User Guide

XTM-50

Optical Tunable Filter

www.EXFO.com

EXFO

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Units of measurement in this publication conform to SI standards and practices.

Patents

The exhaustive list of patents is available at www.EXFO.com/patent.

Version number: 3.0.0.1

Information in this document applies to the XTM-50 version B.

Contents

1 Introducing the XTM-50

The XTM-50 is a reliable optical tunable filter that features wavelength and bandwidth tuning. The large wavelength range, the narrow FWHM and the flat-top shape ensure a clean extraction of the optical signal. It is designed for closely-spaced channel selection and extraction in DWDM applications.

The XTM-50 is based on the use of a reflection diffraction grating mounted in a Littman-Metcalf configuration.

When an optical signal is detected at the XTM-50 input port, the input wave is directed towards the output port after passing through the XTM-50 monochromator.

Technical Specifications

The following table lists the technical specifications of the XTM-50 models.

IMPORTANT

The following technical specifications can change without notice. The information presented in this section is provided as a reference only. To obtain this product's most recent technical specifications, visit the EXFO Web site at *www.exfo.com*.

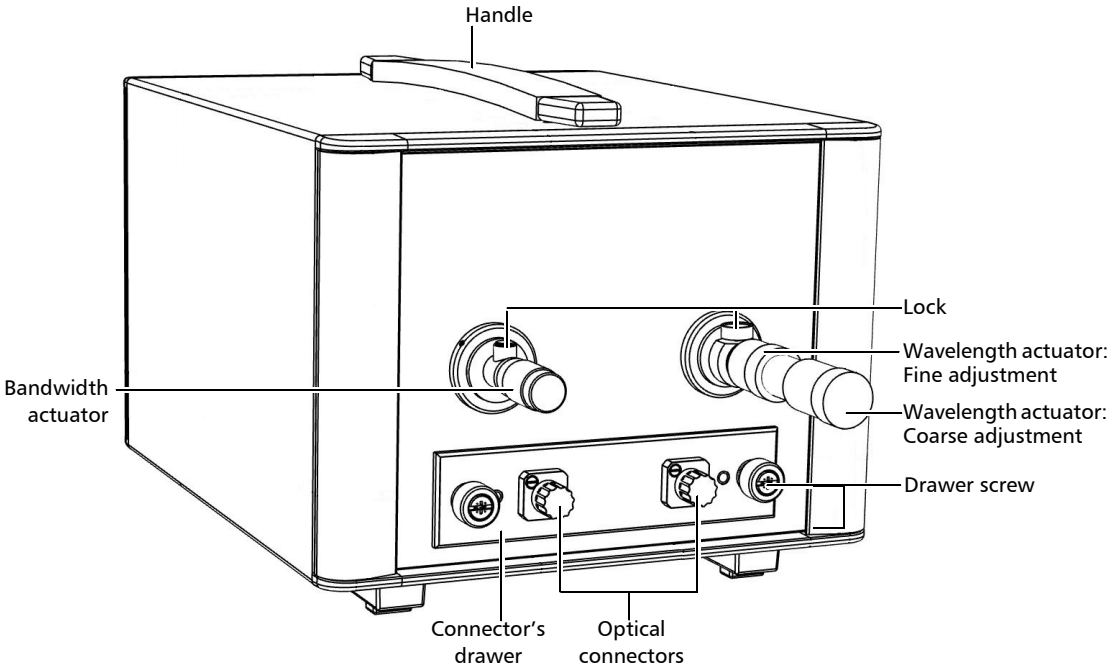
All optical specifications apply at constant temperature.

	Standard	Ultrafine	O-band[a]	Wide
Optical specifications				
Wavelength range	1450–1650 nm	1480–1620 nm	1260–1360 nm	1525–1610 nm
Wavelength resolution	5 pm[b]	5 pm[b]	5 pm[b]	5 pm[b]
Minimum bandwidth (FWHM)	50 pm (6.25 GHz)	32 pm (4 GHz)	50 pm (8 GHz)	50 pm (6.25 GHz)
Maximum bandwidth (FWHM)	950 pm (120 GHz)	650 pm (80 GHz)	900 pm (160 GHz)	5000 pm (625 GHz)
Bandwidth resolution	1 pm	1 pm	1 pm	0.3 % of FWHM typical
Filter edge gradient	500 dB/nm typical[c]	800 dB/nm typical	500 dB/nm typical[c]	500 dB/nm typical[d]
Insertion loss	5 dB (4.5 dB typical)[e,f]	5 dB (4.0 dB typical)[f,g]	5 dB (4.5 dB typical)[f,h]	5 dB (4.5 dB typical)[i,j]
Flatness	0.2 dB[k]	0.2 dB[l]	0.3 dB[k,m]	0.2 dB[n]
Polarization dependent loss	±0.2 dB[e]	±0.2 dB[g]	±0.2 dB[h]	±0.2 dB[i]
Out-of-band suppression (crosstalk)	40 dB (60 dB typical)[o]	40 dB (50 dB typical)[o]	40 dB (60 dB typical)[o]	40 dB (45 dB typical)[o]

