HEWLETT® PACKARD

HP 37778A
STM-16/OC-48 test set

Product Overview

Performance characteristics and ordering information

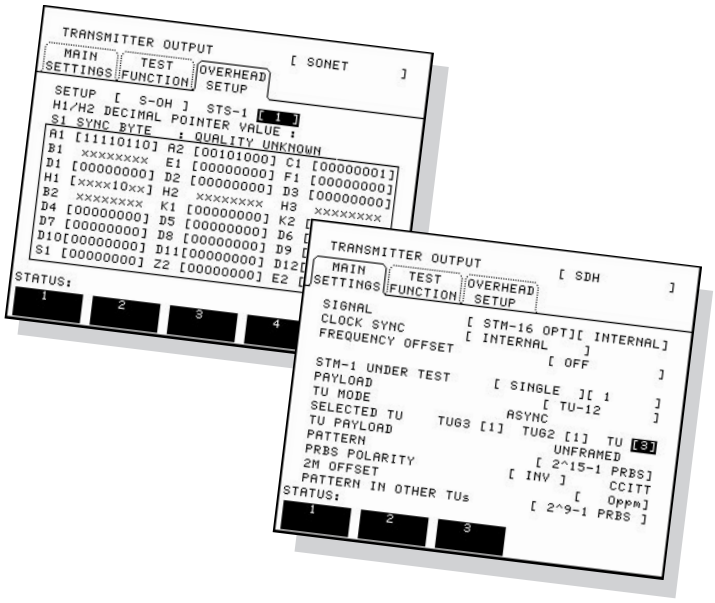
Designed for portability
Based on proven technology

Installation, commissioning and acceptance testing to SDH/SONET standards

Faster installation testing of 2.4 Gb/s links with overhead and BER testing in one test set

Overhead analysis to SDH standard ITU-T G.707 and SONET standard GR-253-CORE.

BER testing of regenerators with concatenated payloads and ADMs/DXCs with embedded PDH payload structures.



Are you sure that new STM-16/OC-48 equipment, needed to support key revenue-earning services, will survive all stresses and strains of your network? You need to be!

Since STM-16/OC-48 links will form the backbone of your digital network, your customers will be directly affected by the quality and availability of your STM-16/OC-48 equipment.

Transporting bulky lab test equipment is awkward and time-consuming – what you need is a 2.4 Gb/s test set designed for field testing.

Powerful STM-16/OC-48 test set that's portable

The HP 37778A test set is a portable tester that provides comprehensive out-of-service measurements for STM-16/OC-48 equipment installation and commissioning, and powerful non-intrusive measurements for in-service acceptance and maintenance testing to ITU-T G.826 quality-of-service objectives.

Fast functional testing

Simple instrument setup means functional test is performed with the minimum of fuss. The most frequently used test setups are stored in memory.

Single unit solution

With interfaces at both 155 Mb/s and 2.4 Gb/s you can test across 2.4 Gb/s multiplex equipment with a single test set.

Modular

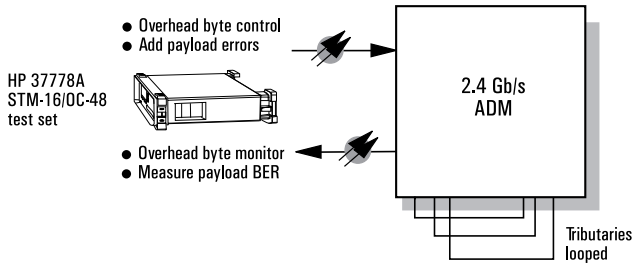
Simply add the modules that suit your test needs. A series of plug-in test and interface modules means flexible 1310 nm optics can be exchanged for 1550 nm. And, you can add jitter generation and analysis.

