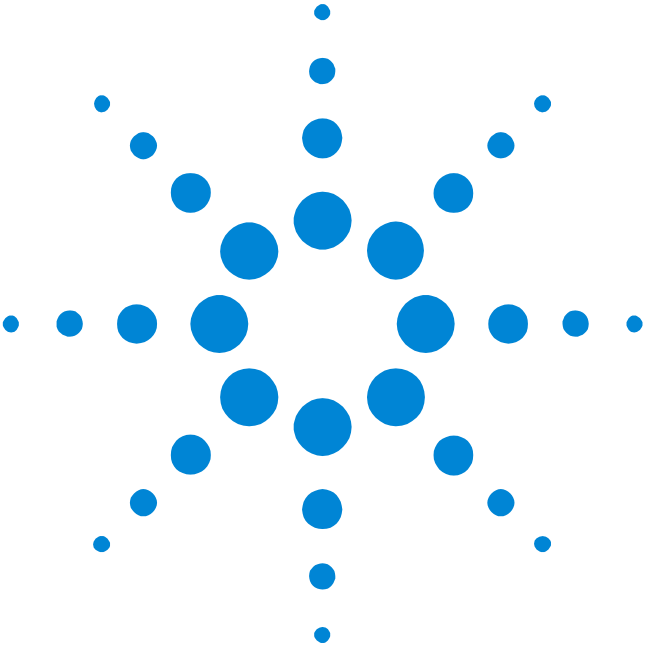


E6020A Mini-Fiber Break Locator User's Guide

Agilent Technologies

Notices

Warranty

The material contained in this document is subject to change without notice. Agilent Technologies makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Agilent Technologies shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

Edition / Print Date

All Editions and Updates of this manual and their creation dates are listed below.

E6020-91011: E0401

First Edition ..... April 2001

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For any assistance, contact your nearest Agilent Technologies Sales and Service Office (see *"Service and Support" on page 11*).

ISO 9001 Certification

Produced to ISO 9001 international quality system standard as part of Agilent Technologies' objective of continually increasing customer satisfaction through improved process control.

Bellcore Certification of Excellence

Agilent Technologies is officially designated Bellcore Certification Eligible, and is awarded Bellcore's Certification of Excellence for its OTDR Data Format.

Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

GENERAL

This product is a Safety Class 3 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

ENVIRONMENTAL CONDITIONS

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

BEFORE APPLYING POWER

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under Safety Symbols.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

DO NOT REMOVE THE INSTRUMENT COVER

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Safety Symbols

Caution, refer to accompanying documents

Hazardous laser radiation

Electromagnetic interference (EMI)

Initial Laser Safety Information

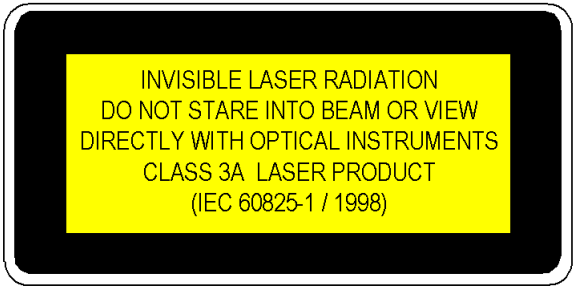
	E6021A	**E6022A**	**E6007A**
Laser Type	FP-Laser InGaAsP	FP-Laser InGaAsP	MQW-Laser AlGaInP
Laser Class			
According to IEC 825 (Europe)	3A	3A	2
According to 21 CFR 1040.10 (Canada, Japan, USA)	1	1	2
Output Power (Pulse Max)	50 mW	50 mW	n/a
Pulse Duration (Max)	10 µs	10 µs	n/a
Pulse Energy (Max)	500 nWs	500 nWs	n/a
Output Power (CW)	500 µW	500 µW	500 µW
Beam Waist Diameter	9 µm	9 µm	9 µm
Numerical Aperture	0.1	0.1	0.1
Wavelength	1310 ±25nm	1550 ±25nm	635 ±10nm

Safety Labels

The following laser safety warning labels are fixed on the panel of the Mini-FBL modules (that is, all modules except the E6006A and E6007A submodules):

USA

Non-USA



The following symbol is fixed to the panel of the Mini-FBL modules, next to the laser output:

A sheet of laser safety warnings is included with the laser module. You *must* stick the labels in the local language onto the outside of the instrument, in a position where they are clearly visible to anyone using the instrument.

The following laser safety labels should be fixed to the E6007A submodule:

Submodule E6007A

The laser safety labels for the USA, according to 21 CFR 1040.10 Class II, are already attached to the module.

A sheet of laser safety warnings is included with the laser module. You *must* stick the labels in the local language onto the outside of the instrument, in a position where they are clearly visible to anyone using the instrument.

All modules also have a CE class A label.

The recommended position for the laser safety warning label is at the rear side of the instrument near the optical output.

You **must** return instruments with malfunctioning laser modules to an Agilent Technologies Service Center for repair and calibration, or have the repair and calibration performed on-site by Agilent Technologies personnel.

About This Manual

The Structure of this Manual

This manual is divided into 4 parts:

- *"Getting Started" on page 21* tells you how to set up your Mini-FBL.
- *"Additional Features" on page 35* shows you what you can do with your Mini-FBL.
- *"Sample Sessions: Instrument Configuration" on page 47* and *"Sample Sessions: Other Mini-FBL Modes" on page 61* give you a step-by-step guide to making typical measurements and using other Mini-FBL features.
- The appendices contain additional information not required for routine day-to-day use.

Conventions used in this manual

- **Mini-FBL keys** are indicated by small capitals, for example RUN/STOP, SELECT.
- **Menus** are indicated by small capitals enclosed by square brackets, for example [SETTINGS], [FILE].
- **Menu items** are indicated by small capitals enclosed by angled brackets, for example [FILE]<OPEN>, <SET OFFSET>.
- **Modes** are indicated by italics, for example *Fiber Break Locator*, *Source Mode*.
- **Dialog** is indicated by Courier font, for example OK.

Related Publications

- For more information, please consult the following publications

- E4310-91016 Agilent Technologies OTDRs Programming Guide
- E6000-91017 Agilent OTDRs Pocket Guide
- 5963-3538F Cleaning Procedures for Lightwave Test and Measurement Equipment: Pocket Guide

Service and Support

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at: http://www.agilent.com/find/assist

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:

United States	1 800 452 4844
Canada	1 877 894 4414 (905) 206 4120 (FAX)
Europe	(31 20) 547 2323 (31 20) 547 2390 (FAX)
Japan	(81) 426 56 7832 (81) 426 56 7840 (FAX)
Latin America	(305) 269 7500 (305) 269 7599 (FAX)
Australia	1 800 629 485 (613) 9272 0749 (FAX)

New Zealand	0800 738 378 64 4 495 8950 (FAX)
Asia-Pacific	(852) 3197 7777 (852) 2506 9284 (FAX)

1

Getting Started

Getting Started introduces the features of the Agilent Technologies E6020A Mini-FBL (Fiber Break Locator). Here you will find a quick description of the instrument, an explanation of how to insert a module and Connector Interface, and a description of the main Mini-FBL screens.

Features of the Mini-FBL

The Front panel

Figure 1 shows the front panel of the Mini-FBL. The front panel contains the screen, the hardkeys discussed below, and three lights:

Laser On

- The red Laser-On LED behind the blue Run/Stop key is lit whenever the laser is active.

Battery Charging

- The red battery charging light is lit when the battery is charging.

Power On

- The green power on light is lit when the power is on.

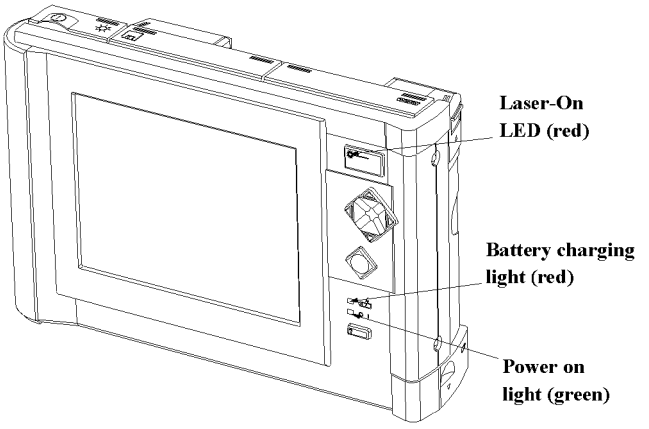


Figure 1 The Front Panel

The hardkeys

There are four keys on the front of the Mini-FBL.

Run / Stop
- The blue RUN/STOP key starts or stops a trace acquisition.

Cursor
- The CURSOR keys enable you to navigate around the menu system, or to move markers and so on. The four corners of this key are also referred to in this manual as the UP key, DOWN key, LEFT key and RIGHT key.

Select
- The SELECT key enables you to select the currently highlighted object, or to activate the popup panel.

Help
- The HELP key, marked ?, gives you information about the currently highlighted object. If no object is highlighted, you see more general help information.

The RUN/STOP and HELP keys do not change their meaning wherever you are in the menu system.

The CURSOR keys and the SELECT key can be used for more specific purposes. The current interpretation of these keys is shown in the diagram at the right of the screen

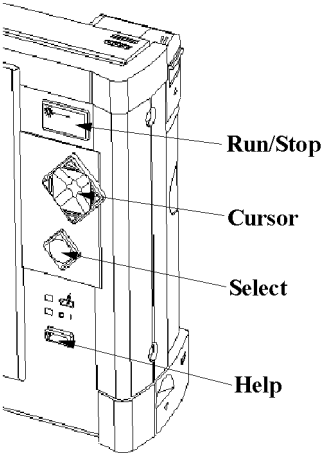


Figure 2 Mini-FBL hardkeys

The Mini-FBL module

Figure 3 shows a Mini-FBL with a module inserted in the back.

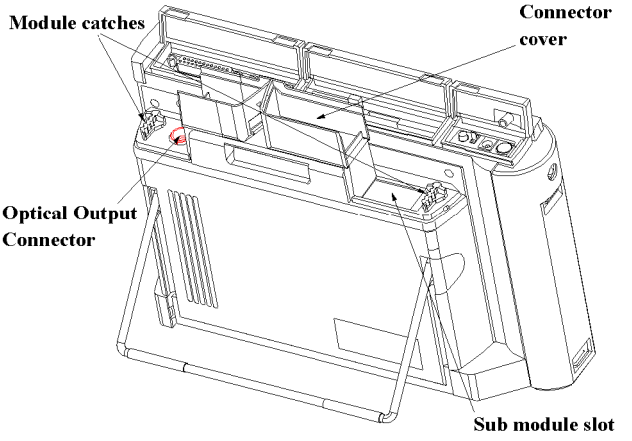


Figure 3 The Mini-FBL module

Module catches

- You keep the module in place with the module catches. When the module is in place, the catches should be perpendicular to the screen.

Connect fiber

- You connect fibers to the Optical Output Connector. For more details, see “Adding a Connector Interface” on page 27.

Submodule

- You add submodules to the submodule slot. Submodules currently available are the Power Meter (Agilent E6006A) and the Visual Fault Finder (Agilent E6007A). See “Inserting and Removing a Submodule” on page 41.

Removing a Module

NOTE You should switch off your Mini-FBL before inserting or removing a module or submodule.

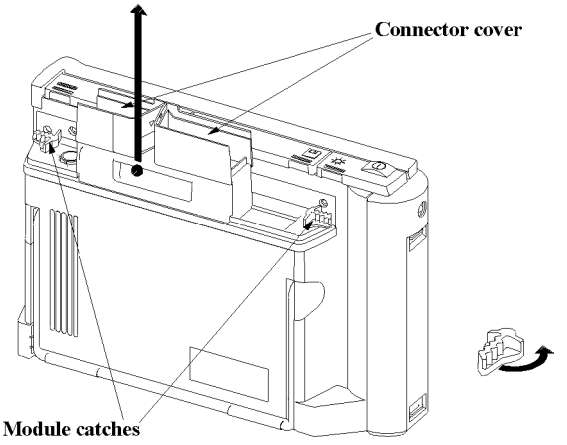


Figure 4 Removing a module

Module slot

The slot in the back of the Mini-FBL is used for the various Mini-FBL measurement modules. When you are inserting or removing a module, open the connector covers at the top of the module.

1 Open the connector covers

You can now see the Optical Output Connector where fibers are attached and the module catches either side of the module.

Rotate module catches

2 Rotate the module catches, so that they run parallel to the screen, as shown in Figure 4.

Remove module

3 Pull the module out of the module slot.

When the module has been fully removed, turn the catches 90 degrees so that they are perpendicular to the screen.

Inserting a Module

NOTE You should switch off your Mini-FBL before inserting or removing a module or submodule.

Module slot The slot in the back of the Mini-FBL is used for the various Mini-FBL measurement modules. When you are inserting or removing a module, open the connector covers at the top of the module.

1 Open the connector covers

You can now see the Optical Output Connector where fibers are attached and the module catches either side of the module.

Rotate module catches

2 Make sure that the module catches run perpendicular to the screen.

3 Lower the module into the module slot until you hear a click.

4 Push the module further in, until you hear a second click.

NOTE You should make sure that your module is fully inserted into the module slot. If the module is not fully inserted, this may affect the quality of your traces.

Adding a Connector Interface

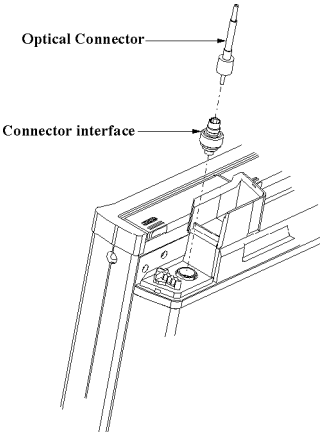


Figure 5 Adding a Connector Interface

Before you add the connector interface, you must have inserted a module to your Mini-FBL.

On the left of the module when viewed from behind, you see an Optical Output Connector (see Figure 5).

NOTE Before you attach a connector and fiber, you should clean them both.

See “How to clean connectors” on page 120 and “How to clean bare fiber adapters” on page 124.

Insert the Connector Interface into the Optical Output Connector. You can now attach a fiber to the Connector Interface.

Switching on the Mini-FBL

Self test

When you switch on the Mini-FBL it goes through self test.

If the Mini-FBL indicates a problem with the module, switch off the instrument, make sure the module is properly inserted and snapped into the Mini-FBL, and try switching the instrument on again.

Check power supply

If you have no reaction, check that the machine is connected to a power source (AC/DC adapter or battery). See “Battery Handling” on page 42.

The Applications Screen

The Applications Screen is the controlling screen that allows you to choose the best application for what you want to do.

