TFS-1020

Optical Fault Finder

Operation Manual

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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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” introduces the equipment and features of the TFS-1020.
- Chapter 3, “Operation” describes how to use the features of the TFS-1020.
- Chapter 4, “Specifications” shows the technical specifications of the TFS-1020.

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

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

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

Precautions

To avoid possible eye injuries, please do not look directly into the optical output ports when using the instrument.

In order to protect against instrument damage, do not subject the instrument to strong impacts, shock, prolonged exposure to direct sunlight or heat sources.

The rear cover of the instrument should only be removed for battery replacement. There are no other user serviceable parts inside. Contact Trilithic for repairs.

Always store the instrument in a clean, cool, and dry location and always remember to replace the protective cap over the optical outputs.

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-1020. In the event that the port needs to be cleaned, 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.

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Chapter 2
Introduction

Overview

The TFS-1020 Optical Fault Finder uses Optical Time Domain Reflectometer technology to determine fiber length or fault location for the installation and maintenance of fiber optic systems. The unit also features a simple to use Visible Fault Locator (VFL) that can be used to find the location of fiber optic cable breaks and to locate individual cables.

These functions, along with easy operation and portability, makes it simple for a Fiber Optic Technician to install and maintain fiber optic systems, improving work efficiency by reducing time in the field.

Features

The TFS-1020 Optical Fault Finder includes the following features:

- Dual-source operation with 650 nm and 1550 nm light sources
- Performs visible fault location using the 650 nm visible light source for fiber optic cable lengths up to 5 km
- Performs invisible fault location (metering) using the 1550 nm laser light source for fiber optic cable lengths from 20 m to 30 km
- Up to five fault event measurements per fiber optic cable
- Auto-power off feature with low power alarm

Included Items

The TFS-1020 is supplied with the following components:

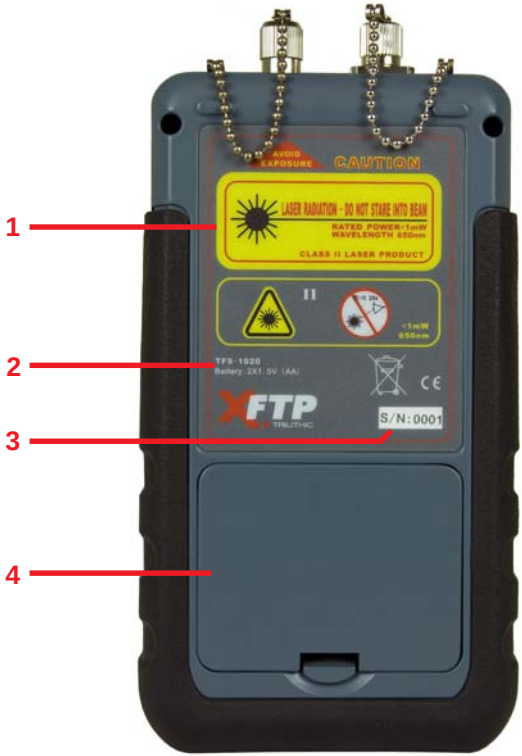
- TFS-1020 Optical Fault Finder
- Two (2) "AA" Alkaline Batteries
- Protective Carrying Case
- Strap for Carrying Case
- ST to FC Optical Patch Cable
- Printed Operation Manual
- Printed Quick-Start and Unit Conversion Card

Front Panel


1
2
3
4
5
6
7
8
Metering
VFL
Event 08
Hi Lo
88.888
km
Event 08-08
88888 m
Alarm 01
Alarm 02
Alarm 08
XFTP
TRILITHIC
VFL
UP/+
MEASURE
DOWN/-
TFS-1020

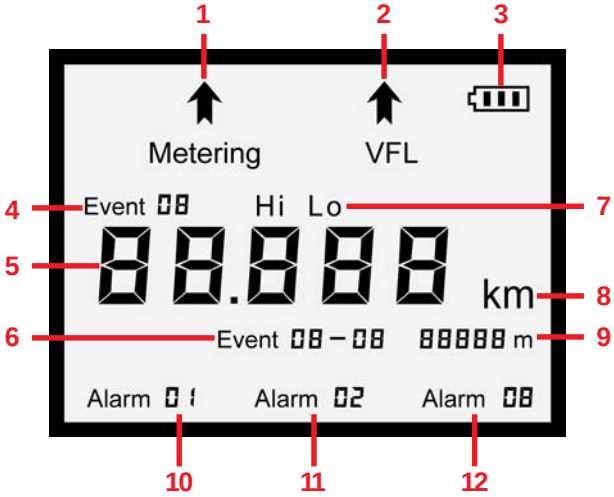
1. **VFL Output** - This is the visible light source (650 nm) output port.
2. **Metering Output** - This is the invisible laser light source (1550 nm) output port.
3. **Display Screen** - The display screen is used to show the cable length and fault location.
4. **Power** - This button is used to turn the instrument on and off.
5. **VFL** - This button is used to turn the visible light source on and off.
6. **Up/+** - This button is used to scroll upward through the list of event measurement numbers.
7. **Measure** - This button is used to start the metering measurement using the invisible laser light source.
8. **Down/-** - This button is used to scroll downward through the list of event measurement numbers.