Your comprehensive solution to field-portable test at 2.4 Gb/s

- Overhead analysis
- STM-16c/OC-48c concatenated payloads
- 2, 34 and 140 Mb/s payloads
- 155 Mb/s drop and insert ports for external SDH/SONET payload testing
- Pointer generation and analysis
- G.826 analysis
- Frequency offset and measurement
- Thru data mode
- Jitter analysis

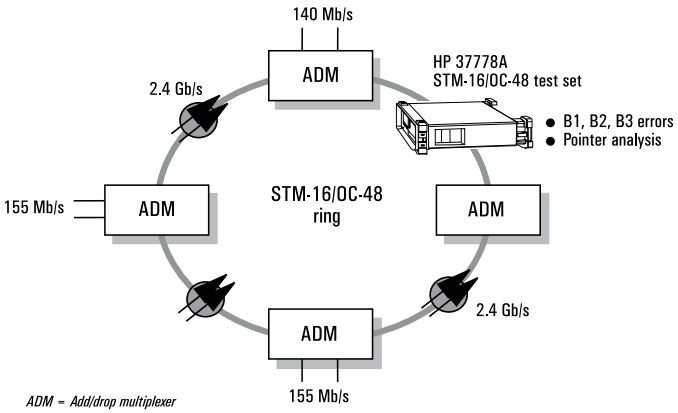
For comprehensive installation testing

Verify both payload and overhead byte integrity across network equipment.



For flexible in-service testing

Perform in-service monitoring during commissioning by connecting the HP 15744A optical coupler or using the test set's thru mode capability.



HP 37778A STM-16/OC-48 test set

The HP 37778A test set generates and receives optical and electrical signals in accordance with both ITU-T SDH and Bellcore SONET standards.

Frame formats

SDH: STM-1 and STM-16 to ITU-T G.707.
SONET: OC-48 to GR-253-CORE.

Payload types

Internal: 2, 34 and 140 Mb/s payload mapping via AU-4 to ITU-T G.707. STM-16c/OC-48c bulk filled payloads.
External: External 155 Mb/s drop/insert is provided via coded or binary ports for external SDH/SONET payload testing.

Clock sources

Internal: Accuracy ± 4.5 ppm.
Offset: Range ± 999 ppm (requires option A1T module).
External: 2 Mb/s MTS signal. Received STM-16/OC-48 signal. Inserted STM-1/STS-3 signal.

Alarm generation and detection

SDH: LOF, AU-LOP, MS-AIS, MS-RDI/FERF, AU-AIS, AU-RDI, TU-LOP, TU-AIS, TU-RDI.
SONET: LOF, SPE-LOP, AIS-S, AIS-L, RDI-L, AIS-P, RDI-P. VT level alarms via 155 Mb/s drop/insert ports.

Additional test function capability

SDH STM-1/STM-16: SOH/POH control and display, SOH/POH channel sequence programming, AU/TU pointer generation (including G.783 sequences and programmable pointer value), pointer analysis (including pointer value and increment/decrements), SOH/POH channel BER measurement, MSP timing measurement, ITU-T G.958 CID immunity optical stress sequence.
SONET OC-48c: TOH/POH control and display, TOH/POH channel sequence programming, SPE pointer generation (increments/decrements and programmable pointer value), pointer analysis (including pointer value and increment/decrements), TOH/POH channel BER measurement, APS timing measurement, ITU-T G.958 CID immunity optical stress sequence.

Measurements and results

All measurements are collected simultaneously.

Measurement period: Manual, timed single or short term period. Ranging from 1 second to 99 days.
Measurement types: Error count, error ratio, error seconds and alarm seconds.

Analysis measurements: G.821 and G.826 block based measurement (block length one frame).
Measurement types: Error block count, error seconds, severely errored seconds, unavailable seconds, severely errored seconds ratio, background block error ratio.

Connectors and interfaces

Optical: Customer exchangeable, FC/PC (HP 81000FI) adapters are supplied as standard.
Electrical: BNC/small Siemens on all transmit/receive and drop/insert ports.

Interfaces

Electrical: 155 Mb/s CMI coded, 2.4 Gb/s ECL clock and data.
Connector type: BNC at 155 Mb/s, SMA at 2.4 Gb/s.
Optical: 155 Mb/s (STM-1 format) and 2.488 Gb/s.
Wavelength: 1310 or 1550 nm.
Average output power: –3 dBm at 1310 nm and –2 dBm at 1550 nm.
Connector type: FC/PC fitted as standard, other connector types are available. Refer to optical connector-pair adapters (page 7).

Auxilary interfaces

Trigger output: Pulse or level indicates one of the following: Frame pulse, descrambler trigger, MS-RDI/RDI-L, MS-AIS/AIS-L, MSP/APS word change, B1/section BIP error, B2/line BIP error, MS-REI/FEBE/RFI-L.