	Standard	Ultrafine	O-band[a]	Wide
Interfaces				
Optical fiber type	SMF or PMF			SMF
Connector type	FC/PC or FC/APC			
Operating conditions				
Maximum optical input power	30 dBm			27 dBm
Temperature range	15° to 35°C, indoor use only			
Storage temperature	-20°C to 60°C			
Maximum relative humidity	80 % for temperatures up to 31°C decreasing linearly to 50 % relative humidity at 40°C			
Altitude	2000 m (maximum operating)			
Size and Weight				
Dimensions (W x D x H)	193 mm x 231 mm x 164 mm (7.6 in x 9.1 in x 6.4 in)			
Weight	3.5 kg (7.7 lbs)			

a Specifications apply for wavelengths not equal to any water absorption line.
b Typical, related to user dexterity.
c From -3 and -40 dB for FWHM <800 pm.
d Between -3 and -40 dB. Typically 550 dB/nm @ FWHM = 50 pm, 450 dB/nm @ FWHM = 1 nm, 225 dB/nm @ FWHM = 5 nm.
e From 1500 to 1600 nm & FWHM >100 pm.
f At lowest FWHM the insertion loss is 7 dB typical.
g From 1500 to 1600 nm & FWHM >60 pm.
h From 1280 to 1340 nm & FWHM >100 pm.
i For FWHM >100 pm.
j At lowest FWHM the insertion loss is < 7.0 dB.
k Centered width of FWHM - 150 pm. For 150 pm < FWHM < 650 pm.
l Centered width of FWHM - 100 pm. For 100 pm < FWHM < 500 pm.
m From 1280 to 1340 nm.
n Centered width of FWHM - 150 pm. For 150 pm < FWHM < 2000 pm.
o Measured 1 nm away from the -3 dB points.

XTM-50 Overview



Handle

The handle bar enables you to carry the XTM-50.

Micrometer Actuators

Two high resolution micrometer actuators enable you to perform wavelength and bandwidth tuning.

The screw located on top of the actuators enable you to lock the actuator at the wanted setting.

- The bandwidth actuator is composed of two graduated scales:
  - On the sleeve: 13 mm stroke with 0.5 mm graduation interval.
  - On the thimble (rotary part): 250 μm by turn, with 5 μm graduation interval.
- The wavelength actuator includes coarse and fine position adjustments, with four graduated scales:
  - Coarse adjustment:

    On the sleeve: 13 mm stroke with 0.5 mm graduation interval.

    On the thimble (rotary part): 0.5 mm by turn, with 0.01 mm graduation interval.
  - Fine adjustment:

    On the sleeve: 200 μm stroke with 25 μm graduation interval.

    On the thimble: 25 μm by turn, with 0.5 μm graduation interval.

For more details on how to adjust wavelength and FWHM, see *Setting the Wavelength/Frequency and FWHM Values* on page 11.

Optical Connectors

The two following optical connectors, protected by a dust cap, are located on the front panel:

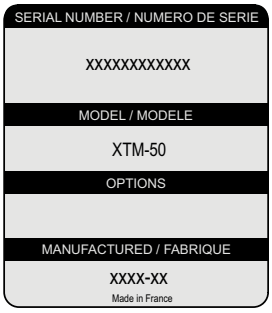
- **Input**: channel filter input port.
- **Output**: channel filter output port.

The two optical connectors are mounted on a drawer, which enables you to access the internal optical connectors for cleaning (see *Cleaning Optical Connectors* on page 18).

Retractable Leg

The retractable leg enable you to tilt the XTM-50 upward for convenient purpose, so that it stands on both front legs and the rear feet (see *Unpacking and Installing the XTM-50* on page 9).

Labels and markings

Label	Description
	Identification of the product. Indicates serial number, model, options (if any) and date of manufacture.
	Warranty seal. The XTM-50 cover must not be open, otherwise the warranty is not valid anymore.