Rear Panel


1
2
3
4
AVOID EXPOSURE
CAUTION
LASER RADIATION - DO NOT STARE INTO BEAM
RATED POWER:1mW
WAVELENGTH:650nm
CLASS II LASER PRODUCT
II
<1mW
650nm
TFS-1020
Battery: 2X1.5V (AA)
CE
XFTP
TRILITHIC
S/N:0001

1. **Warnings** - Read and understand these warnings before using the instrument.
2. **Model Name & Battery Type** - This field displays the model number and battery type.
3. **Serial Number** - This field displays the serial number of the instrument.
4. **Battery Access Cover** - Remove this cover to access the batteries for replacement.

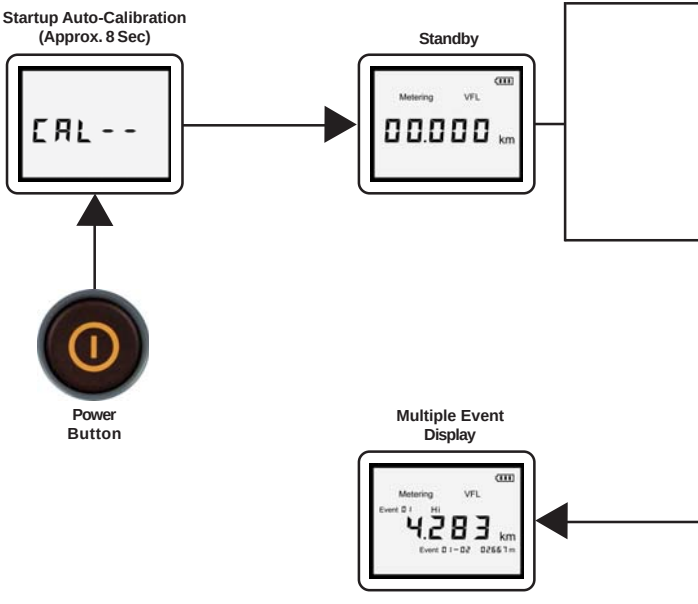
Display Screen

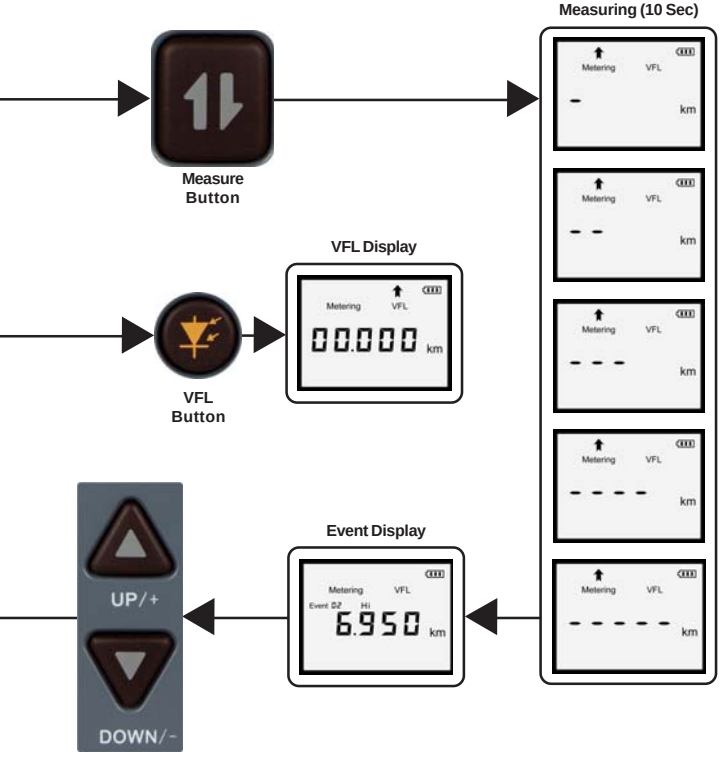


1. **Metering Output Indicator** - The indicator arrow will be displayed when the Metering Output is active.
2. **VFL Output Indicator** - The indicator arrow will be displayed when the VFL Output is active.
3. **Battery Power Indicator** - This field displays the battery power level.
4. **Event Number** - This field displays the currently selected event number from 01 to 05.
5. **Measured Distance Value** - This field displays the distance to the currently selected event.

