User Manual

Tektronix

TOP 130, 140, 150, 160, 200, 300
Fiber Optic Instruments

070-9372-01
User Manual

Tektronix

TOP 130, 140, 150, 160, 200, 300
Fiber Optic Instruments

070-9372-01

First Edition: July 1996
Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B010000 Tektronix, Inc., Beaverton, Oregon, USA
E200000 Tektronix United Kingdom, Ltd., London
J300000 Sony/Tektronix, Japan
H700000 Tektronix Holland, NV, Heereneen, The Netherlands

Tektronix, Inc., PO. Box 500, Beaverton, OR 97077
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FCC Class A Device

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Changes or modification not expressly approved by Tektronix can affect emission compliance, and could void the user's authority to operate this equipment.

Tektronix, Inc.
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FAX: (503) 690-3926 (worldwide)
EC Declaration of Conformity

We, Tektronix Holland N.V.
Marktweg
8444 AB Heerenveen
The Netherlands

declare under the sole responsibility that the

Tektronix TOP130, TOP140, TOP150, TOP160
Optical Light Sources
TOP200 Optical Power Meter
TOP300 Visual Fault Finder

meet the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the official Journal of the European Communities:

EN 50081-1 Emissions:

EN 55022 Radiated, Class B
EN 55022 Conducted, Class B
EN 60555-2 Power Harmonics

EN 50082-1 Immunity:

IEC 801-2 Electrostatic Discharge
IEC 801-3 RF Radiated
IEC 801-4 Fast Transients
IEC 801-5 Surge
WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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# Table of Contents

**Safety Terms in This Manual**
- Laser Safety ........................................ iii
- Specific Precautions ................................. iv

**Specifications**
- Optical Dual LED Source ............................ v
- Optical Laser Sources ................................. vi
- Optical Dual Laser Source ............................ vii
- Optical Power Meter ................................ viii
- Visual Fault Finder ................................... ix

**Section 1 General Information**
- 1.1 Overview ......................................... 1
- 1.1.1 The TOP Series Optical Dual LED Source .... 1
- 1.1.2 The TOP Series Optical Laser Sources ....... 2
- 1.1.3 The TOP Series Optical Power Meters ....... 3
- 1.1.4 The TOP Series Visual Fault Finders ....... 4
- 1.2 Scope of This Manual ............................. 5
- 1.3 Unpacking and Inspection ......................... 6
- 1.4 Accessories and Adapters ....................... 7

**Section 2 Basic Operation**
- 2.1 Introduction ...................................... 9
- 2.2 Battery Installation or Replacement ............ 9
- 2.3 Interchanging the Connector Adapters .......... 11
- 2.4 Cleaning the Connector Interfaces .............. 12
- 2.5 Cleaning the Connector Adapters ............... 13
- 2.6 Cleaning Connectors ............................. 14

**Section 3 Instrument Operation**
- 3.1 TOP130 Optical Dual LED Source ............... 15
- 3.2 TOP140/150 Optical Laser Sources .............. 17
- 3.3 TOP160 Optical Laser Source ................... 18
- 3.4 TOP200 Optical Power Meter ................... 19
- 3.5 TOP300 Visual Fault Finder ..................... 22

**Section 4 Applications**
- 4.1 Connector Insertion Loss ....................... 24
- 4.2 Link Loss Testing ............................... 26
- 4.3 Visually Locating a Break within a Fiber .... 29
- 4.4 Visually Locating a Defective Connector ...... 30
- 4.5 Visually Identifying Breaks within Ferrules and Polishing Problems .................. 31
- 4.6 Dual Wavelength SM Testing with TOP160/TOP200 .......... 32

**Section 5 Factory Service and Calibration**
- 5.1 Introduction ................................... 34
- 5.2 Obtaining Service ............................... 34
- 5.3 Recommended Calibration Interval ............. 34
List of Figures

1.1 Connector Identification Chart ................. 8
2.1 Removing the Protective Cover ................. 10
2.2 Opening the Battery Compartment ............. 10
2.3 Interchanging the UCI Connector Adapter ...... 11
2.4 Interchanging the SOC Connector Adapter ...... 11
2.5 Cleaning the Connector Interfaces ............. 12
2.6 Cleaning the Connector Adapters .............. 13
2.7 Cleaning Connectors ........................... 14

3.1 TOP130 Controls and Indicators .............. 15
3.2 Changing the Modulation Frequency
of the TOP130/140/150 Sources .................. 16
3.3 TOP140/150 Controls and Indicators ........... 17
3.4 TOP160 Controls and Indicators .............. 18
3.5 TOP200 Controls and Indicators .............. 20
3.6 Location of the CAL/OP Switch of the
TOP200 Power Meter ............................ 21
3.7 TOP300 Controls and Indicators .............. 22

4.1 Initial Setup .................................. 24
4.2 Establishing a Reference Measurement ...... 25
4.3 Measuring the Insertion Loss of
Connector/Cable .................................. 25
4.4 Checking the Local Test Set(s) ................. 26
4.5 Forward Link Connection ....................... 27
4.6 Reverse Link Connection ....................... 28
4.7 Locating a Fiber Break ......................... 29
4.8 Locating a Defective Connector ............... 30
4.9 Locating Fiber Break in a Ferrule ............ 31
4.10 Identifying a Bad Polish ...................... 31
4.11 Dual Wavelength Initial Setup ............... 32
4.12 Measuring the Insertion Loss of
Connector/Cable .................................. 33

List of Tables

1.1 Connector Adapter Selection Chart ............ 7
4.1 Source Selection Guide ........................ 23
4.2 Source Output Guide .......................... 27
Safety Terms in this Manual

The WARNING heading in this manual explains dangers that could result in personal injury or death.

The CAUTION heading in this manual explains hazards that could damage these instruments.

In addition, a NOTES heading gives information to the user that may be beneficial in the use of these instruments.

General Warnings and Cautions

The following general warnings and cautions are applicable to these instruments:

**LASER SAFETY**

The TOP140, 150, 160, and 300 are laser devices conforming to the requirements of CDRH, CFR 1040, Subchapter J. While there is no potential for eye damage due to unaided direct exposure, users should always avoid looking directly into the Output Port. The use of optical viewing instruments (such as microscopes, magnifiers, etc.) should always be avoided. The use of these devices around active fibers can focus a highly intense beam on to the retina which can result in permanent eye damage.

**TOP140 / TOP150 / TOP160**

![CAUTION](image)

**TOP300**

![CAUTION](image)
Specific Precautions

**Power Sources.** The TOP series is designed to operate from two AA alkaline batteries. Note proper orientation of batteries before turning the instrument on.

**Battery Power.** Do not expose battery to fire or intense heat, nor open or mutilate the battery. Avoid contact with electrolyte which is corrosive and may damage eyes, skin and clothing. Check with local codes for disposal instructions.

