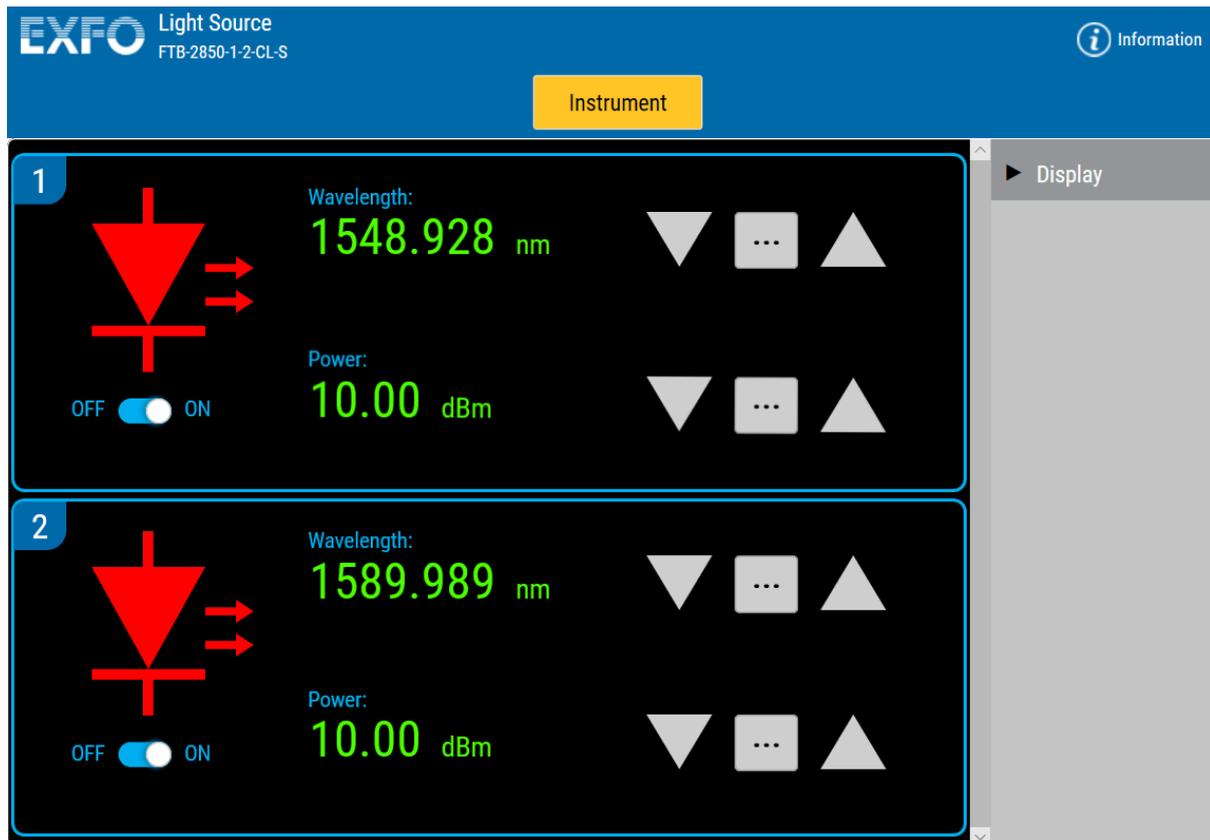


# FTBx-2850 / FTB-2850

## Light Source Laser Module



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***Units of Measurement***

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

***Version Number: 1.21***

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## **Regulatory Information**

### ***Canada and USA Electromagnetic Interference Regulatory Statement***

This unit was certified by an agency approved in both Canada and the United States of America. It has been evaluated according to applicable North American approved standards for product safety for use in Canada and the United States.

Electronic test and measurement equipment is exempt from FCC Part 15, subpart B compliance in the United States of America and from ICES-003 compliance in Canada. However, EXFO Inc. makes reasonable efforts to ensure compliance to the applicable standards.

The limits set by these standards are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user documentation, 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.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

### ***European Electromagnetic Compatibility Regulatory Statement***

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures. Mettre la section 4.3.3 Lien vers la déclaration de conformité. Your product is compliant with industrial electromagnetic environments.

### ***European Declaration of Conformity***

The full text of the EU declaration of conformity is available at the following Internet address:  
[www.exfo.com/en/resources/legal-documentation](http://www.exfo.com/en/resources/legal-documentation).



## **CAUTION**

- The FTBx-2850/FTB-2850 expansion modules are sensitive to electrostatic discharge (ESD). In the event of a discharge, the module may enter protection mode, and the user might need to restart the software manually. If the laser was ON before the ESD event, the laser will turn OFF and the user will have to turn it back ON.

## 1. Conventions

Before using the instrument described in this manual, 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.
- The use of controls, adjustments and procedures other than those specified herein may result in exposure to hazardous situations or impair the protection provided by this unit.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- 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.



### CAUTION

- Please be sure to store the modules that are not installed in protective electrostatic packaging.



### 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.
- 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.
- 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.
- **NOTE:** If the FTBx-2850/FTB-2850 Module is used outside the limits of stable operation, the module will automatically shutdown to protect the user and the device.

### 3. Laser Safety Information

Your instrument is in compliance with standards IEC 60825-1: 2007 and 2014. Complies with standards 21 CFR 1040.10, except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.



#### WARNING

- (IEC 60825-1: 2007) Viewing the laser output with certain optical instruments designed for user at a distance (for example, telescopes and binoculars) may pose an eye hazard.

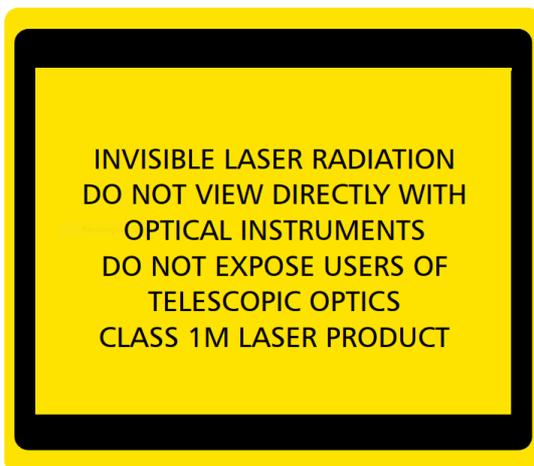


#### WARNING

- (IEC 60825-1: 2014) Viewing the laser output with telescopic optical instruments (for example, telescopes and binoculars) may pose an eye hazard and this the user should not direct the beam into an area where such instruments are likely to be used.

Laser radiation may be encountered at the optical output port.

The following labels indicate that the product contains a Class 1M source:



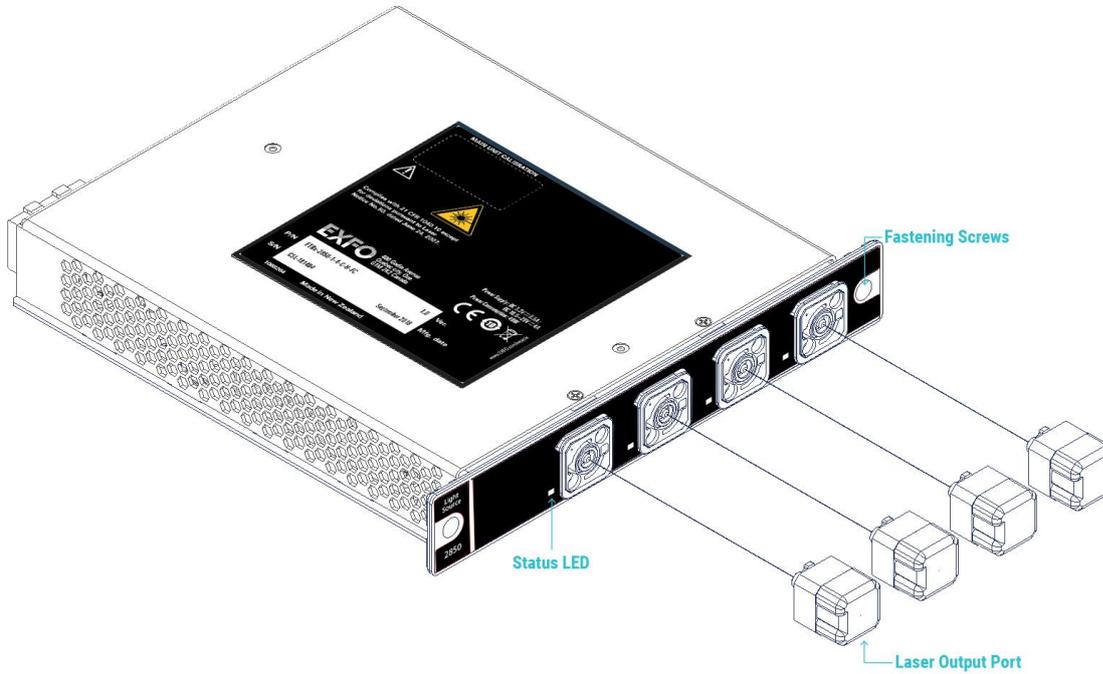
**Wavelength/ Longueur d'onde:**  $\lambda = 1550 \text{ nm}$   
**Pout max/ Psortie max:**  $\leq 15 \text{ dBm}$