6. **Event Distance Number** - This field displays the first and second event numbers that are selected and that correspond to the measured distance value as shown in the Distance Between Events field.
7. **Hi/Lo Accuracy** - This field displays whether there is a reflective signal received (Hi) or no reflective signal received (Lo).
8. **Distance Units** - This field displays the measured distance value in kilometers (km).
9. **Distance Between Events** - This field displays the distance in meters (m) between the two events indicated by the Event Distance Numbers.
10. **Alarm 01** - This field is displayed for alarm 01.
11. **Alarm 02** - This field is displayed for alarm 02.
12. **Alarm ##** - This field is displayed for alarms 03 through 09.

Operation Diagram




Measuring (10 Sec)
Measure
Button
VFL Display
VFL
Button
Event Display
UP/+
DOWN/-
Metering
VFL
km
00.000
Event 02 Hi
6.950

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Auto Power-Off Feature

The Auto Power-Off feature of the instrument will automatically power-off the instrument three (3) minutes after the last button has been pressed. Also, user's can turn the instrument off manually by pressing the **Power** button.

Visible Fault Locator (VFL)

The TFS-1020 Optical Fault Finder includes a Visible Fault Locator (VFL) function that emits a high-power 650 nm (red light) from the **VFL Output.** This visible light is transmitted through a connected fiber optic cable up to 5 km from the source. This allows the user to trace individual fiber optic cables or locate breaks and leaks inside of patch panels, fiber distribution boxes or pigtails within a splicing tray.

Perform the following steps to start a visible light measurement:

1. Select a suitable patch cord for testing that matches the system connector interface.
2. Press the **Power** button to turn the instrument on.
3. The TFS-1020 will run an auto-calibration routine on startup typically lasting around eight (8) seconds, depending on the current environmental conditions.

NOTE

The VFL Output of the TFS-1020 uses a Universal Connector Interface (UCI) style optical connector with a 2.5 mm ferrule.

4. When the self-calibration routine is complete, two (2) short BEEP tones will indicate that the instrument is powered on and ready to use.
5. Connect one end of the patch cable to the **VFL Output** on the TFS-1020 and then connect the other end to the cable to be tested.

6. Press the **VFL** button to enable the visible light source. The **VFL Output Indicator** arrow will turn on.
7. Inspect the connected fiber optic cable for locations of possible light leakage. Any breaks or open connections (end of fiber) will be indicated by the red light that is emitted from the **VFL Output**.
8. After you have finished, press the **VFL** button to disable the **VFL Output**. The **VFL Output Indicator** arrow will turn off.

Metering Operation

The TFS-1020 Optical Fault Finder uses Optical Time Domain Reflectometer technology to send and receive a reflective signal to determine the length of a fiber optic cable or the distance to faults within in a fiber optic cable. The instrument uses the **Metering Output** to emit a 1550 nm invisible laser light up to 30 km from the source. This signal travels through the connected cable and is reflected back to the instrument at the location of fiber faults or from the end of the cable.

The instrument will display up to five faults and indicate the distance in km to each fault as well as the distance between faults.

Perform the following steps to start a metering measurement:

1. Select a suitable patch cord for testing that matches the system connector interface.
2. Press the **Power** button to turn the instrument on.
3. The TFS-1020 will run an auto-calibration routine on startup typically lasting around eight (8) seconds, depending on the current environmental conditions.

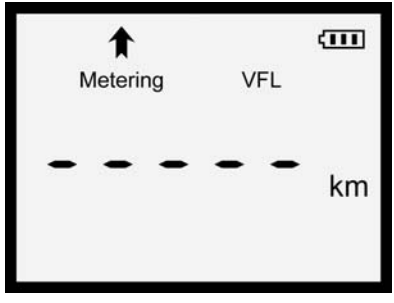
NOTE

The Metering Output of the TFS-1020 uses an FC style optical connector with a 2.5 mm ferrule.

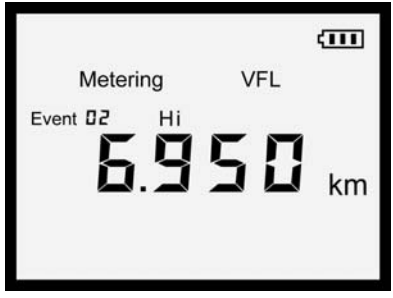
4. When the self-calibration routine is complete, two (2) short BEEP tones will indicate that the instrument is powered on and ready to use.

