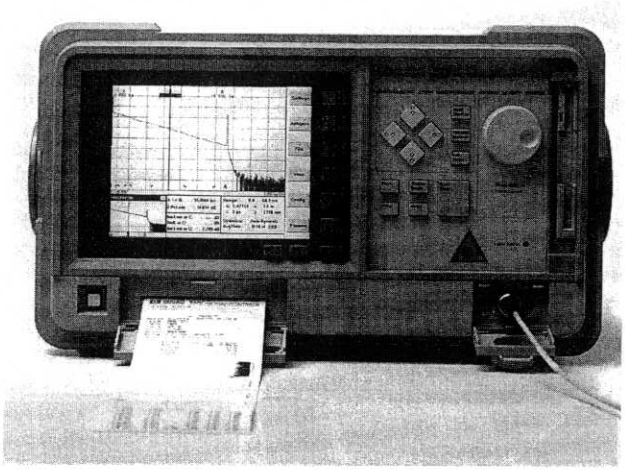
- High resolution and long range in one unit
- Automatic measurement and analysis
- Simple one-button operation
- Accurate fault location
- Programmable procedures
- Two-way measurement
- Up to four-trace comparison
- Full on-line analysis
- Configuration flexibility
- Event table template



The HP 8147 combines automatic measurement and analysis capability with pre-programmable procedures that speed operation. Functionality spans on-site, problem-solving, bench-top characterization and remote monitoring, while modular architecture allows you to expand its capabilities in keeping with both your needs and budget.

One-Button Convenience

How easy is it to analyze your fiber? Just apply power to the HP 8147, connect the fiber, and press "Run". Within seconds, you will have your answer. With its built-in intelligence, the HP 8147 automatically sets itself up to make the best possible analysis of your fiber under any condition it encounters.

No formal training is required as it performs precise, repeatable measurements and analysis of your fiber links, quickly and easily, no matter how infrequently you use the instrument. Traditional functions are augmented with additional features to help you get the job done efficiently and competently.

"Optimize" for Best Results

Whether you are testing for dynamic range (long-range/high-loss links), resolution (events close together), or linearity (fiber homogeneity), the HP 8147 will meet your needs.

The "Optimize" mode sets the instrument to achieve the best possible performance for each of these criteria. The HP 8147 adjusts itself to required conditions in either automatic or manual setting. The instrument's built-in intelligence then provides you with precisely the results you are pursuing.

Program for Consistent Operation

The best way to ensure that everyone sets up the HP 8147 the same way to perform the same test—for example, for acceptance testing—is to program the instrument with "Easy mode". Preset all the measurement parameters before the team leaves for the installation site, and all they have to do is connect up the fiber, select the desired measurements, and press the Run button. Human error is minimized, measurements are consistent, and efficiency is assured.

The HP 8147 also provides a macro capability that allows you to program complete procedures, including measurement, setup, printing and saving. On site, results are produced with a few keystrokes.

Accurate Fault Location

A major source of errors (uncertainties) in fault/event location can be caused by different refractive indices in the fiber segments which compose a link.

The HP 8147 helps you overcome this problem by allowing you to input the refractive index for each segment in the fiber, thus ensuring the most accurate positioning possible. In addition, the HP 8147 lets you add known landmarks and features to the measurement result.

Many of today's problems occur because the transmitters in high-speed links use sophisticated lasers, which are sensitive to reflections. If any of these link components do cause problems, the HP 8147 can help detect them.

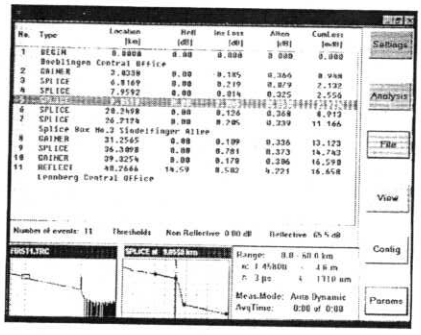
A return loss chart shows the loss associated with each individual event, as well as total return loss of the link. The result—added confidence that you are pinpointing the faults where they really occur.

Enhanced Analysis Functions

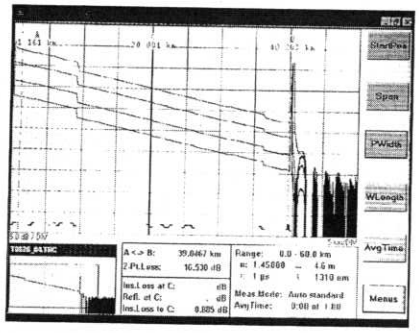
Beyond automatic characterization, the HP 8147 assists in carrying out a more in-depth analysis of a link. Instead of transferring the measurement results to a floppy for later analysis on a PC, you can do your analysis with the HP 8147 on the spot.