#### 4. Electrical Safety Information

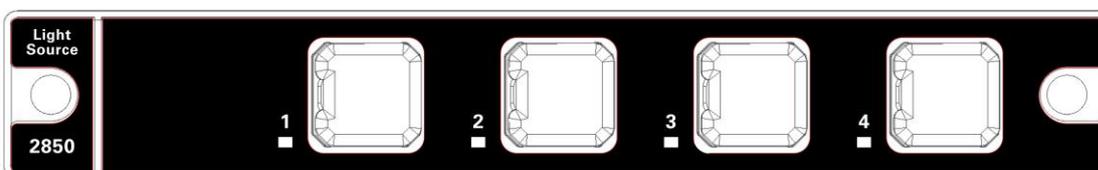
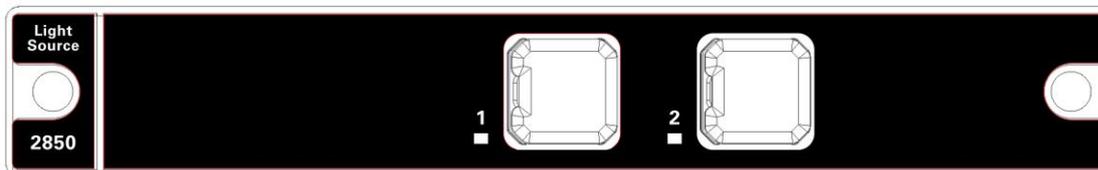
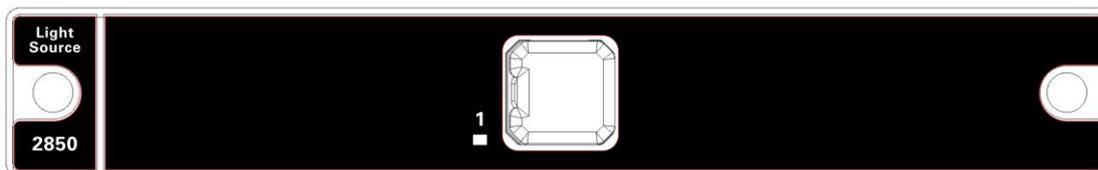
The maximum input power for the FTBx Series Optical Source is **12 W**. For more information on equipment ratings, refer to the user guide for your specific platform.

## 5. Introducing the FTBx-2850/FTB-2850 Light Source Laser Module

The FTBx-2850/FTB-2850 is a continuous wave (CW) tunable laser source providing high-power output, narrow linewidth and superior power accuracy.



The FTBx-2850/FTB-2850 is available in 1, 2 and 4 source configurations.



## 6. Connecting Optical Output



### IMPORTANT

To ensure maximum power and to avoid erroneous readings always inspect fiber ends and make sure that they are clean as explained below before inserting them into the port. EXFO is not responsible for damage or errors caused by bad fiber cleaning or handling.



### CAUTION

The type of optical connectors is specific to the FTBx-2850/FTB-2850 module. The connectors will be of type APC/FC narrow key, UPC/FC narrow key, or UPC/SC. This information can be found printed on the front plate of the FTBx-2850/FTB-2850 module. Joining mismatched connectors will damage the ferrules



### IMPORTANT

These 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 Website at [www.exfo.com](http://www.exfo.com).

### Cleaning and Connecting Optical Fibers

To connect the fiber-optic cable to the port:

1. Inspect the fiber using a fiber inspection microscope. If the fiber is clean, proceed to connecting it to the port. If the fiber is dirty, clean it as explained below.
2. Clean the fiber ends as follows:
  - 2a. Gently wipe the fiber end with a lint-free swab dipped in isopropyl alcohol.
  - 2b. Use compressed air to dry completely.
  - 2c. Visually inspect the fiber end to ensure its cleanliness.
3. Carefully align the connector and port to prevent the fiber end from touching the outside of the port or rubbing against other surfaces. If your connector features a key, ensure that it is fully fitted into the port's corresponding notch.
4. Push the connector in so that the fiber-optic cable is firmly in place, thus ensuring adequate contact. If your connector features a screw sleeve, tighten the connector enough to firmly maintain the fiber in place. Do not over tighten, as this will damage the fiber and the port.

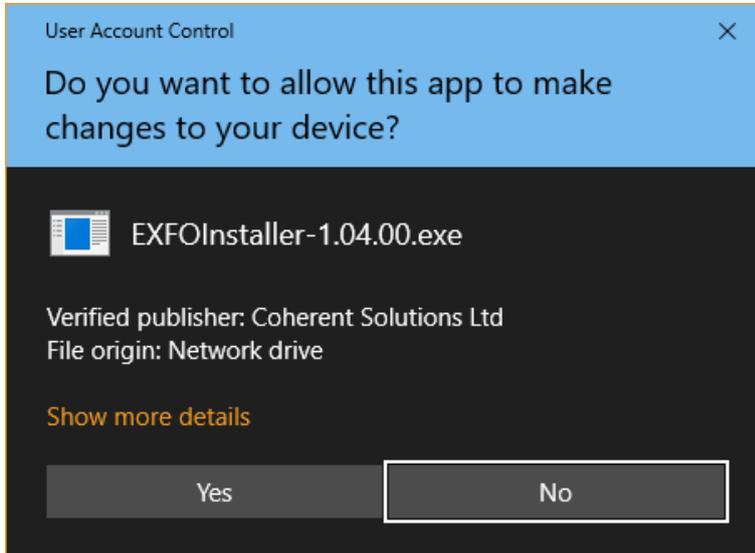
**Note:** *If your fiber-optic cable is not properly aligned and/or connected, you will notice heavy loss and reflection.*

EXFO uses good quality connectors in compliance with EIA-455-21A standards.

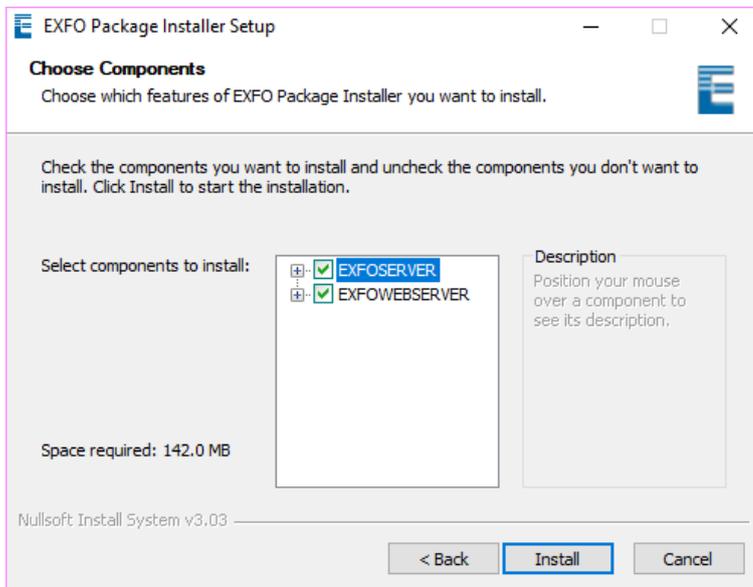
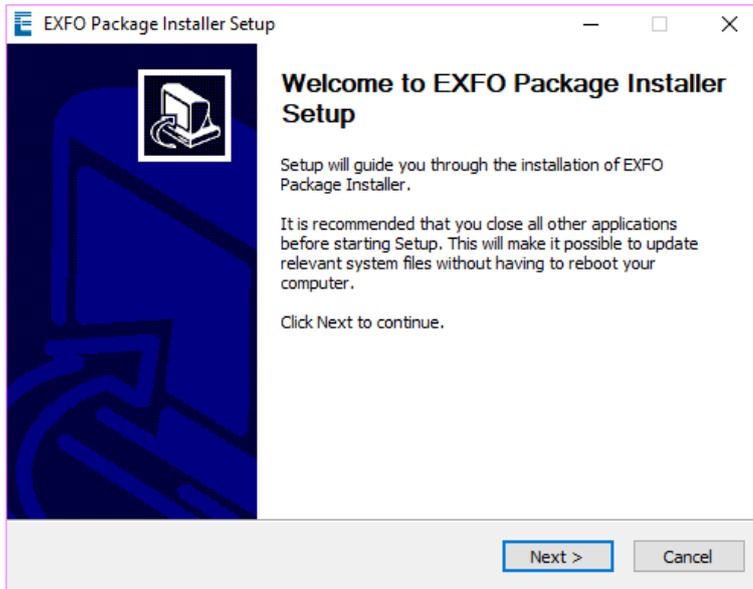
To keep connectors clean and in good condition, EXFO strongly recommends inspecting them with a fiber inspection probe before connecting them. Failure to do so will result in permanent damage to the connectors and degradation in measurements.

## 7. EXFO Package Installer

The necessary packages to install are all bundled together in the EXFO Package Installer application. Running this application will install the **EXFO Server** and the **EXFO Web Server**.