**External Power.** Any external power adapter is not recommended for the TOP series.

**Laser Radiation.** When making measurements on optical systems, avoid eye exposure to any open-ended fibers, optical connectors, optical interfaces or other sources, because they may be connected to laser transmitters.

• Do not look into the optical port when a source is turned on.

• Keep the dust cap on the optical port when not in use.

• Avoid looking at the free end of a test fiber (the end not connected to the instrument). If possible, direct the free end toward a non-reflective surface.

**Do Not Operate in Explosive Atmospheres.** Do not operate the TOP series in an explosive atmosphere unless it has been specifically certified for such operation.

**Do Not Remove Covers or Panels.** Do not remove the instrument covers or panels, nor operate without covers and panels in place.

**Repair.** Refer all repair problems to qualified service personnel.
# Specifications:
*Optical Dual LED Sources*

<table>
<thead>
<tr>
<th>Model Number</th>
<th>TOP130</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Center Wavelength</strong></td>
<td>850nm</td>
</tr>
<tr>
<td>(nominal)</td>
<td></td>
</tr>
<tr>
<td><strong>Wavelength Range</strong></td>
<td>830-870nm</td>
</tr>
<tr>
<td>(nominal)</td>
<td></td>
</tr>
<tr>
<td><strong>Spectral Width (RMS)</strong></td>
<td>≤55nm</td>
</tr>
<tr>
<td><strong>Power Stability</strong></td>
<td>± 0.05dB</td>
</tr>
<tr>
<td>(1 hr max. deviation)</td>
<td></td>
</tr>
<tr>
<td><strong>Power Output</strong></td>
<td></td>
</tr>
<tr>
<td>Into 62.5/125 Gi MM fiber</td>
<td>-13dBm (50µW)</td>
</tr>
<tr>
<td>into 9/125 SM fiber</td>
<td>-38dBm (158nW)</td>
</tr>
<tr>
<td><strong>Power Output Uncertainty</strong></td>
<td>±1dB (Calibrated launch level into 62.5/125 Gi MM Fiber)</td>
</tr>
<tr>
<td><strong>Functions</strong></td>
<td>MOD (Modulated) output mode CW (Continuous Wave) DC output mode FREQ (Frequency) Selection switch accessible from battery compartment, setable to 270Hz, 1kHz or 2kHz</td>
</tr>
<tr>
<td><strong>Connector Interface</strong></td>
<td>Snap-On Connector Interface (SOC), see Table 1.1 for available SOC adapters</td>
</tr>
<tr>
<td><strong>Operating Environment</strong></td>
<td>-15°C to +55°C, 0-95% RH (non-condensing)</td>
</tr>
<tr>
<td><strong>Storage Environment</strong></td>
<td>-35°C to +70°C, 5% to 95% RH (non-condensing)</td>
</tr>
<tr>
<td><strong>Batteries</strong></td>
<td>Two AA size, alkaline (&gt;20hrs battery life)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>240g (8.4oz)</td>
</tr>
<tr>
<td><strong>Size (W x H x D)</strong></td>
<td>72 x 142 x 36mm (2.8 x 5.6 x 1.4in.)</td>
</tr>
</tbody>
</table>

**WARNING**

While there is no potential for eye damage due to unaided direct exposure, users should always avoid looking directly into the output port. The use of optical viewing instruments (such as microscopes, magnifiers, etc.) should always be avoided. The use of these devices around active fibers can focus a highly intense beam onto the retina which can result in permanent eye damage.
## Specifications:
### Optical Laser Sources

<table>
<thead>
<tr>
<th>Model Number</th>
<th>TOP140</th>
<th>TOP150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser Type</td>
<td>Fabry-Perot</td>
<td>Fabry-Perot</td>
</tr>
<tr>
<td>Center Wavelength (nominal)</td>
<td>1310nm</td>
<td>1550nm</td>
</tr>
<tr>
<td>Wavelength Range (nominal)</td>
<td>1280-1340nm</td>
<td>1520-1575nm</td>
</tr>
<tr>
<td>Spectral Width (RMS)</td>
<td>&lt;5nm</td>
<td>&lt;10nm</td>
</tr>
<tr>
<td>Power Stability (1 hr max. deviation)</td>
<td>± 0.03dB</td>
<td>± 0.03dB</td>
</tr>
<tr>
<td>Power Stability (24 hr max. deviation)</td>
<td>± 0.15dB</td>
<td>± 0.15dB</td>
</tr>
<tr>
<td>Power Output (CW mode only)</td>
<td>-7dBm (100μW) into SMF-28/9μm core fiber</td>
<td>-7dBm (100μW) into SMF-28/9μm core fiber</td>
</tr>
<tr>
<td>Power Output Uncertainty</td>
<td>± 0.5dB Calibrated launch into SMF-28/9μm core fiber</td>
<td>± 0.5dB Calibrated launch into SMF-28/9μm core fiber</td>
</tr>
<tr>
<td>Connector Interface</td>
<td>Universal Connector Interface (UCI), see Table 1.1 for available UCI adapters</td>
<td>Universal Connector Interface (UCI), see Table 1.1 for available UCI adapters</td>
</tr>
<tr>
<td>CDRH</td>
<td>Class I</td>
<td>Class I</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>-15°C to +55°C, 0-95% RH (non-condensing)</td>
<td>-15°C to +55°C, 0-95% RH (non-condensing)</td>
</tr>
<tr>
<td>Storage Environment</td>
<td>-35°C to +70°C, 0-95% RH (non-condensing)</td>
<td>-35°C to +70°C, 0-95% RH (non-condensing)</td>
</tr>
<tr>
<td>Batteries</td>
<td>Two AA size, alkaline (&gt;80hrs battery life)</td>
<td>Two AA size, alkaline (&gt;80hrs battery life)</td>
</tr>
<tr>
<td>Weight</td>
<td>230g (8.0oz)</td>
<td>230g (8.0oz)</td>
</tr>
<tr>
<td>Size (W x H x D)</td>
<td>72 x 142 x 36mm (2.8 x 5.6 x 1.4in.)</td>
<td>72 x 142 x 36mm (2.8 x 5.6 x 1.4in.)</td>
</tr>
</tbody>
</table>

*Specifications subject to change without notice.*

**Notes:**
1. Within specified ambient environment +20°C to +25°C
2. In MODulated mode, output power is 3dB lower.

### CAUTION

**LASER LIGHT - DO NOT STARE INTO BEAM**

**CLASS I LASER PRODUCT**

### WARNING

The TOP 140 and 150 are devices conforming to the requirements of CDRH Class I, CFR 1040 Subchapter J. While there is no potential for eye damage due to unaided direct exposure, users should always avoid looking directly into the output port. The use of optical viewing instruments (such as microscopes, magnifiers, etc.) should always be avoided. The use of these devices around active fibers can focus a highly intense beam onto the retina which can result in permanent eye damage.
### Specifications:

