ETS-1000L
Ethernet Tester Analyzer

Trademarks

EXFO's trademarks have been identified as such. However, the presence or absence of such identification does not affect the legal status of any trademark.

Units of Measurement

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

April 10, 2014

Version number: 2.0.0

Certification Information

Federal Communications Commission (FCC) and Industry Canada (IC) Information

Electronic test and measurement equipment is exempt from FCC Part 15 compliance in the United States and from IC ICES 003 compliance in Canada. However, EXFO Electro-Optical Engineering Inc. (EXFO) 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 guide, 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.

European Union (CE) Information

Electronic test and measurement equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment. This unit has been tested and found to comply with the limits for a Class A digital device. Please refer to the *CE Declaration of Conformity* on page iv.

Note: *If the equipment described herein bears the CE symbol, the said equipment complies with the applicable European Union Directive and Standards mentioned in the Declaration of Conformity.*

CE Declaration of Conformity

EXFO $C\epsilon$ **DECLARATION OF CONFORMITY**

Application of Council Directives:	2006/95/EC - The Low Voltage Directive
	2004/108/EC - The EMC Directive
	2006/66/EC - The Battery Directive
	93/68/EEC - CE Marking
	And their amendments
Manufacturer's Name:	EXFO Inc.
Manufacturer's Address:	400 Godin Avenue
	Quebec, Quebec
	Canada, G1M 2K2
Equipment Type:	Information Technology Equipment (ITE)
Trade Name/Model No.:	Ethernet Loopback Device / ETS-1000L

Standard(s) to which Conformity is Declared:

EN 55022: 2006	**Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement**
EN 55024 :1998 + A1: 2001 + A2: 2003	**Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurements**
EN 61010-1:2001 Edition 2.0	**Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.**
EN 60825-1:2007 Edition 2.0	**Safety of laser products – Part 1: Equipment classification and requirements**
EN 61000-3-2:2006	**Electromagnetic compatibility (EMC).** **Limits for harmonic current emissions (equipment input current < 16 A per phase)**
EN 61000-3-3:1995 + A1: 2001 + A2: 2005	**Electromagnetic compatibility (EMC).** **Limits. Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Manufacturer

Signature:

Full Name:	Stephen Bull, E. Eng
Position:	Vice-President Research and Development
Address:	400 Godin Avenue, Quebec (Quebec), Canada, G1M 2K2
Date:	February 08, 2010

Contents

1 *Introducing the ETS-1000L*

Ethernet/Gigabit Ethernet loopback unit ETS-1000L (referred to as unit, analyzer) is intended for performing loopback at the physical, data link, network and transport layers of the OSI model.

The unit allows to carry out loopback control via OAM protocol and remote control via TELNET protocol.

Overview

This section describes all connectors (ports) and LEDs available on the ETS-1000L.

Front Panel

LEDs

The green color of LEDs corresponds to a loopback layer.

➤ 1 — physical layer (1)

➤ 2 — data link layer (2)

➤ 3 — network layer (3)

➤ 1+3 — transport layer (4)

Loopback Control (L)

This button is available for loopback mode control. To switch between layers 1, 2, 3, 4 or turn loopback off, press this button till required selection is made.

Link Speed LED Indicators

LED indicators represents link speed.

Speed	LED	LED Colors
10 Mbit/s	100 and 1000	green
100 Mbit/s	100	green
1000 Mbit/s	1000	green

Link

LED indicators represents link state.

Link State	LED Colors
Connection is established	green
No connection established	off

ACT

LED shows the data transmission state:

Data Transmission State	LED Colors
Data is being transmitted or received currently	green
No data is being transmitted or received currently	off

FDX

LED shows Ethernet interface state:

Ethernet Interface State	LED Colors
Full-duplex connection	green
Half-duplex connection	off

Power

LED lights up when the power supply unit is connected.

External Connectors

You unit is equipped with the communication ports shown below:

10/100/1000 Mbps
Electrical with RJ-45
connector

1000 Mbps Optical with
SFP connector
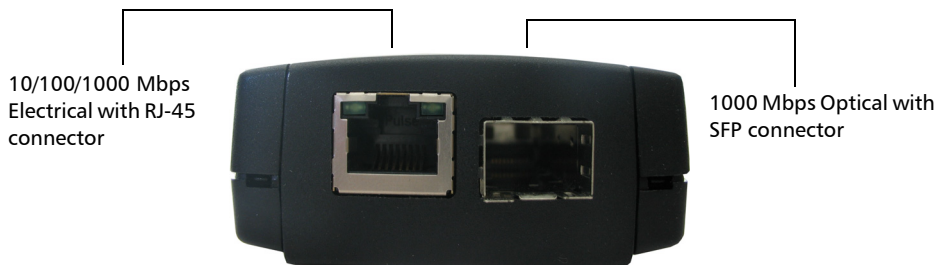
Unit connectors and equipment to be connected are described in the table below.

