E6000C Mini-OTDR

Technical Data Sheet

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

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 E6000C Mini-OTDR 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.

Agilent Technologies

Characteristics

Horizontal Parameters

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

Vertical Parameters

- **Vertical scale:** 0.1 to 10.0 dB/ Div
- **Read-out resolution:** 0.001 dB
- **Reflectance range:** -14 dB to -60 dB
- **Backscatter coefficient:** 10 to 70 dB at 1 µs

Pulsewidth

You can select any of the following pulsewidths:

- 10 ns, 30 ns, 100 ns, 300 ns, 1µs, 3µs, and 10µs (all modules). You can also select 5 ns for all multimode modules, and 20µs for E6003B, E6008B, and E6013A.

With the E6005A module, you can select a pulsewidth from 5 ns to 100 ns at 850 nm, and from 5 ns to 10µs at 1300 nm.

With the E6009A module, you can select a pulsewidth from 5 ns to 100 ns at 850 nm, and from 5 ns to 1µs at 1300 nm.

Storage

- **3.5" floppy disk drive:** for high density 720/1440 kByte floppy disks. MS-DOS format compatible. Reduced operating temperature of 5°C to 45°C, with 35% to 80% humidity at 40°C.
- **Memory Card:** PCMCIA Type II. 440 MB with up to 13000 traces (typical with 16000 data points).
- **Internal memory:** SRAM up to 2 MB. Up to 300 traces(typical with 4000 data points

OTDR Trace Formats

- **Trace format:** compliant to the following Bellcore/Telcordia OTDR trace formats:

– GR 196, Revision 1.0

– GR 196, Revision 1.1

– SR-4731 Revision 2.0.

- **Trace Information:** 5 comment labels of up to 15 alphanumeric characters, and 5 comment fields of up to 41 alphanumeric characters are provided for each trace.
- Real-time clock and date

Scan Trace

- **Type of events:** reflective and non-reflective.
- **Maximum number of events:** 100.
- **Threshold for non- reflective events:** 0.0 to 5.0 dB, selectable in 0.01 dB steps.
- **Threshold for reflective events:** -14.0 to –65.0 dB, selectable in 0.1 dB steps.
- **Threshold for fiber breaks:** 0.1 to 10 dB, selectable in 0.1 dB steps.
- **Fiber End Threshold:** 0.1 to 20 dB, selectable in 0.1 dB steps.

Display

- **Color or monochrome VGA-LCD:** 18.3 cm (7.2")
- **Display points:** 640 x 480 Points
- **Measurement update rate:** two measurements per second in refresh mode

Interfaces

- **RS232C:**
  Maximum baud rate: 115200 bps
  Transmission time at 115200 baud for trace data: 4000 points at approx. 1 second; 16000 points at approx. 4 seconds.
- **Centronics:** Standard parallel port (SPP).
- **Keyboard:** PS2 (Min-DIN). For English Standard, PS2, or AT keyboard.

General

- Automatic setup analysis
- **Instrument settings:** storage and recall of user-selectable instrument settings.
- **Laser safety class**: All OTDR laser sources specified by this data sheet are classified as Class 1M according to IEC 60825-1 (2001).

  The Visual Fault Finder Sub-Module E6007A complies with Class 2 according to IEC 60825-1 (2001).

All laser sources comply with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated 2001-July-26

- **Recommended module recalibration period:** 2 years. (OTDR Modules and Power Meter only)
- **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 OTDR module.

Built in Applications

- Automatic Multi Fiber Test
- Pass/Fail Test
- Fiber Break Locator
- Power Meter / Loss Test mode[1]
- Visual Fault Finder mode [1]
- Optical Return Loss
- End to End Loss
- Easy OTDR
- OTDR Training
- OTDR Assistant

Environmental

- **Operating Temperature:** 0°C to 50°C
- **Storage Temperature:** -40°C to +60°C
- **Humidity:** 95% R.H from 0°C to 40°C

Power

- AC: 100 - 240 Vrms ±10% 50-60 Hz
- DC: 16 – 24 V
- **External Battery:** NiMH typically 8 hours continuous operation (minimum 4 hours) with Option #006. Charging time < 3 hours, non-operating
- Low battery indicator
- Battery charge status

[1] The E6013A 1310/1550/1625 nm Mini-OTDR module doesn't have a slot available for E6006A Power Meter Sub-module or the E6007A Visual Fault Finder

Module Specifications / Characteristics

Specifications: Optical performance

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

Module	**E6001A**					**E6003A**			
Central Wavelength	**1310**±25 nm					**1310**±25 nm/**1550**±25 nm			
Applicable Fiber	single-mode					single mode			
Pulsewidth	10 ns	100 ns	1µs	10 µs		10 ns	100 ns	1µs	10µs
Dynamic Range[1][dB]	13	18	23	**30**		19/17	24/22	30/29	35/34
Event Deadzone[2]	**3m**					**3m**			
Attenuation Deadzone[3]	**10m**					**10/12m**			