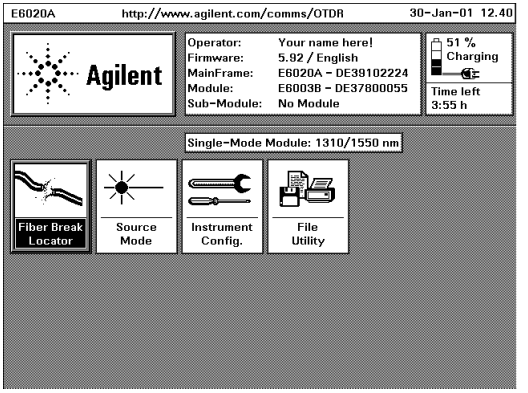


Figure 6 The Applications Screen

Application Modes

There are 4 different applications for different tasks and user groups:

- *Fiber Break Locator* is a simplified trace setting that enables you to locate fiber breaks quickly.
- *Source Mode* enables the stabilized laser source for loss measurements and identification with fixed modulation frequencies.

  If a submodule is installed, this icon is labeled *Power Meter* or *Visual Light*.
- *Instrument Config* enables you to set up the configuration for general features concerning the Mini-FBL.
- *File Utility* enables you to look at the internal directory structure of the Mini-FBL or an added device, and to copy, delete, or print files. See “The File Utilities screen” on page 30.

NOTE You can change the `Boot Into` mode in *Instrument Config*. This changes the mode that appears when you power on.

Use the Cursor keys to move to the application you want, and then press SELECT.

The File Utilities screen

You see the File Utilities screen by selecting *File Utility* from the Applications screen.

The File Utilities screen allows you to perform standard operations on one or more files.

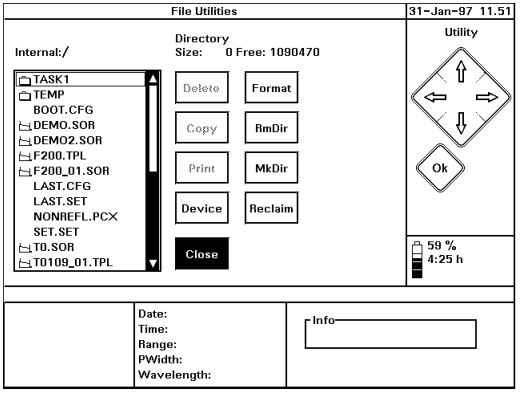


Figure 7 The File Utilities screen

Search for files

You can use the UP and DOWN cursors to look at files on the current device (by default, this is the Mini-FBL's internal directory structure). At the bottom of the screen, you see information about the currently highlighted file.

Press SELECT to select the highlighted file or directory. When a file is selected, you see a tick next to it. You may select as many files as you like.

You may perform the following operations from the File Utilities screen:

Delete

Delete: Delete the currently selected file(s).
If no file is selected, this option is grayed.

NOTE

If you choose Delete, you are asked to confirm this for each file selected. You may choose Delete All, to delete every file selected without being asked to confirm again.

Copy and Print

Copy All and Print All offer a similar facility for the Print and Copy options.

Copy: Copy the currently selected file(s). When you select this option, you may choose a new directory or a different device.
If no file is selected, this option is grayed.

Print: Print the currently selected file(s).

You must have a printer connected to the Mini-FBL.

If no file is selected, this option is grayed.

NOTE

You may only print traces. Traces usually have the extension .SOR or .TRC.

Select device

Device: Select a device from INTERNAL, FLOPPY, SRAMCARD, and FLASHDISK. The files displayed at the left of the File Utilities screen correspond to the current device.

NOTE

Before you select FLOPPY, SRAMCARD, or FLASHDISK, you must insert a floppy disk, an SRAM Card, or a Flash Disk as appropriate.

See “Inserting and Removing a Floppy Disk, Flash Disk, or SRAM Card” on page 39 for details.

Format device

Format: Format a device. You may choose between Internal, Flash Disk, SRamCard and Floppy.

Please note that the Mini-FBL cannot perform a “low-level format” (one which involves creating a new file system) on a floppy disk. This means that you cannot format a completely unformatted floppy disk with your Mini-FBL. This must be done on a PC.

The format function on your Mini-FBL is similar to the “Quick Format” function on a PC.

WARNING Formatting a device will destroy all data on the device.

If you try to format the internal device, your configuration is lost and your Mini-FBL must be reconfigured.

Delete directory

RmDir: Delete a directory. After you have selected RmDir move to the directory you want to delete, changing device if necessary. Then cursor RIGHT to Delete and press SELECT.

NOTE You cannot delete a directory if there are any files in that directory.

Create directory

MkDir: Create a new directory. When you have selected MkDir enter a name using the on-screen keyboard. You are now able to save files in the new directory.

Reclaim internal memory

Reclaim: Reclaim the internal memory. This may be necessary if you have deleted a number of files and require the maximum possible contiguous memory for storing new files.

Getting Help

To get help on the Mini-FBL you press the help key ? to activate the online documentation. The key can be found in the lower right-hand corner of the instrument

Press SELECT to see the Help screen of the item currently highlighted. Alternatively, cursor right to `Index`, and select one of the listed screen.

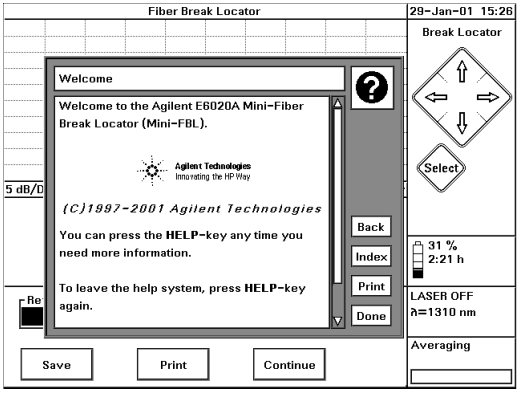


Figure 8 The Mini-FBL's Help Display

To leave the online documentation and resume your task, press the HELP key again. Alternatively, cursor right to `Done` and press SELECT.

2

Additional Features

Additional Features introduces additional features of the Agilent Technologies E6020A Mini-FBL (Fiber Break Locator). Here you will find descriptions of how the Mini Fiber Break Locator works, and how you can add external features to your Mini-FBL.

How the Mini-FBL Works

The Mini-FBL repeatedly outputs an optical pulse into the connected fiber and measures the reflections from this pulse. The trace displayed on the screen is a graph of this reflected power (backscatter) as a function of the distance along the fiber.

Events

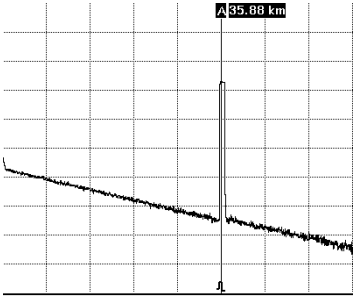
Events are changes in the fiber causing the trace to deviate from a straight line. Events can be *Reflective* or *Non-Reflective*.

Reflective Events

Reflective Events occur when some of the pulse energy is reflected, for example at a connector. Reflective Events produce a spike in the trace (you see a steep rise and fall in the graph: see the first diagram below).

Non-Reflective Events

Non-Reflective Events occur at parts of the fiber where there is some loss but no light is reflected. Non-Reflective Events produce a dip on the trace (see the second diagram below).



The Mini-FBL calculates the distance of such an “event” in the fiber from the time it takes the reflected signal to return. The further away an event is, the longer it takes for its reflection to return to the Mini-FBL.

By examining the trace of the reflected signal, the parameters of the fiber and the connectors, splices and so on can be determined.

Finding a Break

The Mini-FBL scans the trace for the first Event with an insertion loss greater than a given threshold. This Event is known as the Break. After the first Break has been found, the trace is not examined any further.

External connections

Figure 9 shows the external connections to the Mini-FBL. There are 3 flaps on top of the Mini-FBL:

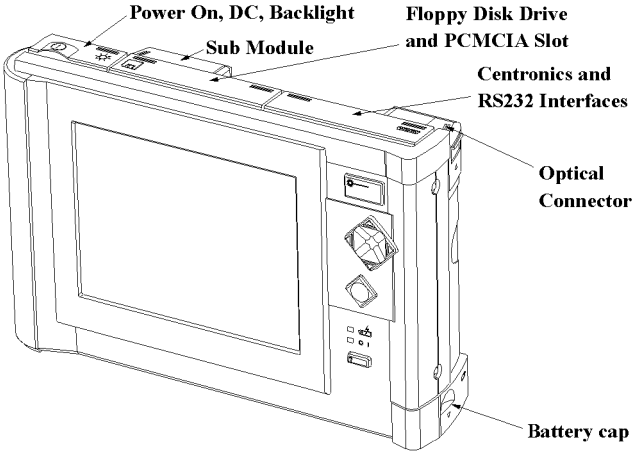


Figure 9 Mini-FBL external connections

Flaps at top of Mini-FBL

- Under the left flap you see switches. See “Switches” below.
- Under the middle flap you see the floppy disk drive and the PCMCIA Slot for 2 MB SRAM cards or flash disks. For more information, see “Inserting and Removing a Floppy Disk, Flash Disk, or SRAM Card” on page 39.

– Under the right flap you see interfaces to connect with Centronics and RS232.

Shoulder strap

- You can attach a shoulder strap to points on either side of the Mini-FBL. See “Adding a Shoulder Strap” on page 40.

Battery

- You insert the battery behind the flap in the bottom right corner of the Mini-FBL. See “Inserting and Removing a Battery” on page 42.

Submodule

- You can insert a submodule if you have already inserted a module into the back of the Mini-FBL. See “Inserting and Removing a Submodule” on page 41

Switches

You can see a number of switches and other features under the flap at the top left of the Mini-FBL:

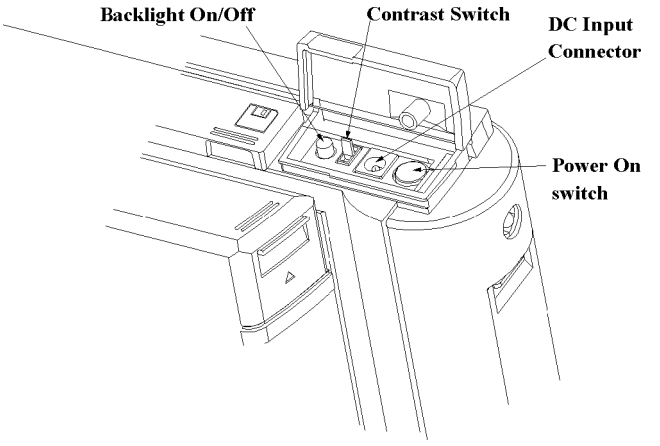


Figure 10 Switches and so on (viewed from behind the Mini-FBL)

Brightness

- You change the brightness of the picture with the backlight button.

Contrast
- You change the contrast of the picture with the contrast switch.

Input connector
- You use the DC input connector when you want to attach an AC/DC connector. See “Connecting an AC/DC Adapter” on page 45 for more details.

Power on
- You turn the Mini-FBL on and off with the power on switch. The power on switch can be activated when the flap is up or down

Inserting and Removing a Floppy Disk, Flash Disk, or SRAM Card

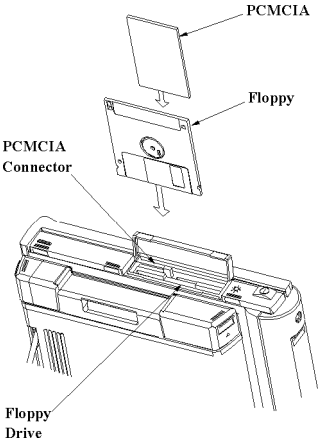


Figure 11 Inserting a Floppy Disk, Flash Disk, and SRAM Card

To insert a floppy disk, flash disk, or 2 MB SRAM card, open the center flap at the top of the Mini-FBL (see Figure 11). You see two slots here - at the front there is a PCMCIA slot for an SRAM card or a flash disk; at the back there is a slot for floppy disks.

NOTE Please make sure that the disk that any floppy disks that you insert are pre-formatted.

The Mini-FBL will not format disks, and does not recognize unformatted disks.

Adding a Shoulder Strap

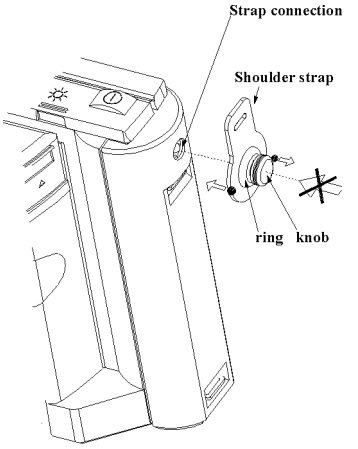


Figure 12 Adding hinges for the shoulder strap

You can attach a shoulder strap to the connection points on the left and right sides of the Mini-FBL.

The shoulder strap has a hinge at each end, consisting of a black knob and a larger ring on the strap itself (see Figure 12).

Attach shoulder strap To attach the strap, push in the ring. **Do not try to attach the strap by pushing in the knob**.

Remove shoulder strap To remove the shoulder strap, pull the black knob away from the Mini-FBL.

Inserting and Removing a Submodule

NOTE You should switch off your Mini-FBL before inserting or removing a module or submodule.

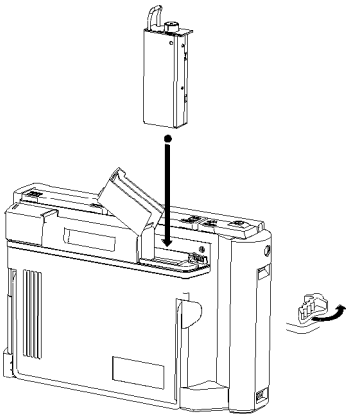


Figure 13 Inserting a submodule

Module **1** Insert a module

The submodules E6006A and E6007A go in the submodule slot at the top of main Mini-FBL modules. Follow the steps in “Inserting a Module” on page 26.

Connector cover **2** Lift the Connector cover and rotate the module catches

If you are looking at the Mini-FBL from the front, the submodule slot is under the left Connector Cover on the module. The submodule will only fit into the module if the module catches run parallel to the screen, that is if the module is unlocked.

Insert submodule **3** Now insert the submodule

The submodule slips easily in and out of its slot (Figure 13). When the submodule is in place, you can now connect an Optical Output Connector and a fiber, and lock the module.

Battery Handling

Inserting and Removing a Battery

The battery should be inserted in the slot at the foot of the Mini-FBL (see Figure 14.)

NOTE Only use the Agilent spare NiMH battery pack (Agilent Product Number E6080A) or comparable batteries. Other batteries may be damaged by the Mini-FBL battery charger

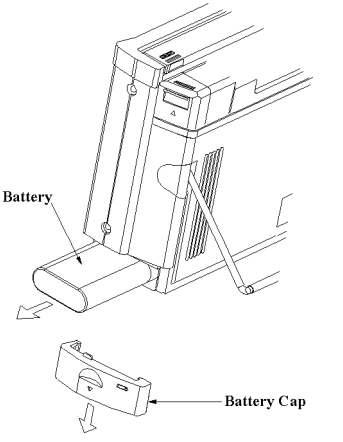


Figure 14 Removing a Battery

Battery cap

Before inserting or removing the battery, pull down the cap at the bottom of the right-hand side of the machine. The battery will then slide in and out.