Conventions

Before using the product described in this guide, you should understand the following conventions:

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in *death or serious injury*. Do not proceed unless you understand and meet the required conditions.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in *minor or moderate injury*. Do not proceed unless you understand and meet the required conditions.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in *component damage*. Do not proceed unless you understand and meet the required conditions.

IMPORTANT

Refers to information about this product you should not overlook.

2 Safety Information

WARNING

Do not install or terminate fibers while a light source is active. Never look directly into a live fiber and ensure that your eyes are protected at all times.

WARNING

The use of controls, adjustments and procedures, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.

WARNING

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING

Use only accessories designed for your unit and approved by EXFO. For a complete list of accessories available for your unit, refer to its technical specifications or contact EXFO.

IMPORTANT

Refer to the documentation provided by the manufacturers of any accessories used with your EXFO product. It may contain environmental and/or operating conditions limiting their use.

IMPORTANT

When you see the following symbol on your unit  **, make sure that you refer to the instructions provided in your user documentation. Ensure that you understand and meet the required conditions before using your product.**

IMPORTANT

When you see the following symbol on your unit  **, it indicates that the unit is equipped with a laser source, or that it can be used with instruments equipped with a laser source. These instruments include, but are not limited to, modules and external optical units.**

IMPORTANT

Other safety instructions relevant for your product are located throughout this documentation, depending on the action to perform. Make sure to read them carefully when they apply to your situation.

3 Getting Started with Your XTM-50

This section explains how to properly install and connect your XTM-50.

Unpacking and Installing the XTM-50

The XTM-50 is a bench-top instrument designed for indoor use only, and is not dedicated to wet locations. It is designed for use either in the horizontal or tilted position.

CAUTION

- **Do not expose the XTM-50 to rain or excessive moisture.**
- **Do not install the XTM-50 near flammable gases or fumes.**

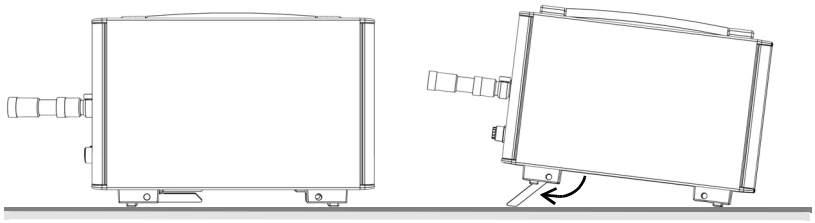
To unpack and install the XTM-50:

1. Open the package with care and remove the protective foam.

IMPORTANT

When unpacking, handle the device with care and do not damage the original shipping container in case the XTM-50 needs to be returned to EXFO.

2. Pull out the XTM-50 vertically from its packaging.
3. Set the XTM-50 on a flat stable surface free of excessive vibration.
4. Place the XTM-50 in the wanted operating position as illustrated in the following figure:
5. To tilt the XTM-50 upward, deploy the two retractable legs located underneath it.



Connecting an Optical Source to the XTM-50

CAUTION

- **Make sure you use the appropriate connector type, corresponding to the one mounted on your XTM-50 (see *Technical Specifications* on page 1 for available models).**
- **Make sure optical connectors are perfectly clean. It is essential to achieve optimum system performance (see *Cleaning Optical Connectors* on page 18).**
- **To prevent premature failure of the XTM-50 optical connectors due to frequent connections, always keep a fiber-optic jumper cable connected to the XTM-50 optical port while you use the jumper's free end to connect to other devices.**

To connect an optical source to the XTM-50:

Remove the protective cap from the **IN** and **OUT** connectors and connect the appropriate jumper corresponding to the connector type mounted on your product, as indicated next to the connectors (see *XTM-50 Overview* on page 3).

IMPORTANT

Keep protective caps on optical connectors when not in use.

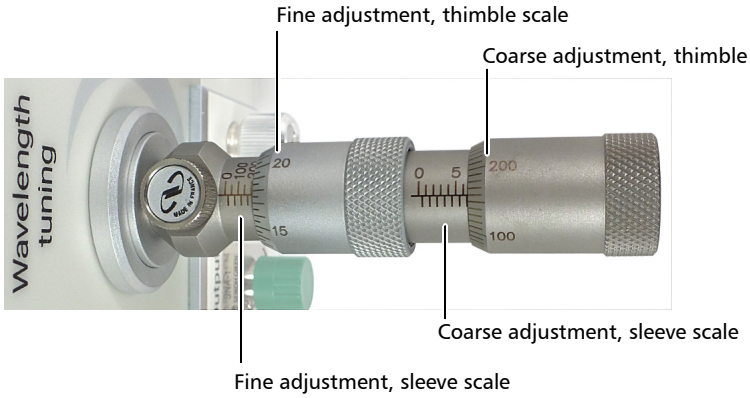
4 Setting the Wavelength/Frequency and FWHM Values

IMPORTANT

When using thimbles, account for any backlash in the system: always use the thimble in the same rotating direction.