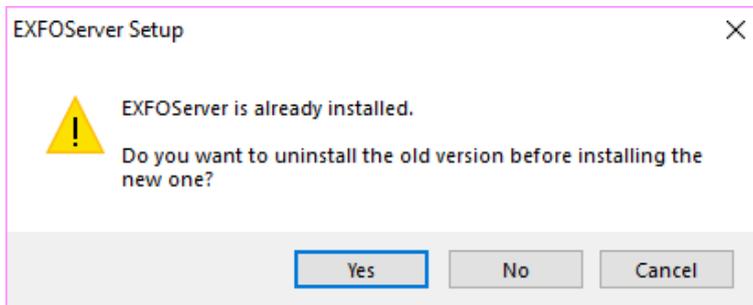


1. Proceed with the EXFO Package Installer by clicking **Next**.

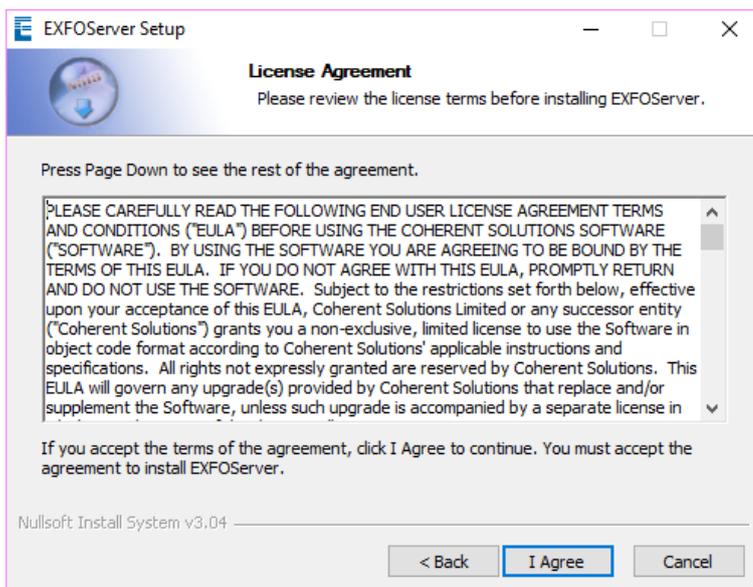
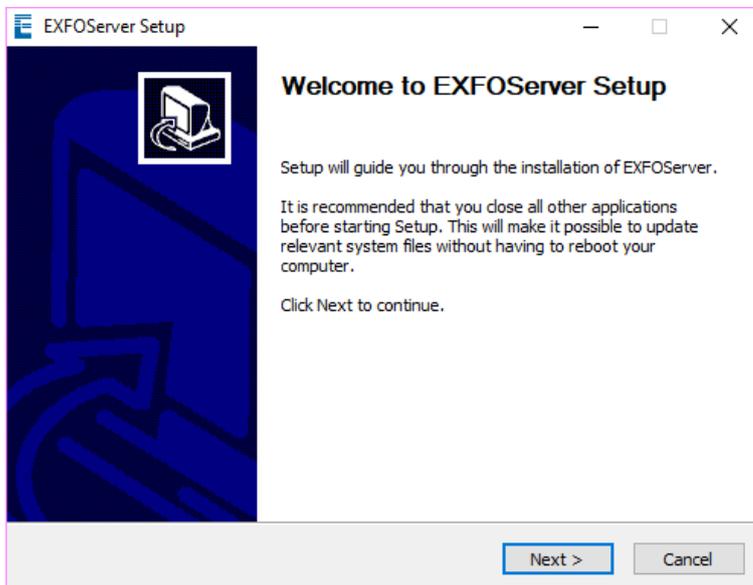


2. If a previous version of EXFO Server is already installed on the system, the EXFO Installer will ask to uninstall the old version.

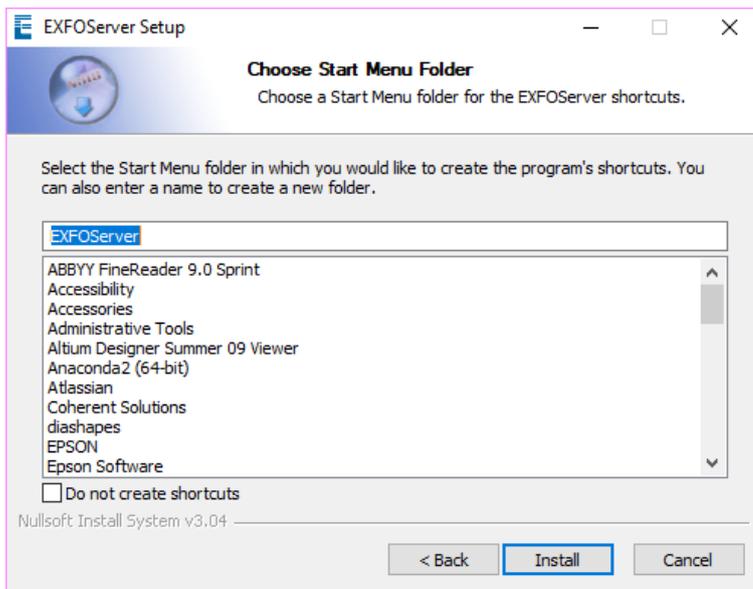
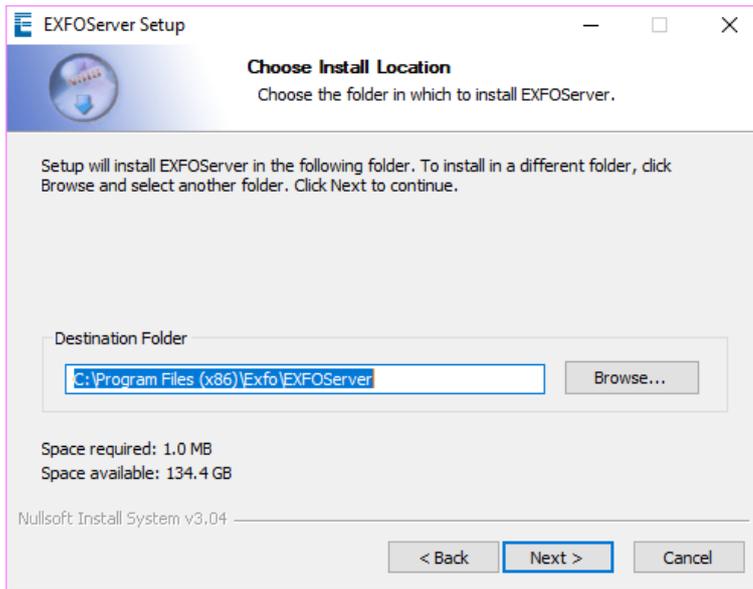
Clicking **Yes** will continue the installation of the EXFO Server and Web Server packages.

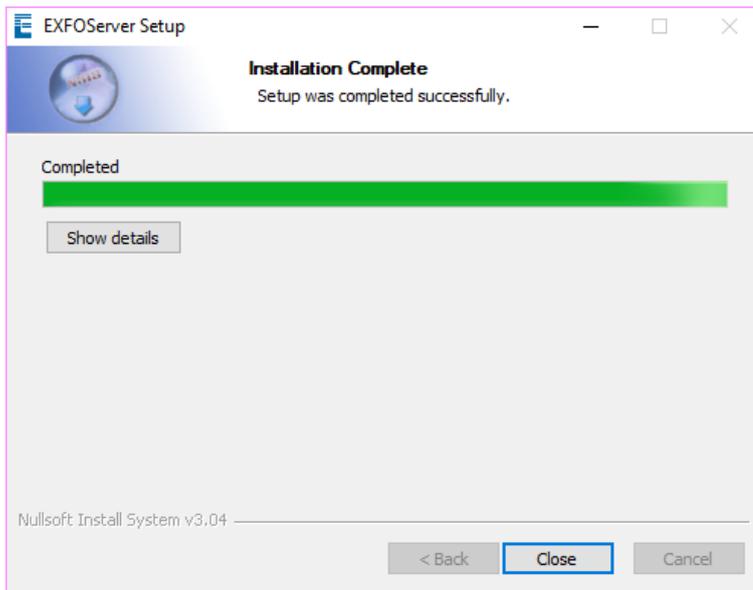


3. The EXFOServer will first be installed. Proceed by clicking **Next**. Accept the License Agreement and continue.

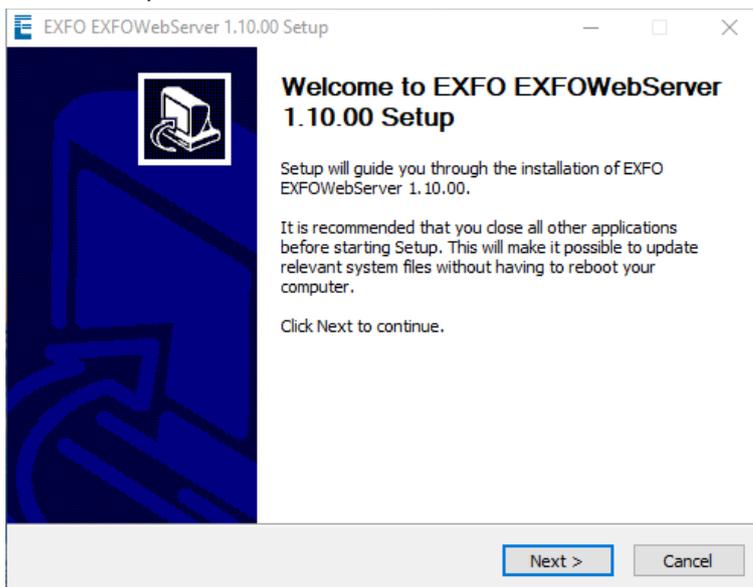


4. Select an installation location and folder to install the EXFOServer to. Clicking **Next** and **Install** will proceed to the installation.