Once you have inserted or removed the battery, replace the cap

CAUTION

Do not insert the battery while operating the instrument.

Charging the Batteries

The Mini-FBL has a built-in charger. It is able to charge the battery operating or non-operating. Fast-charge is typically performed non-operating in 2 hours.

Charging for the first time

- When you charge the battery for the first time, insert the battery and connect the AC-Adapter (see “Connecting an AC/DC Adapter” on page 45).

Old batteries

- If your battery is new or has been in storage for a long time, you may need to charge it two or three times to achieve optimum performance levels.

Best performance

- For the best battery performance and accuracy of the fuel gauge (showing percentage use of the battery), completely discharge the battery, then make a complete fast charge cycle (non-operating), and completely discharge the battery again.

NOTE

You must ensure that the charging cycle is not interrupted by a battery discharge, and that the discharge cycle is not interrupted by battery charging.

Battery temperature

- It is best if you charge the battery at a limited and controlled temperature (10°C to 35°C, 50°F to 95°F).
- It is normal for the battery to become warm during charging or after use.

- When completely charged, the battery will discharge down to 80% before a new charging cycle is activated.

Battery Storage

- Remove your battery from the Mini-FBL when not in use. Store at room temperature (59°F to 86°F, 15°C to 30°C), and in a dry place for optimal performance.
- A charged battery will gradually lose its charge if left in storage. It is therefore better if you top-off the charge before use.
- It is good practise to recharge the battery every 2-3 months during storage.

Battery safety

Your battery has passed a UL-listed safety test. For the best results, wipe the battery with a soft dry cloth if it becomes dirty.

Do not disassemble or attempt to open the battery under any circumstances.

- The battery can explode, leak or catch fire if heated or exposed to fire or high temperatures.
- Do not short circuit the battery by directly connecting the metal terminals (+,-). Be certain that no metal objects such as coins, paper clips and so on touch the terminals.
- Do not drop the battery or subject it to mechanical shock.

Connecting an AC/DC Adapter

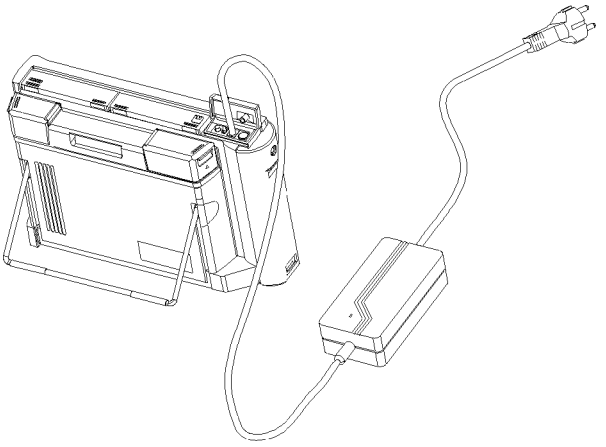


Figure 15 Connecting an AC/DC Adapter

To connect an AC/DC adapter charger, open the flap at the top of the Mini-FBL (on the left-hand side when viewed from the front).

Input connector

You see an input connector next to the On/Off button. Attach the lead from the charger to this connector (Figure 15).

The Mini-Keyboard

If you order the Agilent E6081A, you receive a PS2 keyboard, that you can attach at the back of your Mini-FBL, to the right-hand side (see Figure 16).

You can use the keyboard in place of the screen keyboard to enter text (see, for instance, “How to change a text setting” on page 50).

Keyboard shortcuts

You can also use the keyboard to control your Mini-FBL using the following Cursor keys:

keyboard key	equivalent Mini-FBL hardkey
<*f2*>	Run/Stop
Up arrow Down arrow Left arrow Right arrow	Cursor Up Cursor Down Cursor Left Cursor Right
<*Enter*> or <*Return*>	Select
<*f1*>	Help

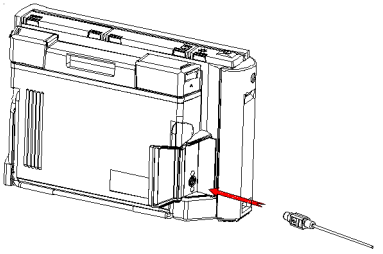


Figure 16 Attaching a keyboard

You can use a mini-DIN connector to attach any standard PS2 keyboard, such as the Agilent E6081A, to the keyboard connector.

3

Sample Sessions: Instrument Configuration

Sample Sessions

The following Sample Sessions show you how to configure your Mini-FBL.

The following sample sessions show you how to:

- General Configuration,
- Trace Information,
- Instrument Setup,
- Printer Configuration (including How to Add a Logo),
- Firmware/Language Update.

How to Set the General Configuration

Start up screen

1 Switch on the Mini-FBL. You will see one of the following screens:

Select Instrument Config

– If you see a series of boxes like Figure 6, you are in the Applications Screen. Cursor Right to `Instrument Config` and press SELECT.

– Otherwise, you are in *Fiber Break Locator* (Figure 26) or *Source Mode* (Figure 27). Move to the `Close` box and press SELECT. You are now at the Applications Screen, and can select `Instrument Config`.

How to Set the General Parameters

2 You now see a window with the headings `Instrument Configurations` and `General Parameters`. The window contains two columns of features that can be changed.

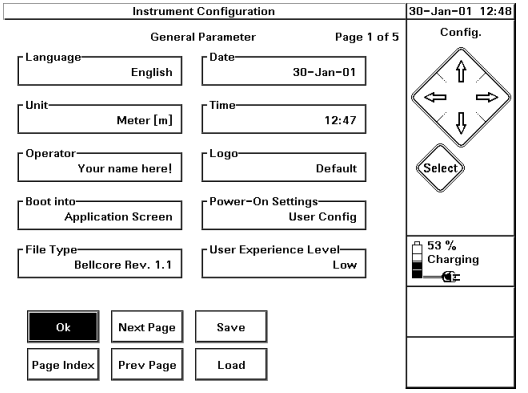


Figure 17 Instrument Configuration General Parameters Screen

You can move to any of these boxes and press Select. You can change the default setting using one of the following methods. Note that the changes are not applied until you save the settings (see step 12 below).

How to select a setting from a list

Change language

3 Move to the box headed `Language` and press SELECT. You see a list of the available languages for the User Interface.

4 Cursor DOWN to the language you want and press SELECT. The language that you have just selected appears in the dialog box.

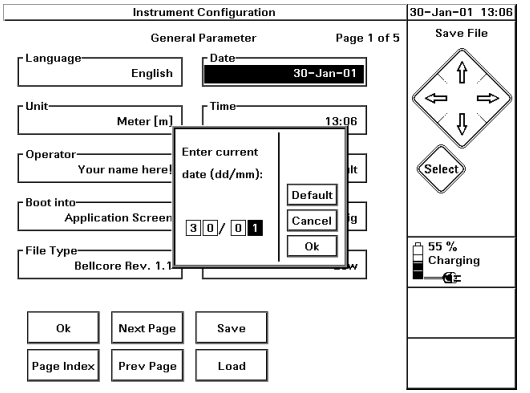


Figure 18 Entering Numerical Data

How to change a numerical setting

Change Time

5 Move to the box headed `Time` and press SELECT. You see the current time.

6 Cursor LEFT and RIGHT to highlight the digit(s) that you want to change. Cursor UP and DOWN to increase or decrease the highlighted digit.

7 When you have the correct time, cursor right to `OK` and press SELECT.

How to change a text setting

Change Operator name

8 Move to the box headed `Operator` and press SELECT. You see a keyboard with the Current Operator name.

9 Move to the letters you want, and press the SELECT key. Move to `Del` to delete the previous character, and to `CAPS` to change the case of subsequent letters.

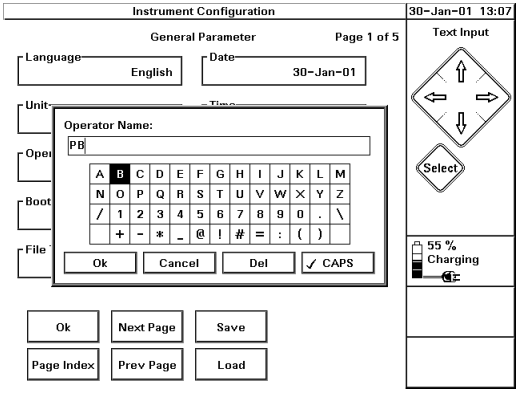


Figure 19 Keyboard to Enter Text

10 When you have the text you want, move to `OK` and press SELECT.

NOTE You can also add text from an external keyboard such as a PC or an organizer. Attach a serial line to the Mini-FBL, and type `keyb`. See the *OTDR Programming Guide* (Agilent Product Number E4310-91016) for more details.

You can also operate your Mini-FBL remotely using the Agilent E6091A OTDR Toolkit II software. See the *OTDR Toolkit Operating Instructions* (Agilent Product number E6091-91013) for more details.

Change other parameters

11 Set other features in the General Parameters screen as required:

- Select units from `Meter [m]`, `Feet [Ft]`, and `Miles [mi]`.
- Select Bellcore revision type.

  Bellcore revision 2.0 conforms to standards, but you may need to use earlier Bellcore revisions for backward compatibility.
- Select and set the Date. Confirm with `OK`, then use the same procedure to set the Year.

NOTE The date is entered in European format dd/mm, for example 08/02 for 8 February

- Select and set the screen and settings that appear when you switch on (`Boot into` and `Power-on Settings` respectively).

How to Save the Instrument Configuration

12 When you have chosen the configuration you want, move to the `Save` box and press SELECT. The configuration that you have just specified is saved as the default configuration.

Exit Instrument Configuration

13 Select `OK` to return to the Applications screen.

How to Set the Trace Information

How to Set the Default Trace Information

Select Default Trace Info page

1 Access the *Instrument Configuration* Screen by following step 1 from "How to Set the General Configuration" on page 47

2 Select `Default Trace Info.` from the `Page Index` menu. You see a screen listing 5 labels and 5 comments.

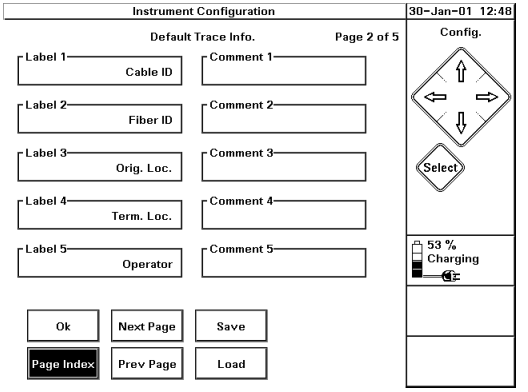


Figure 20 Default Trace Info Configuration screen

Change comments

3 Move to the box headed `Comment 1` and press SELECT. You see a keyboard on the screen (see Figure 19), Add letters from the keyboard until your comment is complete.

4 Confirm your comment by moving to `OK` and pressing SELECT.

5 Repeat steps 3 and 4 for the remaining comments.

Change labels

6 By default the labels are `Cable ID`, `Fiber ID`, `Orig.Loc.`, `Term Loc.` and `Operator`. If you want to change any of these labels, move to the appropriate box and press SELECT. Enter the text as before, selecting `Del` to delete unwanted text.

7 Cursor down to the `Save` box and press SELECT. The new Comments and Labels are now saved.

How to Connect to a PC using the RS232

This is a brief example of how you configure your Mini-FBL for connecting to a PC. For more details and information about the hardware settings, please consult the *Agilent OTDRs Programming Manual* (E4310-91016).

How to Set the Instrument Setup

Instrument Configuration

1 Follow step 1 in "How to Save the Instrument Configuration" on page 51 to bring up the Instrument Configuration screen.

2 Select `Page Index` to see a list of the Configuration screens. Select <INSTRUMENT SETUP> from this list.

You see the Instrument Setup screen (Figure 21).

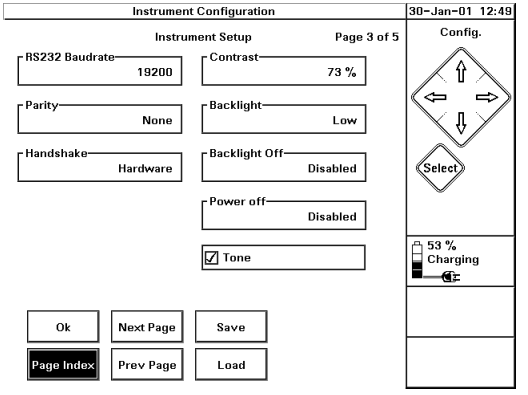


Figure 21 Instrument Setup screen

Set Baudrate and Handshaking

3 If necessary, change the baudrate to 19200. To change the baudrate, select the `RS232 Baudrate` box and choose the required menu option.

4 If necessary, select `Handshake` and change to Hardware.

Save settings

5 Select `Save` to save this configuration.

How to Set up the Printer Configuration

NOTE For information on how to print a file, see “How to Print the Measurement” on page 98.

Instrument Configuration

1 Select `Instrument Config` from the Applications screen.

2 Move to `Page Index` and press SELECT. Select `Printer Setup`. You see a window showing the current printer configuration.

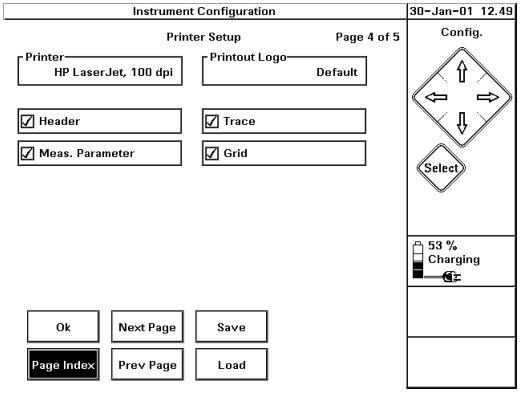


Figure 22 Printer Setup Configuration

Select printer

3 Cursor UP to the box headed `Printer`. If the printer listed there is not the one you want, press SELECT. Choose a printer from the available ones listed.

NOTE

Most HP printers (but not the Thinkjet) will work in the HP LaserJet, 100dpi setting. For non-HP printers, set emulation mode on your printer, and select an appropriate print option.

So, select the `HP LaserJet/HP DeskJet` for HP emulation, `PCL` for PCL emulation, or `Epson 8-pin` for Epson emulation.

Choose a 150 dpi option if you want a compact printout.

Select logo

4 If you want to change the printed logo, cursor DOWN to `Printout Logo` and press SELECT. Choose a logo from the available .PCX files. Select `Default` for the default

Logo, or `Select` for the one that is currently highlighted.

If you want to create a new logo, follow the steps in How to Add a Logo, below.