5. Connect one end of the patch cable to the **Metering Output** on the TFS-1020 and then connect the other end to the cable to be tested.

6. Press the **Measure** button to enable the **Metering Output**. The **Metering Output Indicator** arrow will turn on and the display will show a series of dashes on the screen to indicate the progress of the measurement.



7. Once the metering has finished, the instrument will display the **Event Number** and Measured Distance Value as well as **Hi/Lo** to indicate measurement tolerance.



Measurement Tolerance

The measurement tolerance is represented by the **Hi/Lo** indicator above the **Measured Distance Value**. Each indicator will be displayed based on the following conditions:

- **Hi** - This indicates that a reflective signal was received by the instrument. The system setting for high tolerance is 10 m.
- **Lo** - This indicates that a reflective signal was not received by the instrument. The system setting for low tolerance is 200 m.

Viewing Multiple Events

To view multiple events, press the **Up/+** or **Down/-** buttons. Up to five faults can be viewed for each fiber optic cable.

Take note of the following items when viewing multiple events:

- The highest event number always indicates the opposite end of the cable or a break in the cable.
- The **Event Number** indicates faults at increasing distances from the instrument.
- The **Measured Distance Value** provides a distance measurement from the instrument to the selected **Event Number**.
- The **Event Distance Number** shows the current and next **Event Number** with the **Distance Between Events** in meters displayed directly to the right.

Alarm Conditions

The TFS-1020 Optical Fault Finder includes both audible and visual Alarms to indicate the following conditions:

Sound	Display	Condition & Troubleshooting
1 Short BEEP	N/A	Power Off
2 Short BEEPs	N/A	Power On - After the Self-Calibration Routine is Complete
1 Long BEEP	Alarm 01	**Spurious Signal Judgment** - Press the Down button to find the correct distance.
2 Long BEEPs	Alarm 02	**Loose or Dirty Optical Connection** – Check or clean the optical connector. **Improper Optical Adapter** – Check, clean or replace the adapter.
N/A	No Display at Startup	**Patch Cable Connected on Startup** – Disconnect one end of the patch cable and restart the unit by pressing the **Power** button. **Initialization Error** – Restart the unit by pressing the **Power** button.
N/A	Unit only displays 0 km	**Measurement < 20 Meters** – Less than 20 meters measured if all connections are perfect. **Signal Inside Measured Cable** – There is an active signal inside the measured fiber optic cable, disconnect the unit and turn off signal before reconnecting the cable to the unit.
Consecutive Long BEEP	Battery Indicator Flashes	**Low Battery Warning** – Replace the battery.

Unit Conversion Table

The TFS-1020 Optical Fault Finder provides measurements in km (kilometers) and m (meter) for distance between faults, see the following table for conversion from these units to inches, feet, yards, and miles:

Meter	Km	Inch	Feet	Yard	Mile
1	0.001	39.37	3.28	1.093	0.00062
1000	1	39370	3260.8	1093.61	0.62137
0.0254	0.00003	1	0.0833	0.02778	0.00002
0.3048	0.00031	12	1	0.33333	0.00019
0.9914	0.00091	36	3	1	0.00057
1609.35	1.60935	63360	5280	1760	1

Specifications

Invisible Light Source

Connector:	FC/PC
Emitter:	FP Laser Diode
Wavelength:	1550 nm
Fiber Mode:	G652
Max Measurable Distance:	Up to 30 km
Dead Zone:	20 m
Operating Time:	> 1000 times @ 25°C

Visible Light Source

Connector:	Universal
Emitter:	Visible Light
Wavelength:	650 nm
Fiber Mode:	G651, G652, ANSI/FDDI
Max Measurable Distance:	Up to 5 km
Dead Zone:	0 m
Operating Time:	> 10 hours

Measurement

Measurement Time:	< 10 seconds
Precision:	±10 m (High), ±200 m (Low)
Resolution:	0.001 km
Display Units:	km

Physical

Battery:	Two (2) “AA” Alkaline Batteries
Auto-Shutoff:	3 minutes
Operating Temperature:	32 to 104 °F (0 to +40 °C)
Storage Temperature:	-40 to 158 °F (-40 to +70 °C)
Humidity:	0% to 95%, non-condensing
Dimensions:	6.18 x 3.39 x 1.57 inch (157 x 86 x 40 mm)
Weight:	1.06 lb (480 grams)

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 two (2) years 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 of 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.