Error addition and detection

SDH at STM-1 and STM-16: A1A2 frame, B1, B2, B3, payload errors.
SONET at OC-48: A1A2 frame, section BIP, line BIP, path BIP and payload errors (concatenated payloads only).

Jitter analysis

As a jitter analyzer, the HP 37778A test set supports testing 2.4 Gb/s equipment and systems for compliance with ITU-T G.958.

Unless otherwise stated, the following specifications apply to an SDH/SONET formatted signal with valid overhead and a scrambled all zeros or all ones virtual container.

Jitter generation

Internal modulation: Adds jitter to either an internally generated 2^7 PRBS signal or an external 2.4 Gb/s data signal.
Frequency range: 1 Hz to 20 MHz.
Amplitude: Up to 20 UI from 1 Hz to 750 kHz, with roll-off each decade to 0.75 UI at 20 MHz.

Jitter mask generation

Jitter tolerance: ITU-T G.958 masks type A and B masks are provided. Maximum permissible jitter tolerance is plotted automatically against the G.958 mask. User mask generator is provided allowing a customized mask of up to 34 points to be generated for rms and peak-to-peak ranges.
Jitter transfer: Jitter transfer can be plotted automatically for compliance with G.958.

External modulation

Frequency range: DC to 20 MHz.
Amplitude: Up to 20 UI from 1 Hz to 750 kHz, with roll-off each decade to 0.75 UI at 20 MHz.
Sensitivity: 24 UI p-p/V.
Connector type: BNC.

Jitter measurement

Measurement modes: Wide, medium or fine. RMS and peak-to-peak jitter measurement.

RMS jitter amplitude ranges

Wide mode: 0 to 10 UI.
Medium mode: 0 to 2 UI.
Fine mode: 0 to 0.4 UI.

RMS jitter amplitude resolution

Wide mode: 0.025 UI.
Medium mode: 0.005 UI.
Fine mode: 0.001 UI.

Peak-to-peak jitter amplitude ranges

Wide mode: 0 to 20 UI.
Medium mode: 0 to 4 UI.
Fine mode: 0 to 0.8 UI.

Peak-to-peak jitter amplitude resolution

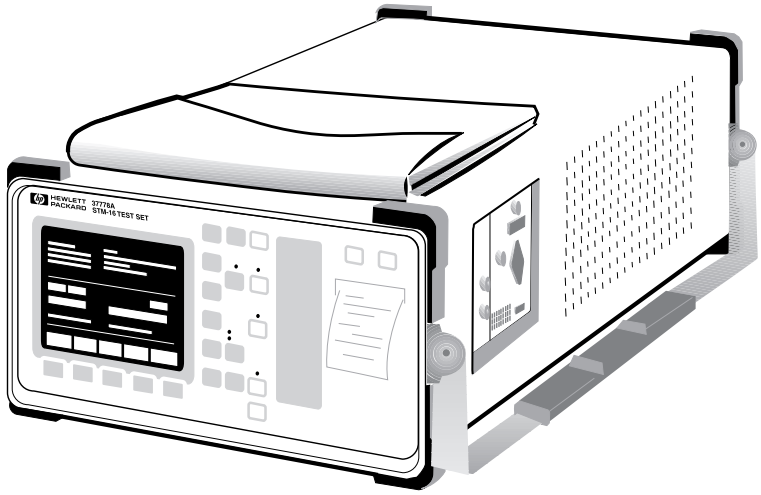
Wide mode: 0.025 UI.
Medium mode: 0.005 UI.
Fine mode: 0.001 UI.

Jitter hit measurement and analysis

Results: Hit count, hit seconds, peak jitter magnitude.
Threshold range: 0.01 UI to 10 UI peak.
Threshold resolution: 0.01 UI.

Demodulated jitter output

Bandwidth: 10 Hz to 20 MHz.
Sensitivity
Wide mode: 2 V/UI p-p.
Medium mode: 0.4 V/UI p-p.
Fine mode: 0.08 V/p-p.



Ordering information

Overhead and BER analysis

A single HP 37778A test set can be configured for stand-alone overhead and BER analysis. STM-16c and OC-48c concatenated payloads are provided with a choice of optical interface. 155 Mb/s drop/insert ports are supplied for external payload testing. Additional test payloads are available.