Specify what is printed

5 Look at the options on the right of the `Printer Setup` window. There is a tick next to the features that will appear on the printout. If you wish to add or delete any of these features, move to that item and press SELECT.

6 When you have the printer configuration you want, select `Save` then `OK` to return to the Applications Screen.

How to Add a Logo

To add a specified logo to the screen and printout, you should do the following:

How to copy a Logo to the Mini-FBL

Create PCX file

1 Create a PCX image, with 200 x 100 pixels. Make sure that the file has the extension `.PCX`.

NOTE Your .PCX image can be monochrome or with 7 colors. If your original image has more colors, you may want to save it with 7 colors to preserve its clarity.

Your PCX file must not be bigger than 25 kilobytes.

2 Record the file on a floppy disk, and insert the disk into the Mini-FBL's floppy disk drive.

Select File Utilities

3 Select `File Utility` from the *Applications Screen*.

You now see the *File Utilities* screen.

4 Select `Copy`. A dialog box appears containing a list of files.

Copy PCX to your Mini-FBL

5 Select `Device` from the dialog box. You see a submenu listing the available devices. Select `Floppy`, if it is not selected already. The <COPY> menu now lists the files on the floppy disk.

6 Move to the correct .PCX file containing the logo, and press SELECT. A tick appears next to the filename.

7 Move to `Copy` and press SELECT. You see a dialog box asking you to select a device name. Highlight `Internal` and press SELECT.

How to Update the Firmware and Languages

Follow these instructions to update a new version of the Mini-FBL firmware, or to update the languages of your Help and User Interface.

NOTE Updating the firmware and the language involves rebooting your Mini-FBL.

Before starting an update, make sure that you have saved all traces, settings, and so on, that would be lost during a reboot. The internal memory is not deleted by the update.

Update floppy disks

To update the firmware or languages, you need the floppy disks provided with your Mini-FBL. There are 3 floppy disks for the firmware update, and 1 for the language update.

NOTE Make sure that the language update disks and the firmware update disks are for the same revision of the Mini-FBL software.

The update revision is noted on each disk.

Connect to power supply

1 Connect your Mini-FBL to an AC/DC power supply. See “Connecting an AC/DC Adapter” on page 45

Instrument Configuration

2 Access the *Instrument Configuration* Screen by following step 1 from “How to Set the General Configuration” on page 47

3 Select `Firmware/Language Update` from the `Page Index` menu.

4 You see a screen where you can set the languages or Update the Language or Firmware (Figure 23).

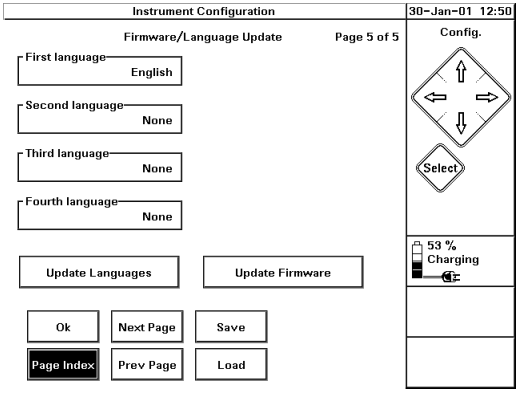


Figure 23 Firmware / Language Update configuration page

How to Update the Firmware

Update firmware

5 Cursor to `Update Firmware` and press SELECT.

You see a message reminding you to save all important data (see first note in this section).

6 Select `Yes` to continue.

You are now asked to insert update disk #1.

7 Insert the disk and press SELECT.

8 Follow the remaining instructions that you see on your Mini-FBL screen.

How to Update the Languages

After the firmware update, you return to the `Firmware/ Language Update` screen, so that you can update the languages configured on your Mini-FBL.

Please note that after you have updated the firmware, you should follow this procedure, even if you just have the English interface.

NOTE You can also follow these instructions to change the languages configured on your Mini-FBL without updating the firmware.

Update first language

9 Cursor up to `First Language` and press SELECT.

You are asked to insert the Language Update Floppy disk. This disk contains the information about which languages you can select.

10 Insert the disk in your Mini-FBL floppy disk drive and press SELECT.

You see a list of available languages.

11 Cursor up or down to the language that you want, and press SELECT.

Select more languages

12 Repeat this process as required for `Second Language`, `Third Language`, and `Fourth Language`.

If require fewer than 4 languages, you can select `None` for the extra language options.

NOTE You cannot choose the same language twice.

So, for example, if you choose French as both the second and third language, you will see an error message, and the Mini-FBL will suggest an appropriate configuration.

13 When you selected your required languages, cursor to `Update Language` and press SELECT.

You see a message telling you to make sure that you have save all important data.

14 Follow the instructions on the Mini-FBL screen.

After the update, your Mini-FBL automatically reboots.

NOTE You can also update your firmware or languages using the Update executable file provided on your support CD.

Connect your Mini-FBL to a pc with an RS232 cable (see *"External connections" on page 37*). You can then set the configuration you need, and press `Start`. The update software will tell you how to proceed.

4

Sample Sessions: Other Mini-FBL Modes

"Sample Sessions: Instrument Configuration" on page 47 showed you how to configure your Mini-FBL.

This chapter shows you how to use other modes of the Mini-FBL. The available modes are seen as options on the Applications Screen (see "The Applications Screen" on page 28).

Sample Sessions

The following sample sessions show you how to:

- Use the Fiber Break Locator,
- Use Source Mode,
- Use Source Mode with the Power Meter and Visual Fault Finder Submodules.

If you have not used a Mini-FBL before, you should first read the previous sections. The equipment used in the following Sample Sessions is the same as before.

How to Use the Fiber Break Locator

The Fiber Break Assistant

When you first start the Fiber Break Locator, you see a message giving you hints on how to proceed. This is the Fiber Break Assistant.

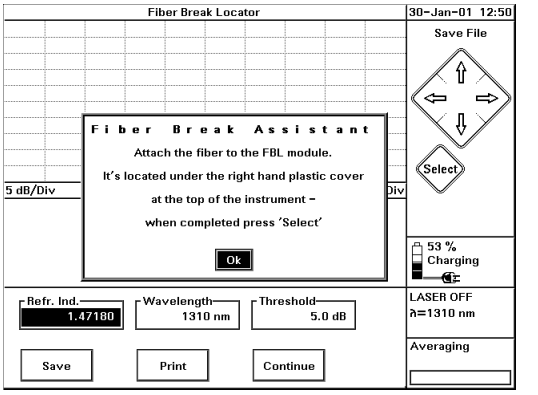


Figure 24 Fiber Break Assistant

Purpose of Fiber Break Assistant

The aim of the Fiber Break Assistant is to help people who have not used the Fiber Break Locator before.

You can turn off the Fiber Break Locator as follows:

1 Bring up the *General Settings* page of the Instrument Configuration (see *"How to Set the General Configuration" on page 47*).

Change User Experience Level

2 Select a `High` *User Experience Level*.

3 Select `Save`, then exit the Instrument Config pages.

With a High user experience level, some of the steps in the following example will be missing. To re-enable the Fiber Break Assistant, return to the Instrument Config page, and select a user experience level of Low.

Using the Fiber Break Locator

1 Select *Fiber Break Locator* from the Applications Screen.

Attach a fiber

2 If you have not already done so, attach a fiber to your Mini-FBL module (see *"Inserting a Module" on page 26* and *"Adding a Connector Interface" on page 27*).

The Fiber Break Assistant gives you information about connecting a fiber and selecting a cable vendor.

3 To move to the next screen in the Fiber Break Assistant, press SELECT after reading each page.

Cable vendor list

You should see a dialog containing the recommended Refractive Indexes for selected cable vendors.

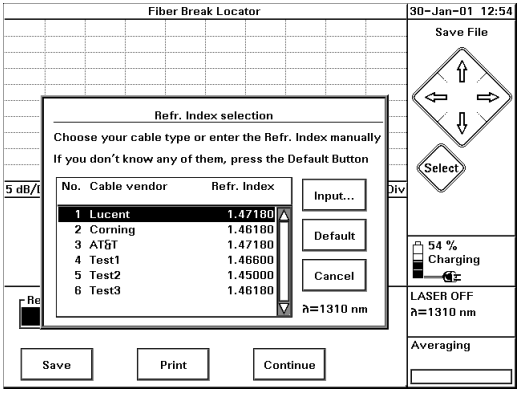


Figure 25 Fiber Break Locator: Refractive Index selection

NOTE If you don't see this dialog, this means that you do not have a vendor file (VENDOR.INI) in your Mini-FBL internal memory.

Please contact your Agilent representative if you need any assistance, or see *"Appendix: VENDOR.INI" on page 141*.

If you do not have a vendor file, you can use the Cursor keys to manually input a Refractive Index.

Select cable vendor

4 Cursor to an appropriate vendor name (or to Default), and press SELECT.

Start Fiber Break Locator

5 Press the RUN/STOP key to activate the laser source.The light behind the RUN/STOP key will be lit and the text Measuring will flash beneath the screen.

The Fiber Break Locator stops automatically as soon as a break is detected. You can also stop it manually by pressing the blue Run/Stop key.

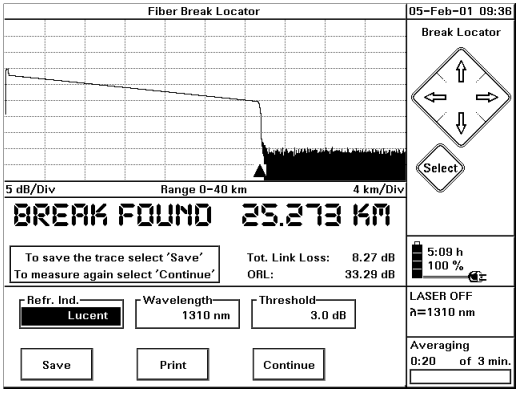


Figure 26 Fiber Break Locator trace

The first break above the specified threshold level will be marked, or you will see the text No Break Found.

Save or Print

6 Select `Save` or `Print` to save or print your trace as required.

Change settings

7 If you want to change the settings, cursor to the Wavelength or Threshold box and press SELECT. You can then use the Cursor and Select keys to choose new settings.

Continue or Quit

8 Cursor to Continue and press SELECT. If you want to make a new measurement, select `Start`. If you want to exit the Fiber Break Locator, select `Close`.

How to Use Source Mode

Source Mode diagram

1 Select *Source Mode* from the Applications Screen.You see two diagrams on the Source Mode screen. The Source Mode diagram is on the right.

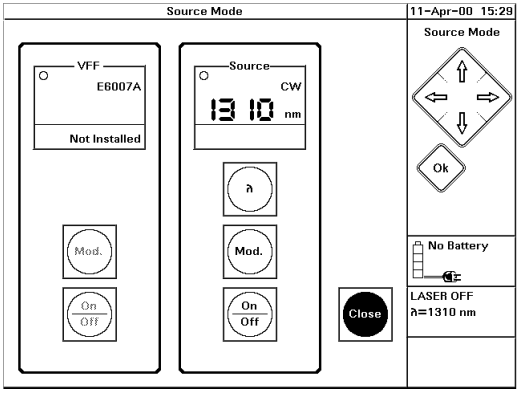


Figure 27 Source Mode

NOTE The left-hand diagram shows the current submodule. If no submodule is installed, you see `Not installed` in the screen.

See “How to Use the Power Meter Submodule” on page 66 and “How to Use the Visual Fault Finder submodule” on page 73.

Change settings

2 If you want to change the Wavelength or Modulation Frequency, use the cursor keys to move to the appropriate box on the screen. Press SELECT, and select the required value.

3 Press the RUN/STOP key to start a trace. The light behind the RUN/STOP key will be lit, and the Operation button on the screen will flash on and off.

How to Use the Power Meter Submodule

Insert submodule

1 Switch off the Mini-FBL, and insert a module. Insert an E6006A Power Meter submodule into the submodule slot in the module (see “Inserting and Removing a Submodule” on page 41).

Connect fiber

2 Attach the required optical connector interface to the optical output.

3 Connect the fiber to this interface.

4 Attach the other end of the fiber to a Source, such as the Agilent N3974A Dual Laser Source.

Alternatively, attach the other end of the fiber to the module currently installed in the Mini-FBL

5 Switch on the Mini-FBL. The second box in the Applications screen will now be called `Power Meter`. Move to this box and press SELECT.

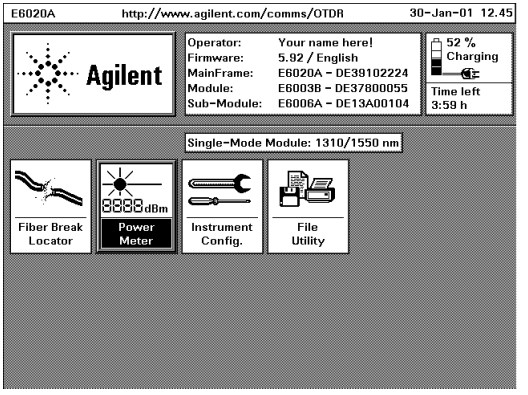


Figure 28 Applications Screen when the E6006A submodule is attached

Power Meter screen

You now see the *Power Meter* screen. You see 2 diagrams: the Power Meter is on the left, the Source is on the right. In the Power Meter screen, you see the current power level, which is updated 3 times per second.

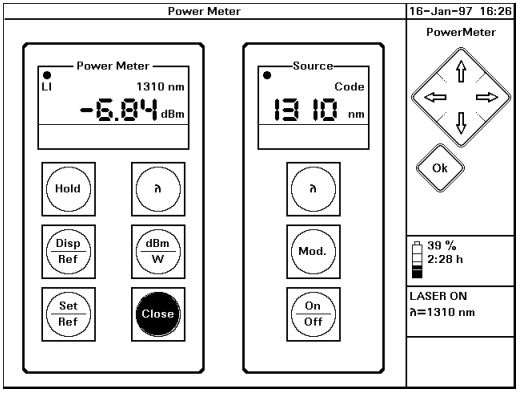


Figure 29 The Power Meter Screen

NOTE If the left-hand diagram is not titled `Power Meter`, you do not have a Power Meter submodule installed, or it is installed incorrectly. If you have a submodule in the back of your instrument, check that both the module and the submodule are in their slots properly.

Change settings

6 Move to the Power Meter (left-hand) diagram. If you want to alter the units used, select `dBm/W` to toggle between dBm, dB, and Watts.

7 If you want to alter the Wavelength, select λ from the Power Meter diagram.

The Power Meter toggles between the available wavelengths for the module.

Freeze display

8 If you want to freeze the display, press `Hold`. You see "Hold" written in the Power Meter (left-hand) screen. The display is now not updated, so you will not see any new power levels.

Press `Hold` again to unfreeze the display.

How to Show the Power relative to a Reference Value

Set Reference value

Either

9 Select `Disp/Ref` from the left-hand screen. All subsequent power levels are shown relative to the current power level.

Or

- Select `Set/Ref` from the left-hand screen. Manually input a reference value (see "How to change a numerical setting" on page 49). All subsequent power levels are shown relative to this value.

