ARU-100
HPNA Test Probe

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.

Version number 2.0.0

Contents

Certification Information

F.C.C. Information

Electronic test equipment is exempt from Part 15 compliance (FCC) in the United States. However, compliance verification tests are systematically performed on most EXFO equipment.

$C \epsilon$ Information

Electronic test 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 undergone extensive testing according to the European Union Directive and Standards.

EXFO CE DECLARATION OF CONFORMITY

Application of Council Directive(s):   2004/108/EC - The EMC Directive
                                                        And their amendments
Manufacturer's Name: EXFO Electro-Optical Engineering Inc.
Manufacturer's Address: 400 Godin Avenue
                                                        Quebec, Quebec
                                                        Canada, G1M 2K2
                                                        (418) 683-0211
Equipment Type/Environment: Industrial, Scientific and Medical Equipment
Trade Name/Model No.:   ARU-100
                                                        HPNA Test Probe

Standard(s) to which Conformity is Declared:

EN 61326-1:2006   **Electrical Equipment for Measurement, Control and Laboratory
                                 Use - EMC Requirements – Part 1: General requirements**
EN 55011: 2007   **Limits and methods of measurements of radio disturbance
                                 characteristics of industrial, scientific and medical (ISM) radio-
                                 frequency equipment**

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive 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: June 18, 2009

1 Introducing the ARU-100 HPNA Test Probe

The ARU-100 HPNA Test Probe was designed to allow technicians to validate triple-play services, such as IPTV, voice and Internet data by leveraging existing coax cable in the home network environment. The ARU-100 together with test software that resides on any AXS-600 series module (except the AXS-200/610) provides HPNA to Ethernet network tests, performance measurement tools and methods. The HPNA Test Probe is an external box with one HPNA coax port and one Ethernet port.

Main Features

➤ Plastic case supports 1 Coax jack receptacle (F-TYPE female connector), 1 Ethernet RJ45 with LEDs for link states, an AC adapter jack for battery recharging and power, and a power switch.

➤ HPNA firmware is the latest version from Coppergate®.

➤ Software features on AXS-6xx

  ➤ Supported by both LAN and WAN Ethernet ports on AXS-6xx module.

  ➤ HPNA Tests application entry is part of the AXS-6xx Home menu.

  ➤ HPNA tests enhance triple play tests, such as CPE, data, VoIP and IPTV Analysis applications collecting HPNA physical layer related information.

➤ The lithium-ion battery provides a minimum 4 hours operation time and can be recharged through the supplied AC/DC adapter.
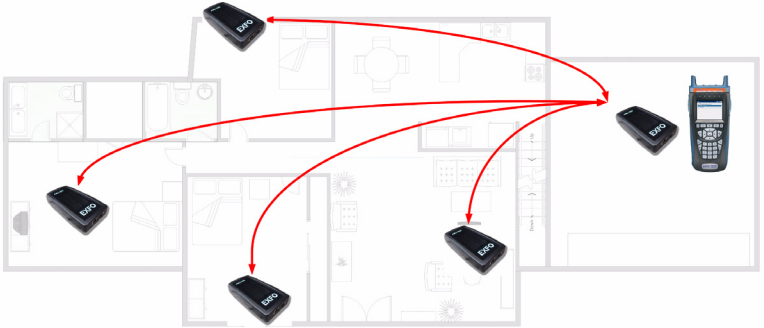
Use the power switch with LED to conserve the battery power during non-operational modes. Another LED shows the link state of the HPNA port.

Connect the HPNA port to home coax cable and the Ethernet (RJ45) to your AXS-6xx during the test.

Primary Applications

To test in a new environment where HPNA has not been installed:

Position the ARU-100 throughout the home and connect the main HPNA Test Probe to your AXS-600 series unit to determine the PHYsical layer data or PHY rate and other physical parameters.