Adjusting the Central Wavelength

The wavelength actuator enables you to adjust the wavelength with coarse and fine adjustment positions.



➤ **Coarse adjustment**:

On the coarse adjustment screw, the scale on the thimble is graduated from 0 to 500. One complete revolution of the thimble reaches one graduated marking on the sleeve.

➤ On the sleeve: 13 mm stroke with 0.5 mm graduation interval.

1 scale graduation corresponds to:

XTM-50 Standard: 11 nm (typ.)

XTM-50 Ultrafine: 6.5 nm (typ.)

XTM-50 O-band: 12 nm (typ.)

XTM-50 Wide: 11 nm (typ.)

➤ On the thimble (rotary part): 0.5 mm by turn, with 0.01 mm graduation interval.

1 scale graduation corresponds to:

XTM-50 Standard: 220 pm (typ.)

XTM-50 Ultrafine: 130 pm (typ.)

XTM-50 O-band: 240 pm (typ.)

XTM-50 Wide: 220 pm (typ.)

➤ **Fine adjustment**:

On the fine adjustment screw, the scale on the thimble is graduated from 0 to 30. One complete revolution of the thimble reaches one graduated marking on the sleeve.

➤ On the sleeve: 200 μm stroke with 25 μm graduation interval.

1 scale graduation corresponds to:

XTM-50 Standard: 550 pm (typ.)

XTM-50 Ultrafine: 325 pm (typ.)

XTM-50 O-band: 600 pm (typ.)

XTM-50 Wide: 550 pm (typ.)

➤ On the thimble: 25 μm by turn, with 0.5 μm graduation interval.

1 scale graduation corresponds to:

XTM-50 Standard: 11 pm (typ.)

XTM-50 Ultrafine: 6.5 pm (typ.)

XTM-50 O-band: 12 pm (typ.)

XTM-50 Wide: 11 pm (typ.)

IMPORTANT

Modifying the FWHM can slightly alter the central wavelength setting. So you may need to re-adjust the central wavelength after FWHM change.

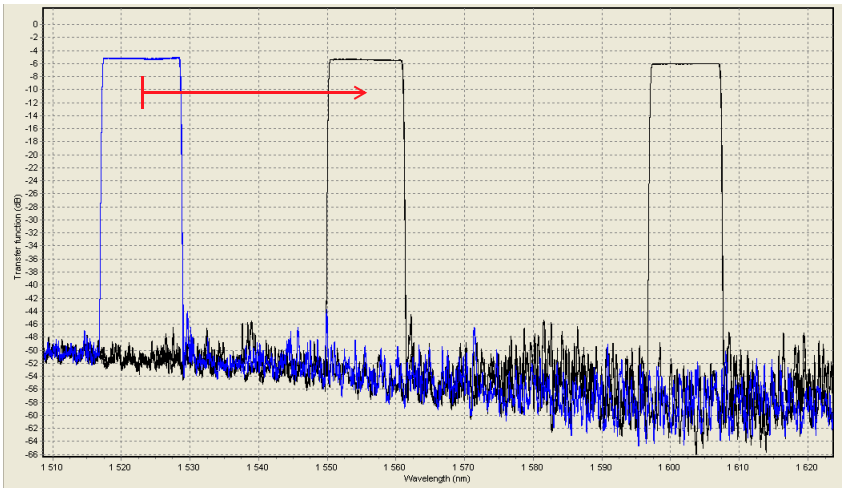
To tune the central wavelength:

1. Move the **Wavelength tuning** coarse thimble as follows:

- ➤ To increase the central wavelength from lower wavelength to higher wavelengths, turn the thimble clockwise (from high to low values).
- ➤ To decrease the central wavelength from higher wavelength to lower wavelengths, turn the thimble counterclockwise (from low to high values).

2. To finely adjust the central wavelength value, move the **Wavelength tuning** fine thimble as follows:

- ➤ To increase the central wavelength from lower wavelength to higher wavelengths, turn the thimble clockwise (from high to low values).
- ➤ To decrease the central wavelength from higher wavelength to lower wavelengths, turn the thimble counterclockwise (from low to high values).