The power level is now shown relative to the Reference value set. The Reference value is written after "Ref." in the Power Meter (left-hand) window.

NOTE If you reset the units (by selecting `dB/W`), the absolute power level is shown again. To return to the relative power level, select `dB/W` for a second time.

How to Send Code Modulated Output

Select Code mode

10 Cursor to the Source Mode (right-hand) diagram. Select `Mod.`, until you see the word "Code" in the Source Mode window.

If the Power Meter detects the code, it switches to the correct wavelength of the source, and you see LI in the Power Meter window.

You have now selected Code modulation. You can use Code modulation when you have connected the power meter submodule to another source (such as a second Mini-FBL), and you want to use the wavelength of this source.

NOTE `Code` is equivalent to selecting the Dual λ or Single λ mode from the Agilent N3974 handheld Dual Laser Source.

How to Perform an Insertion Loss Measurement

How to Set up the Power Meter

Insert submodule

1 Install a Power Meter submodule, and select the Power Meter screen (see "How to Use the Power Meter Submodule" on page 66).

Set CW mode

2 Cursor to `Mod.` on the Source (right-hand) diagram. Press SELECT until you see `CW` in the Source window.

Select Wavelength

3 Staying in the right-hand diagram, cursor UP to λ. Press SELECT until you see the correct wavelength for your measurement in the Power Meter window.

4 Cursor Left to the Power Meter (left-hand) diagram. Select λ until the wavelength in the power meter window is the same as the wavelength you have selected for the Source.

How to Take a Reference value

Attach fiber

5 Attach output connectors to the module and the power meter submodule. Connect the module and submodule with a fiber (Figure 31, first picture).

6 Switch on the Source.

Select `On/Off` from the Source window.

7 Select `dBm/W` from the Power Meter diagram until the measurement in the Power Meter window is in dB.

Select Reference value

8 Wait for the measurement to stabilize, then select `Disp/Ref`.

The measurement is taken as a reference value, which you can see next to `Ref:` in the Power Meter window.

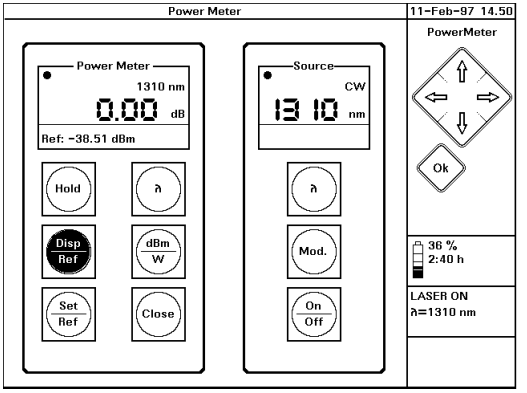
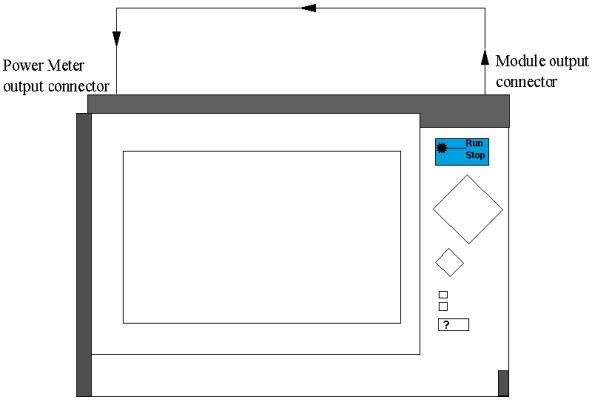


Figure 30 Taking a Power Meter Reference value

9 Switch off the Source.

Select `On/Off` from the Source window.

Steps 5 to 9: take a Reference value



Steps 10 to 14: take the measurement

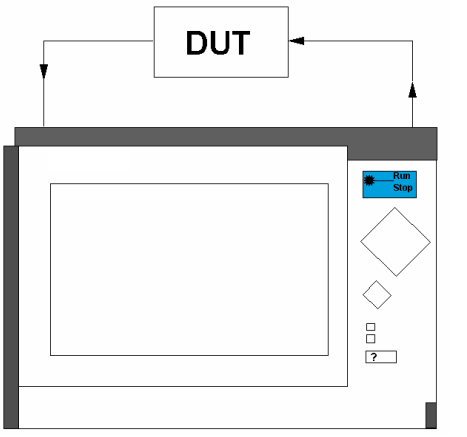


Figure 31 Fiber setups for performing an Insertion Loss measurement

How to Take the Measurement

Insert DUT

10 Insert the Device Under Test in the link between the Source and the Power Meter (Figure 31, second picture).

11 Switch on the Source.

Select `On/Off` from the Source window.

Read Insertion Loss

12 Read the insertion loss for the DUT from the Power Meter window.

13 Switch off the Source.

Select `On/Off` from the Source window.

14 Disconnect the DUT.

How to Use the Visual Fault Finder submodule

Insert submodule

1 Switch off the Mini-FBL, and insert a module. Insert a 6007A Visual Fault Finder submodule into the submodule slot in the module (see “Inserting and Removing a Submodule” on page 41).

Connect fiber

2 Attach the required optical connector interface to the optical output.

3 Connect the fiber to this interface.

4 Switch on the Mini-FBL. The second box in the Applications screen will now be called `Visual Light`. Move to this box and press SELECT.

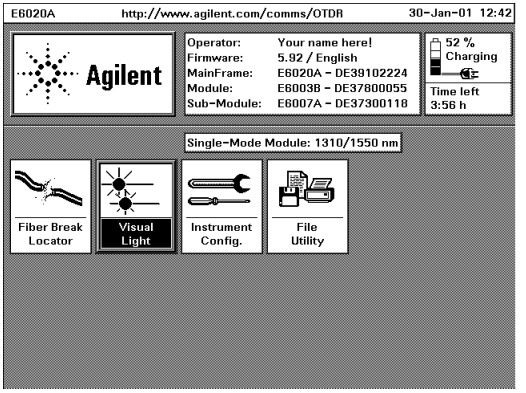


Figure 32 Applications Screen when the E6007A submodule is attached

Visual Fault Finder screen

You now see the *Visual Fault Finder* screen. You see 2 diagrams: the Visual Fault Finder is on the left, the Source is on the right

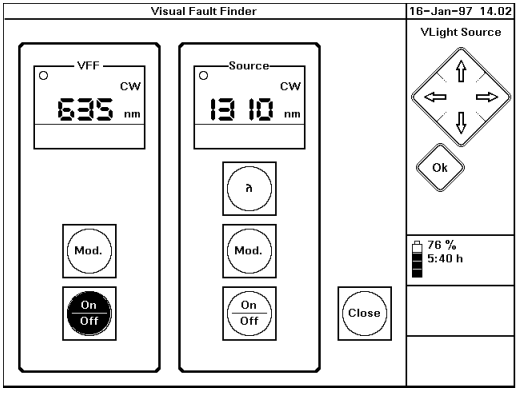


Figure 33 The Visual Fault Finder Screen

NOTE If the left-hand diagram is grayed, as in Figure 27, you do not have a submodule installed, or it is installed incorrectly. If you have a submodule in the back of your instrument, check that both the module and the submodule are in their slots properly.

Select modulation

5 Cursor to the left-hand diagram. If you want to alter the modulation, select MOD. You can choose CW for Continuous Wave modulation, or 1Hz for a light flashing at a frequency of 1 Hertz.

Activate Visual Fault Finder

6 Remain at the left-hand diagram and select ON/OFF. The Visual Fault Finder is activated, and the circle at the top of the screen is filled.

7 Examine the fiber attached to the submodule. Red light shows through the casing where there are breaks or a remote fiber outlet. If you have chosen a 1 Hz Modulation, this light is flashing.

WARNING Under no circumstances look into the end of an optical cable attached to the optical output when the device is operational. The laser radiation can seriously damage your eyesight.

The Visual Fault Finder works on fibers with coatings of up to 3 mm, and at distances of up to 5 km.

A

Installation and Maintenance

This appendix provides installation instructions for the Mini-FBL. It also includes information about initial inspection and damage claims, preparation for use, packaging, storage, and shipment.

Safety Considerations

Safety class and markings

The Mini-FBL is a Class 3 instrument (that is, an instrument with no protective earth command and DC input voltages less than 60V DC).

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically.

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer housing.

Internal Back-Up Battery

This instrument contains a lithium battery. Replacing the battery should be carried out only by a qualified electrician or by Agilent Technologies service personnel.

Battery replacement

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or an equivalent type (PANASONIC CR 2477). Discard used batteries according to local regulations.

AC Line Power Supply Requirements

The Agilent E6020A can operate through the supplied AC adapter between 100V and 240V ± 10%, at a frequency in the range from 50 to 60 Hz. The maximum power consumption is 30VA with all options installed.

Line Power Cable

According to international safety standards, the charger has a three-wire power cable.

The type of power cable shipped with each instrument depends on the country of destination. Refer to Figure 34 for the part numbers of the power cables available.

NOTE You only need to use the line power cable to connect to the AC adapter.

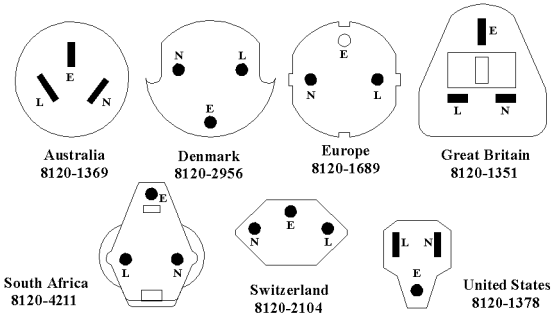


Figure 34 Line Power Cables – Plug Identification

WARNING

To avoid the possibility of injury or death, you must observe the following precautions before switching on the instrument.

- If this instrument is to be energized via an autotransformer for voltage reduction, ensure that the common terminal connects to the earth pole of the power source.

- Insert the power cable plug only into a socket outlet provided with a protective earth contact. Do not negate this protective action by the using an extension cord without a protective conductor.

The following work must be carried out by a qualified electrician. All local electrical codes must be strictly observed. If the plug on the cable does not fit the power outlet, or if the cable is to be attached to a terminal block, cut the cable at the plug end and rewire it.

Cable color coding

The color coding used in the cable depends on the cable supplied.

Connecting a new plug

If you are connecting a new plug, it should meet the local safety requirements and include the following features:

- Adequate load-carrying capacity (see table of specifications).
- Ground connection.
- Cable clamp.

WARNING

To avoid the possibility of injury or death, please note that the Agilent E6020A does not have a floating earth.

DC Power Supply Requirements

WARNING

When using a DC line supply, before switching on the instrument, make sure that the supply meets the local protection requirements.

The Agilent E6020A can operate from a DC power source that supplies between 16V and 24V. The maximum power consumption during a quick charge is 30W with all options installed. Typical power consumption is below 8W.

Operating and Storage Environment

The following summarizes the Agilent E6020A operating environment ranges. In order for the Mini-FBL to meet specifications, the operating environment must be within these limits.

Temperature and Humidity

Protect the instrument from temperature extremes and changes in temperature that may cause condensation within it.

The temperatures and the humidity for the Agilent E6020A are given in the table below. Please note the restricted operating range when you are using the optional floppy disk drive.

	Operating Temperature	*Storage Temperature*	*Humidity*
All / Complete Systems except ...	0°C to 50°C	-40°C to 60°C	95% at 0°C to 40°C
... using Floppy Disk Drive	5°C to 45°C	-40°C to 60°C	35% to 80% at 40°C
Battery charging	0°C to 40°C		

Altitude

The Agilent E6020A can be used up to 3300m (10800ft.)

Installation Category

The Agilent E6020A has an Installation Category II and Pollution Degree 2 according to IEC 664

NOTE The AC Adapter is for indoor use only

Parallel Interface

This is a CENTRONICS type parallel port for a parallel printer, with a DB-25 connector.

If you do not use an Agilent 5180-0010C Centronics cable, the EMI performance of the optical time domain reflectometer cannot be guaranteed.

Serial Interfaces

RS232 port There is one ST-compatible RS232 port, with DB9 connectors.

If you do not use an Agilent 5180-2477 RS232 cable or the RS232 cable supplied with the rack, the EMI performance of the optical time domain reflectometer cannot be guaranteed.

Programming user tasks on a PC

You can select Input/output commands for sending and receiving data from the serial interface and for initializing transmission parameters.

You should follow the following steps:

1 Initialize the Hardware Interface parameters

2 Check the automatic connection to the instrument

3 Send or receive commands to/from the Mini-FBL.

The *OTDR Programming Guide* (Agilent Product Number E4310-91016) shows how to perform steps 2 and 3. Step 1 depends strongly on the Operating system.

NOTE The programming and speed performance depend on the Operating system used on the PC. Generally speaking, speed and reliability are better with Windows NT and Windows 95 than with Windows 3.1.

Claims and Repackaging

If physical damage is evident or if the instrument does not meet specification when received, notify the carrier and the nearest Agilent Technologies Service Office. The Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

Return Shipments to Agilent Technologies

If the instrument is to be shipped to an Agilent Technologies Sales/Service Office, attach a tag showing owner, return address, model number and full serial number and the type of service required.

Repacking instructions

The original shipping carton and packing material may be reusable, but the Agilent Technologies Sales/Service Office will provide information and recommendation on materials to be used if the original packing is no longer available or reusable.

General instructions for repacking are as follows:

Shipping box

- Put the Mini-FBL in its softcase, then put the softcase into a shipping box. The packaging has the following part numbers:

E6000-49304	Cushion convoluted
E6000-49303	Cushion convoluted
E6000-49302	Scored sheet
E6000-49301	Carton Corrugated

- The shipping box uses single wall corrugated carton (Material 1.40 per DIN 55468), which is the equivalent of 200-pound bursting strength material.
- Inside the shipping box are 2 inserts. One insert is a folded separator to keep the power supply and the power cord. The second insert goes around the softcase. It is a corrugated part including convoluted foam on the outer side.
- If you do not have the original shipping box you must use an appropriate shock absorbing material.

Shipping container

- Seal the shipping container securely.

- Mark the shipping container FRAGILE to encourage careful handling.
- In any correspondence, refer to the instrument by model number and serial number.

CAUTION If you use foam to pack the box, make sure you use a soft foam. EPS and most other foams may be too hard.

Installing New Firmware

To install firmware on the Mini-FBL, you need the floppy disks provided with your Mini-FBL. There are 3 floppy disks for the firmware update, and 1 for the language update.

Follow the steps in “How to Update the Firmware and Languages” on page 57

B

Accessories

The Agilent Technologies E6020A is a high performance time domain reflectometer. It is available in various configurations for the best possible match to the most common applications.

This appendix provides information on the available options and accessories.