**Dual Optical Laser Source**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>TOP160</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Center Wavelength (nominal)</strong></td>
<td>1310nm</td>
</tr>
<tr>
<td><strong>Laser Type</strong></td>
<td>Fabry-Perot</td>
</tr>
<tr>
<td><strong>Wavelength Range (nominal)</strong></td>
<td>1280-1340nm</td>
</tr>
<tr>
<td><strong>Spectral Width (RMS)</strong></td>
<td>≤5nm</td>
</tr>
<tr>
<td><strong>Power Stability (^1,^3) (1 hr max. deviation)</strong></td>
<td>±0.05dB</td>
</tr>
<tr>
<td><strong>Power Stability (^2,^4) (24 hr max. deviation)</strong></td>
<td>±0.15dB</td>
</tr>
<tr>
<td><strong>Power Output (^1,^2,^3) (CW mode only)</strong></td>
<td>-7dBm (200μW) into SMF-28 / 9μm core fiber</td>
</tr>
<tr>
<td><strong>Power Output (^1,^2,^3) Uncertainty</strong></td>
<td>±0.75dB Calibrated launch into SMF-28/9μm core fiber</td>
</tr>
<tr>
<td><strong>Connector Interface</strong></td>
<td>Universal Connector Interface (UCI), see Table 1.1 for available UCI adapters</td>
</tr>
<tr>
<td><strong>CDRH</strong></td>
<td>Class I</td>
</tr>
<tr>
<td><strong>Operating Environment</strong></td>
<td>-15°C to +55°C, 0-95% RH (non-condensing)</td>
</tr>
<tr>
<td><strong>Storage Environment</strong></td>
<td>-30°C to +60°C, 0-95% RH (non-condensing)</td>
</tr>
<tr>
<td><strong>Batteries</strong></td>
<td>Two AA size, alkaline (&gt;50hrs battery life)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>230g (8.0oz)</td>
</tr>
<tr>
<td><strong>Size (W x H x D)</strong></td>
<td>72 x 142 x 36mm (2.8 x 5.6 x 1.4in.)</td>
</tr>
</tbody>
</table>

*Specifications subject to change without notice.*

**Notes:****
1. Within specified ambient environment+20°C to +25°C
2. In MODulated mode, output power is 3dB lower.
3. Return Loss to be > 30 dB

---

### CAUTION

Laser light—do not stare into beam
CLASS 1 LASER PRODUCT

---

### WARNING

The TOP 160 device conforms to the requirements of CDRH Class1, CFR 1040 Subchapter J. While there is no potential for eye damage due to unaided direct exposure, users should always avoid looking directly into the output port. The use of optical viewing instruments (such as microscopes, magnifiers, etc.) should always be avoided. The use of these devices around active fibers can focus a highly intense beam on to the retina which can result in permanent eye damage.
## Specifications:
### Optical Power Meter

<table>
<thead>
<tr>
<th>Model Number</th>
<th>TOP200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector Material</td>
<td>InGaAs</td>
</tr>
<tr>
<td>Calibration Wavelengths</td>
<td>850, 1300, 1550 nm</td>
</tr>
<tr>
<td>Power Range</td>
<td>+3 to -60 dBm</td>
</tr>
<tr>
<td>Absolute Accuracy</td>
<td>±0.25 dB at Calibration Conditions, Traceable to U.S. N.I.S.T. (Boulder, CO)</td>
</tr>
<tr>
<td>Display</td>
<td>LCD, simultaneously displays power to 0.01 dB, mode and wavelength range. Low battery &amp; calibration annunciators.</td>
</tr>
<tr>
<td>Calibration Data</td>
<td>Data stored in non-volatile memory</td>
</tr>
<tr>
<td>Connector Interface</td>
<td>Snap-On Connector Interface (SOC), see Table 1.1 for available SOC Adapters</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>-15°C to +55°C, 0% to 95% RH (non-condensing)</td>
</tr>
<tr>
<td>Storage Environment</td>
<td>-35°C to +70°C, 0% to 95% RH (non-condensing)</td>
</tr>
<tr>
<td>Batteries</td>
<td>Two AA size, alkaline (&gt;100hrs battery life)</td>
</tr>
<tr>
<td>Weight</td>
<td>250g (8.9oz)</td>
</tr>
<tr>
<td>Size (W x H x D)</td>
<td>72 x 142 x 36 mm (2.8 x 5.6 x 1.4 in.)</td>
</tr>
</tbody>
</table>

viii
### Specifications:
**Visual Fault Finder**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>TOP 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Wavelength (Mean FWHM)</td>
<td>635nm</td>
</tr>
<tr>
<td>Nominal</td>
<td>635nm</td>
</tr>
<tr>
<td>Range</td>
<td>615nm-660nm</td>
</tr>
<tr>
<td>Spectral Width (RMS)</td>
<td>&lt; 1.2nm</td>
</tr>
<tr>
<td>Stability</td>
<td>±0.15dB</td>
</tr>
<tr>
<td>1 hour max. deviation</td>
<td>±0.15dB</td>
</tr>
<tr>
<td>10 hours max. deviation</td>
<td>±0.25dB</td>
</tr>
<tr>
<td>Power Output</td>
<td>-5dBm (Class II)</td>
</tr>
<tr>
<td>SMF-28 Fiber</td>
<td></td>
</tr>
<tr>
<td>Connector Interface</td>
<td>Universal Connector Interface. See Table 1.1 for available UCI adapters.</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>-15°C to +40°C, 0-95%RH (non-condensing)</td>
</tr>
<tr>
<td>Storage Environment</td>
<td>-35°C to +70°C, 0-95%RH (non-condensing)</td>
</tr>
<tr>
<td>Batteries</td>
<td>Two AA alkaline batteries (&gt;20 hours battery life)</td>
</tr>
<tr>
<td>Weight</td>
<td>230g (7.6 oz)</td>
</tr>
<tr>
<td>Size (W x H x D)</td>
<td>72 x 142 x 36 mm (2.8 x 5.6 x 1.4in.)</td>
</tr>
</tbody>
</table>

---

**CAUTION**

**LASER LIGHT: DO NOT STARE INTO BEAM**

1 mW max at 630-670 nm

CLASS II LASER PRODUCT

---

**WARNING**

The TOP300 is a device conforming to the requirements of CDRH Class II, CFR 1040 Subchapter J. While there is no potential for eye damage due to unaided direct exposure, users should always avoid looking directly into the output port. The use of optical viewing instruments (such as microscopes, magnifiers, etc.) should always be avoided. The use of these devices around active fibers can focus a highly intense beam on to the retina which can result in permanent eye damage.
Section 1
General Information

Overview

1.1.1 The TOP Optical LED Source

The Tektronix TOP130 Dual-Wavelength (850/1300nm) Optical LED Source is a small, rugged handheld instrument for use in installing and testing attenuation of both singlemode and multimode fiber optic links, including telephony, datacom, CATV, FDDI and LAN applications. The instrument provides two calibrated outputs at 850nm and 1300nm to speed up transmission loss measurements. Providing both CW and MODulated outputs, the user can internally set the modulation frequency to match the frequency signatures (270/1000/2000Hz) required by fiber identifiers and signal tracers.