Description	Connected Equipment
RJ-45 connector to connect to the tested network or equipment	Ethernet cable
SFP-module connectors	SFP-module
External power unit connector	Power supply unit

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*
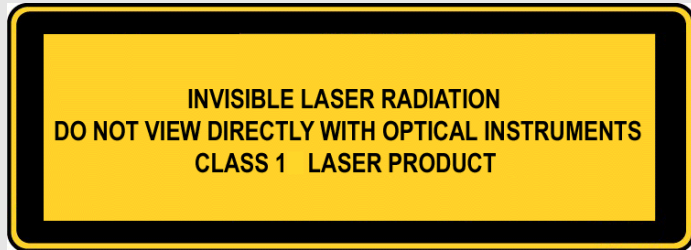
Laser Safety Warnings

WARNING

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

WARNING

This product may employ pluggable SFP lasers.a Class 1.

INVISIBLE LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 1   LASER PRODUCT

WARNING

When the **LASER LED is on, the** ETS-1000L **is receiving/emitting an optical signal.**

Installation Instructions Warnings

CAUTION

No user serviceable parts are contained inside. Contact the manufacturer regarding service of this equipment.

IMPORTANT

All wiring and installation must be in accordance with local building and electrical codes acceptable to the authorities in the countries where the equipment is installed and used.

CAUTION

Electrostatic Discharge (ESD) Sensitive Equipment:

To minimize the risk of damage, dissipate static electricity by touching a grounded unpainted metal object

➤ **before connecting or disconnecting cables to/from the module.**

➤ **before inserting or removing SFPs to/from the analyzer.**

IMPORTANT

Unauthorized modifications to this equipment shall void the user's authority to operated this equipment.

Laser

Class 1 laser product.

This product complies with IEC 60825-1 and 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

3 Getting Started

Before configuring and performing tests on the ETS-1000L analyzer, turn the unit on.

To turn the unit on:

1. Get the unit from the box and make the external inspection.

2. Connect the power supply unit to the electric network (if you use mains voltage 110-240 V with 50/60 Hz frequency) and to the ETS-1000L.

   The unit is ready in 15 second.

3. To turn off the unit switch off the power supply unit.

Note: *if you want to restore default settings of the unit hold the button of a loop's level choice (L) for 5 seconds. Three LEDs will flash once for a second to inform you.*

4 *Loopback*

The Loopback function is necessary for networks testing in compliance with the RFC 2544, as well as for a number of other tasks. This function allows to test the network without changing it's settings.

Network testing with the Loopback function can be performed at the four OSI layers, jumbo frames are supported (up to 9600 bytes).

➤ At the Physical layer (L1) all the incoming traffic is being retransmitted backward without changing.
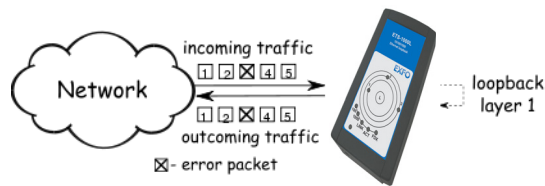

All the connection schemes use the following notation:

➤ **MAC Src**: indicates the source MAC address

➤ **MAC Dst**: indicates the destination MAC address

➤ **IP Src**: indicates the source IP address

➤ **IP Dst**: indicates the destination IP address

➤ **TCP/UDP Dst**: indicates the destination TCP/UDP port number

➤ **TCP/UDP Src**: indicates the source TCP/UDP port number

➤ At the Data link layer (L2), the incoming traffic (frames without errors) is being retransmitted backward with swapping destination and source MAC addresses.
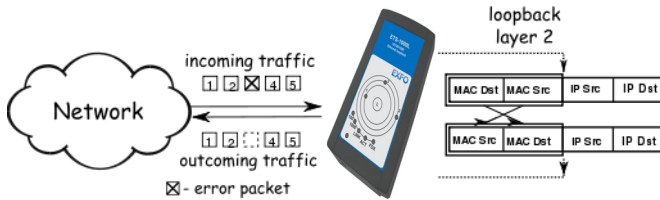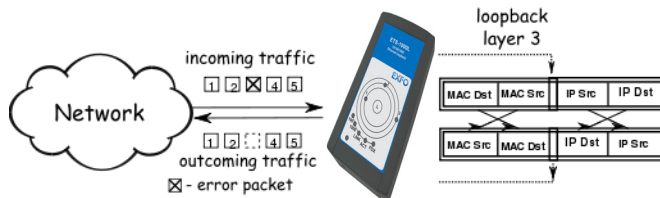

Note: *Frames with destination MAC address different than MAC address of ETS-1000L are not retransmitted.*

Note: *Frames with equal destination and source MAC address are not retransmitted at the data link, network and transport layers.*

➤ At the Network layer (L3) the incoming traffic (packets without errors) is being retransmitted backward with source and destination IP and MAC addresses swapping.

