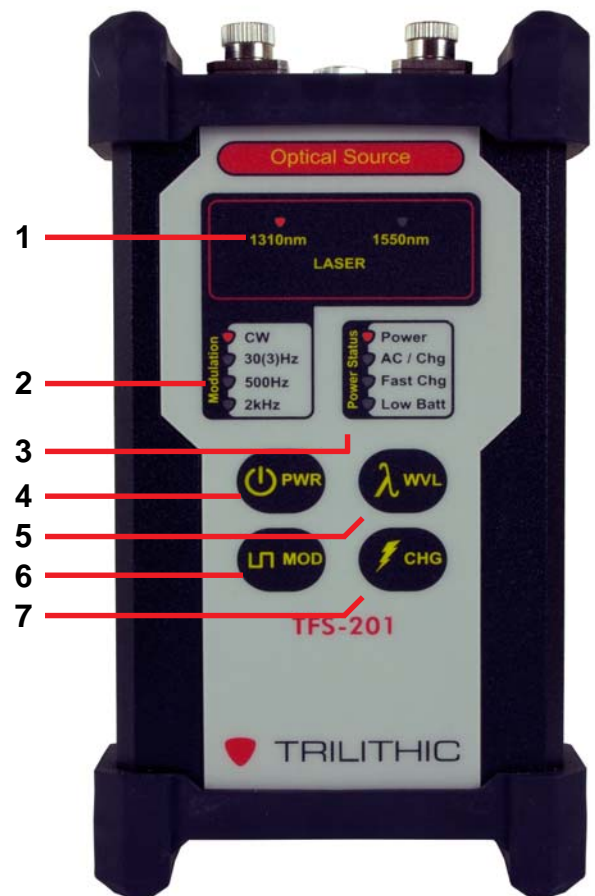
General Use



Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Front Panel


1. **Wavelength Indicators** - Shows the current emitter selected. In dual wavelength units, both emitters can be enabled simultaneously.
2. **Modulation Indicators** - Shows the current modulation status. Use 2 kHz with the Trilithic TFS-FS1™ Optical Leakage Detector probe.
3. **Power Status** - Indicates the source power status, battery charge mode, and battery condition.
4. **PWR (Power Button)** - Turns the unit on and off. Emitters are off until WVW is pressed.
5. **WVW (Wavelength Select Button)** - Selects the laser. This button must be depressed to turn the laser on.
6. **MOD (Modulation Select Button)** - Cycles through modulation modes.
7. **CHG (Quick Charge)** - Changes the type of charging between normal and fast for the NiMH (Nickel Metal Hydride) batteries.



Getting Started

The TFS-201™ Optical Light Source is shipped with four AA type rechargeable NiMH batteries. Although charged partially during lab inspection and calibration, the batteries should be charged fully before field use. This is accomplished by connecting the included AC power adapter to the charging socket at the top of the unit. The unit will automatically power off without front panel button activity after 20 minutes.

Turn On

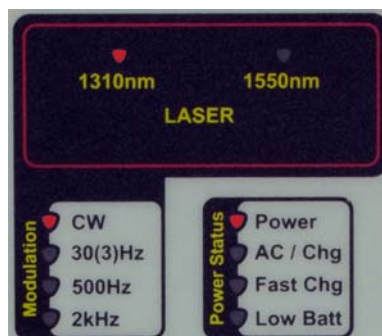


WARNING *When working with any fiber optic test equipment or in an area with active fiber optic links, be aware there can be infrared optic energy present.*

Depressing the PWR button will turn on the source circuit. Although the ON LED will light instantly (indicating that the circuit has energized), the emitter(s) themselves will not turn on until the WVL button is depressed to select the actual laser or LED port. Again, to turn on the laser, depress the PWR button then the WVL button until the desired emitter is turned on.

The display shown below is representing a single wavelength, 1310 nm laser which has been turned on and emitting CW (continuous wave or constant) light. By depressing the MOD button, the light will change from CW to one of three modulations. Modulated light is light pulsed at a given frequency in order to be traced by fiber identifiers.

Finally, it is recommended that a 5 minute stabilization time be allowed before testing to let the internal devices reach thermal equilibrium.



Launch Cable and Source

To properly test for loss in a fiber system, it is necessary to launch not only the correct wavelength of light into a system, but that light must also be conditioned to check the core glass only.

First, when light sources are powered up, they should be allowed to stabilize for a minimum of 15 minutes to allow accurate reference points to be taken. Next, a launch cable of similar fiber size and performance to the cable under test must be connected to the source. The launch cable will not only connect the source to the system under test but will also provide a fiber core source. Fiber optic emitters generally fill both the core and cladding of a fiber. In loss tests, cladding light is not desired since it is not carried well by fiber. Also, in multimode fibers, an equilibrium mode distribution (EMD) must be established. EMD is the illumination of the entire fiber core in the same way it would be lit in a long run of fiber. Both the cladding mode strip and mode scrambling function can be realized through the use of a mandrel wrap in the launch cable.

A mandrel wrap is five loops of fiber around a 1/2" rod under zero tension and is generally wound by hand in the field. Some specifications may require a .7" diameter for 62.5/125, 3 mm patch cords and .9" diameter for 50/125, 3 mm patch cords.



NOTE

Some military tests do not permit the use of a mandrel wrap for mode conditioning.