To test in an existing HPNA environment:

Use the ARU-100 with your AXS-600 series unit to determine the PHY rate and other physical parameters including triple-play performance.
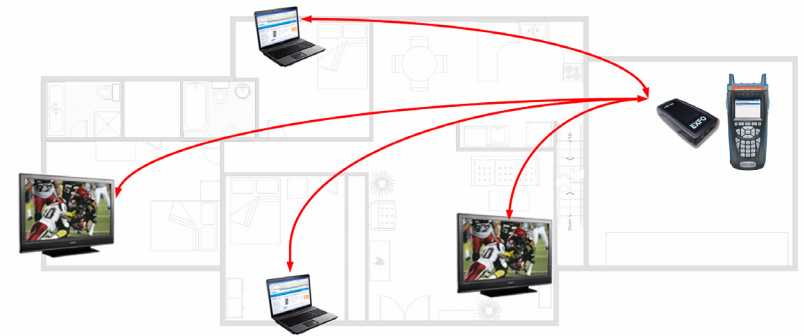
Conventions

Before using the product 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 HPNA Tests

Using the HPNA Test Probe combined with your AXS-6xx module allows you to test for triple-play services such as IPTV, voice, and Internet data by leveraging existing coax cable in the home network environment. The HPNA tests provide performance measurements and information to determine the physical parameters of the home networking environment.

To test for HPNA and triple-play performances:
Connect the ARU-100 HPNA port to home coax cable and the Ethernet RJ45 to your AXS-200/6xx series unit.

Note: *EXFO recommends using the ARU-100 without the AC adapter plugged in when performing HPNA testing. Only use the AC adapter when recharging the battery.*

Configure Tests

The purpose of the **Configure Tests** function is to modify the unit to include the test parameters to perform the HPNA test. The function has three pages: **Select Profile**, **Performance**, and **Thresholds**, and are accessible through the different pane tabs.

To access the configure tests during HPNA tests:
1. From the **HPNA Tests** pane, use the up/down arrows to select the **Configure Tests** entry.
2. Press ✔ to confirm the selection.

To view the available tabs:
Press the F1, F2, and F3 keys.

Select Profile

The **Select Profile** tab allows you to select multiple profiles containing specific test configurations stored in the unit.

Profile Name is a list of all available profile files in the current directory with the first entry being **Default** which uses the default structures values. At power up, all settings are read from the last current profile.
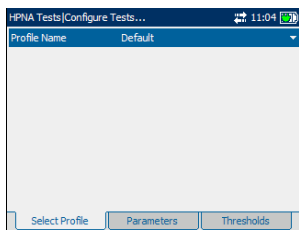
Before you press either the ⬅ or 🏠 keys and the selection is not **Default**, save the modifications (if any) to the current profile file and proceed with the selected action.

To select a profile name:
1. Press ✔ to open the list.
2. In the list, press the up/down arrows to select the value.
3. Press ✔ to confirm the selection.

Enter Profile Name is the new name of the profile.

To save modifications made to a CustomProfile:

1. Select **Save as New Profile** and create and save a new **CustomProfile** name in the current directory.

2. If the file with **CustomProfile** name already exists in the current directory, you will be prompted to overwrite it.
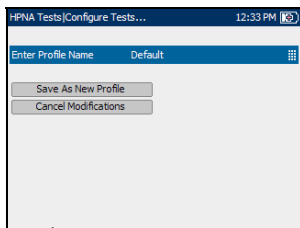
To cancel modifications made to a CustomProfile:

1. Select **Cancel Modifications** and reload the current profile with the default profile.

2. Proceed with the previously selected action (Back/Home/Start).

Parameters

The **Parameters** tab allows you to configure performance test parameters to run the HPNA test.

➤ **Packet Length** is the length of the packet, ranging from 1 to 1480. Default value is 1480.

➤ **Number of Packets** is the number of packets for the CERT test, ranging from 1 to 99,999. Default value is 10000.
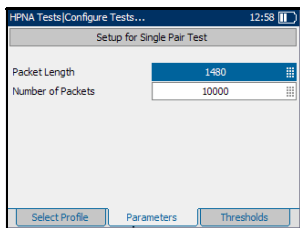
To select the performance parameters to configure:

1. From the **Configure Tests** pane, press the F1, F2, or F3 key located just below the **Parameters** tab to select it.

2. Press the up/down arrows to select the desired parameter.

3. Press ✔ to open the list or modify the parameter.

4. In the list, press the up/down arrows to select the function or mode.
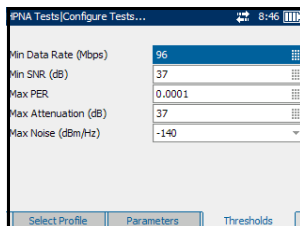
   OR

   Use the alphanumeric keypad to enter the value you want to specify.

5. Press ✔ to confirm the selection.

Thresholds

The **Thresholds** tab allows you to specify upper and lower thresholds against which the actual measured unit negotiated results will be evaluated.

