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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 performance.
- 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:** 4 cm
- **Refractive index:** 1.00000 to 2.00000
- **Length unit:** km, ft, or miles
- **Measurement points:** up to 64000

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, 1 µs, 3 µs, and 10 µs (all modules). You can also select 5 ns for E6003C, 5A, 9A modules, and 20 µs for E6003B, E6003C, 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 10 µs 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 1 µs 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 64000 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 transmission rate: 115200 bps
  Transmission time at 115200 bps for trace data: 4000 points at approx. 1 second; 64000 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 does not 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	E6003A					E6003B				
Central Wavelength	**1310 nm** ± 25 nm/**1550 nm** ± 25 nm					**1310 nm** ± 25 nm/**1550 nm** ± 25 nm				
Applicable Fiber	single mode					single mode				
Pulsewidth	10 ns	100 ns	1 µs	10 µs		10 ns	100 ns	1 µs	10 µs	20 µs
Dynamic Range[1] [dB]	19/17	24/22	30/29	35/34		19/17	24/22	30/29	38/37	**40/39**
Event Deadzone[2]	**3 m**					**3 m**				
Attenuation Deadzone[3]	**10/12m**					**10/12 m**				

Module	E6003C					E6004A			
Central Wavelength	**1310 nm** ± 25 nm/**1550 nm** ± 25 nm					**1310 nm** ± 25 nm/**1550 nm** ± 25 nm			
Applicable Fiber	single-mode					single-mode			
Pulsewidth	10 ns	100 ns	1 µs	10 µs	20 µs	10 ns	100 ns	1 µs	10 µs
Dynamic Range[1] [dB]	21/20	27/25	33/32	40/39	**43/41**	13/13	18/18	23/23	**30/30**
Event Deadzone[2]	**1.5 m**					**3 m**			
Attenuation Deadzone[3]	**8/10 m**					**10/12 m**			

Module	E6008B					E6012A				
Central Wavelength	**1310 nm** ± 25 nm/**1550 nm** ± 5 nm					**1550 nm** ± 25 nm/**1625 nm** ± 20 nm				
Applicable Fiber	single-mode					single-mode				
Pulsewidth	10 ns	100 ns	1 µs	10 µs	20 µs	10 ns	100 ns	1 µs	10 µs	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]	**3 m**					**3 m**				
Attenuation Deadzone[3]	**10/12 m**					**12/14 m**				

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

Module	E6013A				
Central Wavelength	**1310 nm** ± 25 nm/**1550 nm** ± 25 nm/**1625 nm** ± 20 nm				
Applicable Fiber	single-mode				
Pulsewidth	10 ns	100 ns	1 µs	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]	**3 m**				
Attenuation Deadzone[3]	**10/12/14 m**				

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 ≤ 1000 m at 4 cm sample spacing, optimize resolution. E6003C at 5 ns pulsewidth (< –40 dB); with FW Rev. 6.41 and higher

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:** $\pm 10^{-4}$
- **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, 100 ns

Source Mode

	E6003A, E6003B, E6003C, 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) –8 dBm / –7 dBm / –6 dBm 1310 / 1550 / 1625 nm
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 2 kHz 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 upon 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 nm ± 3 nm, 1310 nm ± 3 nm, 1550 nm ± 3 nm

Fiber type: 50/125 µm graded index, Agilent/HMS-10 connector

Spectral bandwidth: up to 10 nm

Ambient temperature: +18°C 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 nm ± 3 nm, 1300 nm ± 3 nm, 1310 nm ± 3 nm, 1550 nm ± 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°C 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 –45dBm (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: <130 g.

Operating Temperature: 0°C to +50 °C

Storage Temperature: –40°C 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 9 µm fiber (typ.): –3 dBm

Detection range: up to 5 km

Optical output: User-exchangeable Connector Interface

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°C to 40°C

Storage Temperature: –40°C 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
E6003A		1310/1550 nm standard performance single-mode module
	021	with straight connector interface
	022	with angled connector interface
E6003B		1310/1550 nm high performance single-mode module
	021	with straight connector interface
	022	with angled connector interface
E6003C		1310/1550 nm very high performance single-mode module
	021	with straight connector interface
	022	with angled connector interface
E6004A		1310/1550 nm economy single-mode module
	021	with straight connector interface
	022	with angled connector interface
E6005A	021	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
	021	with straight connector interface
	022	with angled connector interface
E6009A	021	850/1300 nm economy multimode module
E6012A		1550/1625 nm ultra high performance single-mode module
	021	with straight connector interface
	022	with angled connector interface
E6013A		1310/1550/1625 nm very high performance single-mode module
	021	with straight connector interface
	022	with angled connector interface

Warranty, Service & Calibration Plan

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

- R1280A – Return to Agilent Warranty and Service Plan. Available for 36 months (3 years) or 60 months (5 years).
- R1282A – Return to Agilent Calibration Plan. Available for 36 months (3 years) or 60 months (5 years).

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
- Power cord
- NiMH battery pack
- User´s Guide
- OTDR Trace Viewer PC Software
- Support CD
- RS232 cable
- Shoulder Strap

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

- Each single mode OTDR Module ordered with Option 021 is provided with 81000FI (FC/PC) and 81000 KI (SC) connector interface
- Each single mode OTDR Module ordered with Option 022 is provided with 81000NI (FC/APC) and 81000 KI (SC) connector interface
- E6005A and E6009A multi mode OTDR Modules are provided with 81000 KI (SC) and 81000 VI (ST) 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
N3980A	192 MB CompactFlash™ card with PCMCIA adapter
E6092A	OTDR Toolkit III Plus trace analysis & acceptance test documentation software
24542U	RS232 cable, 9-pin to 9-pin
E6000-13601	OTDR Support CD

Connector Interfaces

If you want your Mini-OTDR supplied with an angled connector, please order option #022. (Option #022 is only available for single-mode modules). Straight connector interfaces must be ordered with option #021.

Optical Connectors

Agilent Model No.	Description
81000SI	DIN connector interface
81000HI	E2000 connector interface
81000NI	FC/APC connector interface
81000FI	FC/PC connector interface
81000KI	SC connector interface
81000VI	ST connector interface
81000LI	LC connector interface

Product Documentation

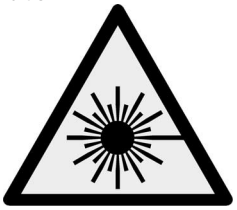
Agilent Part Number	Title
N3900-90AJ1	Cleaning Procedures for Lightwave Test and Measurement Equipment pocket guide
E6000-91031	Mini-OTDR User´s Guide (also available in other languages)
E6000-91017	OTDR Pocket Guide (also available in other languages)
E4310-91016	OTDRs Programming Guide

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.

All laser sources bear the laser warning label



The class 1M laser sources (all OTDR test engines) bear the laser label



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



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.

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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

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