The palm-sized TOP130 provides the flexibility in a single unit to interface to all industry standard fiber-optic connectors with high throughput, repeatability and stability. This optical interface of this instrument features the precision snap-on connector (SOC) interface. A wide range of push-pull SOC adapters are available covering all popular industry-standard fiber-optic connectors (including FC, ST, SC, SMA, E2000, DIAMOND, etc.).

The TOP series LED source is powered by two common AA alkaline batteries which provide over 20 hours of portable life. The front panel Status LED blinks when the batteries are low. Together with the TOP200 optical power meter, the fiber optic technician possesses the smallest, high-performance fiber optic test set in its class.
Overview

1.1.2 The TOP Optical Laser Sources

The Tektronix TOP Series comprise a range of palm-sized, single and dual wavelength laser sources supporting the 1310nm and 1550nm windows. This series was developed in response to requests from the fiber optic industry for small, rugged light sources for use in installing, maintaining and researching singlemode SONET/SDH, CATV, ATM and other types of fiber optic links. The TOP140 (1310nm) and TOP150 (1550nm) were developed for applications requiring only a single wavelength source. Where loss measurements at both windows are required, the TOP160 also offers the added convenience of a single output port.

The optical interface of the TOP series optical laser sources is the high performance, universal connector interface (UCI). The UCI interface is ideally suited to the unique requirements of optical instrumentation whether in the most-demanding outside plant (OSP) or lab environment. First, being truly universal, the UCI interface is complemented by a full range of UCI screw-on/screw-off connector adapters supporting a broad range of industry-standard PC connector types (FC, SC, ST, D4, DIN, E2000 and more). Second, where cleaning connectors is an especially important and routine step in the optical fiber world, the UCI interface offers direct access for routine cleaning. Third, the durable tungsten carbide ferrule outperforms and outlasts traditional ceramic ferrule connectors.

In addition to the overall advantages of the UCI interface, the output signal performance is characterized by two useful features. One, the absolute output power is calibrated which can speed up transmission-loss measurements. The user can always be assured that the output level will be consistent every time the unit is powered on. Furthermore, this reproducibility is matched by the multiwavelength reference storage of the TOP200 optical power meter (see section 3.4 - TOP200 and section 4.6 - Dual Wavelength Testing). Two, using the user-selectable CW or MODulated function, the user can also internally set the MOD frequency to match the frequency signatures (270/1000/2000Hz) required by fiber identifiers and other types of optical signal tracers.

Together with the Tektronix TOP200 optical power meter, the fiber optic technician possesses the smallest and high performance test set in its class.
1.1.3 The TOP200 Optical Power Meter

The palm-sized Tektronix TOP 200 optical power meter covers an extensive range of optical fiber applications. It is engineered for field and lab personnel requiring a high-performance, cost-effective, compact and rugged optical power meter.

This power meter family incorporates the precision and repeatability of the snap-on connector interface (SOC) which interfaces to all industry standard fiber optic connectors via a complete line of simple, push-on/pull-off SOC adapters. The novel design of these power meters combines a state-of-the-art signal processor and microcomputer electronics to provide superb performance as well as simple and elegant operation. Only three controls are used: ON/OFF, dBm/dB and λ (wavelength).

The TOP200 optical power meter incorporates a state-of-the-art InGaAs photodiode for optimum IR wavelength performance. InGaAs detectors provide wide dynamic range and improved temperature stability as compared to the Ge detectors. The TOP200 also features non-volatile memory together with an internal CAL function allowing the user the option to recalibrate the instrument in his/her own lab. The power meters are powered by two common AA batteries which provide over 100 hours of operating life. The custom LCD provides simultaneous display of both wavelength and dBm/dB units as well as battery status. Together with the Tektronix TOP series sources, the fiber optic technician possesses the smallest and highest-performance fiber optic test set in its class.
1.1.4 The TOP Fiber-Optic Visual Fault Finder

The Tektronix TOP300 answers the request from the industry for a small, rugged and truly versatile visual fault finder (VFF) for use in the installation, maintenance and troubleshooting of fiber optic systems.

This palm-sized visual fault finder features both CW and MOD (blinking) output modes. The blinking mode is used for finding faults and breaks in any fiber. The blinking light enhances viewing contrast, light loss can easily be detected by the human eye. Steady CW light output may be used for measuring fiber loss in the visible 630nm wavelength region. The VFF may also serve as a substitute for HeNe gas laser applications.

The TOP300 employs a hermetically sealed laser diode coupled to the fiber interface. Two AA alkaline batteries power the unit for a minimum of 20 hours. Like the TOP140/150/160 optical laser sources, the TOP300 also features the precision universal connector interface (UCI) which interfaces to all standard fiber optic connectors via a complete line of simple, screw-on/screw-off UCI adapters.
1.2 Scope of this Manual

Please carefully read this instruction manual before using these instruments. Be especially careful to observe the warnings and cautions throughout this manual. If any operating instructions are not clear, contact Tektronix, Inc.

This instruction manual contains the necessary information for operation and maintenance of the Tektronix TOP series fiber optic instruments as well as information for troubleshooting and obtaining service if necessary.

This information is divided into the following sections:

Section 1 provides general information about this manual and about the power meters and sources. It contains general product descriptions and gives the options that are available.

Section 2 explains the basic operating procedures common to the TOP series instruments, including battery replacement, changing connector adapters, and cleaning the optical interface.

Section 3 describes how to operate the various TOP series fiber optic instruments.

Section 4 describes various applications of the TOP series fiber optic instruments, including component insertion loss, link loss, and visual fault finding.

Section 5 provides information about obtaining service.

Tektronix fiber optic instruments are carefully assembled, and inspected mechanically, electrically, and optically before shipment. Your instrument was shipped with an adapter, two AA batteries and this instruction manual. Upon receiving this instrument, check for any obvious signs of physical damage that might have occurred during shipment. Report any such damage to the shipping agent immediately. Retain the original packing materials in case reshipment becomes necessary.
1.3 Unpacking and Inspection

Unpacking
The TOP series instruments are shipped to you with the following equipment:

The TOP series instruments are shipped to you with the following equipment. The connector adapter type is as identified in Table 1.1.

TOP130 and 2x SOC Adapters
TOP140 and 1x UCI Adapter
TOP150 and 1x UCI Adapter
TOP160 and 1x UCI Adapter
TOP200 and 1x SOC Adapter
TOP300 and 1x UCI Adapter

Operator manual (070-9372-01)

AA alkaline battery, Qty. 2

If the contents of the shipping container are incomplete, contact your Tektronix representative.