➤ **Min Data Rate (Mbps)** is the minimum data rate ranging from 35 to 160.

➤ **Min SNR (dB)** is the minimum signal-to-noise ratio ranging from 35 to 45.

➤ **Max PER** is the maximum packet error rate ranging from 1E-7 to 1E-2.

➤ **Max Attenuation (dB)** is the maximum value for the reduction in signal strength, ranging from 5 to 55.

➤ **Max Noise (dBm/Hz)** lists the maximum noise level values allowed in the setup when no traffic is present on the wire. Default value is -140 dBm/Hz

To select the threshold parameters to configure:

1. From the **Configure Tests** pane, press the F1, F2, or F3 key located just below the **Thresholds** tab to select it.

2. Press the up/down arrows to select the desired parameter.

3. Press ✔ to modify the parameter.

4. Use the alphanumeric keypad to enter the value you want to specify.

5. Press ✔ to confirm the selection.

HPNA Analysis

The HPNA Analysis functionality provides information on detected HPNA devices, noise floor, and performance threshold test results on the network.

Test Summary

The **TestSummary** tab allows you to view the status and **Details** of the three tests configured for HPNA.

➤ **DevInfo Test** displays the test status of a HPNA device as **In Progress, Idle** or **Completed**.

➤ **NET Test** displays the performance threshold test results status on the network, as above.

➤ **Noise Floor** displays the status as above, of the measure of noise level in the setup when no traffic is present on the wire.

➤ **Details** button shortcuts to the applicable tab which provides more information about a particular test result.
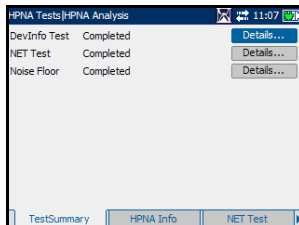
To view more information about each available test result:

1. Press the up/down arrows to highlight the **Details** button alongside the desired test result.

2. Press ✔ to select the desired **Details** button.

HPNA Info

The **HPNA Info** tab allows you to view the results of the HPNA devices detected on the network.

➤ **Device Detected** displays the total number of detected HPNA devices.

   Refresh button allows you to rerun the **DevInfo Test** and update the page with new data.

➤ **Device MAC Address** lists all the MAC addresses for the detected HPNA devices.

➤ **Mode** displays **Master** or **Client** for the selected device.

➤ **Link State** is the **Up** to **Down** (or vice versa) routing protocol of the network link for the selected device.

➤ **Sync State** is the sync status of the selected device.

➤ **SW Version** is the software version number of the selected device.

➤ **Chipset Version** is the version number of the chipset for the selected device.

➤ **Frequency Band** displays the range of signal frequency for the selected device.
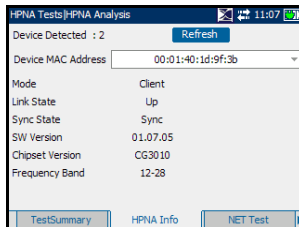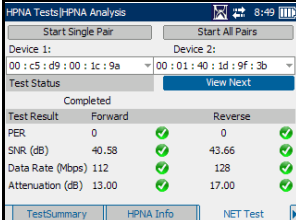
To select a detected device:

1. Press ✔ to open the list.

2. In the list, press the up/down arrows to select the MAC address of the desired device.

3. Press ✔ to confirm the selection and view the results.

NET Test

The **NET Test** tab allows you to view the performance test results on the network.

➤ **Start Single Pair** button starts a single-pair network test between selected **Device 1** and **Device 2**. The single-pair test is performed with the current parameters setup for **Packet Length** and **Number of Packets**.

➤ **Start All Pairs** button starts all network performance tests for each device in both lists. The all-pairs test is performed with default values for **Packet Length** = 1480 and **Number of Packets** = 1000.

➤ **Device 1/2** list all the HPNA device MAC addresses on the network to select in the NET test.

➤ **View Next** button sets the values in **Device 1/2** to reflect the next pair in the HPNA network, after running an all-pairs test. The button also refreshes the **Forward** and **Reverse** values to show the results between the selected pair of MAC addresses.

➤ **Test Status** is **Idle**, **In Progress**, **Completed** or **Failed** for the latest test performed.

➤ **Test Result** displays the **Forward** (Device 1/Transmitter) and **Reverse** (Device 2/Receiver) values and pass/fail status of the following results for the selected pair(s).

  ➤ **PER** is the packet error rate.