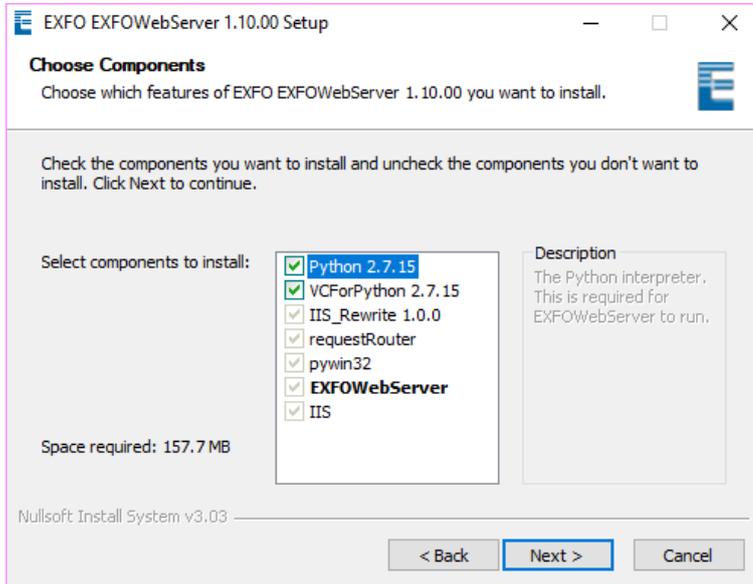




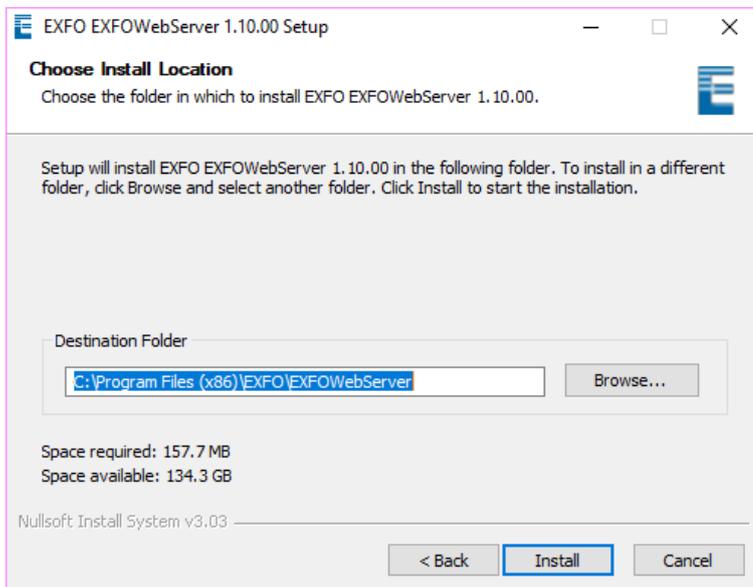
5. After the EXFOServer has successfully installed, a new window will popup with the installation process for the EXFOWebServer.

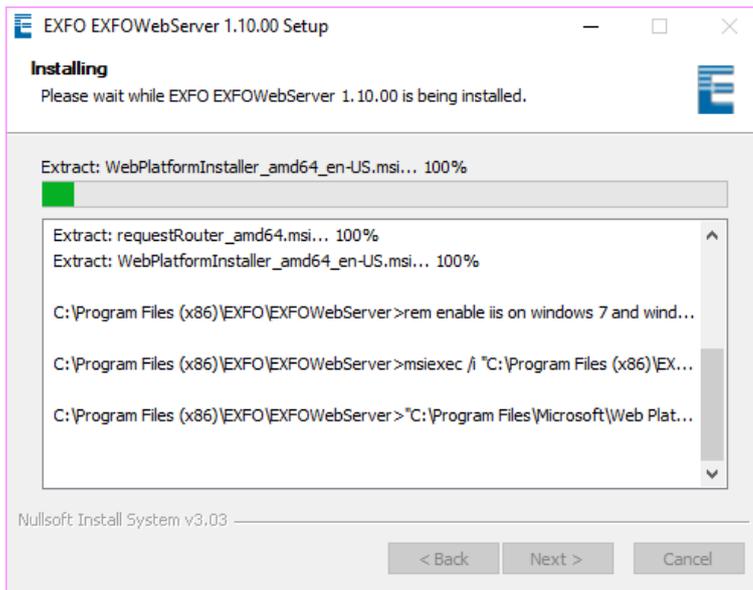


6. EXFOWebServer will install necessary dependencies.  
If Python 2.7.15, VCForPython, IIS\_Rewrite, and requestRouter are already installed, then these may be unchecked.

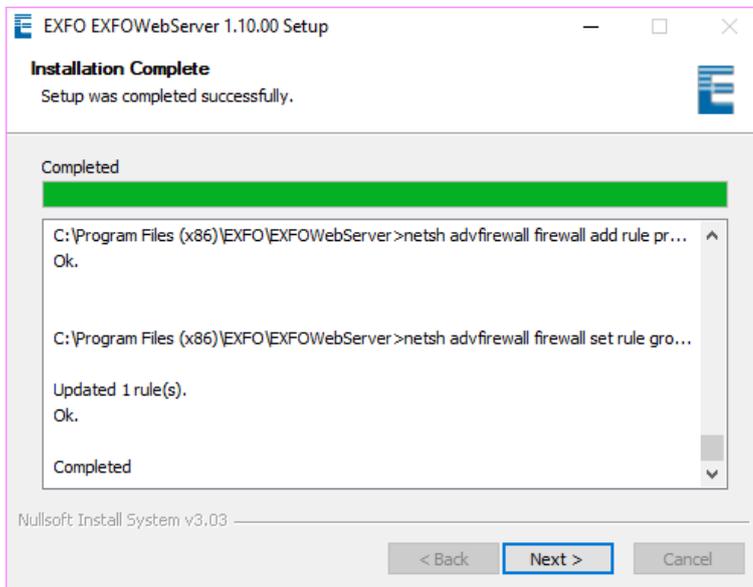


7. Select an installation location for the EXFOWebServer. Clicking **Install** will proceed to the installation.



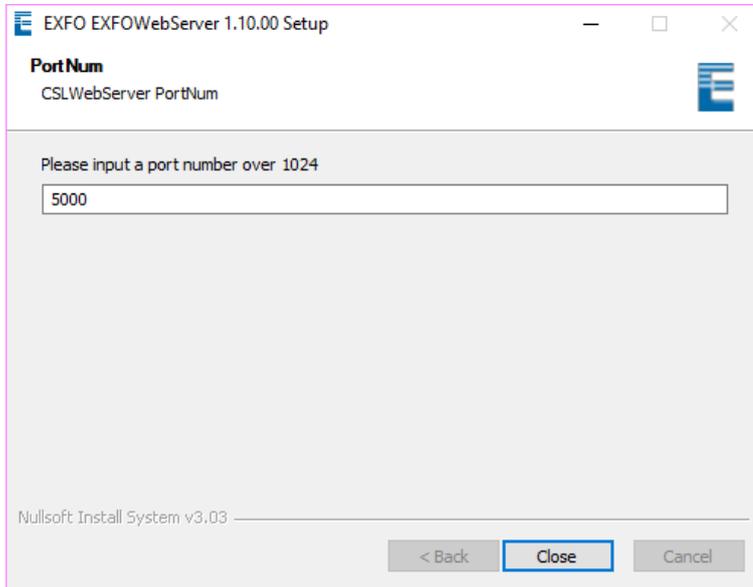


8. Once the installation is completed, click **Next** to finish.

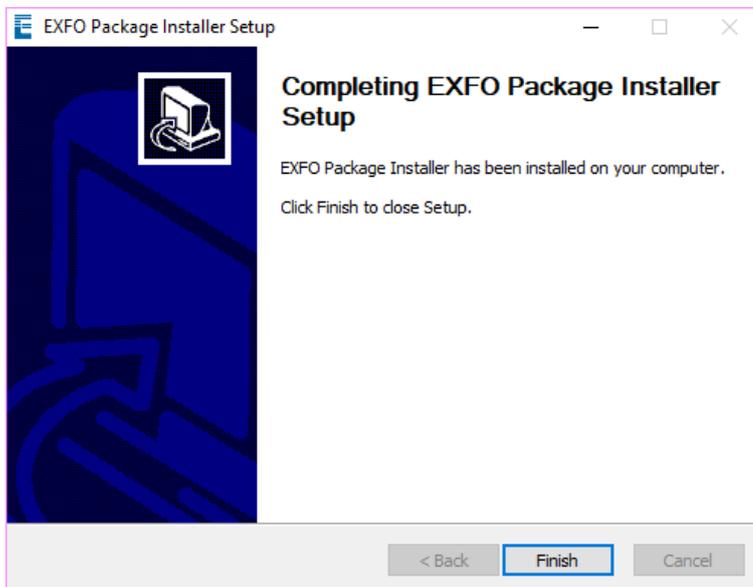


- When prompted for a port number, input any number greater than 1024. **Port 5000 is the default value.**

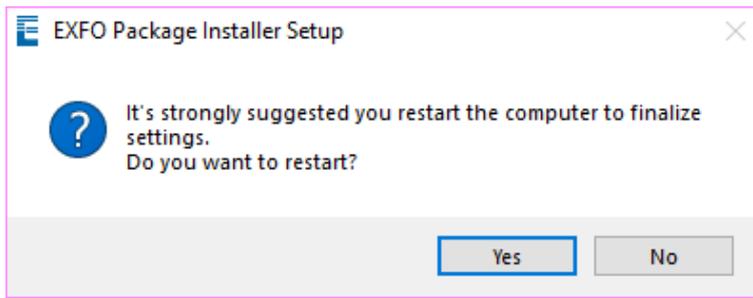
If the entered port number is valid the installation will continue. **If the port number is not valid, a new one will have to be entered.**



- Click **Finish** to complete the installation process.