In addition to standard splice loss, reflectance, attenuation and distance measurements, the HP 8147 also provides:

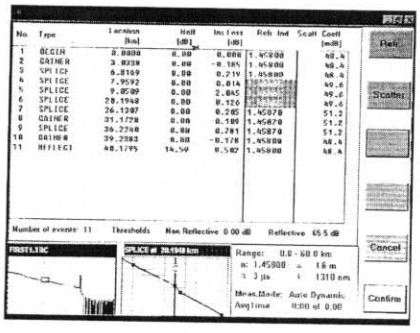
- two-way measurement for improved splice loss averaging
- subtract traces which show differences instantly
- more accurate return loss measurements by means of an editable scatter coefficient
- cumulative and total link loss readouts at a glance
- an event bar which displays events on the trace, even when they are not completely visible



Event screen



Trace screen



Partial and backscatter coefficient

Cost-Effective Performance in a Compact Package

No more trade-offs. Now you can tailor both performance and cost to your actual requirements.

Select a variety of performance classes to meet your application specifically. They range from high-end dynamic range modules in the 40 dB class for long-distance or high-loss link testing, down to 28 dB modules for short-distance or low-loss links.

No matter which dynamic range you choose, you can configure your OTDR to your specific requirements. The HP 8147 includes full on-line analysis capabilities, one-button automatic measurement, and a variety of options including dc-input, color display, and thermal printing.

All this traditionally heavyweight, full-size OTDR performance is packed into a surprisingly small, lightweight package—a mere 9 kg (19.8 lb).

Instant Expert

No matter how easy it is to make optical fiber testing, questions will inevitably arise. The HP 8147 makes getting the answers easy, too.

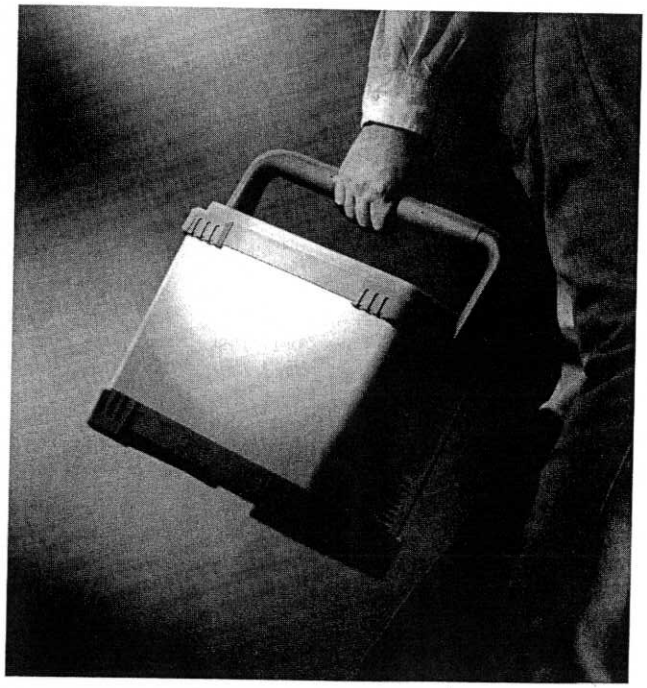
Simply press a button and task-orientated help appears. The HP 8147 assesses the situation, considers the difficulty, describes it, and offers a solution. It is like having your own HP fiber-optic network expert right there at your shoulder.

Dedicated Desktop

Attach a VGA monitor, keyboard, mouse, and external printer to the HP 8147's standard connectors and you have a dedicated OTDR desktop machine. You can even attach it to your LAN with an optional interface for quick data transfer.

Modularity Secures Your Investment

With the growing complexity of telephone networks continually pushing the limits of existing test technology, flexible solutions are mandatory. The HP 8147 can respond to these demands elegantly. As new solutions to new challenges are developed by HP, new firmware can be downloaded into the HP 8147 via the built-in floppy drive. You get the most up-to-date capabilities, without having to replace your test equipment investment.