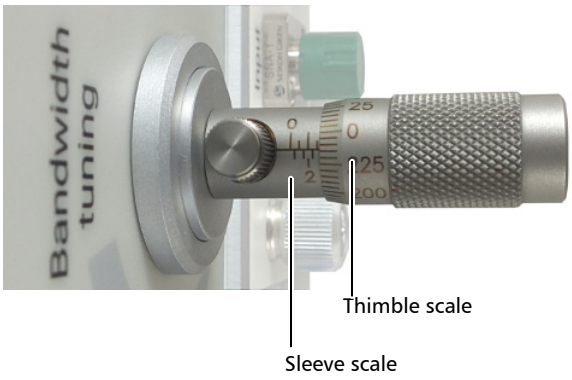


3. Tighten the lock screw (see *XTM-50 Overview* on page 3) to lock the central wavelength setting.

4. If you had previously adjusted the FWHM, re-adjust it as it may have been slightly altered by the central wavelength change.

Adjusting the FWHM

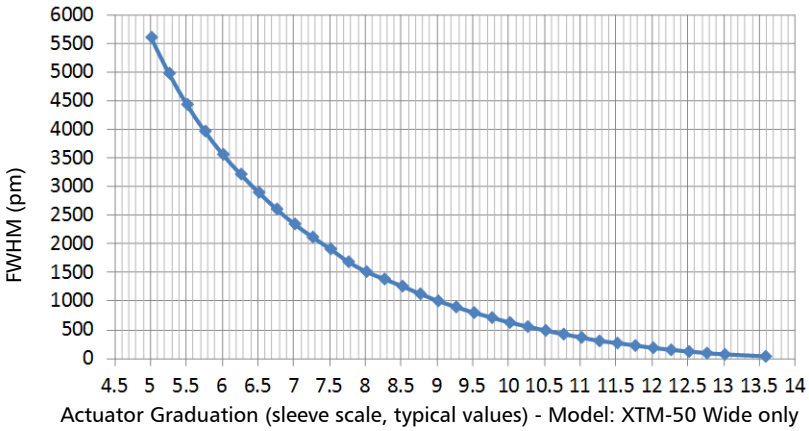
The bandwidth actuator is graduated from 0 to 250. Two complete revolution of the thimble reach one graduated marking on the sleeve.



- On the sleeve: 13 mm stroke with 0.5 mm graduation interval.

  1 scale graduation corresponds to:
  - XTM-50 Standard: 105 pm (typ.)
  - XTM-50 Ultrafine: 68 pm (typ.)
  - XTM-50 O-band: 96 pm (typ.)
  - XTM-50 Wide: not linear, see the following figure.
- On the thimble (rotary part): 250 μm by turn, with 5 μm graduation interval.

  1 scale graduation corresponds to:
  - XTM-50 Standard: 0.21 pm (typ.)
  - XTM-50 Ultrafine: 0.14 pm (typ.)
  - XTM-50 O-band: 0.19 pm (typ.)
  - XTM-50 Wide: not linear, see the following figure



Actuator Graduation (sleeve scale, typical values) - Model: XTM-50 Wide only

IMPORTANT

Modifying the central wavelength can slightly alter the FWHM. So you may need to re-adjust the FWHM after central wavelength change.

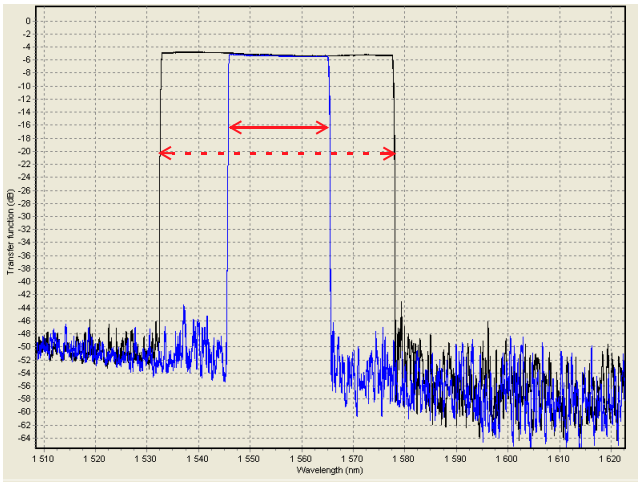
To tune the bandwith:

1. Move the **Bandwidth tuning** actuator as follows:

- ➤ To increase the FWHM, turn the actuator clockwise (from high to low values)
- ➤ To decrease the FWHM, turn the actuator counterclockwise (from low to high values).

CAUTION

To avoid damaging your XTM-50, do not turn the bandwidth actuator beyond the 0 graduation marked on the sleeve.