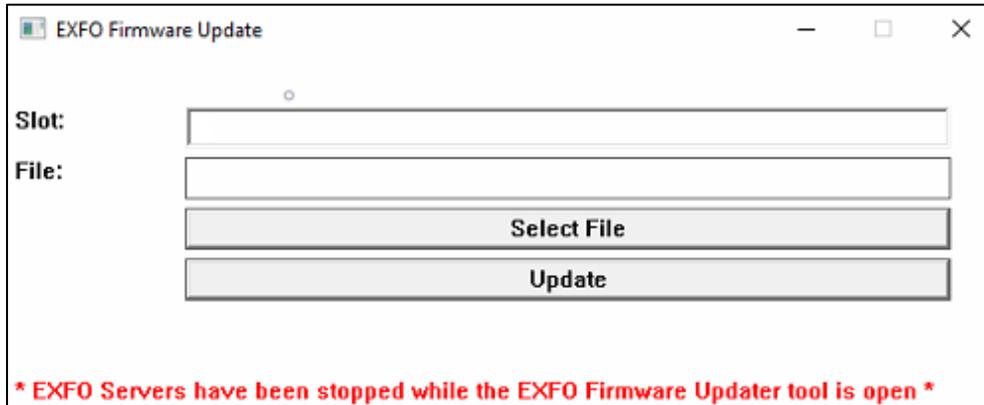


11. After installation, a reboot is recommended.



## 8. EXFO Firmware Updater

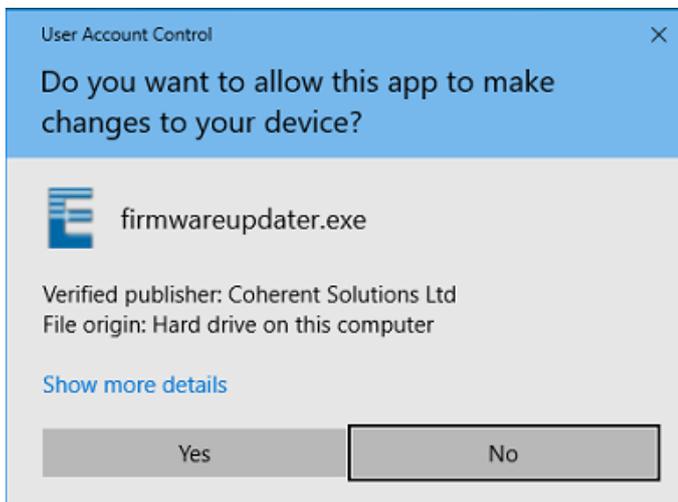
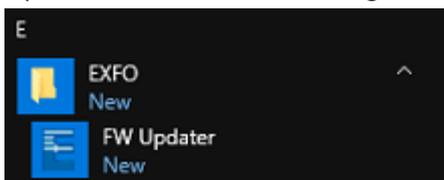
The EXFO Firmware Updater is a Windows GUI utility used to simplify installation of new firmware onto the EXFO modules.



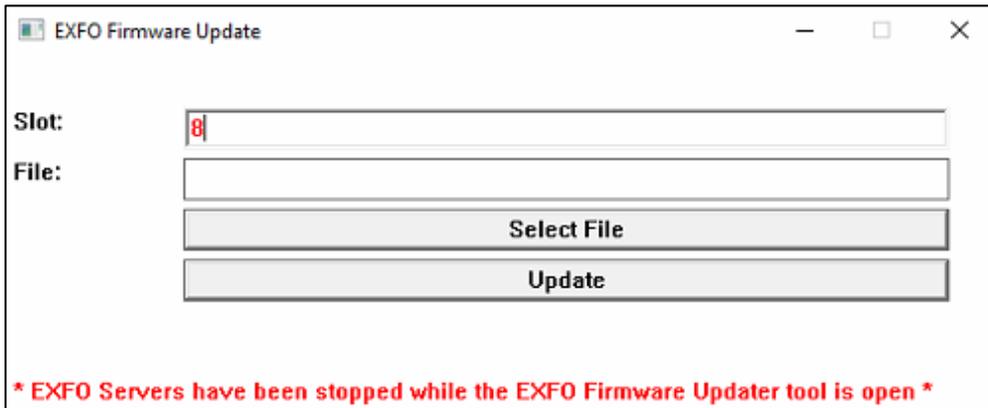
### Running the EXFO Firmware Updater

To run the EXFO Firmware Updater

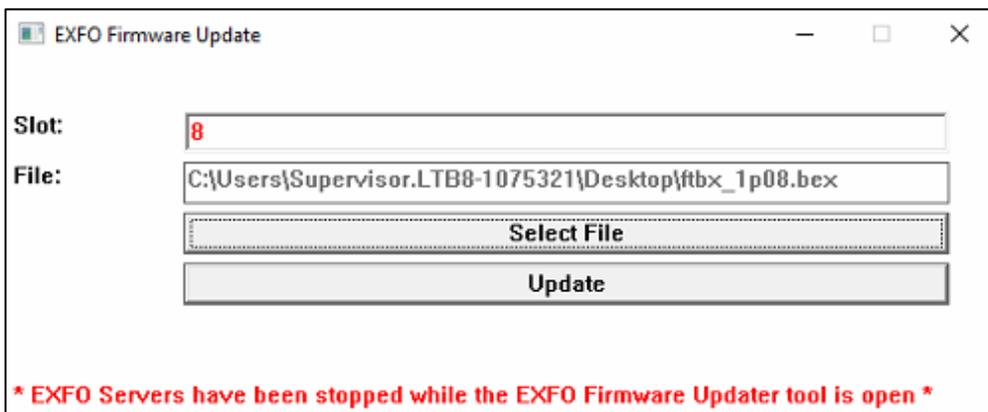
1. Open the Start menu and navigate to the **EXFO** folder.



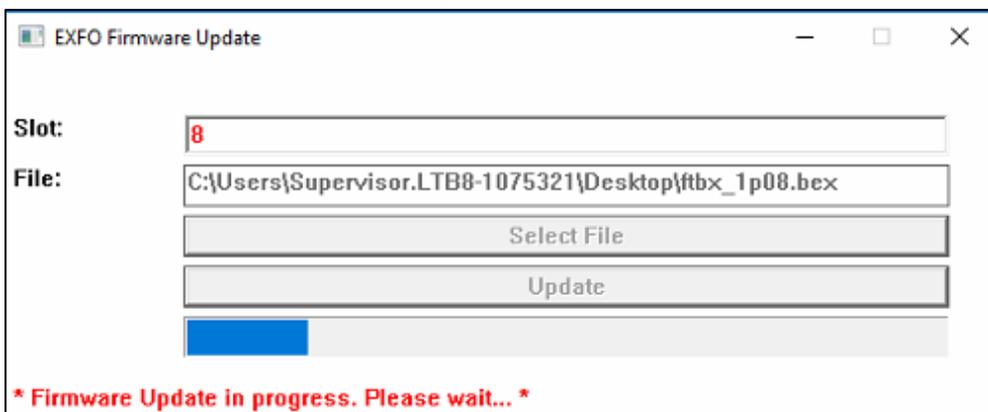
2. Once open, enter in the **Slot** number of the module to update (example is Slot 8).



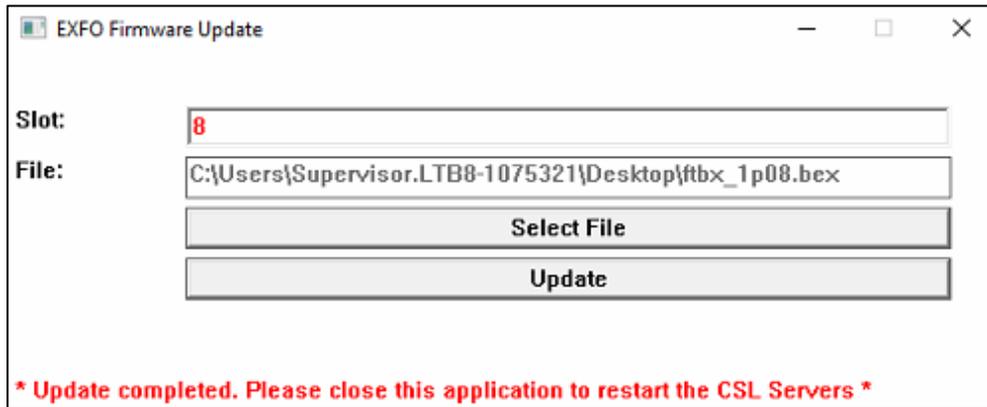
3. Click the **Select File** button to open the file dialog and browse to the desired new Firmware file (example is ftbx\_1p08.bex).