Instrument and Options

Agilent Product	Opt	Description
E6020A		Mini-FBL Mainframe
	003	Color screen VGA LCD
	006	B/W Screen VGA-LCD
	AB2	Simplified Chinese user interface
	ABD	German user interface
	ABF	French user interface
E6021A		1310 nm, 35 dB single-mode module

Agilent Product	Opt	Description
	022	angled connector
E6022A		1550 nm, 35 dB single-mode module
	022	angled connector
E6006A		Optical Power Meter
E6007A		Visual Fault Finder

Support Options

For all Agilent Mini-FBLs, the following support options are available.

W30	3 years of Customer Return Repair Service
W32	3 years of Customer Return Calibration Service
W50	5 years of Customer Return Repair Service
W52	5 years of Customer Return Calibration Service

Accessories supplied

The following accessories are supplied with your Mini-FBL Mainframe:

	Soft carrying case
	Power cord
	AC/DC adapter
	User's Guide
	OTDR Support CD
	RS 232 cable
	Mini-FBL Reference Card
	OTDR Pocket Guide
	Cleaning Procedures Pocket Guide
	NiMH battery pack

The following accessories are supplied with your Mini-FBL modules:

81000FI	FC/PC connector interface
81000KI	SC connector interface

All modules come with a commercial calibration certificate.

Additional Accessories

The following accessories are also available. To order these products, please contact your Agilent Technologies representative.

Product	Description
E6080A	Spare NiMH battery pack
E6081A	Mini-Keyboard (see “The Mini-Keyboard” on page 45).
E6082A	Hard transit case
E6083A	64 MB flash disk
E6091A	OTDR Toolkit II software
5180-0010C	Centronics cable
24542U	RS232 cable, 9-pin to 9-pin
E6000-13601	OTDR Support CD
E4310-91016	OTDRs Programming Guide
5963-3538F	Cleaning Procedures for Lightwave Test and Measurement Equipment pocket guide

Connector Interfaces and Other Accessories

The Agilent E6020A Mini-FBL is usually supplied with a straight contact output connector interface.

Optical Connector

To connect to the instrument, you must

1. attach your connector interface (see list of connector interfaces below) to the interface adapter,
2. then connect your fiber.

Agilent Model No.	Description
81000AI	Diamond HMS/10 connector interface
81000FI	FC/PC connector interface
81000GI	D4 connector interface
81000HI	E2000 connector interface
81000KI	SC connector interface
81000SI	DIN 47256 connector interface
81000VI	ST connector interface
81000WI	Biconic connector interface

Related Agilent Literature

Agilent Part Number	Title
5963-3538F	Cleaning Procedures for Lightwave Test and Measurement Equipment pocket guide
E6000-91017	OTDR Pocket Guide
E4310-91016	OTDRs Programming Guide

C

Specifications

Specifications describe the instrument's warranted performance, measured with typical PC-type connectors. Uncertainties due to the refractive index of fiber are not considered.

Specifications vs. Characteristics

The following section contains both Specifications and Characteristics:

- *Specifications* describe the instrument's warranted performances.
- *Characteristics* and *typical data* provide information about the non-warranted instrument performance.

ISO 9001

The Agilent Technologies E6020A Mini-FBL is produced to the ISO 9001 international quality system standard as part of Agilent's commitment to continually increasing customer satisfaction through improved quality control.

Definition of Terms - Fiber Break Locator

Fiber Break — Any point on the backscatter of a trace immediately preceding either a reflective or non-reflective event with insertion loss exceeding 3 dB.

Loss Budget to Break (LBB) — the amount of fiber attenuation (loss budget) below the initial backscatter level up to which a fiber break is correctly detected.

Break Location Distance Range (BLDR) — the distance from the break locator beyond which a fiber break is no longer correctly detected. The break location distance range is a parameter derived from the Loss Budget to Break and a constant fiber attenuation as follows:

@ 1310 nm: BLDR = LBB / (0.34 dB/km)

@ 1550 nm: BLDR = LBB / (0.20 dB/km)

Characteristics

Horizontal Parameters

- **Start-km:** 0 km
- **Span:** 0.1 km to 400 km (automatic)
- **Readout resolution:** 0.1 m
- **Minimum sample spacing:** 8 cm (automatic)
- **Refractive index:** 1.00000 to 2.00000
- **Length unit:** km, ft, or miles
- **Measurement points:** 16000

Vertical Parameters

- **Vertical scale:** 5 dB/Div

- **Read-out resolution:** 0.001 dB
- **Reflectance range:** -14 dB to -60dB

Other Parameters

- **Pulsewidth**: automatically selected
- **Threshold for fiber breaks:** 0.1 to 10 dB, selectable in 0.1 dB steps.
- **Backscatter coefficient**: 48.5 dB (1310 nm), 51.5 dB (1550 nm)

Source Mode

- **CW output power**: -3 dB
- **CW stability** (after 10 minute warm-up: 15 min. T = constant): ±0.1 dB
- **Modulation**: 270 Hz, 1 KHz, and 2 KHz squarewave

Output Connector

- Optional Diamond HMS-10, FC/PC, DIN 47256, ST, Biconic, SC, NEC D4. All options are user-exchangeable.

Documentation

- **3.5" floppy disk drive:** for high density 720/1440 kByte floppy disks. MS-DOS format compatible. Reduced operating temperature of 5° to 45° C, with 35% to 80% humidity at 40° C.
- **Memory Card:** PCMCIA Type II. SRAM up to 2 MB
- **Flash Disk**: 440 MB with up to 13000 traces (typical with 16000 data points).

- **Internal memory:** up to 100 traces (typical with 16000 data points).
- **Trace format:** compliant to SR-4731 of Bellcore Version 2.0 OTDR Data Format.
- **Trace information:** 5 comment labels of up to 15 alphanumeric characters, and 5 comments of up to 41 alphanumeric characters are provided for each trace.
- **Real-time clock and date**

Display

- **Color or monochrome VGA-LCD:** 18.3 cm (7.2”)
- **Display points:** 640 x 480 points

Interfaces

RS232C

- **Maximum baud rate**: 115200 bps
- **Transmission time** at 115200 baud for trace data: 16000 points at approx. 4 seconds.
- **Centronics**: Standard parallel port (SPP).
- **Keyboard**: PS2 (Min-DIN). For English Standard, PS2, or AT keyboard.

General

- **Laser Safety Class:** 21 CFR Class 1, IEC 825 Class 3A
- **Recommended recalibration period:** 2 years.
- **Dimensions:** 194 mm H, 290 mm W, 75 mm D (7.7” x 11.4” x 3.0”).
- **Weight:** net < 2.9 kg (6.4 lbs), typical, including battery pack and FBL module.

Built in Applications

Fiber Break Locator

Power Meter / Loss Test mode

Visual Fault Finder mode

Optical Return Loss

Environmental

See “Operating and Storage Environment” on page 81

Power

See also “AC Line Power Supply Requirements” on page 78 and “DC Power Supply Requirements” on page 80.

- **AC**: 100 -240 Vrms ± 10% 50-60 Hz
- **DC**: 16 - 24 V
- **External Battery:** NiMH typically 8 hours continuous operation (minimum 4 hours). Charging time < 3 hours, non-operating.
- **Low battery indicator**
- **Battery charge status**

Module Specifications / Characteristics

Specifications: Optical Performance

Measured at 22 °C ± 3°C. Guaranteed specifications unless otherwise noted. **Bold** values are typical specifications

Module	E6021A				E6022A			
Central Wavelength	**1310** ±25 nm				**1550** ±25 nm			
Applicable Fiber	single-mode				single-mode			
Pulsewidth	10ns	100ns	1µs	10µs	10ns	100ns	1µs	10µs
Dynamic Range[1] *[dB]*	19	**24**	**30**	35	17	**22**	**29**	34

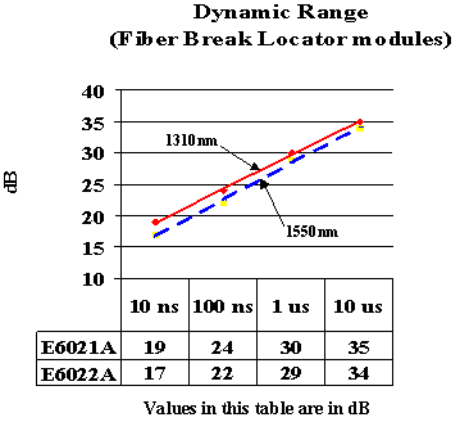


Figure 35 Dynamic Range for Mini-FBL modules

The guaranteed values above are tested specifications. All Agilent E6000 Series OTDR modules can also be used in the Fiber Break Locator mainframe.

Notes:

1 Measured with a standard single-mode fiber at SNR=1 noise level and with 3 minutes averaging time. Optimize mode: dynamic

Characteristics

Distance Accuracy [A]

- **Offset Error**: ± 1 m
- **Scale Error**: ± 10^{-4}
- **Sampling Error**: ± 0.5 sampling spacing

Loss/Reflectance Accuracy [B]

- **Backscatter Measurements**: ± 0.05 dB (1dB step), typical
- **Reflectance Measurements**[C]: ± 2.0 dB, typical

Acoustic Noise Emission

< 40dBA, not continuous.
Data are results from type tests per ISO 7779 (EN 27779).

Deadzones

- **Event Deadzone**: 5 m (typical)
- **Attenuation Deadzone** [D]: 25 m
- **Attenuation Deadzone** [E]: 10 m (1310 nm), 12 m (1550 nm)

Table 1 Break parameters

Module/Wavelength	Loss Budget to Break	Break Locate Distance Range	Fiber attenuation
E6021A: 1310 nm	30.6 dB	90 km	0.34 dB/km
E6022A: 1550 nm	30.0 dB	150 km	0.20 dB/km

Notes:

A Total distance accuracy = ± (offset error + scale error*distance + sampling error).

B SNR ≥ 15 dB and with 1 μs, averaging time max. 3 minutes.

C -20 dB to -60 dB

D Guaranteed Specification at Reflectance ≤ -35 dB at 30 ns pulsewidth, and with span ≤ 4 km. Optimize mode: resolution.

E Typical Specification at Reflectance ≤ -50 dB at 30 ns pulsewidth, and with span ≤ 4 km (typical value).

Agilent E6006A Power Meter Submodule

Characteristics

Sensor element:	InGaAs
Wavelength range:	800 - 1650 nm
Calibrated wavelengths:	850 nm, 1300 nm, 1310 nm, 1550 nm, 1625 nm (special wavelength on request).
Power range:	+10 to -70 dBm
Max. input power (damage level)	+13 dBm / 20 mW
Display Resolution	0.01 dB
Display Units:	dBm, dB, mW, µW, nW, pW
Display Contents:	Calibrated λ in nm Modulation frequency in Hz Reference value in dB
Display Updates per second	3
Optical input:	User-exchangeable Connector Interface
Applicable fiber type	9/125 µm, 50/125 µm, 62.5/125 µm

Specifications

Uncertainty at reference conditions: ± 3%

Power level: -20 dBm
Continuous wave (CW)
Wavelength: 1300±3 nm, 1310±3 nm, 1550±3 nm
Fiber type: 50/125 µm graded index, Agilent/HMS-10 connector
Spectral bandwidth: up to 10 nm
Ambient temperature: +18 to +28 °C

At day of calibration (add 0.3% for aging of over one year; add 0.6% for aging of over two years).

Total uncertainty: ±5% ± 0.5 nW (1310, 1550 nm)

Power level: +0 to -50 dBm
Continuous Wave (CW)
Wavelength: 850±3 nm, 1300±3 nm, 1310±3 nm, 1550±3 nm
Fiber type: SM to 50 µm graded index
(add 2% to total uncertainty for fiber 62.5 µm).
Straight and angled connectors
Ambient temperature: +10 to +40 °C

Within 2 years after calibration

Supplementary Performance Characteristics

- Automatic Zeroing Circuitry.
- Automatic Ranging.
- Modulation frequency recognition (270 Hz, 1 kHz, 2 kHz) is available at power levels between +10 and -45 dBm (peak amplitude).

- Wavelength encoding recognition (350 Hz, 550 Hz) is available at power levels between +10 and -45 dBm (peak amplitude).
- Dual Wavelength measurement is available at power levels between +10 and -45 dBm (peak amplitude).
- Reference value is presettable from +30 to -80 dBm.
- Each calibrated wavelength has its own reference memory.
- The actual display content can be transferred to reference memory (DISP → REF).
- Hold Data functionality.

General Specifications:

Dimensions: ca. 120 mm H x 40 mm W x 25 mm D (4.7” x 1.6” x 1.0”)

Weight: < 130 g.

Operating Temperature: 0 to +50 °C

Storage Temperature: -40 to +60 °C

Humidity: 95% R.H. from 0 °C to 40 °C non cond.

Recommended Recalibration Period: 2 years

Agilent E6007A Visual Fault Finder Submodule

Characteristics

Source type:	Laser diode
Center Wavelength:	635 nm ± 10 nm (visible red light)
Output power level (CW):	0 dBm maximum
Output power level (CW) into 9 µm fiber (typ.):	-3 dBm
Detection range:	up to 5 km
Optical output:	User-exchangeable Connector Interface

Laser Class II (21 CFR 1040), Class II (IEC 825-1)

Supplementary Performance Characteristics

- Continuous Wave and Blink Mode (1 Hz for better visibility).
- Single-Mode and multimode fibers applicable.

General Specifications:

Dimensions: ca. 120 mm H x 40 mm W x 25 mm D (4.7” x 1.6” x 1.0”)

Weight: < 100 g.

Operating Temperature: 0 to 40 °C

Storage Temperature: -40 to +60 °C

Humidity: 95% R.H. from 0 °C to 40 °C non cond.

Declaration of Conformity

DECLARATION OF CONFORMITY CE

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name:	Agilent Technologies Deutschland GmbH
Manufacturer's Address:	Optical Communication Measurement Division (OCMD) Herrenberger Str. 130 D-71034 Boeblingen

Declares, that the product

Product Name:	**Fiber Break Locator**	
Model Number:	**E6020A**	
Product Modules:	**E6021A** (2)	1310 nm single-mode module
	E6022A (2)	1550 nm single-mode module
	E6001A (2)	1310 nm single-mode module
	E6003A (2)	1310 nm/1550 nm single-mode module
	E6003B (2)	1310 nm/1550 nm single-mode module
	E6004A (2)	1310 nm/1550 nm single-mode module
	E6005A (2)	850 nm/1300 nm multi-mode module
	E6006A	Optical Power Meter module
	E6007A	Visual fault finder module
	E6008B (2)	1310 nm/1550 nm single-mode module
	E6009A (2)	850 nm/1300 nm multi-mode module
	E6010A (2)	1625 nm single-mode module
	E6012A (2)	1550 nm/1625 nm single-mode module

Conforms with the following European Directives:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly.

This product herewith complies with the requirements of the Machinery Directive 98/37/EC and carries the CE marking accordingly.