If shipping resulted in damage to the TOP instrument, notify the carrier and your Tektronix representative.

Initial Inspection
This Tektronix TOP instrument was inspected mechanically, electrically and optically before shipment. If it fails to perform satisfactorily, contact your Tektronix representative immediately or in the U.S. and Canada telephone toll free 1-800-TEK-WIDE (835-9433).

If the TOP instrument must be returned to Tektronix for service:

1) Use the original carton, or equivalent with dimensions at least six inches greater than the unit to allow for cushioning.
2) Cover the instrument with polyethylene sheeting to protect its finish.
3) Cushion the instrument equally on all sides with packing material. Seal the carton with shipping tape or an industrial stapler.
4) Ship insured to:

Tektronix, Inc., CNA Division,  
Attn: Customer Service  
625 SE Salmon Ave. BLDG X7  
Redmond, OR 97756

Include name of your company, person to contact, telephone number, and description of problem.
### 1.4 Accessories and Adapters

The following adapters and accessories are available. Please contact your Tektronix representative if you cannot find the desired adapter or connector that matches it.

<table>
<thead>
<tr>
<th>Connector Types</th>
<th>TOP Order Option</th>
<th>SOC Series Adapters Used on: TOP130 LED Source TOP200 Power Meter</th>
<th>UCI Series Adapters Used on: TOP140 Laser Source TOP150 Laser Source TOP160 Laser Source TOP300 Visual Fault Finder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biconic</td>
<td>30</td>
<td>119-5166-00</td>
<td>119-4515-00</td>
</tr>
<tr>
<td>D4-PC</td>
<td>32</td>
<td>119-5167-00</td>
<td>119-4514-00</td>
</tr>
<tr>
<td>DIAMOND-2.5</td>
<td>37</td>
<td>119-5171-00</td>
<td>119-4556-00</td>
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<tr>
<td>DIAMOND-3.5</td>
<td>36</td>
<td>119-5172-00</td>
<td>119-4558-00</td>
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<tr>
<td>DIN-PC</td>
<td>35</td>
<td>119-5166-00</td>
<td>119-4546-00</td>
</tr>
<tr>
<td>DIN-APC/HRL-10</td>
<td>35</td>
<td>119-5166-00</td>
<td>—</td>
</tr>
<tr>
<td>E2000-PC</td>
<td>31</td>
<td>119-5165-00</td>
<td>119-4516-00</td>
</tr>
<tr>
<td>E2000-APC</td>
<td>31</td>
<td>119-5165-00</td>
<td>—</td>
</tr>
<tr>
<td>FC-PC</td>
<td>31</td>
<td>119-5146-00</td>
<td>119-4516-00</td>
</tr>
<tr>
<td>FC-APC</td>
<td>31</td>
<td>119-5146-00</td>
<td>—</td>
</tr>
<tr>
<td>SC-PC</td>
<td>38</td>
<td>119-5145-00</td>
<td>119-4518-00</td>
</tr>
<tr>
<td>SC-APC</td>
<td></td>
<td>119-5145-00</td>
<td>—</td>
</tr>
<tr>
<td>SMA 905/906</td>
<td>33</td>
<td>119-5169-00</td>
<td>119-4557-00</td>
</tr>
<tr>
<td>SMA-2.5</td>
<td>39</td>
<td>119-5170-00</td>
<td>119-4517-00</td>
</tr>
<tr>
<td>ST-PC</td>
<td>34</td>
<td>119-5144-00</td>
<td>119-4513-00</td>
</tr>
</tbody>
</table>

*Table 1.1 Connector Adapter Selection Chart*
<table>
<thead>
<tr>
<th>Connector Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biconic</td>
</tr>
<tr>
<td>D4-PC</td>
</tr>
<tr>
<td>DIAMOND-2.5</td>
</tr>
<tr>
<td>DIAMOND-3.5</td>
</tr>
<tr>
<td>DIN-PC, DIN-APC/HRL-10</td>
</tr>
<tr>
<td>E2000-PC, E2000-APC</td>
</tr>
<tr>
<td>FC-PC, FC-APC</td>
</tr>
<tr>
<td>SC-PC, SC-APC</td>
</tr>
<tr>
<td>SMA 905</td>
</tr>
<tr>
<td>SMA 905</td>
</tr>
<tr>
<td>SMA-2.5</td>
</tr>
<tr>
<td>ST-PC</td>
</tr>
</tbody>
</table>

*Figure 1.1 Connector Identification Chart*
Section 2
Basic Operation

2.1 Introduction

This section describes how to use the Tektronix TOP series optical power meters and sources. We suggest that you take the time to read this material carefully, so that you can take full advantage of the wide variety of applications for these instruments. If you are required to service and maintain these instruments, then please contact your Tektronix representative for technical assistance.

2.2 Battery Installation or Replacement

These instruments are designed to operate on two common 1.5V AA alkaline batteries. The units come with two batteries for installation by the customer. With long life alkaline batteries, your instrument will typically operate for more than 100 hours for the TOP200 optical power meter and more than 80 hours for the TOP140/150 optical laser sources. The typical operating life for carbon zinc batteries would be reduced by 30-40%.

For the optical power meters, LOW BATTERY status is indicated by a "B" annunciator appearing in the upper left-hand region of the LCD. When the "B" first appears, the operator has at least five hours before the batteries must be replaced.

For the sources, LOW BATTERY status is indicated when the front panel LED indicator is blinking. You may continue to operate the source until the front panel LED shuts off. However the optical output may not be stable while the battery discharges past this LOW BATTERY point.

To replace the battery, follow these steps:
Step 1
To replace the battery, remove the protective rubber jacket.

Fig 2.1 Removing the Protective Cover

Step 2
Turn the instrument on its front face and remove the battery cover by pressing on the center of the cover while pulling on its sides.

Fig 2.2 Opening the Battery Compartment

Step 3
Remove the used batteries and replace them with fresh new batteries. Observe the correct polarization as indicated in the bottom of the battery compartment. Failure to properly install the batteries in the correct orientation may cause damage to the instrument.
2.3 Interchanging the Connector Adapter

Your Tektronix TOP series instruments are equipped with either a SOC or UCI universal interface which allow the user to quickly adapt to all popular industry standard fiber optic connectors. Select the appropriate adapter and attach it to the front end of the instrument as follows:

**UCI Interface: TOP140/150/160/300 Sources**

Instructions:
1. Firmly press the adapter over the interface ferrule until it reaches the stop.
2. Rotate the adapter body until the anti-rotation pin engages.
3. Firmly tighten the knurled adapter shell.
4. To remove, simply unscrew the adapter.

![Fig 2.3 Interchanging the UCI Connector Adapter](image)

**SOC Interface: TOP130, TOP200**

Instructions:
1. Locate the anti-rotation key on the instrument's connector.
2. With the keyway properly aligned, slip the adapter over the interface until fully locked into place indicated by a "snap."
3. To remove, simply pull adapter off the instrument.