  ➤ **SNR (dB)** is the signal-to-noise ratio.

  ➤ **Data Rate (Mbps)** is the data rate.

  ➤ **Attenuation (dB)** is the value for the reduction in signal strength.

To select a MAC address:

1. Press the left/right arrows to highlight the **Transmitter** or **Receiver** lists.

2. Press ✔ to open the list.

3. In the list, press the up/down arrows to select the desired MAC address.

4. Press ✔ to confirm the selection and view the test status and results.

Noise Floor

The **Noise Floor** tab displays a plotted graph of Frequency/NoiseFloor(dBM) depicting the measure of noise level in the setup when no traffic is present on the wire. This test triggers 32 noise measurements for the selected device and collects data samples.

➤ **Select Device** lists all the MAC addresses of the detected HPNA devices on the network.

➤ The red line represents the **Max Noise** threshold that you selected during the **Configure Tests**. Values were -140, -145, -150, or -155 dBm/Hz.

To select a MAC address:

1. Press ✔ to open the list.

2. In the list, press the up/down arrows to select the MAC address of the desired device.

3. Press ✔ to confirm the selection and view the results.

   Start button tests the noise floor of the selected device.
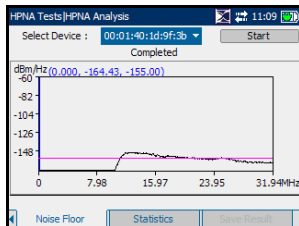
Statistics

The **Statistics** tab allows you to view counter statistics of the selected HPNA device.

➤ **Select Device** lists all the MAC addresses of the detected HPNA devices on the network.

➤ **Tx Packets** is the number of packets sent.

➤ **Rx Packets** is the number of packets received.

➤ **Tx Bytes** is the count of bytes sent.

➤ **Rx Bytes** is the count of bytes received.

➤ **Rx CRC Packets** is a count of cyclical redundancy check(CRC) errors received.

➤ **Tx Packets Dropped** is the number of outgoing packets dropped.

➤ **Rx Packets Dropped** is the number of incoming packets dropped.

To select a MAC address:

1. Press ✔ to open the list.

2. In the list, press the up/down arrows to select the MAC address of the desired device.

➤ Press ✔ to confirm the selection and view the test results.
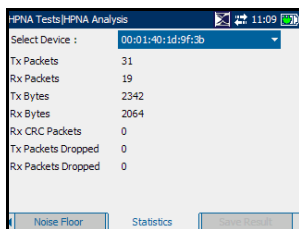
Save Result

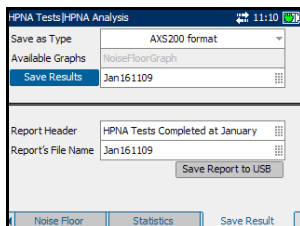The **Save Results** tab allows you to save your test results in either text or graphical format to a file or to an HTML report. Each entry on the pane is described as follows:

> **Save as Type** lists the following formats to save your test results:

> > **AXS200 format** is a binary file format with ext *.dat. This format can be opened only on an AXS200 unit. The **Available Graphs** list box will be unavailable in this case.

> > ***.csv** saves only graphical results.Textual results must be formatted as a comma-separated-values table for easy importation to Excel. Results are saved to a USB.

> > ***.gif** stands for graphics interchange format and is one of the most common file formats for graphic images on the World Wide Web. Results are saved to a USB.

> > ***.bmp** saves graphical results in a bitmap file format. Results are saved to a USB.

> > ***.xml** saves your data in a common language format to share on the Web.

> **Available Graphs** is enabled only if the selected format under **Save as Type** is ***.csv**, ***.gif, or *.bmp**. The list box is filled with **NoiseFloorGraph** for the current test. For a test that does not have a graph, this feature is not available and saving with this format cannot be performed.

> **Save Results** button saves the test results in internal or external memory (depending on the **Save as Type** format). You will be prompted to insert a USB device if the save as format is anything other than **AXS200 format**.

> *Filename* is the current date and time stamp plus you can enter any name. If it already exists, you will be prompted to overwrite the existing file.

> **Report Header** is where you can enter any comment. The initial value is the current test followed by the date and time stamp.

> **Report's File Name** is where you can enter any name for the HTML filename. If the name already exists, you will be prompted to overwrite the existing file.The default extension is .html.

> The default name is generated from the current time.