4. Click **Update** and the process will begin.



5. Once complete, close the application to automatically restart the EXFO Server and Web Server services.



## 9. EXFO Web GUI

Control of the FTBx-2850/FTB-2850 modules can be realized using the EXFO Web GUI. In order to access your module from a supported Web browser, enter in **http://[IP address of your chassis]** into the address bar.

### EXFO Web GUI Home page

The EXFO Web GUI Home page will display all the installed modules in the chassis. It provides a high-level view of the chassis with finer, more module specific controls available by clicking on any module's instrument tab.



**Figure 1: The main landing page of the EXFO Web GUI, showing all installed modules in the chassis. The modules listed will differ from what is shown, depending on your chassis module configuration.**

### Operating the FTBx-2850/FTB-2850

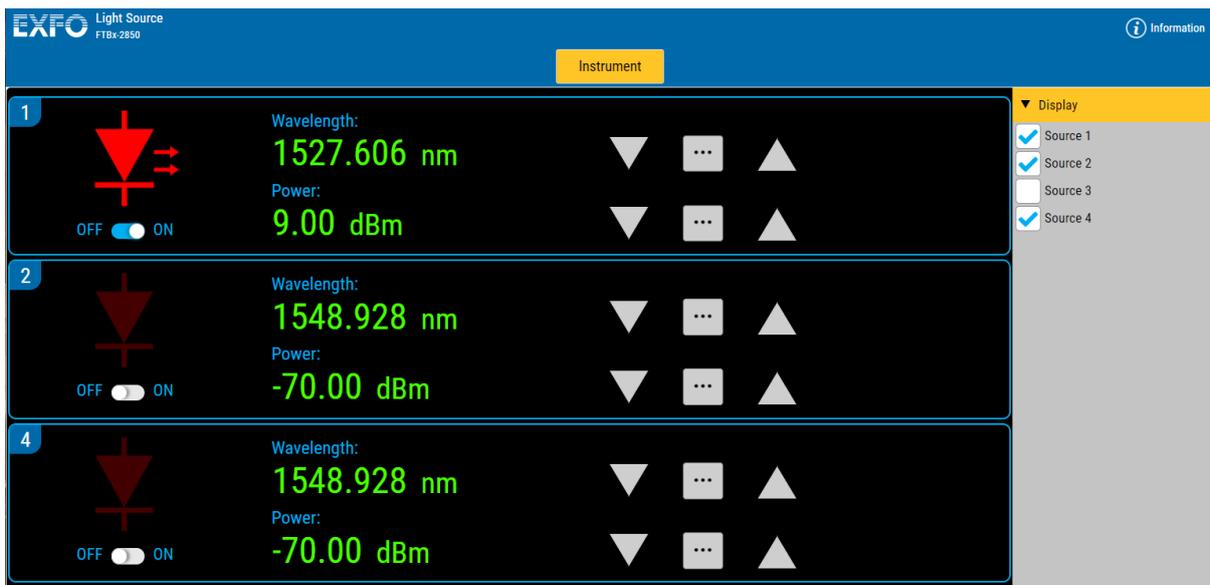
The FTBx-2850/FTB-2850 module can be operated from the EXFO Web GUI by clicking on their respective instrument tab from the Home page. Depending on the model, some or all of the following operations may not be available.

- Enable/ Disable an optical source
- Set wavelength (for multiple wavelength models only)
- Set power



If the installed module features multiple optical sources, you can select which ones are displayed.

First click on the **Instrument** tab, and then toggle the appropriate check boxes for the desired source from the display bar on the right side of the screen.



### Enabling/ Disabling an Optical Source

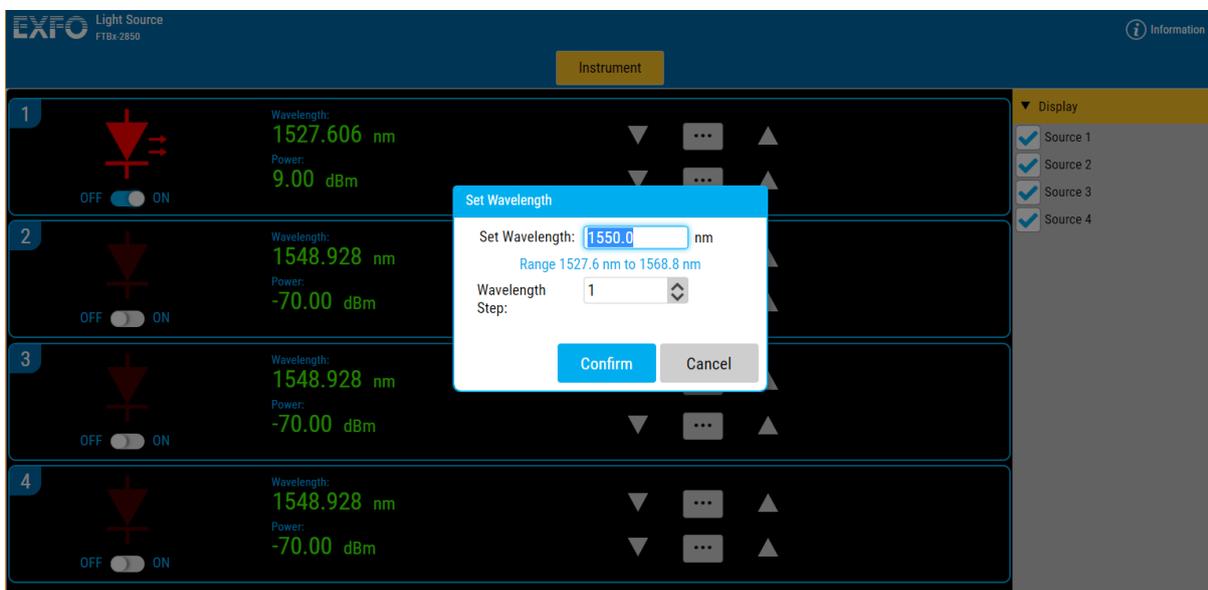
To enable or disable an Optical Source, toggle the **OFF/ ON** button. Alternatively, if the Laser Diode icon is clicked, the source will be turned ON, and clicking it again will turn it OFF.

### Setting the Wavelength

On some models, the Optical Source's wavelength can be modified.

The wavelength can directly be set by entering a valid value into the **Set Wavelength** field, or by setting the **Wavelength Step** and then using the arrow buttons to increment/ decrement the wavelength to the desired value.

1. Click the  button that is aligned with the displayed wavelength value. This will bring up a **Set Wavelength** window.



2. Either select a wavelength step from the drop down menu or enter in the desired wavelength.
3. Click **Confirm** to apply the changes.

**NOTE:** If the value entered in the **Set Wavelength** or **Wavelength Step** field is not valid, the **Confirm** button will be grayed out.

## Setting the Power

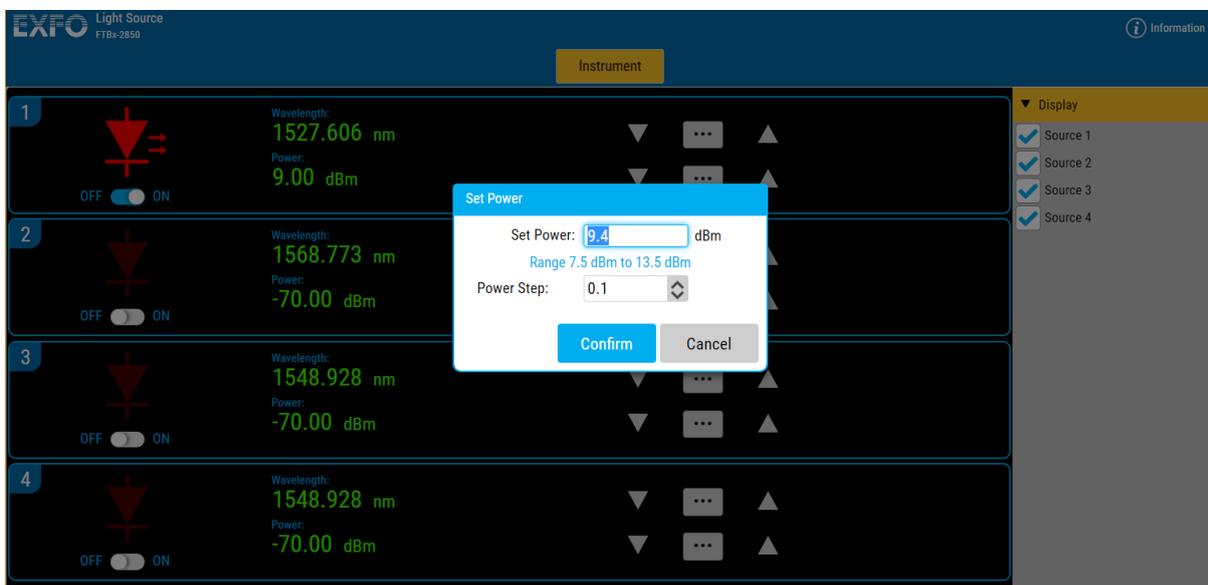
On some models, the Optical Source output power can be modified.

The power can directly be set by entering in a valid value into the **Set Power** field, or by setting the **Power Step** value, and then using the arrow buttons to increment/ decrement the power to the desired value.