Module	**E6003B**					**E6004A**			
Central Wavelength	**1310**±25 nm/**1550**±25 nm					**1310**±25 nm/**1550**±25 nm			
Applicable Fiber	single-mode					single-mode			
Pulsewidth	10 ns	100 ns	1µs	10 µs	20 µs	10 ns	100 ns	1µs	10µs
Dynamic Range[1][dB]	19/17	24/22	30/29	38/37	**40/39**	13/13	18/18	23/23	**30/30**
Event Deadzone[2]	**3m**					**3m**			
Attenuation Deadzone[3]	**10/12m**					**10/12m**			

Module	**E6008B**					**E6012A**				
Central Wavelength	**1310**±25 nm/**1550**±25 nm					**1550**±25 nm/**1625**±20 nm				
Applicable Fiber	single-mode					single-mode				
Pulsewidth	10 ns	100 ns	1µs	10 µs	20 µs	10 ns	100 ns	1µs	10µs	20 µs
Dynamic Range[1][dB]	24/22	29/27	35/34	42/41	**45/43**	22/18	27/24	34/30	41/**40**	**43/ -**
Event Deadzone[2]	**3m**					**3m**				
Attenuation Deadzone[3]	**10/12m**					**12/14m**				

Module	**E6005A**				**E6009A**		
Central Wavelength	**850**±30 nm/ **1300**±30 nm				**850**±30 nm/ **1300**±30 nm		
Applicable Fiber	multimode 62.5 µm				multimode 62.5 µm		
Pulsewidth	10 ns	100 ns	1µs	10 µs	10 ns	100 ns	1µs
Dynamic Range[4][dB]	19/17	26/22	- /28	- /34	12/12	18/18	- /23
Event Deadzone[5]	3m				3m		
Attenuation Deadzone[6]	10m				10m		

Module	**E6013A**				
Central Wavelength	**1310**±25 nm/**1550**±25 nm/**1625**±20 nm				
Applicable Fiber	single-mode				
Pulsewidth	10 ns	100 ns	1µs	10 µs	20 µs
Dynamic Range[1][dB]	18/17/17	23/22/22	29/28/28	36/35/35	**39/38/37**
Event Deadzone[2]	**3m**				
Attenuation Deadzone[3]	**10/12/14m**				

The guaranteed values above are tested specifications. Agilent OTDR modules have the pulsewidths listed in "Pulsewidth" on page 2.

Notes:

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

2 Reflectance ≤ -35 dB at 10 ns pulsewidth, and with span ≤ 400 m at 8 cm sample spacing, optimize resolution.

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

4 Measured with a standard 62.5 µm guided index multimode fiber at SNR=1 noise level and with 3 minutes averaging time, optimize dynamic.

5 Reflectance ≤ -35 dB at 5 ns pulsewidth, and with span ≤ 4 km, optimize resolution.

6 Reflectance ≤ -35 dB at 10 ns pulsewidth, and with span ≤ 4 km.

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

Acoustic Noise Emission

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

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

Source Mode

	E6001A built-in CW laser source	E6003A, E6003B, E6004A, E6008B built-in CW dual laser source	E6005A, E6009A built-in CW dual laser source	E6012A, E6013A built-in CW dual/triple laser source
CW output power	-3 dBm		-20 dBm (850 nm) -13 dBm (1300 nm)	-3 dBm (E6012A) -8dBm/-7dBm/-6dBm 1310/1550/1625nm
CW stability (15 min., T=const.) after a 10 minute warm-up with CW on	±0.1 dB		±0.15 dB	±0.1 dB / ±0.15 dB
Optical Output	User-exchangeable Connector Interfaces			
Source Mode Modulation	270 Hz, 1 KHz and 2KHz squarewave, Code			

Agilent E6006A Power Meter Submodule[2]

Characteristics

Sensor element: InGaAs

Wavelength range: 800 – 1650 nm

Calibrated wavelengths: 850 nm, 1300 nm, 1310 nm, 1550 nm, 1625 nm (special wavelengths 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 50µm graded index (add 2% to total uncertainty for fiber 62.5µm).

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 level between +10 and –45 dBm (peak amplitude).
- Dual Wavelength measurement 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).
- 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: <130g.