![Fig 2.4 Interchanging the SOC Connector Adapter](image)

Please refer to Section 1.4 for a list of available adapters. For additional information or other connector types contact Tektronix, Inc. or your local Tektronix representative.
2.4 Cleaning the Connector Interfaces

To ensure absolute measurement integrity, it is absolutely essential that the instrument interfaces be cleaned before each major use. **MOST IMPORTANTLY IT IS ABSOLUTELY CRITICAL THAT MATING CONNECTORS BE CLEANED EACH AND EVERY TIME BEFORE CONNECTING OR RECONNECTING TO ANYTHING - INSTRUMENT INPUTS/OUTPUTS, TRANSMISSION EQUIPMENT, PATCH PANELS, ETC.**

Without proper maintenance practices, fiber optic equipment and systems will fail to function properly. These performance degradations take many forms:

- Measurement errors
- Poor analog transmission quality, critical to CATV and microwave-on-fiber applications
- Digital bit error rates increase
- Coupled light power is reduced
- Receiver input power outside optimum operating range
- Dirty connectors may cause damage to their mated counterparts

Tektronix TOP series instruments are equipped with either a SOC or UCI universal interface which allow the user to quickly adapt to all popular industry standard fiber optic connectors.

**TO CLEAN INTERFACE:**

Remove the adapter as described in Section 2.3. Clean the exposed ferrule tip (UCI) or optical window (SOC) with a dry lint-free cloth (TEXWIPE TX404 or equivalent) per Figure 2.5. In severe cases you will need to use reagent-grade isopropyl alcohol (IPA). Finally, make sure that all residual alcohol is removed by wiping again with a fresh wipe.

![Fig 2.5 Cleaning the Connector Interface](image-url)
2.5 Cleaning the Connector Adapters

Both the UCI and SOC adapters should be inspected and cleaned on a routine basis.

TO CLEAN ADAPTER:
Using a clean lintless swab (RIFOCS #946 or equivalent), insert a swab into the thru-hole of the adapter.

![Diagram of cleaning a connector with a swab](image)

*Fig 2.6 Cleaning of the Adapter*

Clean exterior surfaces using a lintfree cloth (such as TEXWIPE wetted with reagent-grade isopropyl alcohol). Finally, make sure that all residual alcohol is removed by wipping again with a fresh wipe.
2.6 Cleaning Connectors

To achieve the desired performance from connectors, it is important that they be cleaned each and every time before connecting or reconnecting to anything—i.e. transmission equipment, test equipment, patch panels, other connectors, etc.

The conventional method of cleaning optical plug ferrule endfaces is worker-skill dependent, and generally requires use of expensive and difficult-to-transport consumables such as alcohol, solvents, wiping tissue and/or freon gas. However, the CLETOP All-In-One Connector Cleaner (RIFOCS 945 or equivalent, see Figure 2.7) replaces the conventional cleaning method and its easy-to-use operation produces consistent results in one self-contained unit. In addition, mating adapters (a.k.a. butt joint adapters or alignment sleeves) can be easily cleaned using the CLETOP stick-type cleaner previously described in Figure 2.6.

![Wipe connector across cleaning track as shown.]

Fig 2.7 Cleaning a Connector
Section 3
Instrument Operation

3.1 TOP130 Optical Dual LED Source

<table>
<thead>
<tr>
<th>WAVELENGTH SELECT</th>
<th>This switch determines which LED is active.</th>
</tr>
</thead>
<tbody>
<tr>
<td>850nm INDICATOR</td>
<td>This indicator is on when the 850nm LED is on.</td>
</tr>
<tr>
<td>1300nm INDICATOR</td>
<td>This indicator is on when the 1300nm LED is on.</td>
</tr>
<tr>
<td>OFF/CW/MOD</td>
<td>This switch turns the unit off or selects continuous (CW) or modulated (MOD) &quot;blink&quot; (~1Hz) mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ON and LOW BATTERY INDICATOR</th>
<th>This LED indicator is on when the unit is turned on. It will blink to indicate a low battery condition.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>FREQUENCY SELECT</th>
<th>This switch, located inside the battery compartment, sets the modulation frequency. (See Figure 3.2)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>OUTPUT CONNECTOR</th>
<th>This is the optical output connector interface. The TOP130 is equipped with a snap-on connector (SOC) interface. See Table 1.1 for a list of available adapters.</th>
</tr>
</thead>
</table>

Fig 3.1 TOP130 Controls and Indicators
NOTE:
These Source instruments are shipped with the modulation frequency switch set to 1kHz. To change this setting simply remove the two AA batteries and set the switch to the desired position (see Figure 3.2). Replace the batteries, battery cover, and protective instrument cover. To operate the instrument in the modulated mode, simply slide the main switch to the MOD position and the light will be square wave modulated. Note: The average power output will be 3dB less than the average power in CW mode.

Fig. 3.2 Changing the Modulation Frequency of the TOP130/140/150/160 Sources
3.2 TOP140/150 Optical Laser Sources

OFF/CW/MOD This switch turns the unit off or selects continuous (CW) or modulated (MOD) "blink" (~1Hz) mode.

ON and LOW BATTERY INDICATOR This LED indicator is on when the unit is turned on. It will blink to indicate a low battery condition.

FREQUENCY SELECT This switch, located inside the battery compartment, sets the modulation frequency. (See Figure 3.2)

OUTPUT CONNECTOR This is the optical output connector interface. The TOP140/150/160 laser sources are equipped with the universal connector interface (UCI). See Table 1.1 for a list of available UCI adapters.

Fig 3.3 TOP140/150 Controls and Indicators
3.3 TOP160 Dual Optical Laser Source

ON/OFF  This button turns the unit on or off. When the unit is first turned on, the 1310nm laser is automatically selected in CW mode.

WAVELENGTH SELECT  This button allows the user to toggle between the 1310nm and 1550nm lasers. Only one source can be on at a time.

MOD  This button toggles between CW (Continuous Wave or DC, MOD indicator is off) and MODulated modes (source output is modulated, MOD indicator is on). When the MODulation mode has been selected, the MODulation frequency is determined by the setting of the Modulation Frequency Switch (270/1000/2000Hz) accessible via the battery compartment. (See Figure 3.2)

1310/1550 INDICATOR  When lit, the corresponding LED indicates which laser is on. When either LED blinks continuously, this indicates a low battery condition. It is time to replace the internal batteries.