**NOTE:** The step value can be different for each source in a module.

In order to set the **Power step value**:

1. Click the **Instrument** tab
2. Within the intended source's tab, click the  button. This will bring up a **Set Power** window.



3. Either select a power step value from the drop down menu, or enter in the desired power.
4. Click **Confirm** to apply the changes.

**NOTE:** If the value entered in the **Set Power** or **Power Step** field is not valid, the **Confirm** button will be grayed out.

## 10. Programming Guide

### Introduction

Remote communication with the FTBx laser is achieved through the Standard Commands for Programmable Instruments (SCPI). Support for VISA I/O API over TCP/IP is provided by a VXI-11 server. With VISA communication drivers installed on the client, the implementation of VISA programming within environments such as MATLAB becomes available. This guide provides general information on the commands available to communicate with FTBx laser remotely using the VISA I/O.

### Programming Conventions

This section details the programming and measurement conventions to follow while executing the commands for the FTBx laser.

**Table 1 - Valid Units**

Parameter	Default Unit	Alternative Units
Power	dBm	mdBm
Frequency	Hz	THz, GHz, MHz, kHz
Wavelength	m	nm, pm

**Table 2 - Data Formats**

Argument	Data Format
<wsp>	Specifies whitespace character (01 <sub>16</sub> – 09 <sub>16</sub> , 0B <sub>16</sub> – 20 <sub>16</sub> ).
<value>	Is numerical data, an integer, a decimal, exponential (10e-9 or 5.8e6) or string
[VALUE1   VALUE2]	This is a parameter choice. The ‘ ’ separates the unique parameters available, only one of the choices can be used. In the example you can use the input parameter [VALUE1] or [VALUE2] not both. Some commands may have more than two choices available. This parameter can be omitted where the command has a default defined in the command description.

### Index Addressing of Modules (Slot and Source)

When executing commands, it is almost always necessary to provide the index of a specific FTBx Laser module or an index of a specific laser source.

For the commands that require index values:

- [n] : is the slot (or source) index of the specific blade module, this is an integer, <1 to 9>
- [m] : is the index of a specific source, this is an integer <1 to 4>

### Message Queues

Information is exchanged in the form of messages. These messages are held in input and output queues.

The output queue stores responses to query commands. The FTBx laser transmits any data in the output queue when a read request is received. Unless explicitly specified otherwise in the command description, all output response data is transmitted in ASCII format.

### Common Command Summary

To comply with Standard Commands for Programmable Instruments (SCPI) 1999 standards see following common commands.

**Table 2 – SCPI Common Commands**

Command	Name
*CLS	Clear Status Command <sup>1</sup>
*IDN?	Identification Query
*OPC?	Operation Complete Query
INSTRument	
:CATalog?	-Query all the logical instruments installed in the chassis
:FULL?	-Query all the logical instruments installed in the chassis, with detailed information about the instrument

**Table 3 - SCPI Specific Commands**

Commands	Description
LINSTRument[n]	
:OPC?	-Query the stability status of the sources (WAV lock)
:SNUMber?	-Query the serial number of the installed module
:SOURce[m]:	
:COUNT?	-Query the number of sources present
:OPC?	-Query the stability status of a specific source (WAV lock)
:POWER/?	-Set or query the laser power
:FREQuency/?	-Set or query the laser frequency
:STATe/?	-Set or query the optical output state of the laser
:WAVelength/?	-Set or query the laser wavelength
:TEMPerature?	-Query the laser temperature

**Common Command Descriptions**

<b>Command</b>	<b>*CLS</b>
<b>Syntax</b>	*CLS
<b>Description</b>	Clears data structures in the Message Queues (Output and Error)
<b>Parameters</b>	None
<b>Response</b>	None
<b>Example</b>	*CLS

<b>Command</b>	<b>*IDN?</b>
<b>Syntax</b>	*IDN?
<b>Description</b>	Query the device for manufacturer information strings
<b>Parameters</b>	None
<b>Response</b>	Comma separated string containing the <manufacturer>, <part number>, <serial number>,<firmware version>
<b>Example</b>	*IDN -> "EXFO Inc.", "LTB-8", "1075321", 1.00.17 <i>Note: Hardware and firmware versions are combined and not separated by a comma</i>

<b>Command</b>	<b>*OPC?</b>
<b>Syntax</b>	*OPC?
<b>Description</b>	Query the Operation Complete status
<b>Parameters</b>	None
<b>Response</b>	1: If the FTBx modules are ready to execute commands. 0: If any FTBx modules still have commands in the input queue to be executed.
<b>Example</b>	*OPC? -> 0

<b>Command</b>	<b>:INSTrument:CATalog?</b>
<b>Syntax</b>	:INSTrument:CATalog?
<b>Description</b>	Query all the logical instruments installed in the chassis
<b>Parameters</b>	None
<b>Response</b>	A comma separated string of the names of all the logical instruments installed in the chassis
<b>Example</b>	INST:CAT? -> "FTB-2850-1-2-C-S-EI"

<b>Command</b>	<b>:INSTrument:CATalog:FULL?</b>
<b>Syntax</b>	:INSTrument:CATalog:FULL?
<b>Description</b>	Query all the logical instruments installed in the chassis, with detailed information about the instrument
<b>Parameters</b>	None
<b>Response</b>	A comma separated string of names and slot information of all the logical instruments installed in the chassis
<b>Example</b>	INST:CAT:FULL? -> "FTB-2850-1-2-C-S-EI", 1, "FTB-2850-1-1-L-S-EI", 2

**Specific Command Descriptions**

<b>Command</b>	<b>:LINStrument[n]:OPC?</b>
<b>Syntax</b>	:LINStrument[n]:OPC?
<b>Description</b>	Query the stability status of the sources (WAV lock)
<b>Parameters</b>	None
<b>Response</b>	1 is returned if any laser in the module that is ON is LOCKed 0 is returned if any laser is OFF or is ON and NOT LOCKed
<b>Example</b>	LINS4:OPC? -> 0

<b>Command</b>	<b>:LINStrument[n]:SNUMber?</b>
<b>Syntax</b>	:LINStrument[n]:SNUMber?
<b>Description</b>	Query the serial number of the installed module
<b>Parameters</b>	None
<b>Response</b>	String containing the serial number of the installed module in the slot
<b>Example</b>	LINS4:SNUM? -> "CSL-181213"

<b>Command</b>	<b>:LINStrument[n]:SOURce:COUNT?</b>
<b>Syntax</b>	:LINStrument[n]:SOURce:COUNT?
<b>Description</b>	Query the number of sources present
<b>Parameters</b>	None
<b>Response</b>	An integer of the number of optical laser sources available in a module.
<b>Example</b>	LINS4:SOUR:COUN? -> 2

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:OPC?</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:OPC?
<b>Description</b>	Query the stability status of a specific source (WAV lock)
<b>Parameters</b>	None
<b>Response</b>	1 is returned if the laser in the module is ON and LOCKed 0 is returned if the laser is OFF or ON and NOT LOCKed.
<b>Example</b>	LINS4:SOUR1:OPC? -> 1

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWER</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWER<wsp><value>
<b>Description</b>	Set the power of the laser
<b>Parameters</b>	<value>: A valid numerical value which is in the range between the MIN and MAX response queried with the POWER? command, or found in the FTBx specifications. Default units of dBm (DBM).
<b>Response</b>	None
<b>Example</b>	LIN4:SOUR1:POW 13.00 DBM

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer?</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer?<wsp>[MIN MAX DEF SET ACT ALL]
<b>Description</b>	Query the power of the selected laser
<b>Parameters</b>	MIN: Get the minimum programmable value MAX: Get the maximum programmable value DEF: Get the default value of power SET: Get the desired set value ACT: Get the current value (default). ALL: Returns all of the above parameters
<b>Response</b>	Returns the minimum, maximum, default, set or actual (current) power for the laser as specified by parameters. Default units of dBm (DBM).
<b>Example</b>	LIN4:SOUR1:POW? -> 13.00 LIN4:SOUR1:POW? MAX -> 15.00 LIN4:SOUR1:POW? ALL -> 10.00,15.00,10.00,13.00,13.00 <b>Note:</b> The values are returned in order of MIN,MAX,DEF,SET,ACT. When no parameter is provided to the command, the ACT value is returned by default.

**IMPORTANT**

If the laser STATE is ON while setting WAVelength or FREQuency, please note that there will be a minimal non-stable output generated during the transition to the new value when the configuration commands are executed.

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer:FREQuency</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer:FREQuency <wsp><value>
<b>Description</b>	Set the laser frequency
<b>Parameters</b>	<value> is a valid numerical value which is in the range between the MIN and MAX response queried with the FREQuency? command, or found in the FTBx specifications. Default units of Hz (HZ).
<b>Response</b>	None
<b>Example</b>	LIN4:SOUR1:POW:FREQ 1.92e+14 HZ

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer:FREQUENCY?</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer:FREQUENCY?<wsp>[MIN MAX DEF SET ACT LOCK ALL]
<b>Description</b>	Get the laser frequency
<b>Parameters</b>	MIN: Get the minimum programmable value MAX: Get the maximum programmable value DEF: Get the default value of frequency SET: Get the set frequency value ACT: Get the actual frequency value LOCK: Query whether the laser is currently at the SET frequency ALL: Returns all of the above parameters
<b>Response</b>	Returns the minimum, maximum, default, or currently set frequency for the laser as specified by parameters. The lock parameter will return as TRUE or FALSE . Units of Hz (HZ) only.
<b>Example</b>	LIN4 : SOUR1 : POW : FREQ? -> 1.92000000e+14 LIN4 : SOUR1 : POW : FREQ? MAX -> 1.96249984e+14 LIN4 : SOUR1 : POW : FREQ? ALL -> 1.91099960e+14,1.96249984e+14,1.93548387e+14,1.92000000e+14,1.92000000e+14, FALSE <b>Note:</b> The values are returned in order of MIN,MAX,DEF,SET,ACT,LOCK. When no parameter is provided to the command, the ACT value is returned by default.