Revision: A Issue Date: 2001-January-29

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

CE

Conforms with the following product standards:

	Standard	Limit
EMC	*IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998*	
	CISPR 11:1997 / EN 55011:1998	*Group 1 Class A [1]*
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995	*4kV CD, 8kV AD*
	IEC 61000-4-3:1995 / EN 61000-4-3:1995	*3 V/m, 80-1000 MHz*
	IEC 61000-4-4:1995 / EN 61000-4-4:1995	*0.5kV signal lines, 1kV power lines*
	IEC 61000-4-5:1995 / EN 61000-4-5:1995	*0.5 kV line-line, 1 kV line-ground*
	IEC 61000-4-6:1996 / EN 61000-4-6:1996	*3V, 0.15-80 MHz*
	IEC 61000-4-8:1993 / EN 61000-4-8:1993	*3 A/m, 50 Hz*
	IEC 61000-4-11:1994 / EN 61000-4-11:1994	*1 cycle/100%*
	Canada: ICES-001:1998	
	Australia/New Zealand: AS/NZS 2064.1	
Safety	*IEC 61010-1:1990+A1:1992+A2:1995 /*	
	EN 61010-1:1993+A2:1995	
	IEC 60825-1:1993+A1:1997 / EN 608251:1994+A11:1996	
	Canada: CSA C22.2 No. 1010.1:1992	
	USA: UL 3111-1:1994; FDA 21CFR1040.10	

Supplemental Information:

[1] The product was tested in a typical configuration with Agilent Technologies test systems.
[2] FDA Accession Numbers 8721422-14 to 8721422-19

2001-January-29
Date

Hans-Martin Fischer
Name
Product Regulations Engineer
Title

For further information, please contact your local Agilent Technologies sales office, agent or distributor.
Authorized EU-representative: Agilent Technologies Deutschland GmbH, Herrenberger Strasse 130, D-71034 Boeblingen, Germany

Revision: A Issue Date: 2001-January-29

D

Cleaning Information

The following Cleaning Instructions contain some general safety precautions, which must be observed during all phases of cleaning. Consult your specific optical device manuals or guides for full information on safety matters.

Please try, whenever possible, to use physically contacting connectors, and dry connections. Clean the connectors, interfaces, and bushings carefully after use.

Agilent Technologies assume no liability for the customer's failure to comply with these requirements.

Cleaning Instructions for this Instrument

The Cleaning Instructions apply to a number of different types of Optical Equipment. The following section is relevant for this instrument.

- "How to clean instruments with a physical contact interface" on page 127

For more information, please consult the Agilent Technologies Pocket Guide *Cleaning Procedure fir Lightwave Test and Measurement Equipment* (Agilent Part Number 5963-3538F)

Safety Precautions

Please follow the following safety rules:

- Do not remove instrument covers when operating.
- Ensure that the instrument is switched off throughout the cleaning procedures.
- Use of controls or adjustments or performance of procedures other than those specified may result in hazardous radiation exposure.
- Make sure that you disable all sources when you are cleaning any optical interfaces.
- Under no circumstances look into the end of an optical device attached to optical outputs when the device is operational. The laser radiation is not visible to the human eye, but it can seriously damage your eyesight.
- To prevent electrical shock, disconnect the instrument from the mains before cleaning. Use a dry cloth, or one slightly dampened with water, to clean the external case parts. Do not attempt to clean internally.
- Do not install parts or perform any unauthorized modification to optical devices.
- Refer servicing only to qualified and authorized personnel.

Why is it important to clean optical devices ?

In transmission links optical fiber cores are about 9 µm (0.00035") in diameter. Dust and other particles, however, can range from tenths to hundredths of microns in diameter. Their comparative size means that they can cover a part of the end of a fiber core, and as a result will reduce the performance of your system.

Furthermore, the power density may burn dust into the fiber and cause additional damage (for example, 0 dBm optical power in a single mode fiber causes a power density of approximately 16 million W/m^2). If this happens, measurements become inaccurate and non-repeatable.

Cleaning is, therefore, an essential yet difficult task. Unfortunately, when comparing most published cleaning recommendations, you will discover that they contain several inconsistencies. In this section, we want to suggest ways to help you clean your various optical devices, and thus significantly improve the accuracy and repeatability of your lightwave measurements.

What do I need for proper cleaning?

Some Standard Cleaning Equipment is necessary for cleaning your instrument. For certain cleaning procedures, you may also require certain Additional Cleaning Equipment.

Standard Cleaning Equipment

Before you can start your cleaning procedure you need the following standard equipment:

- Dust and shutter caps
- Isopropyl alcohol
- Cotton swabs
- Soft tissues
- Pipe cleaner
- Compressed air

Dust and shutter caps

All of Agilent Technologies' lightwave instruments are delivered with either laser shutter caps or dust caps on the lightwave adapter. Any cables come with covers to protect the cable ends from damage or contamination.

We suggest these protected coverings should be kept on the equipment at all times, except when your optical device is in use. Be careful when replacing dust caps after use. Do not press the bottom of the cap onto the fiber too hard, as any dust in the cap can scratch or pollute your fiber surface.

If you need further dust caps, please contact your nearest Agilent Technologies sales office.

Isopropyl alcohol

This solvent is usually available from any local pharmaceutical supplier or chemist's shop.

Using isopropyl alcohol If you use isopropyl alcohol to clean your optical device, do not immediately dry the surface with compressed air (except when you are cleaning very sensitive optical devices). This is because the dust and the dirt is solved and will leave behind filmy deposits after the alcohol is evaporated. You should therefore first remove the alcohol and the dust with a soft tissue, and then use compressed air to blow away any remaining filaments.

Denatured alcohol If possible avoid using denatured alcohol containing additives. Instead, apply alcohol used for medical purposes.

Never try to drink this alcohol, as it may seriously damage to your health.

Other solvents Do not use any other solvents, as some may damage plastic materials and claddings. Acetone, for example, will dissolve the epoxy used with fiber optic connectors. To avoid damage, only use isopropyl alcohol.

Cotton swabs

Size of swab We recommend that you use swabs such as Q-tips or other cotton swabs normally available from local distributors of medical and hygiene products (for example, a supermarket or a chemist's shop). You may be able to obtain various sizes of swab. If this is the case, select the smallest size for your smallest devices.

Foam swabs Ensure that you use natural cotton swabs. Foam swabs will often leave behind filmy deposits after cleaning.

Use care when cleaning, and avoid pressing too hard onto your optical device with the swab. Too much pressure may scratch the surface, and could cause your device to become misaligned. It is advisable to rub gently over the surface using only a small circular movement.

Reuse of swabs

Swabs should be used straight out of the packet, and never used twice. This is because dust and dirt in the atmosphere, or from a first cleaning, may collect on your swab and scratch the surface of your optical device.

Soft tissues

These are available from most stores and distributors of medical and hygiene products such as supermarkets or chemists' shops.

Cellulose tissues

We recommend that you do not use normal cotton tissues, but multi-layered soft tissues made from non-recycled cellulose. Cellulose tissues are very absorbent and softer. Consequently, they will not scratch the surface of your device over time.

Use care when cleaning, and avoid pressing on your optical device with the tissue. Pressing too hard may lead to scratches on the surface or misalignment of your device. Just rub gently over the surface using a small circular movement.

Reuse of tissues

Use only clean, fresh soft tissues and never apply them twice. Any dust and dirt from the air which collects on your tissue, or which has gathered after initial cleaning, may scratch and pollute your optical device.

Pipe cleaner

Pipe cleaners can be purchased from tobacconists, and come in various shapes and sizes.The most suitable one to select for cleaning purposes has soft bristles, which will not produces scratches.

There are many different kinds of pipe cleaner available from tobacco shops.

Use of pipe cleaners

The best way to use a pipe cleaner is to push it in and out of the device opening (for example, when cleaning an interface). While you are cleaning, you should slowly rotate the pipe cleaner.

Only use pipe cleaners on connector interfaces or on feed through adapters. Do not use them on optical head adapters, as the center of a pipe cleaner is hard metal and can damage the bottom of the adapter.

Reuse of pipe cleaners

Your pipe cleaner should be new when you use it. If it has collected any dust or dirt, this can scratch or contaminate your device.

Metal tip / center

The tip and center of the pipe cleaner are made of metal. Avoid accidentally pressing these metal parts against the inside of the device, as this can cause scratches.

Compressed air

Compressed air can be purchased from any laboratory supplier.

Purity of air

It is essential that your compressed air is free of dust, water and oil. Only use clean, dry air. If not, this can lead to filmy deposits or scratches on the surface of your connector. This will reduce the performance of your transmission system.

Spraying

When spraying compressed air, hold the can upright. If the can is held at a slant, propellant could escape and dirty your optical device. First spray into the air, as the initial stream of compressed air could contain some condensation or propellant. Such condensation leaves behind a filmy deposit.

Please be friendly to your environment and use a CFC-free aerosol.

Additional Cleaning Equipment

Some Cleaning Procedures need the following equipment, which is not required to clean each instrument:

- Microscope with a magnification range about 50X up to 300X
- Ultrasonic bath
- Warm water and liquid soap
- Premoistened cleaning wipes
- Polymer film
- Infrared Sensor Card

Microscope with a magnification range about 50X up to 300X

A microscope can be found in most photography stores, or can be obtained through or specialist mail order companies. Special fiber-scopes are available from suppliers of splicing equipment.

Light source

Ideally, the light source on your microscope should be very flexible. This will allow you to examine your device closely and from different angles.

A microscope helps you to estimate the type and degree of dirt on your device. You can use a microscope to choose an appropriate cleaning method, and then to examine the results. You can also use your microscope to judge whether your optical device (such as a connector) is severely scratched and is, therefore, causing inaccurate measurements.

Ultrasonic bath

Ultrasonic baths are also available from photography or laboratory suppliers or specialist mail order companies.

An ultrasonic bath will gently remove fat and other stubborn dirt from your optical devices. This helps increase the life span of the optical devices.

Use of solvents

Only use isopropyl alcohol in your ultrasonic bath, as other solvents may damage.

Warm water and liquid soap

Only use water if you are sure that there is no other way of cleaning your optical device without corrosion or damage. Do not use hot water, as this may cause mechanical stress, which can damage your optical device.

Soap properties

Ensure that your liquid soap has no abrasive properties or perfume in it. You should also avoid normal washing-up liquid, as it can cover your device in an iridescent film after it has been air-dried.

Some lenses and mirrors also have a special coating, which may be sensitive to mechanical stress, or to fat and liquids. For this reason we recommend you do not touch them.

If you are not sure how sensitive your device is to cleaning, please contact the manufacturer or your sales distributor.

Premoistened cleaning wipes

Use pre-moistened cleaning wipes as described in each individual cleaning procedure. Cleaning wipes may be used in every instance where a moistened soft tissue or cotton swab is applied.

Polymer film

Polymer film is available from laboratory suppliers or specialist mail order companies.

Using polymer film is a gentle method of cleaning extremely sensitive devices, such as reference reflectors and mirrors.

Infrared Sensor Card

Infrared sensor cards are available from laboratory suppliers or specialist mail order companies.

With this card you are able to control the shape of laser light emitted. The invisible laser beam is projected onto the sensor card, then becomes visible to the normal eye as a round spot.

Take care never to look into the end of a fiber or any other optical component, when they are in use. This is because the laser can seriously damage your eyes.

Preserving Connectors

Listed below are some hints on how best to keep your connectors in the best possible condition.

Making Connections

Before you make any connection you must ensure that all cables and connectors are clean. If they are dirty, use the appropriate cleaning procedure.

When inserting the ferrule of a patchcord into a connector or an adapter, make sure that the fiber end does not touch the outside of the mating connector or adapter. Otherwise you will rub the fiber end against an unsuitable surface, producing scratches and dirt deposits on the surface of your fiber.

Dust Caps and Shutter Caps

Be careful when replacing dust caps after use. Do not press the bottom of the cap onto the fiber as any dust in the cap can scratch or dirty your fiber surface.

Replacing caps

When you have finished cleaning, put the dust cap back on, or close the shutter cap if the equipment is not going to be used immediately.

Keep the caps on the equipment always when it is not in use.

Replacement caps

All of Agilent Technologies' lightwave instruments and accessories are shipped with either laser shutter caps or dust caps. If you need additional or replacement dust caps, contact your nearest Agilent Technologies Sales/ Service Office.

Immersion Oil and Other Index Matching Compounds

Where it is possible, do not use immersion oil or other index matching compounds with your device. They are liable to impair and dirty the surface of the device. In addition, the characteristics of your device can be changed and your measurement results affected.

Cleaning Instrument Housings

Use a dry and very soft cotton tissue to clean the instrument housing and the keypad. Do not open the instruments as there is a danger of electric shock, or electrostatic discharge. Opening the instrument can cause damage to sensitive components, and in addition your warranty will be voided.

Which Cleaning Procedure should I use ?

Light dirt

If you just want to clean away light dirt, observe the following procedure for all devices:

- Use compressed air to blow away large particles.
- Clean the device with a dry cotton swab.

- Use compressed air to blow away any remaining filament left by the swab.

Heavy dirt

If the above procedure is not enough to clean your instrument, follow one of the procedures below. Please consult “Cleaning Instructions for this Instrument” on page 107 for the procedure relevant for this instrument.

If you are unsure of how sensitive your device is to cleaning, please contact the manufacturer or your sales distributor

How to clean connectors

Cleaning connectors is difficult as the core diameter of a single-mode fiber is only about 9 µm. This generally means you cannot see streaks or scratches on the surface. To be certain of the condition of the surface of your connector and to check it after cleaning, you need a microscope.

Polishing a connector

In the case of scratches, or of dust that has been burnt onto the surface of the connector, you may have no option but to polish the connector. This depends on the degree of dirtiness, or the depth of the scratches. This is a difficult procedure and should only be performed by skilled personal, and as a last resort as it wears out your connector.

WARNING

Never look into the end of an optical cable that is connected to an active source.

Infrared sensor card

To assess the projection of the emitted light beam you can use an infrared sensor card. Hold the card approximately 5 cm from the output of the connector. The invisible emitted light is project onto the card and becomes visible as a small circular spot.

Preferred Procedure

Use the following procedure on most occasions.

1 Clean the connector by rubbing a new, dry cotton-swab over the surface using a small circular movement.

2 Blow away any remaining lint with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the connector:

1 Moisten a new cotton-swab with isopropyl alcohol.

2 Clean the connector by rubbing the cotton-swab over the surface using a small circular movement.

3 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.

4 Blow away any remaining lint with compressed air.

An Alternative Procedure

A better, more gentle, but more expensive cleaning procedure is to use an ultrasonic bath with isopropyl alcohol.

1 Hold the tip of the connector in the bath for at least three minutes.

2 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.

3 Blow away any remaining lint with compressed air.

How to clean connector adapters

CAUTION

Some adapters have an anti-reflection coating on the back to reduce back reflection. This coating is extremely sensitive to solvents and mechanical abrasion. Extra care is needed when cleaning these adapters.

Preferred Procedure

Use the following procedure on most occasions.