Hand carry the HP 8147 wherever it is needed

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. Typical specifications are in **bold** typeface. *Supplementary performance characteristics provide information about non-warranted instrument performance in the form of nominal values, and are printed in italic typeface.*

Optical Performance

Module	HP E4319A								HP E4316A							
	HP E4317A				HP E4318A				HP E4314A				HP E4315A			
Central Wavelength	1310 ±15 nm				1550 ±15 nm				1310 ±15 nm				1550 ±15 nm			
Fiber Type	single-mode				single-mode				single-mode				single-mode			
Pulsewidth	100 ns	1 µs	10 µs	20 µs	100 ns	1 µs	10 µs	20 µs	30 ns	100 ns	1 µs	10 µs	30 ns	100 ns	1 µs	10 µs
Dynamic Range (dB)[a]	24	32	39	40	23	31	38	39	16	20	28	35	15	19	27	34

a. Measured at SNR = 1 noise level with 3 minutes averaging time at 25°C. Optimizing mode: dynamic

Module	HP E4313A															
	HP E4311A				HP E4312A				HP E4321A				HP E4324A			
Central Wavelength	1310 ±15 nm				1550 ±15 nm				1625 ±15 nm				1310/1550 ±15 nm			
Fiber Type	single-mode				single-mode				single-mode				single-mode			
Pulsewidth	30 ns	100 ns	1 µs	10 µs	30 ns	100 ns	1 µs	10 µs	100 ns	1 µs	10 µs	20 µs	100 ns	1 µs	10 µs	20 µs
Dynamic Range (dB)[a]	13	16	22	**30**	12	15	21	**30**	25	31	38	**42**	28/27	34/33	41/40	**45/43**

a. Measured at SNR = 1 noise level with 3 minutes averaging time at 25°C. Optimizing mode: dynamic

Resolution

Module	HP E4313A/E4316A		HP E4319A		HP E4321A	HP E4324A
	HP E4311A/ HP E4314A	HP E4312A/ HP E4315A	HP E4317A	HP E4318A		
Event Deadzone[a]	4 m	4 m	4 m	4 m	5 m	4.5 m
Attenuation Deadzone[b]	10 m	12 m	10 m	12 m	14 m	10/12 m

a. Return loss ≥35 dB at 10 ns pulsewidth with span ≤4 km.
b. Return loss ≥50 dB at 30 ns pulsewidth with span ≤4 km.

Distance Accuracy

Offset Error	±0.5 m
Scale Error	$\pm 5 \times 10^{-5}$
Sampling Error	±0.5 sample spacing
Total Distance Accuracy	± offset error ± scale error × measured distance ± sampling error

Loss/Reflectance Accuracy

SNR ≥15 dB with 1 µs pulsewidth	
Backscatter Measurements	±0.05 dB
Reflectance Measurements	±2.0 dB

Horizontal Parameters

Start-km	0 km–499 km
Span	1 km–500 km
Readout Resolution	0.1 m
Minimum Sample Spacing	0.1 m
Refractive Index	1.00000–2.00000
Backscatter Coefficient	20.00–80.00 dB at 1 µs
Length Unit	km, kft or miles selectable (10 cm resolution)
Measurement Points	Up to 16000

Vertical Parameters

Vertical Scale	0.1–5.0 dB/Div (in 1, 2, 5 mode)
Readout Resolution	0.001 dB
Reflectance Range	20 dB (typical 14 dB) to > 60 dB

CW Mode

Output Power	< 0 dBm (IEC825 Class 1/3A)
Stability (15 min., T=const.)	± 0.05 dB after 10 minute warm-up

Additional Specifications

Pulsewidth	Selectable, from 10 ns to 10 µs for E4311A–E4316A, and from 10 ns to 20 µs for E4317A–E4319A, E4324A
Output Connector	Optional Diamond HMS-10, FC/PC, DIN 47256, ST, Biconic, SC, NEC D4[a]
Automatic Setup and Analysis	Provided

a. All are user-exchangeable. For other connector types, please contact your local HP sales office or representative.

Documentation

3.5 inch Disk Drive	For 720/1440 KByte floppies. MS-DOS (double-density and high-density) compatible. Reduced operating temperature during access of 5°C to 40°C, with 35% to 85% humidity at 40°C.
Internal Memory	Built-in hard disk with more than 10,000 traces.
Thermal Printer (optional)	Print speed typical < 40 seconds while instrument continues to operate. Reduced operating during access of 5°C to 40°C, with 35% to 85% humidity at 40°C.
Trace Format	Compliant to Bellcore TA-TWT-00196 Issue 3, supplement OTDR data format
Trace Information	Five comment labels of up to 15 alphanumeric characters and five comments of up to 41 alphanumeric characters are provided for each trace
Real-Time Clock and Date	Provided
Compare Mode	Up to 4 traces can be compared on screen
Instrument Settings	Storage and recall user-selectable instrument settings