---

Fig 3.4 TOP160 Controls and Indicators
3.3 TOP200 Optical Power Meter

ON/OFF  This switch turns the unit on or off.

dBm/dB  This button controls these modes:
- Selects dBm units for absolute power measurements.
- Toggles between absolute dBm and relative dB readouts (without changing internal reference level) when momentarily pressed
- Selects new 0dB reference level when this button is held down for 2-3 seconds, and the little "r" annunciator appears in the lower righthand corner of theLCD display

NOTE
The TOP200 features multiwavelength reference storage. This means that the 0dB reference settings for both TOP130 Dual 850/1300nm LED Source and TOP160 Dual 1310/1550nm Laser Source can be stored in non-volatile memory. See Section 4.3 for specific application information for using the TOP160 and TOP200 together as an efficient, dual wavelength singlemode test system. Powering on/off, changing wavelengths or toggling between dBm/dB modes does not alter these stored values until a new 0dB reference value for a selected wavelength is established by deliberately holding down the [dBm/dB] button as described above.

WAVELENGTH  This button controls two modes:
SELECT  - Selects proper wavelength (and internal calibration factor) corresponding to optical input 850, 1300 or 1550nm.
- When held down at the desired wavelength, pushing the [dBm/dB] button sets the current wavelength as the new power-on default wavelength (stored in non-volatile memory)

NOTE
The TOP200 is shipped with the default/power-on wavelength set to 1300nm. This default/power-on wavelength can be changed to any other available wavelength as described above.
CAL/OP

This switch (see Figure 3.5), located inside the battery compartment, is used when recalibrating the meter. In normal use, this should always be set to the OP position. Consult Service Manual for detailed information about calibrating the TOP200.

INPUT CONNECTOR

This is the optical input connector. The TOP200 is equipped with the snap-on connector (SOC) interface. See Table 1.1 for a list of available SOC adapters.

---

**Fig 3.4 TOP200 Controls and Indicators**
CAUTION

CONSULT SERVICE MANUAL BEFORE USING THIS FUNCTION. FOR NORMAL OPERATION, THIS SWITCH SHOULD ALWAYS BE SET TO THE OP POSITION.

Fig 3.5 Location of the CAL/OP Switch of the TOP200 Power Meter. Switch is located behind tamper label.
3.5 TOP300 Visual Fault Finder

OFF/CW/MOD  This switch turns the unit off or selects continuous (CW) or modulated (MOD) "blink" (~1Hz) mode.

ON and LOW BATTERY INDICATOR  This LED indicator is on when the unit is turned on. It will blink to indicate a low battery condition.

OUTPUT CONNECTOR  This is the optical output connector. The TOP300 is equipped with the universal connector interface (UCI). See Table 1.1 for list of available UCI adapters.

![Fig 3.6 TOP300 Controls and Indicators](image_url)
Section 4
Applications

Fiber optic insertion-loss tests require a stable source and an accurate power meter. The Telecommunications Industries Association (TIA, Washington, D.C.) has developed a comprehensive library of industry approved fiber optic test procedures (FOTPs) and system level optical fiber systems-test procedures (OFSTPs). For a detailed description of various loss measurement methods, consult:

FOTP-34  INTERCONNECTION DEVICE INSERTION LOSS TEST

FOTP-171  ATTENUATION BY SUBSTITUTION MEASUREMENT - FOR SHORT LENGTH MULTIMODE GRADED INDEX AND SINGLE-MODE OPTICAL FIBER ASSEMBLIES

OFSTP-2  OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER CABLE PLANT

OFSTP-7  OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED SINGLE-MODE FIBER CABLE PLANT

These and other FOTPs/OFSTPs can be ordered through Global Engineering Documents (Englewood, CO, USA, Tel: 303/792-2181, Fax: 303/397-7835, credit card orders accepted).

The Tektronix TOP series fiber optic sources serve as precision light sources to provide accurate loss measurements for any fiber optic installation. Except for very special applications, it is recommended the proper source be selected as follows:

Table 4.1 Source Selection Guide

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Fiber Type/Size</th>
<th>Use this TEKTRONIX Source Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>635nm (Red Laser)</td>
<td>SM or MM (Visual Troubleshooting)</td>
<td>TOP300</td>
</tr>
<tr>
<td>850nm</td>
<td>Multimode 62.5/125</td>
<td>TOP130</td>
</tr>
<tr>
<td>1300nm</td>
<td>Multimode 62.5/125</td>
<td>TOP130</td>
</tr>
<tr>
<td>1310nm</td>
<td>Singlemode</td>
<td>TOP140</td>
</tr>
<tr>
<td>1310/1550</td>
<td>Singlemode</td>
<td>TOP160</td>
</tr>
<tr>
<td>1550nm</td>
<td>Singlemode or Dispersion Shifted</td>
<td>TOP150</td>
</tr>
</tbody>
</table>
4.1 Connector Insertion Loss

To measure the insertion loss of a connector (re: FOTP 34, Method A), follow the procedure described below:

A) Connect the TOP source to the TOP power meter using a suitable reference cable, with a length of about 6-10 feet (2-3 meters) per Figure 4.1

![Fig 4.1 Initial Setup]

B) Switch the source to continuous (CW) light output and the power meter to the appropriate wavelength (using button) and dBm units. Note the dBm output of the reference cable should be within acceptable limits.
C) To store this reference level, press the [dBm/dB] button (for about 2-3 seconds until the little "r" annunciator appears on the LCD display) and the display reads 0.00dB. See Figure 4.2

![Diagram of source and power meter with instructions to set 0 dB reference.]

Fig 4.2 Establishing a Reference Measurement

D) Disconnect the cable end from the power meter and insert the cable to be tested using a mating adapter. The power meter now reads the connector/cable loss in dB. The example of Figure 4.3 displays a connector loss of 0.15dB.

![Diagram of source and power meter with connector loss measurement.]

Fig 4.3 Measuring the Insertion Loss of a Connector/Cable
4.2 Link Loss Testing

Now assume that we want to measure the attenuation of a SM or MM link which is so long that we cannot access both ends from a single location. To measure the loss of a fiber optic link (re:OFSTP-2 or OFSTP-7, Method A), follow the procedure described below:

A) If a complete test set (source and power meter) is available at each end, it is advisable to test the output power of the TOP series sources and the condition of the test jumpers. Connect the local source and power meter together with a test jumper per Figure 4.4. The source should be set to continuous (CW) output mode and the power meter set to the correct wavelength and dBm display units. Note the $P_1$ and $P_2$ dBm readings. For example, a TOP140 laser source should read between -9.5 and -10.5 dBm on the power meter.

![Fig 4.4 Checking the Local Test Set(s)](image)
B) Connect the TOP laser source and power meter to their respective patch panel ports using the test jumpers per Figure 4.5.