1 Clean the adapter by rubbing a new, dry cotton-swab over the surface using a small circular movement.

2 Blow away any remaining lint with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the adapter:

1 Moisten a new cotton-swab with isopropyl alcohol.

2 Clean the adapter by rubbing the cotton-swab over the surface using a small circular movement.

3 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.

4 Blow away any remaining lint with compressed air.

How to clean connector interfaces

CAUTION

Be careful when using pipe-cleaners, as the core and the bristles of the pipe-cleaner are hard and can damage the interface.

Do not use pipe-cleaners on optical head adapters, as the hard core of normal pipe cleaners can damage the bottom of an adapter.

Preferred Procedure

Use the following procedure on most occasions.

1 Clean the interface by pushing and pulling a new, dry pipe-cleaner into the opening. Rotate the pipe-cleaner slowly as you do this.

2 Then clean the interface by rubbing a new, dry cotton-swab over the surface using a small circular movement.

3 Blow away any remaining lint with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the interface:

1 Moisten a new pipe-cleaner with isopropyl alcohol.

2 Clean the interface by pushing and pulling the pipe-cleaner into the opening. Rotate the pipe-cleaner slowly as you do this.

3 Moisten a new cotton-swab with isopropyl alcohol.

4 Clean the interface by rubbing the cotton-swab over the surface using a small circular movement.

5 Using a new, dry pipe-cleaner, and a new, dry cotton-swab remove the alcohol, any dissolved sediment and dust.

6 Blow away any remaining lint with compressed air.

How to clean bare fiber adapters

Bare fiber adapters are difficult to clean. Protect from dust unless they are in use.

CAUTION

Never use any kind of solvent when cleaning a bare fiber adapter as solvents can damage the foam inside some adapters.

They can deposit dissolved dirt in the groove, which can then dirty the surface of an inserted fiber.

Preferred Procedure

Use the following procedure on most occasions.

1 Blow away any dust or dirt with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the adapter:

1 Clean the adapter by pushing and pulling a new, dry pipe-cleaner into the opening. Rotate the pipe-cleaner slowly as you do this.

CAUTION Be careful when using pipe-cleaners, as the core and the bristles of the pipe-cleaner are hard and can damage the adapter.

2 Clean the adapter by rubbing a new, dry cotton-swab over the surface using a small circular movement.

3 Blow away any remaining lint with compressed air.

How to clean lenses

Some lenses have special coatings that are sensitive to solvents, grease, liquid and mechanical abrasion. Take extra care when cleaning lenses with these coatings.

Lens assemblies consisting of several lenses are not normally sealed. Therefore, use as little alcohol as possible, as it can get between the lenses and in doing so can change the properties of projection.

Preferred Procedure

Use the following procedure on most occasions.

1 Clean the lens by rubbing a new, dry cotton-swab over the surface using a small circular movement.

2 Blow away any remaining lint with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the lens:

1 Moisten a new cotton-swab with isopropyl alcohol.

2 Clean the lens by rubbing the cotton-swab over the surface using a small circular movement.

3 Using a new, dry cotton-swab remove the alcohol, any dissolved sediment and dust.

4 Blow away any remaining lint with compressed air.

How to clean instruments with a fixed connector interface

You should only clean instruments with a fixed connector interface when it is absolutely necessary. This is because it is difficult to remove any used alcohol or filaments from the input of the optical block.

Dust caps It is important, therefore, to keep dust caps on the equipment at all times, except when your optical device is in use.

Compressed air If you do discover filaments or particles, the only way to clean a fixed connector interface and the input of the optical block is to use compressed air.

Fluids and fat If there are fluids or fat in the connector, please refer the instrument to the skilled personnel of Agilent's service team.

CAUTION Only use clean, dry compressed air. Make sure that the air is free of dust, water, and oil. If the air that you use is not clean and dry, this can lead to filmy deposits or scratches on the surface of your connector interface. This will degrade the performance of your transmission system.

Never try to open the instrument and clean the optical block by yourself, because it is easy to scratch optical components, and cause them to be misaligned.

How to clean instruments with an optical glass plate

Some instruments, for example, the optical heads from Agilent Technologies have an optical glass plate to protect the sensor. Clean this glass plate in the same way as optical lenses (see “How to clean lenses” on page 125).

How to clean instruments with a physical contact interface

Remove any connector interfaces from the optical output of the instrument before you start the cleaning procedure.

Microscope

Cleaning interfaces is difficult as the core diameter of a single-mode fiber is only about 9 µm. This generally means you cannot see streaks or scratches on the surface. To be certain of the degree of pollution on the surface of your interface and to check whether it has been removed after cleaning, you need a microscope.

WARNING

Never look into an optical output, because this can seriously damage your eyesight.

Infrared sensor card

To assess the projection of the emitted light beam you can use an infrared sensor card. Hold the card approximately 5 cm from the interface. The invisible emitted light is project onto the card and becomes visible as a small circular spot.

Preferred Procedure

Use the following procedure on most occasions.

1 Clean the interface by rubbing a new, dry cotton-swab over the surface using a small circular movement.

2 Blow away any remaining lint with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the interface:

1 Moisten a new cotton-swab with isopropyl alcohol.

2 Clean the interface by rubbing the cotton-swab over the surface using a small circular movement.

3 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.

4 Blow away any remaining lint with compressed air.

How to clean instruments with a recessed lens interface

WARNING

For instruments with a deeply recessed lens interface (for example the Agilent Technologies 81633A and 81634A Power Sensors) do NOT follow this procedure. Alcohol and compressed air could damage your lens even further.

Keep your dust and shutter caps on, when your instrument is not in use. This should prevent it from getting too dirty. If you must clean such instruments, please refer the instrument to the skilled personnel of Agilent's service team.

Preferred Procedure

Use the following procedure on most occasions.

1 Blow away any dust or dirt with compressed air. If this is not sufficient, then

2 Clean the interface by rubbing a new, dry cotton-swab over the surface using a small circular movement.

3 Blow away any remaining lint with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the interface, and using the procedure for light dirt is not sufficient. Using isopropyl alcohol should be your last choice for recessed lens interfaces because of the difficulty of cleaning out any dirt that is washed to the edge of the interface:

1 Moisten a new cotton-swab with isopropyl alcohol.

2 Clean the interface by rubbing the cotton-swab over the surface using a small circular movement.

3 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.

4 Blow away any remaining lint with compressed air.

How to clean optical devices sensitive to mechanical stress

Some optical devices, such as the Agilent 81000BR Reference Reflector, which has a gold plated surface, are very sensitive to mechanical stress or pressure. Do not use cotton-swabs, soft-tissues or other mechanical cleaning tools, as these can scratch or destroy the surface.

Preferred Procedure

Use the following procedure on most occasions.

1 Blow away any dust or dirt with compressed air.

Procedure for Stubborn Dirt

To clean devices that are extremely sensitive to mechanical stress or pressure you can also use an optical clean polymer film. This procedure is time-consuming, but you avoid scratching or destroying the surface.

1 Put the film on the surface and wait at least 30 minutes to make sure that the film has had enough time to dry.

2 Remove the film and any dirt with special adhesive tapes.

Alternative Procedure

For these types of optical devices you can often use an ultrasonic bath with isopropyl alcohol. Only use the ultrasonic bath if you are sure that it won't cause any damage anything to the device.

1 Put the device into the bath for at least three minutes.

2 Blow away any remaining liquid with compressed air.

If there are any streaks or drying stains on the surface, repeat the cleaning procedure.

How to clean metal filters or attenuator gratings

This kind of device is extremely fragile. A misalignment of the grating leads to inaccurate measurements. Never touch the surface of the metal filter or attenuator grating.

Be very careful when using or cleaning these devices. Do not use cotton-swabs or soft-tissues, as there is the danger that you cannot remove the lint and that the device will be destroyed by becoming mechanically distorted.

Preferred Procedure

Use the following procedure on most occasions.

1 Use compressed air at a distance and with low pressure to remove any dust or lint.

Procedure for Stubborn Dirt

Do not use an ultrasonic bath as this can damage your device.

Use this procedure particularly when there is greasy dirt on the device:

1 Put the optical device into a bath of isopropyl alcohol, and wait at least 10 minutes.

2 Remove the fluid using compressed air at some distance and with low pressure. If there are any streaks or drying stains on the surface, repeat the whole cleaning procedure.

Additional Cleaning Information

The following cleaning procedures may be used with other optical equipment:

- How to clean bare fiber ends
- How to clean large area lenses and mirrors

How to clean bare fiber ends

Bare fiber ends are often used for splices or, together with other optical components, to create a parallel beam. The end of a fiber can often be scratched. You make a new cleave. To do this:

1 Strip off the cladding.

2 Take a new soft-tissue and moisten it with isopropyl alcohol.

3 Carefully clean the bare fiber with this tissue.

4 Make your cleave and immediately insert the fiber into your bare fiber adapter in order to protect the surface from dirt.

How to clean large area lenses and mirrors

Some mirrors, as those from a monochromator, are very soft and sensitive. Therefore, never touch them and do not use cleaning tools such as compressed air or polymer film.

Coated lenses Some lenses have special coatings that are sensitive to solvents, grease, liquid and mechanical abrasion. Take extra care when cleaning lenses with these coatings.

Multiple lenses Lens assemblies consisting of several lenses are not normally sealed. Therefore, use as little liquid as possible, as it can get between the lenses and in doing so can change the properties of projection.

Preferred Procedure

Use the following procedure on most occasions.

1 Blow away any dust or dirt with compressed air.

Procedure for Stubborn Dirt

Use this procedure particularly when there is greasy dirt on the lens:

CAUTION Only use water if you are sure that your device does not corrode. Do not use hot water as this can lead to mechanical stress, which can damage your device.

Make sure that your liquid soap has no abrasive properties or perfume in it, because they can scratch and damage your device.

Do not use normal washing-up liquid as sometimes an iridescent film remains.

1 Moisten the lens or the mirror with water.

2 Put a little liquid soap on the surface and gently spread the liquid over the whole area.

3 Wash off the emulsion with water, being careful to remove it all, as any remaining streaks can impair measurement accuracy.

4 Take a new, dry soft-tissue and remove the water, by rubbing gently over the surface using a small circular movement.

5 Blow away remaining lint with compressed air.

Alternative Procedure A

To clean lenses that are extremely sensitive to mechanical stress or pressure you can also use an optical clean polymer film. This procedure is time-consuming, but you avoid scratching or destroying the surface.

1 Put the film on the surface and wait at least 30 minutes to make sure that the film has had enough time to dry.

2 Remove the film and any dirt with special adhesive tapes.

Alternative Procedure B

If your lens is sensitive to water then:

1 Moisten the lens or the mirror with isopropyl alcohol.

2 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.

3 Blow away remaining lint with compressed air.

Other Cleaning Hints

Selecting the correct cleaning method is an important element in maintaining your equipment and saving you time and money. This section highlights the main cleaning methods, but cannot address every individual circumstance.

You will see some additional hints which we hope will help you further. For further information, please contact your local Agilent Technologies representative.

Making the connection

Before you make any connection you must ensure that all lightwave cables and connectors are clean. If not, then use appropriate the cleaning methods.

Fiber end

When you insert the ferrule of a patchcord into a connector or an adapter, ensure that the fiber end does not touch the outside of the mating connector or adapter. Otherwise, the fiber end will rub up against something which could scratch it and leave deposits.

Lens cleaning papers

Note that some special lens cleaning papers are not suitable for cleaning optical devices like connectors, interfaces, lenses, mirrors and so on. To be absolutely certain that a cleaning paper is applicable, please ask the salesperson or the manufacturer.

Immersion oil and other index matching compounds

Do not use immersion oil or other index matching compounds with optical sensors equipped with recessed lenses. They are liable to dirty the detector and impair its performance. They may also alter the property of depiction of your optical device, thus rendering your measurements inaccurate.

Cleaning the housing and the mainframe

When cleaning either the mainframe or the housing of your instrument, only use a dry and very soft cotton tissue on the surfaces and the numeric pad.

Never open the instruments as they can be damaged. Opening the instruments puts you in danger of receiving an electrical shock from your device, and renders your warranty void.

E

Environmental Profile

Product Summary

The product reviewed consists of an E6020A and an E6021A as a typical configuration.

Transport restrictions:	none
Hazardous or restricted materials:	no hazardous materials
	no CFCs or brominated fire retardants
Parts requiring special disposal:	Li-Ion Backup-battery
	NiMH Main battery (recycling path)

Materials of Construction

Material	% weight	% recyclable / reusable
Metals		
Aluminium	20	100
Steel	5	100
Plastic parts:		
PC-ABS	25	100
TPU	7	100
Others:		
NiMH	20	80
Printed Circuit Boards	20	0

Energy Use / Efficiency

Normal Operation:	< 20 Watt
Standby:	< 5 Watt

Operation Emissions

Ozone:	No ozone emissions
Radio Frequency Noise:	Meets CISPR 11 (CISPR22)

Materials of Packaging

Material	% weight	% recyclable / reusable
PUR	25	100
Corrugated Paper	75	100

Learning Products

Manuals are 100% recyclable.

Agilent Technologies Manufacturing Process

Agilent Technologies have eliminated ozone depleting substances such as chlorofluorocarbons (CFCs), trichlorethane (TCA), and carbon tetrachloride from its manufacturing process worldwide.

Agilent Technologies are surveying and working with suppliers to identify and eliminate any ozone depleting substances from their manufacturing.

F

Appendix: VENDOR.INI

When you select a Refractive Index, you will normally see a table containing a list of Cable vendors, and the Refractive Index normally used by that vendor (see *"Using the Fiber Break Locator" on page 63*).

The content of this table depends on the file VENDOR.INI, which should be in the top-level directory of your Mini-FBL internal memory.

Below is an example of a typical `VENDOR.INI` file. It names the Cable vendor (in `Name=`), the wavelengths for which you see this vendor (in `WaveLen_1=`, `WaveLen_2=`, and so on), and the respective Refractive Indexes (in `RefrIndex_1=`, `RefrIndex_2=`, and so on.

Cable vendors which have no Refractive Index specified for the current Wavelength are not displayed.

```
[Vendor_1]
Name=Lucent
WaveLen_1=1310
WaveLen_2=1550
WaveLen_3=1625
RefrIndex_1=147180
RefrIndex_2=147110
```

```
RefrIndex_3=147080


[Vendor_2]
Name=Corning
WaveLen_1=1310
WaveLen_2=1550
WaveLen_3=1625
RefrIndex_1=146180
RefrIndex_2=146110
RefrIndex_3=146080


[Vendor_3]
Name=AT&T
WaveLen_1=1310
WaveLen_2=1550
RefrIndex_1=147180
RefrIndex_2=147120
```

Figure 36 Example VENDOR.INI file

If you want to configure your instrument so that you have more or different refractive index values, you can copy this file to a pc, edit it, then copy it back to your Mini-FBL.

See *"The File Utilities screen" on page 30* for more details about copying files.

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V