2. Tighten the lock screw (see *XTM-50 Overview* on page 3) to lock the FWHM setting.

3. If you had previously adjusted the central wavelength, re-adjust it as it may have been slightly altered by the FWHM change.

Reaching a Position on the Bandwidth or Wavelength Tuning Actuator

The Acceptance Test Report delivered with your instrument indicates the actuator position (in mm) of the central wavelength and FWHM on your XTM-50.

This section explains how to adjust the actuators to reach the wanted position.

Reaching a Position on the Bandwidth Tuning Actuator

The bandwidth actuator is composed of two graduated scales:

- On the sleeve: 13 mm stroke with 0.5 mm graduation interval.
- On the thimble (rotary part): 250 μm by turn, with 5 μm graduation interval.

To reach a graduated position on the actuator, you must add both scale values.

Example:
To reach the value of 7.275 mm, proceed as follows:

1. Align value 0 of the thimble to value 7 of the scale on the sleeve.

2. Make a full counterclockwise revolution of the thimble to add 0.250 mm.

3. Turn the thimble counterclockwise to add 0.005 mm.

Reaching a Position on the Wavelength Tuning Actuator

The wavelength actuator enables coarse and fine adjustments.

- Coarse adjustment:
  - On the sleeve: 13 mm stroke with 0.5 mm graduation interval.
  - On the thimble (rotary part): 0.5 mm by turn, with 0.01 mm graduation interval.
- Fine adjustment:
  - On the sleeve: 200 μm stroke with 25 μm graduation interval.
  - On the thimble: 25 μm by turn, with 0.5 μm graduation interval.

To reach a graduated position on the actuator, you must add all four scale values.

Example:
To reach the value of 8.852 mm you can use different combinations; the following procedure explains the "8.7+0.152" combination:

1. On the fine adjustment screw, align value 0 of the rotary thimble to value 100 of the sleeve scale.

2. On the coarse screw:

2a. Align value 0 of the thimble to value 8.5 of the sleeve scale.

2b. Turn the thimble counterclockwise to reach value 200, which adds 0.200 mm.

3. On the fine screw:

3a. Align value 0 of the thimble to value 150 of the of the sleeve scale.

3b. Turn the thimble counterclockwise to add 4 graduations on the thimble scale (which is 0.002 mm).

5 Maintenance

User maintenance of the XTM-50 system is limited to basic maintenance tasks that do not require removing the instrument case-cover or accessing any internal component of the instrument.

WARNING

Never remove the protective cover of the chassis to perform servicing or maintenance operations to the XTM-50 internal parts and optical components.

You must refer to EXFO service representative (see *Contacting the Technical Support Group* on page 21).

To help ensure long, trouble-free operation:

- Always keep the unit and its surroundings clean, free of dust and dirt, even if you are not using it.
- Keep the unit free of dust.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store the unit at room temperature in a clean and dry area, free of dust and out of direct sunlight.
- Avoid high humidity or significant temperature fluctuations.
- Avoid unnecessary shocks and vibrations.
- If any liquids are spilled on or into the unit, turn off the power immediately, disconnect from any external power source and let the unit dry completely.

WARNING

The use of controls, adjustments and procedures, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.

Cleaning Optical Connectors

To ensure measurement accuracy and prevent loss of optical power, you must regularly verify that optical connectors are clean every time you connect a fiber.

Handle optical fiber with appropriate care and preserve the integrity of optical connectors by keeping them free of contamination.

IMPORTANT

To reduce the need for cleaning, immediately replace protective caps on the optical connectors when not in use.

The XTM-50 optical connectors are mounted on a drawer to ease the cleaning of internal connectors.

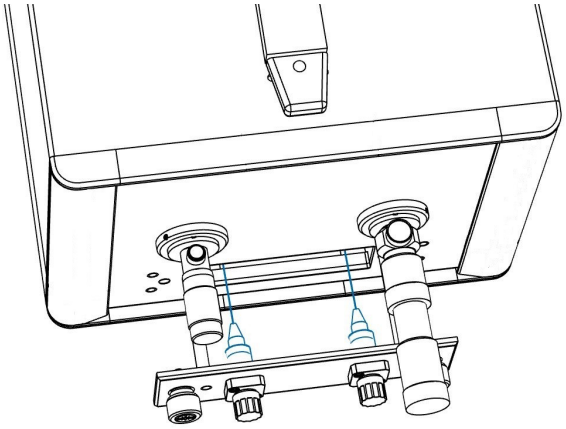
To clean the connectors:

1. Make sure you have the following material:
   - ➤ Optical grade cleaning cotton swabs
   - ➤ Canned air
   - ➤ Isopropyl alcohol
   - ➤ Fiberscope or similar if available
   - ➤ Lint-free tissue or cleaning cartridges

   Use only high quality cleaning supplies that are non-abrasive and leave no residue
2. Turn off all the laser sources connected to the XTM-50 and make sure that no optical power is coming in or out the connector you want to clean.
3. On the front panel, make sure the protective caps of the connectors are in place.
4. On the front panel, use your fingers to unscrew the two screws of the connector drawer.