Fig 4.5 Forward Link Connection

C) Using the formula below, take the dBm power reading of the power meter (P3) and the nominal source output value shown in Table 4.2 corresponding to the TOP source model. For example, if the power meter reads -18dBm then (for a TOP140 or TOP150 laser source) the FORWARD link loss [-10 - (-18)] is calculated to be 8dB.

\[
\text{FORWARD LOSS (dB)} = P_1 - P_3
\]

<table>
<thead>
<tr>
<th>TEKTRONIX Source Model</th>
<th>Wavelength</th>
<th>Calibrated Output Source Value (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOP130</td>
<td>850nm</td>
<td>-13dBm +1dB</td>
</tr>
<tr>
<td></td>
<td>MM 62.5/125</td>
<td></td>
</tr>
<tr>
<td>TOP130</td>
<td>1300nm</td>
<td>-20dBm +1dB</td>
</tr>
<tr>
<td></td>
<td>MM 62.5/125</td>
<td></td>
</tr>
<tr>
<td>TOP140</td>
<td>1310nm</td>
<td>-10dBm +0.5dB</td>
</tr>
<tr>
<td></td>
<td>Singlemode</td>
<td></td>
</tr>
<tr>
<td>TOP150</td>
<td>1550nm</td>
<td>-10dBm +0.5dB</td>
</tr>
<tr>
<td></td>
<td>Singlemode</td>
<td></td>
</tr>
<tr>
<td>TOP160</td>
<td>1310/1550nm</td>
<td>-7dBm +0.5dB</td>
</tr>
<tr>
<td></td>
<td>Singlemode</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.2 Source Output Guide
D) It is advisable to measure losses in both directions. Reverse the source and power meter connections (see Figure 4.6). Calculate the reverse loss using the formula below:

\[
\text{REVERSE LOSS (dB)} = P_2 - P_4
\]

---

**Fig 4.6 Reverse Link Connection**

E) Report both forward and reverse loss values.
4.3 Visually Locating a Break Within a Fiber

The TOP300 injects visible light into a fiber. The visible light escapes the fiber wherever the continuity is interrupted. A break will always generate a highly visible output. If the fiber is only under stress a smaller effect may be produced. In general however, if you see any light escaping the fiber you can be sure that there is a problem which must be repaired.

![Diagram of TOP300 locating a fiber break]

*Fig 4.7 Locating a Fiber Break*

The light in jacketed fiber is heavily attenuated; sometimes it is necessary to darken the room to see better where the light is escaping the fiber.

---

**CAUTION**

TO AVOID ANY POTENTIAL INJURY TO THE EYE
DO NOT LOOK CLOSER THAN 30CM
FROM THE OUTPUT PORT
4.4 Visually Locating a Defective Connector

Fiber breakage often occurs close to a connector or within a connector. Verifying such a fault with confidence is not always easy. Here are some helpful hints on how such problems can be pinpointed exactly. If you inject light into a fiber but can see neither the light coming out at the far end nor is there any visible light loss along the fiber, then a break at exactly the launch end is the likely cause. To verify this do the following:

Reverse the setup and launch from the far end. Most likely you will now see more light escaping at the broken end.

![Diagram](Image)

*Fig 4.8 Locating a Defective Connector*

If the connector does not show any anomaly then start introducing microbends with your finger until you can see the light escaping. Keep introducing microbends while moving to the far end of the fiber until you no longer can see light escaping. If the light is visible just before the connector then you can be sure that the far end connector is broken. Look at the near end of the connector, if excessive light is visible, this is a sure sign of a problem within the connector interface.
4.5 Visually Identifying Breaks within Ferrules and Polishing Problems

The TOP300 can also be used to pinpoint problems caused by bad connectors.

Ceramic ferrules are translucent and if there is a fiber break within the ferrule or right after the ferrule, then the ferrule itself will glow, indicating a broken or damaged fiber. If the connector "glows" then it is definitely a bad connector.

![Fiber Broken Within Ferrule](image)

*Fig 4.9 Locating Fiber Break in a Ferrule*

Similarly, if the endface polish of the fiber is not good then light is being reflected and this light will be visible through the ceramic ferrule.

![Cracked Fiber and/or Bad Polish](image)

*Fig 4.10 Identifying a Bad Polish*
4.6 Dual Wavelength Singlemode Loss Measurements with the TOP160/TOP200

The TOP160 Dual Laser Source is used to measure the attenuation of a singlemode fiber link. Dual wavelength testing at both 1310nm and 1550nm may be required under the following conditions:

1) Telephony systems now operating in the 1310nm window are likely to be upgraded for operation at 1550nm in the future. Consequently, it is important to validate the newly installed link at both 1310nm and 1550nm now to be sure that all specifications are met and can be met in the future. Unless measured and verified at time of installation, unexpected fiber attenuation and excess bend losses might render the link useless for later commissioning at 1550nm. While fiber attenuation decreases at longer wavelengths, microbend and macrobend losses increase at higher wavelengths (1550nm vs 1310nm).

2) The telecommunication system is operating in both the 1310nm and 1550nm windows. Therefore, dual wavelength acceptance testing is required to be performed at this time.

The following test procedure complies with TIA/EIA-526-7 (OFSTP-7, Method A), Attenuation of Installed Singlemode Fiber Link.

A) Connect the TOP160 Dual Source to the TOP200 Optical Power Meter via a suitable REFERENCE cable (minimum 3m long). Turn on both instruments and set wavelength to 1310nm, and 1300 respectively. Expected reading on TOP200 is -6.25dBm to -7.75dBm.

![Fig 4.11 Dual Wavelength Initial Setup](image-url)
B) Press the [dBm/dB] button of the TOP200 until the small “r” annunciator appears and the display reads 0.00dB.

C) Set both TOP160 and TOP200 to 1550nm. Expected reading on TOP160 is -6.25dBm to -7.75dBm.

D) Press the [dBm/dB] button of the TOP200 until the small “r” annunciator appears and the display reads 0.00dB.

E) Connect both TOP160 and TOP200 to opposite ends of the link under test. Use suitable REFERENCE cable for connecting either instrument to the patch panel.

F) With the TOP160 set to 1310nm and the TOP200 set to 1300nm, record the dB reading from TOP200 OPM. This is the link loss at 1310nm.

G) With both the TOP160 and TOP200 set to 1550nm, record the dB reading from the TOP200 OPM. This is the link loss at 1550nm. Go to the next fiber and repeat from Step A.

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**Fig 4.12 Measuring the Insertion Loss of a Connector/Cable**
Section 5
Factory Service and Calibration

5.1 Introduction

This section contains information regarding obtaining factory service and calibration for the TOP series of handheld optical products. The user should not attempt any maintenance or service of these instruments and/or accessories beyond the procedures given in this instruction manual. Any problems which cannot be resolved using the guidelines listed there should be referred to Tektronix factory service personnel. Contact Tektronix, Inc. or your Tektronix representative for assistance.

The Tektronix TOP series optical instruments contain no user-serviceable parts. They are delivered in a permanently sealed condition.

5.2 Obtaining Service

To obtain information concerning factory service, contact Tektronix, Inc., or your Tektronix representative. Please have the following information available:

1. Instrument model number  
2. Instrument serial number  
3. Description of the problem

5.3 Recommended Calibration Interval

It is recommended that the TOP series instruments be recertified/recalibrated every 12 months. This provides the basis for an effective quality assurance/standards program. This service is available for Tektronix products at a nominal charge.