Scan Trace

Type of Events	Reflective and non-reflective events (minimum detectable change 0.05 dB best case)
Max. Number of Events	1000
Threshold for Non-Reflective Events	0.00 (disabled) to 5.00 dB, selectable in 0.01 dB steps
Threshold for Reflective Events	–65.0 to 0.00 dB, selectable in 0.1 dB steps

Display

Display Points	640 × 480 points
Update Rate	3 times/second in refresh mode
Monochrome-LCD	16 cm (6.3 in)
Color-LCD (optional)	16 cm (6.3 in)

Interfaces

RS-232-C Capabilities	All instrument parameters and modes can be programmed
Maximum Baud Rate	19200
Handshake Functions	No handshake, X on, X off, hardware
Used Lines	RX, TX, CTS, RTS, GND
Centronics	Standard parallel port (SPP)
VGA Monitor	DSUB 9 pin
Keyboard	PS/2 (Mini DIN)
Mouse	PS/2 (Mini DIN)
LAN (optional)	RJ-45 connector. Supports TCP/IP and Novell IPX protocols. For data transfer only.
HP-IB Capabilities (optional)	All instrument parameters and modes can be programmed
HP-IB Interface Function Codes	SH1, AH1, T5, L4, SR0, RL1, PP0, DT0, C0

Note: There are two free slots which can be used for only two of the DC/LAN/HP-IB options.

General

Laser Safety Class	21 CFR Class 1, IEC825 Class 3A
Recalibration Period	2 years
Storage Temperature	–40°C to +70°C
Operating Temperature	0°C to +55°C
Humidity[a]	95% R.H. from 0°C to +40°C

a. Reduced ranges when printers and/or floppy disk drives are installed.

Power

ac	100–240 Vrms ±10%, 150 VA max, 50–60 Hz
dc (optional)	11–30 V
Battery Back-Up	Typically 5 years with instrument switched off at 20°C
Dimensions	218 mm H × 371 mm W × 305 mm D (8.6 in × 14.6 in × 12.0 in)
Weight	Net 9 kg (19.8 lb), including one laser module

Ordering Information

HP 8147A	Optical Time-Domain Reflectometer
HP E4310A	Optical Time-Domain Reflectometer Mainframe
Option 001	dc Input 11–30 V
Option 002	Thermal Printer
Option 003	Color Screen, VGA-LCD
Option 004	HP-IB Interface
Option 005	LAN Interface
Option AB2	Chinese Localization
Option UK6	Calibration Report
HP E4311A	1310 nm Single-Mode Module (30 dB)
HP E4312A	1550 nm Single-Mode Module (30 dB)
HP E4313A	1310/1550 nm Single-Mode Module (29/28 dB)
HP E4314A	1310 nm Single-Mode Module (35 dB)
HP E4315A	1550 nm Single-Mode Module (34 dB)
HP E4316A	1310/1550 nm Single-Mode Module (35/34 dB)
Option 022	Angled Connector
HP E4317A	1310 nm Single-Mode Module (40 dB)
HP E4318A	1550 nm Single-Mode Module (39 dB)
HP E4319A	1310/1550 nm Single-Mode Module (40/39 dB)
Option 022	Angled Connector
HP E4320A	Virtual-Remote and Analysis Software
HP E4321A	1625 nm Single-Mode Module (42 dB)
HP E4324A	1310/1550 nm Single-Mode Module (45/43 dB)
Option 022	Angled Connector

Support Options (available for all HP-OTDR modules)

Option W30	Three (3) years of Customer Return Repair Service
Option W32	Three (3) years of Customer Return Calibration Service
Option W50	Five (5) years of Customer Return Repair Service
Option W52	Five (5) years of Customer Return Calibration Service

Connector Interface Options

HP 81000AI	Diamond HMS-10 Connector Interface
HP 81000FI	FC/PC Connector Interface
HP 81000GI	D4 Connector Interface
HP 81000HI	E-2000 Connector Interface
HP 81000KI	SC Connector Interface
HP 81000SI	DIN 47256 Connector Interface
HP 81000VI	ST Connector Interface
HP 81000WI	Biconic Connector Interface

Accessories Supplied

User's Guide
OTDR's Programming Guide
Commercial Calibration Certificate
Power Cord
RS-232 Cable
CD-ROM Upgrade
TraceViewer and PC Filetransfer Software

Optional Accessories

HP E6090A	HP OTDR Toolkit (PC Analysis Software)