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer:STATE?</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer:STATE?
<b>Description</b>	Query the laser output state
<b>Parameters</b>	None
<b>Response</b>	Returns the current output state of the laser 1 : Returned if the laser is ON 0 : Returned if the laser is OFF
<b>Example</b>	LINS4 : SOUR1 : POW : STAT? -> 0

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer:STATe</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer:STATe <wsp>[1 0]
<b>Description</b>	Set the laser output state
<b>Parameters</b>	1 : To set the output state of the laser source to ON 0 : To set the output state of the laser source to OFF
<b>Response</b>	None
<b>Example</b>	LINS4 : SOUR1 : POW : STAT 1

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer:WAVelength</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer:WAVelength <wsp><value>
<b>Description</b>	Set the laser wavelength
<b>Parameters</b>	<value>: A valid numerical value which is in the range between the MIN and MAX response queried with the WAVelength? command, or found in the FTBx specifications. Default units is meter (M).
<b>Response</b>	None
<b>Example</b>	LIN4 : SOUR1 : POW : WAV 1.550000e-06 M

<b>Command</b>	<b>:LINStrument[n]:SOURce[m]:POWer:WAVelength?</b>
<b>Syntax</b>	:LINStrument[n]:SOURce[m]:POWer:WAVelength?<wsp>[MIN MAX DEF SET ACT LOCK ALL]
<b>Description</b>	Get the laser wavelength
<b>Parameters</b>	MIN: Get the minimum programmable value MAX: Get the maximum programmable value DEF: Get the default value of wavelength SET: Get the set wavelength value ACT: Get the actual wavelength value LOCK: Query whether the laser is currently at the SET wavelength ALL: Returns all of the above parameters
<b>Response</b>	Returns the minimum, maximum, default, or currently set value for the laser wavelength as specified by parameters. Default units of meter (M). The lock parameter will return as TRUE or FALSE.
<b>Example</b>	LIN4:SOUR1:POW:WAV? -> 1.550116e-06 LIN4:SOUR1:POW:WAV? MAX -> 1.568773e-06 LIN4:SOUR1:POW:WAV? ALL -> 1.527605e-06, 1.568773e-06, 1.548928e-06, 1.550000e-06, 1.550116e-06, FALSE <b>Note:</b> The values are returned in order of MIN,MAX,DEF,SET,ACT,LOCK. When no parameter is provided to the command, the ACT value is returned by default.

<b>Command</b>	<b>:LINStrument[n]: SOURce[m]:TEMPerature?</b>
<b>Syntax</b>	:LINStrument[n]: SOURce[m]:TEMPerature?
<b>Description</b>	Get the laser temperature
<b>Parameters</b>	None
<b>Response</b>	Numerical temperature in degrees Celsius
<b>Example</b>	LINS4:SOUR1:TEMP? -> 49.99

## 11.Maintenance

### Cleaning EUI Connectors



#### IMPORTANT

If any damage occurs to internal connectors, the module casing will have to be opened and a new calibration will be required.

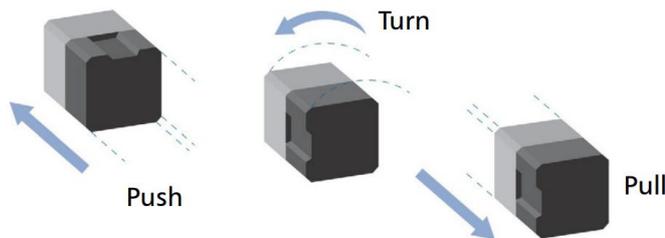


#### WARNING

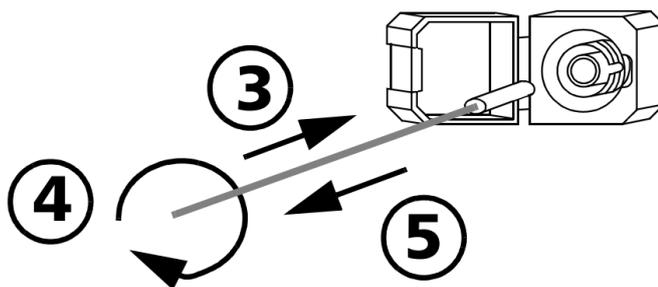
Looking into the optical connector while the light source is active WILL result in permanent eye damage. EXFO strongly recommends to TURN OFF the unit before proceeding with the cleaning procedure.

To clean EUI connectors:

1. Remove the EUI from the instrument to expose the connector baseplate and ferrule.



2. Moisten a 2.5mm cleaning tip with *one drop* of optical grade liquid cleaner.
3. Slowly insert the cleaning tip into the EUI adapter until it comes out on the other side (a slow clockwise rotating movement may help).



4. Gently turn the cleaning tip one full turn, then continue to turn as you withdraw it.
5. Repeat steps 3 to 4 with a dry cleaning tip.

**Note:** Make sure you don't touch the soft end of the cleaning tip.

6. Clean the ferrule in the connector port as follows:
  - a. Deposit one drop of optical grade liquid cleaner on a lint free wiping cloth.



## IMPORTANT

Avoid contact between the tip of the bottle and the wiping cloth, and dry the surface quickly.

- b. Gently wipe the connector and ferrule.
  - c. With a dry lint free wiping cloth, gently wipe the same surfaces to ensure that the connector and ferrule are perfectly dry.
  - d. Verify connector surface with a fiber inspection probe (for example EXFO's FIP).
7. Put the EUI back onto the instrument (push and turn clockwise).
  8. Throw out cleaning tips and wiping cloths after one use.

To help ensure long, trouble-free operation:

- Always inspect fiber-optic connectors before using them and clean them if necessary.
- Keep the unit free of dust.
- Always use blanking modules in slots that do not have an FTBx-2850/FTB-2850 laser module.
- Clean the unit casing and front panel with a cloth slightly dampened with water.
- Store unit at room temperature in a clean and dry area. Keep the unit 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, remove the batteries and let the unit dry completely.



## WARNING

The use of controls, adjustments and procedures other than those specified herein may result in exposure to hazardous situations or impair the protection provided by this unit.

## 12. Technical Support

### 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](http://www.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.

You may also be requested to provide software and module version numbers. This information, as well as technical support contact information, can be found in the 'About' window.

### 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.



### IMPORTANT

Keep this manual close at hand as it contains important details about your product.

## 13. Warranty

### General Information

EXFO Inc. (EXFO) warrants this equipment against defects in material and workmanship for a period of one 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:

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

### 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, transportation 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**

EXFO will charge a fee for replacing optical 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 35). 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 33).

## **14.EXFO Service Centers Worldwide**

If your product requires servicing, contact the 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 10,  
Yu Sheng Industrial Park (Gu Shu Crossing), No. 467,  
National Highway 107,  
Xixiang, Bao An District,  
Shenzhen, China, 518126

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

# NOTICE

## 通告

CHINESE REGULATION ON RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS) 中国关于有害物质限制的规定						
NAMES AND CONTENTS OF THE TOXIC OR HAZARDOUS SUBSTANCES OR ELEMENTS CONTAINED IN THIS EXFO PRODUCT 包含在本 EXFO 产品中的有毒有害物质或元素的名称及含量						
Part Name 部件名称	Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 镉 (Cd)	Hexavalent Chromium 六价铬 (Cr(VI))	Polybrominated biphenyls 多溴联苯 (PBB)	Polybrominated diphenyl ethers 多溴二苯醚 (PBDE)
Enclosure 外壳	O	O	O	O	O	O
Electronic and electrical sub-assembly 电子和电气组件	X	O	X	O	X	X
Optical sub-assembly <sup>a</sup> 光学组件 <sup>a</sup>	X	O	O	O	O	O
Mechanical sub-assembly <sup>a</sup> 机械组件 <sup>a</sup>	O	O	O	O	O	O
<p>Note: 注:</p> <p>This table is prepared in accordance with the provisions of SJ/T 11364. 本表依据 SJ/T 11364 的规定编制。</p> <p>O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572. O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 标准规定的限量要求以下。</p> <p>X: indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572. Due to the limitations in current technologies, parts with the "X" mark cannot eliminate hazardous substances. X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 标准规定的限量要求。标记 "X" 的部件, 皆因全球技术发展水平限制而无法实现有害物质的替代。</p> <p>a. If applicable. 如果适用。</p>						

MARKING REQUIREMENTS  
标注要求

Product 产品	Environmental protection use period (years) 环境保护使用期限 (年)	Logo 标志
This EXFO product 本 EXFO 产品	10	
Battery <sup>a</sup> 电池	5	

a. If applicable.  
如果适用。