Note: *Only frames with destination MAC address and destination IP address corresponding to MAC and IP addresses of the ETS-1000L are retransmitted.*

➤ At the Transport layer (L4) the incoming traffic (packets without errors) is being retransmitted backward with source and destination IP and MAC addresses swapping and source and destination TCP/UDP addresses swapping.

Note: *Only frames with destination MAC address and destination IP address corresponding to MAC and IP addresses of the ETS-1000L are retransmitted.*
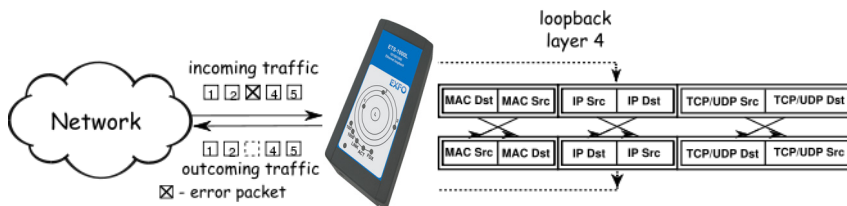
Loopback Adjustment

Connect the ETS-1000L to the Ethernet network and select Loopback layer by pressing **L** button. Additional parameters (IP address, MAC address, etc.) are being configured using the remote management (see Remote Management on page 15).

5 *Remote Management*

Telnet (Telecommunication Network) is a network protocol used to access a remote unit through a personal computer. By means of the commands presented in the tables below, it is possible to configure the ETS-1000L and view its current settings.

To manage unit over Telnet protocol connect ETS-1000L to personal computer through the Ethernet interface. Loopback must be turned off.

Default IP address of the loopback unit is 192.168.1.1.

Username — admin

Default password — admin.

Remote management commands - show mode

Command	Information shown in the console or action performed
show version	software versions
show link	the state of the interface
show ip address	interface IP address
show ip netmask	interface subnet mask
show ip gateway	gateway IP address
show mac	interface MAC address
show gbe speed	interface speed
show gbe autonegotiation	interface autonegotiation state
show gbe mac	interface MAC address
show oam mode	OAM mode: off/active/passive
show oam discovery	state of OAM discovery process
show tftp	state of a TFTP server: on/off
show vlan mode	vlan state: on/off
show vlan id	vlan identifier
show vlan priority	vlan priority
reboot	reboot unit
configure	switch to configuration mode
exit	finish session
help	list of available commands

Remote management commands (Telnet) - configuration mode

Command	Operation
ip address	set interface IP address
ip netmask	set interface subnet mask
ip gateway	set gateway IP address
gbe mac	set interface MAC address
gbe speed	set interface speed: 10/100/1000/automatic
gbe autonegotiation	set autonegotiation mode: on/off
oam	set OAM mode: off/active/passive
vlan mode	set vlan mode: on/off
vlan id	set vlan identifier (a number in the 0–4095 range)
vlan priority	set vlan priority (a number in the 0–7 range)
tftp	enable or disable TFTP server: on/off
password	change admin's password
save	save settings; settings will be applied after unit reboot
reboot	reboot unit
exit	leave configuration mode
help	list of accessible commands

Note: *Configuration mode commands become effective after save and reboot commands.*

OAM

OAM (Operations, Administration, and Maintenance) is a protocol of the link state monitoring. The protocol operates at the Data Link Layer of OSI model. To transmit data between two Ethernet-units, OAM protocol data units (OAMPDU) are used.

An important feature of the OAM protocol is to provide the ability to use Loopback mode for the remote end. Both units should support the IEEE 802.3ah standard.

ETS-1000L and remote unit should be connected directly. Possible OAM states are described below.

➤ **Passive**: In passive mode, the port can only response to Ethernet OAM commands from the remote unit, but cannot initiate the Loopback mode.

➤ **Off**: OAM is disabled.

Upgrading Versions of the Software

To upgrade to the latest versions of software:

1. Establish connection with the unit over Telnet protocol. Provide user name and password.

2. Enable TFTP server (tftp on command in configure mode).

If you use Linux operating system:

1. Configure TFTP client for a work in binary mode (mode binary command).

2. Connect to the unit by means of TFTP client (connect IP-address of unit command).

3. Upload software package file with the new version of software (put path-to-file/image X.X.X.fs).

If you use Windows operating system:

1. Install tftp client on yor PC (WinAgents TFTP Client for example).

2. Enter in console terminal.

tftp.exe -i 192.168.1.1 put C:\work\image_X.X.X.fs

When the software package file is uploaded ETS-1000L will automatically reboot.