Loss Measurement

1. Attach the launch cable with a 1/2", 5 turn mandrel wrap to the source.
2. Turn the source on and allow it to stabilize for a minimum of 15 minutes. If testing two wavelengths, turn on both the emitters and use two separate launch cables.
3. Attach a patch cable to the TFS-301 Optical Power Meter without a mandrel wrap. This will be called the receive cable. Make sure that the free ends of the receive and launch cables have the same connector style or can otherwise be directly mated. Also, make sure to select the proper wavelength on your meter.
4. Connect the free cable ends together with a connector bushing and press the REL control on the meter. The meter should read 00.00 dB. For dual wavelength testing, connect to the second launch cable, select the second wavelength on the meter, and zero the second wavelength also.
5. Disconnect the cable ends that were connected in Step 4, then take the source and meter to the opposite ends of the cable to be tested. Do not remove the launch and receive cables from the instruments.
6. Connect the free ends of the launch and receive cables to the cable under test. The meter will display the loss of the cable under test. For dual wavelength tests, test all the fibers in the link at one wavelength.
7. Switch the launch cables at the source end, change to the second wavelength at the meter end, and repeat Step 6.

Power Supply and Battery Charging

The TFS-201™ Optical Light Source is powered by an AC to DC Power Adapter/Charger or NiMH batteries.

The unit uses four AA size NiMH batteries (cells should be 600 mAh type or better) which are mounted in the lower half of the meter enclosure. Although the included rechargeable cells rarely need changing under normal usage, they are easily replaced.

To change the batteries, perform the following steps:

1. Use a small flat blade screwdriver to loosen the two mounting screws which hold the bottom bumper in place and then gently pull the bumper off.
2. Pull the exposed tab to remove the battery holder, taking note of which slot the holder is in.
3. When installing new cells, make sure that they are seated well.



Use only NiMH rechargeable batteries ONLY with the same mAh rating otherwise damage to the product may occur.

AC to DC Power Adapter/Charger

The AC to DC Power Adapter/Charger is used to power the TFS-201™ Optical Light Source instrument and to charge the four NiMH batteries required for field use. Plug the power adapter into a standard wall socket and connect the charging plug into the top of the power source. Please read the two charge modes of operation and the specific requirements for each mode in the section that follows.

Auto Power Off Feature

The TFS-201™ Optical Light Source includes an Auto Power Off (APO) feature. The source checks the WVL and MOD buttons for activity. If they are not pressed for 20 minutes, the unit will automatically store the last mode of operation along with any references taken and then shut down.

Slow and Fast Charge Modes

The TFS-201™ Optical Light Source operates two different ways.

Slow Charge

When first connected in NiMH mode, power from the AC to DC Power Adapter/Charger is sent not only to the source circuitry, but to the batteries as well. This is referred to as slow charge or trickle charging and is indicated by the SLOW CHG LED on the front panel. Slow charging the batteries will generally take between 12 and 15 hours and provides a full, deep charge. Slow charging is by far the most popular method for recharging batteries due to its simplicity and depth of charge. It is also recommended for general use. Sometimes, however, situations arise which require immediate use. In these cases, TFS-201™ Optical Light Source owners can utilize the fast charge feature.

Fast Charge

Fast charging will not take place unless the AC to DC Power Adapter/Charger is plugged in, the installed batteries are not completely dead, and the CHG button is pressed. Once fast charging is initiated, the batteries will charge until a “peak” charge has been reached or approximately one hour has passed. While charging, the SLOW CHG and FAST CHG LEDs will light and the enclosure may warm by a few degrees. Special circumstances will impact fast charging. First, as mentioned, very dead batteries will need to be slow charged for a few minutes before the fast charger will turn on. This is to prevent damage to the cells. Second, after fast charging is finished, it cannot be re-initiated unless the AC power is removed and connected again. This reduces the likelihood of overcharging. Next, if the unit is very hot or very cold, bring the unit to within the recommended operating temperature before fast charging. The fast charger utilizes battery temperature fluctuations to determine peak charge and temperature extremes defeat the sensing circuitry. A 1 A fuse protects the internal circuitry against short circuits. If the fuse is blown, the unit will not charge.

Fast charging will only charge batteries to about an 80% level before switching to slow charge to top the charge off. Overcharging or excessive fast charging may reduce battery life.

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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.

Optical Light Source Does Not Turn On

- Batteries are installed incorrectly. Check the batteries orientation and make sure they are properly seated.

Optical Light Source Does Not Fast Charge

- Fuse blown. Change the fuse.
- Batteries are drained. Slow charge the batteries for five minutes and try again.
- Batteries are fully charged (if FAST CHG LED lights momentarily then turns off).
- Batteries are installed incorrectly or dislocated from holder. Reinstall the batteries correctly.

Poor Optical Light Source Run Time

- Old or aging batteries. Replace the batteries with AA 600 mAh NiMH type batteries.
- Batteries are not of the AA 600 mAh NiMH type.
- Batteries are too hot or cold or exposed to damaging conditions.

Output Unstable

- The reference cable to the source has been moved.
- An extreme temperature change has occurred.

Specifications

Optical

Emitter	Laser
Port Style	ST, FC, SC, others available
Fiber Size (MAX)	100/140
Wavelength	1310 nm, 1550 nm
Power	-8 dBm
Modulation	CW, 30 Hz, 500 Hz, or 2 kHz
Stability	+/- 0.10 dB/8hr typical
Bandwidth	5 nm



General

Operating Temperature	0°C to +50°C
Storage Temperature	-10°C to +60°C
Humidity	10% to 90%, non-condensing
Power	4 x AA NiMH, 120 VAC / 60 Hz
Battery Life	8 - 10 hours typical
Charge Time	Trickle Charge - 16 hours typical Quick-Charge - 1 hour typical
Physical Specification	Size - 7" x 3.5" x 1.3" Weight - < 1 lb.

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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.



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