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

[2] E6006A Power Meter Submodule not available for E6013A 1310/1550/1625 nm Mini-OTDR module

Agilent E6007A Visual Fault Finder Submodule [3]

Characteristics

Source type: Laser diode

Center Wavelength: 635 nm ± 10 nm (visible red light)

Output power level (CW)

- 0 dBm maximum
- into 9μm fiber (typ.): -3 dBm

Detection range: up to 5 km

Optical output: User-exchangeable Connector Interface

Laser Safety Class: 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: < 100g

Operating Temperature: 0 to 40 °C

Storage Temperature: -40 to +60 °C

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

[3] E6007A Visual Fault Finder Sub-module not available for E6013A 1310/1550/1625 nm Mini-OTDR module

Accessories

The Agilent Technologies E6000C is a high performance time domain reflectometer. It is available in various configurations for the best possible match to the most common applications.

Instrument and Options

Agilent Product	Opt	Description
E6000C		Mini-OTDR Mainframe
	003	Color screen VGA LCD
	006	B/W Screen VGA-LCD
	AB0	Traditional Chinese user interface
	AB1	Korean user interface
	AB2	Simplified Chinese user interface
	AB8	Turkish user interface
	AB9	Portuguese user interface
	ABD	German user interface
	ABE	Spanish user interface
	ABF	French user interface
	ABJ	Japanese user interface
	ABX	Finnish user interface
	ABZ	Italian user interface
	ACB	Russian (Cyrillic) user interface
	AKB	Czech user interface
	AKE	Romanian user interface

Modules

Agilent Product	Opt	Description
E6001A		1310 nm economy single-mode module
E6003A		1310/1550 nm high performance single-mode module
	022	angled connector
E6003B		1310/1550 nm very high performance single-mode module
	022	angled connector
E6004A		1310/1550 nm economy single-mode module
	022	angled connector
E6005A		850/1300 nm high performance multimode module
E6006A		Optical Power Meter
E6007A		Visual Fault Finder
E6008B		1310/1550 nm ultra high performance single-mode module
	022	angled connector
E6009A		850/1300 nm economy multimode module
E6012A		1550/1625 nm ultra high performance single-mode module
	022	angled connector
E6013A		1310/1550/1625 nm very high performance single-mode module
	022	angled connector

Support Options

For all Agilent Mini-OTDRs, 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

All modules come with a commercial calibration certificate.

Accessories supplied

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

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

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

- Each OTDR Module ordered is provided with 81000FI (FC/PC) and 81000 KI (SC) connector Interface
- Each OTDR Module ordered with Option 022 is provided with 81000NI (FC/APC) and 81000 KI (SC) connector Interface

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
E6082A	Hard transit case
E6083A	64 MB Compac / Flash™ disk with PCMCIA adapter
E6091A	OTDR Toolkit II Plus software
5180-0010C	Centronics cable
24542U	RS232 cable, 9-pin to 9-pin
E6000-13601	OTDR Support CD

Connector Interfaces

The Agilent E6000C Mini-OTDR modules are usually supplied with a straight contact output connector interface.

If you want your Mini-OTDR supplied with an angled connector, please order option #022. (Option #022 is only available for single-mode modules.)

Optical Connectors

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

Related Agilent Literature

Agilent Part Number	Title
N3900-90AJ1	Cleaning Procedures for Lightwave Test and Measurement Equipment pocket guide
E6000-91031	Mini-OTDR User ´s Guide (also available in other languages)
E6000-91017	OTDR Pocket Guide (also available in other languages)
E4310-91016	OTDRs Programming Guide

Related Training Material

Web Based Training:

Agilent E6000C – OTDR Solution User's Course

To take this training, go to:

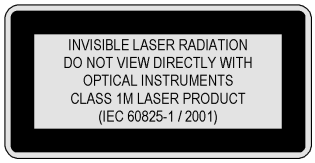
http://www.agilent.com/cm/service/education.shtml

Safety Information

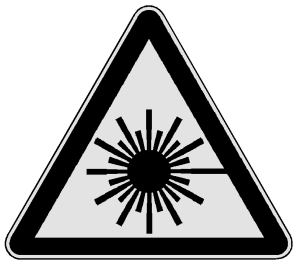
All laser sources specified by this data sheet are classified as class 1M or class 2 according to IEC 60825-1 (2001).

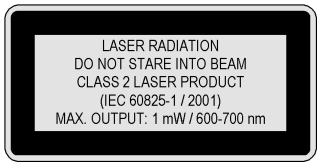
All laser sources comply with FDA 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated 2001-July-26.

The class 1M laser sources (all Mini-OTDR modules except E6006A and E6007A submodules) bear the laser label



The class 2 laser source (E6007A) bears the laser labels





All modules also bear the CE conformity marking

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.

Agilent Technologies Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

By internet, phone, or fax, get assistance with all your test & measurement needs

Online assistance:
www.agilent.com/comms/otdr

Phone or Fax

United States:
(tel) 1 800 452 4844

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Product specifications and descriptions in this document subject to change without notice.

Printed in Germany. March, 2002
p/n 5988-2302EN

Agilent Technologies