> **Save Report to USB** button saves the results to an HTML report. If a USB memory stick is not inserted, the following warning dialogue box appears: **USB device is not detected**.

> **Append to Report** button appears only if **Session result** is **Enable**, and creates an HTML report for the current test in internal memory.
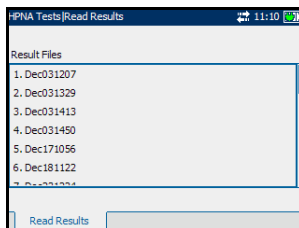

Read Results

The **Read Results** tab allows you to select a file name in the list of **Result Files** to view the results of all the files previously saved.

To select the test type results to read:

1. Press ✔ to open the list.

2. In the list, press the up/down arrows to select the test type.

3. Press ✔ to confirm the selection. The set of HPNA test result tabs will be displayed.

3 Maintenance

General Maintenance

To help ensure long, trouble-free operation:

➤ 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 and let the unit dry completely.

WARNING

Use of controls, adjustments, and procedures for operation and maintenance other than those specified herein may result in hazardous radiation exposure.

Recycling and Disposal (Applies to European Union Only)

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.

This equipment was sold after August 13, 2005 (as identified by the black rectangle).

➤ Unless otherwise noted in a separate agreement between EXFO and a customer, distributor or commercial partner, EXFO will cover costs related to the collection, treatment, recovery and disposal of end-of-lifecycle waste generated by electronic equipment introduced after August 13, 2005 to an European Union member state with legislation regarding Directive 2002/96/EC.

➤ Except for reasons of safety or environmental benefit, equipment manufactured by EXFO, under its brand name, is generally designed to facilitate dismantling and reclamation.

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

4 Troubleshooting

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).

For detailed information about technical support, visit the EXFO Web site at www.exfo.com.

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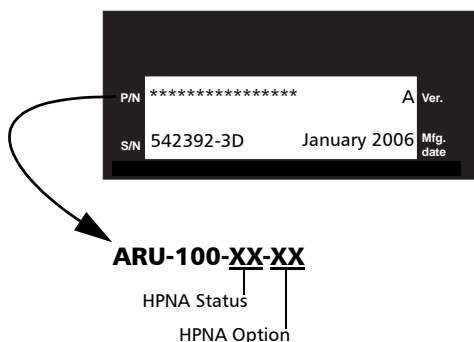
Transportation

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.

5 Warranty

General Information

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.

Service and Repairs

To send any equipment for service or repair:

1. 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 number and provide an address for return.

3. 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.

4. Return the equipment, prepaid, to the address given to you by support personnel. Be sure to write the number on the shipping slip. *EXFO will refuse and return any package that does not bear an 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.

A Technical 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.

SPECIFICATIONS

Size (L x W x H)	163 mm [a] x 84 mm x 31 mm (6.4 in x 3.3 in x 1.2 in)
Weight (without accessories)	0.25 kg (0.55 lb)
Connectors	F81 coaxial, 10/100 Ethernet
Power	Rechargeable Li-Ion battery or AC/DC adapter/charger
Battery life	4 h (continuous use)
Charging time	4.5 h
Temperature	
Operating	0 °C to 40 °C (32 °F to 104 °F)
Storage	−20 °C to 60 °C (−4 °F to 140 °F)
Relative humidity	0 % to 95 % non-condensing

HPNA RECEIVER/ANALYZER

Auto-discovery of HPNA devices and MAC addresses
Auto-test with pass/fail criteria between user-selected HPNA devices or all HPNA devices
Physical layer data rate (Mbit/s)
Signal-to-noise ratio (SNR)
Transmitted and received packets
Lost packets
User-configurable packet count and length
Attenuation (dB)
Power spectral density noise (dBm/Hz)

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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.
    閱穑骀钐裥塞粒粒。

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.
    閱穑骀钐裥塞粒。

www.EXFO.com · info@exfo.com

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	Beijing New Century Hotel Office Tower, Room 1754-1755, No. 6 Southern Capital Gym Road	Beijing 100044 P. R. CHINA Tel.: +86 (10) 6849 2738 · Fax: +86 (10) 6849 2662
EXFO SERVICE ASSURANCE	285 Mill Road	Chelmsford MA, 01824 USA Tel.: 1 978 367-5600 · Fax: 1 978 367-5700
TOLL-FREE	(USA and Canada)	1 800 663-3936

ISO 9001 · CE

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EXPERTISE REACHING OUT