   Once unscrewed from the front panel, the two screws stay attached to the drawer.

5. Gently pull the drawer out of the front panel (no more than 70 mm) so that fiber ends are made visible, as illustrated in the following figure.



6. At the rear of the drawer plate, remove one connector end from the plate:

7. Gently clean the connector end, with the following instructions:

7a. Hold the can of compressed air upright and spray the can into the air to purge any propellant.

7b. Spray the clean compressed air on the connector to remove any loose particles or moisture.

7c. Moisten a clean optical swab with isopropyl alcohol and lightly wipe the surfaces of the connector with gentle circular motion.

7d. Spray the clean compressed air on the connector again to remove any loose particles or isopropyl alcohol.

7e. Check that the connector is clean with a fiberscope (or similar).

8. Replace the connector end at the rear of the drawer plate: make sure the key of the connector is mated with that of the adapter and screw it back.

9. Perform steps 5 to 7 on the second connector.

10. Push the connector drawer back on the front panel and screw the drawer back in its location, making sure no fiber is trapped between the front panel and the drawer plate.

Cleaning the Cover of the XTM-50

If the external cover of the XTM-50 becomes dirty or dusty, clean it by following the instructions below.

CAUTION

Do not use chemically active or abrasive materials to clean the XTM-50.

Material needed: lint free cleaning cloth

To clean the external cover of the XTM-50:

Gently swipe dirt and dust on the external cover of the XTM-50, without applying excessive force onto it.

Recycling and Disposal

This symbol on the product means that you should recycle or dispose of your product (including electric and electronic accessories) properly, in accordance with local regulations. Do not dispose of it in ordinary garbage receptacles.

For complete recycling/disposal information, visit the EXFO Web site at www.exfo.com/recycle.

6 Troubleshooting

Displaying the User Documentation

The user guide is available in PDF format from the EXFO website: www.EXFO.com/en/resources/

Contacting the Technical Support Group

To obtain after-sales service or technical support for this product, contact EXFO at one of the following numbers. The Technical Support Group is available to take your calls from Monday to Friday, 8:00 a.m. to 7:00 p.m. (Eastern Time in North America).

Technical Support Group

400 Godin Avenue
Quebec (Quebec) G1M 2K2
CANADA

1 866 683-0155 (USA and Canada)
Tel.: 1 418 683-5498
Fax: 1 418 683-9224
support@exfo.com

For detailed information about technical support, and for a list of other worldwide locations, visit the EXFO Web site at www.exfo.com.

If you have comments or suggestions about this user documentation, you can send them to customer.feedback.manual@exfo.com.

To accelerate the process, please have information such as the name and the serial number (see the product identification label), as well as a description of your problem, close at hand.

Transportation

Maintain a temperature range within specifications when transporting the unit. Transportation damage can occur from improper handling. The following steps are recommended to minimize the possibility of damage:

- Pack the unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations.
- Keep the unit out of direct sunlight.
- Avoid unnecessary shocks and vibrations.

For instructions on returning the XTM-50, please contact EXFO (see *Contacting the Technical Support Group* on page 21).

To package the XTM-50 for shipment:

1. Place the bandwidth actuator on the 0 graduation marked on the sleeve and tighten the lock screw.
2. Make sure the two retractable legs are not deployed.
3. Place the XTM-50 in the original package for transportation.

7 Warranty

General Information

EXFO Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of 1 year from the date of original shipment. EXFO also warrants that this equipment will meet applicable specifications under normal use.

During the warranty period, EXFO will, at its discretion, repair, replace, or issue credit for any defective product, as well as verify and adjust the product free of charge should the equipment need to be repaired or if the original calibration is erroneous. If the equipment is sent back for verification of calibration during the warranty period and found to meet all published specifications, EXFO will charge standard calibration fees.