Note: *If current and new versions of the software are too different, default settings are restored.*

Note: *If current and new versions of the software are too different, default settings are restored. In case of unsuccessful upgrade, the functionality of the unit may be restored. Hold the L button for 5 seconds while turning on the power. Normal operation will be restored within 1 minute.*

6 *Maintenance*

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.

➤ 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, namely for operation and maintenance, other than those specified herein may result in hazardous radiation exposure or impair the protection provided by this unit.

Recycling and Disposal (Applies to European Union Only)

For complete recycling/disposal information as per European Directive WEEE 2012/19/UE, visit the EXFO Web site at www.exfo.com/recycle.

7 Troubleshooting

Solving Common Problems

Before calling EXFO's technical support, please read the following common problems that can occur and their respective solution.

Problem	Possible Cause	Solution
Connection is lost	➤ Incorrect cable connection ➤ Two active connections at the same time	➤ Check cable connection state ➤ Use only one active connection
No Connection	➤ Internet connection settings	➤ Check autonegotiation mode state and interface settings
No Telnet Connection	➤ Loopback mode is on, incorrect cable connection	➤ Turn off Loopback mode and check cable connection state

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	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	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.

8 *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:**
>
> ➤ **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.

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 31). 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 31).

EXFO Service Centers Worldwide

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

EXFO Headquarters Service Center

400 Godin Avenue	1 866 683-0155 (USA and Canada)
Quebec (Quebec) G1M 2K2	Tel.: 1 418 683-5498
CANADA	Fax: 1 418 683-9224
	support@exfo.com

EXFO Europe Service Center

Winchester House, School Lane	Tel.: +44 2380 246800
Chandlers Ford, Hampshire S053 4DG	Fax: +44 2380 246801
ENGLAND	support.europe@exfo.com

EXFO Telecom Equipment (Shenzhen) Ltd.

3rd Floor, Building 10,	Tel: +86 (755) 2955 3100
Yu Sheng Industrial Park (Gu Shu	Fax: +86 (755) 2955 3101
Crossing), No. 467,	support.asia@exfo.com
National Highway 107,	
Xixiang, Bao An District,	
Shenzhen, China, 518126	

A Specifications

> ### 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*.

Specifications	Values
Ingress protection	IPX0
Weight of Equipment:	
Analyzer	0.64 kg
AC adapter	0.2 kg
Operational Temp	5C to 40C (according to safety report)
Humidity	90 % max
Storage	-20 to 35°C
Internal Battery (qty 4) specs (Refer spec sheet below)	
Storage	-20 to 30°C
AC adapter:	
Input	100-240VAC[a] 50/60Hz 0.5A
Output	DC 11-13V 1.63-1.38A
Pollution Degree	2 (when plugged to AC mains)[b]
	3 (when operated from batteries)[c]
Max operating altitude	2000 m

a. Not exceeding +/- 10 % of the nominal voltage.
b. For indoor use only
c. Equipment normally protected against exposure to direct sunlight, precipitations and full wind pressure.

B   Bibliography

[1] IEEE Std 802.1Q, IEEE Standard for Local and metropolitan area net-works — Virtual Bridged Local Area Networks.

RFC 791, Postel, J., Internet Protocol, DARPA, September 1981.

RFC 826, Plummer, D., Ethernet Address Resolution Protocol or converting network protocol addresses to 48.bit Ethernet address for transmission on Ethernet hardware, November 1982.

RFC 1349, Almquist, P., Type of Service in the Internet Protocol Suite, July 1992.

RFC 2544, Benchmarking Methodology for Network Interconnect Devices, S. Bradner and J. McQuaid, March 1999.

RFC 4689, Terminology for Benchmarking Network-layer Traffic Control Mechanisms, S. Poretsky, October 2006.

ITU-T O.150 (05/96), General requirements for instrumentation for perfomance measurements on digital transmission equipment.

IEEE 802.3ah, Ethernet in the First Mile Task Force.

Index

Index

NOTICE
通告

CHINESE REGULATION ON RESTRICTION OF HAZARDOUS SUBSTANCES
中国关于危害物质限制的规定

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和含量

O	Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。
X	Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

Part Name 部件名称	Toxic or hazardous Substances and Elements 有毒有害物质和元素					
	Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 隔 (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 电子和电子组件	X	O	X	O	X	X
Optical sub-assembly[a] 光学组件 [a]	X	O	O	O	O	O
Mechanical sub-assembly[a] 机械组件 [a]	O	O	O	O	O	O

a. If applicable.
    如果适用。

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[a] 电池 [a]	5	

a. If applicable.
    如果适用。

P/N: 1066206

EXFO
EXPERTISE REACHING OUT

ISO 900   CE