IMPORTANT

The warranty can become null and void if:

- **unit has been tampered with, repaired, or worked upon by unauthorized individuals or non-EXFO personnel.**
- **warranty sticker has been removed.**
- **case screws, other than those specified in this guide, have been removed.**
- **case has been opened, other than as explained in this guide.**
- **unit serial number has been altered, erased, or removed.**
- **unit has been misused, neglected, or damaged by accident.**

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL EXFO BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Gray Market and Gray Market Products

Gray market is a market where products are traded through distribution channels that are legal but remain unofficial, unauthorized, or unintended by the original manufacturer. Intermediaries using such channels to distribute products are considered to be part of the gray market (hereafter unauthorized intermediary).

EXFO considers that a product originates from the gray market (hereafter gray market product) in the following situations:

A product is sold by an unauthorized intermediary.

A product is designed and destined for a particular market and sold on a second market.

A product is resold, despite being reported lost or stolen.

When products are purchased on the gray market, rather than through an authorized EXFO distribution channel, EXFO is unable to guarantee the source and quality of those products nor the local safety regulations and certifications (CE, UL, etc.).

EXFO will not honor warranty, install, maintain, repair, calibrate, provide technical support nor make any support contracts available for gray market products.

For complete information, refer to EXFO's policy regarding gray market products at www.exfo.com/en/how-to-buy/sales-terms-conditions/gray-market/

Liability

EXFO shall not be liable for damages resulting from the use of the product, nor shall be responsible for any failure in the performance of other items to which the product is connected or the operation of any system of which the product may be a part.

EXFO shall not be liable for damages resulting from improper usage or unauthorized modification of the product, its accompanying accessories and software.

Exclusions

EXFO reserves the right to make changes in the design or construction of any of its products at any time without incurring obligation to make any changes whatsoever on units purchased. Accessories, including but not limited to fuses, pilot lamps, batteries and universal interfaces (EUI) used with EXFO products are not covered by this warranty.

This warranty excludes failure resulting from: improper use or installation, normal wear and tear, accident, abuse, neglect, fire, water, lightning or other acts of nature, causes external to the product or other factors beyond the control of EXFO.

IMPORTANT

In the case of products equipped with optical connectors, EXFO will charge a fee for replacing connectors that were damaged due to misuse or bad cleaning.

Certification

EXFO certifies that this equipment met its published specifications at the time of shipment from the factory.

Service and Repairs

EXFO commits to providing product service and repair for five years following the date of purchase.

To send any equipment for service or repair:

1. Call one of EXFO's authorized service centers (see *EXFO Service Centers Worldwide* on page 26). Support personnel will determine if the equipment requires service, repair, or calibration.
2. If equipment must be returned to EXFO or an authorized service center, support personnel will issue a Return Merchandise Authorization (RMA) number and provide an address for return.
3. If possible, back up your data before sending the unit for repair.
4. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and the conditions under which it was observed.
5. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the RMA number on the shipping slip. *EXFO will refuse and return any package that does not bear an RMA number.*

Note: A test setup fee will apply to any returned unit that, after test, is found to meet the applicable specifications.

After repair, the equipment will be returned with a repair report. If the equipment is not under warranty, you will be invoiced for the cost appearing on this report. EXFO will pay return-to-customer shipping costs for equipment under warranty. Shipping insurance is at your expense.

Routine recalibration is not included in any of the warranty plans. Since calibrations/verifications are not covered by the basic or extended warranties, you may elect to purchase FlexCare Calibration/Verification Packages for a definite period of time. Contact an authorized service center (see *EXFO Service Centers Worldwide* on page 26).

EXFO Service Centers Worldwide

If your product requires servicing, contact your nearest authorized service center.

EXFO Headquarters Service Center

400 Godin Avenue
Quebec (Quebec) G1M 2K2
CANADA

1 866 683-0155 (USA and Canada)
Tel.: 1 418 683-5498
Fax: 1 418 683-9224
support@exfo.com

EXFO Europe Service Center

Winchester House, School Lane
Chandlers Ford, Hampshire S053 4DG
ENGLAND

Tel.: +44 2380 246800
Fax: +44 2380 246801
support.europe@exfo.com

EXFO Telecom Equipment (Shenzhen) Ltd.

3rd Floor, Building C,
FuNing Hi-Tech Industrial Park, No. 71-3,
Xintian Avenue,
Fuhai, Bao'An District,
Shenzhen, China, 518103

Tel: +86 (755) 2955 3100
Fax: +86 (755) 2955 3101
support.asia@exfo.com

To view EXFO's network of partner-operated Certified Service Centers nearest you, please consult EXFO's corporate website for the complete list of service partners: http://www.exfo.com/support/services/instrument-services/exfo-service-centers.