HP 37778A STM-16/OC-48 test set

Mainframe has BNC connectors on the 155 Mb/s drop/insert ports. RS-232-C printer/remote-control interface as standard.

Order one only of the following optical interface options

Transmit	Receive	Option
1310 nm	1310/1550 nm	UST
1550 nm	1310/1550 nm	USU
1310 nm *(US FDA Class 1)*	1310/1550 nm	USX

Order one only of the following options

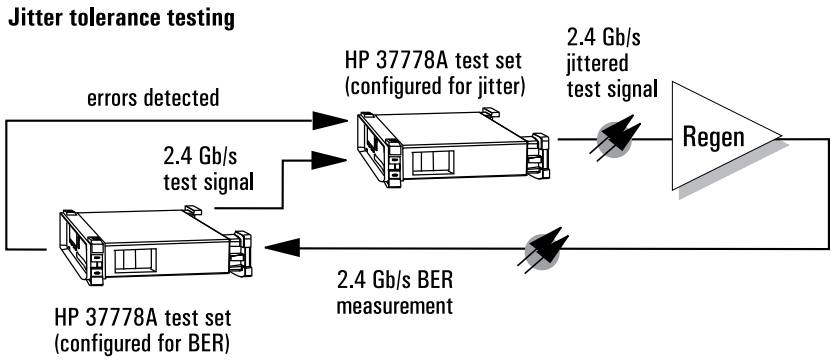
Description	Option
STM-1e overhead and 2, 34, 140 Mb/s PDH payload testing (BNC)	A1T
STM-1e overhead and 2, 34, 140 Mb/s PDH payload testing analysis (small Siemens)	A1U

Order if appropriate

Replace BNC with small Siemens connectors on mainframe	UGT
Replace RS-232-C printer/remote-control with HP-IB equivalent	1A8

Jitter analysis

A companion HP 37778A test set can be configured for jitter testing using the optical interface of the overhead BER test set. Additional transmit only optics (usually alternative wavelength) may be ordered to provide dual wavelength overhead, BER and jitter testing.



HP 37778A STM-16/OC-48 test set

Mainframe has BNC connectors on the 155 Mb/s drop/insert ports. RS-232-C printer/remote-control interface as standard.

Order one only of the following electrical or electrical/optical interface options

Additional transmit	Receive	Option
Electrical only	Electrical only	USQ
1310 nm	Electrical or via BER test set	USV
1550 nm	Electrical or via BER test set	USW
1310 nm (US FDA Class 1)	Electrical or via BER test set	USZ

Note: *Options USV, USW and USZ provide transmit optics only. Order as an alternative transmit wavelength and use the receive optics in the overhead and BER mainframe.*

Order if appropriate

Replace BNC with small Siemens connectors on mainframe	UGT
Replace RS-232-C printer/remote-control with HP-IB equivalent	1A8

Alternative configurations (eg, using a single HP 37778A test set, but interchanging overhead/BER analysis and jitter testing modules) are possible. Contact you local HP sales office for details.

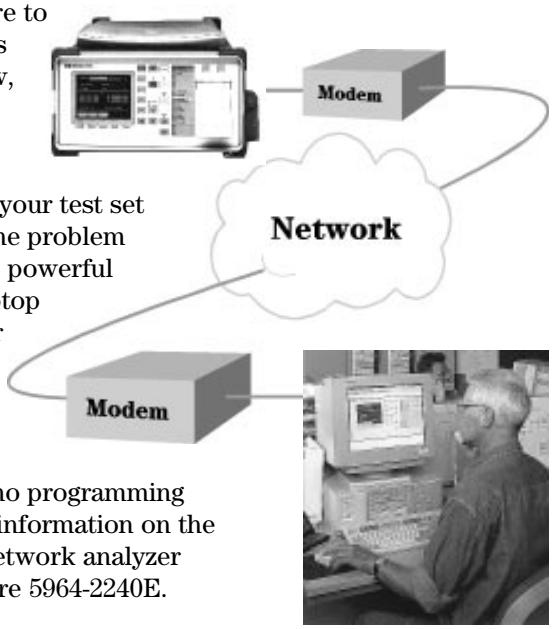
Optical connector-pair adapter

If you have ordered a test/ interface option with optical interfaces, you will need to specify a connector-pair adaptor to suit your particular equipment.
*(**Note:** HP 81000FI FC/PC adaptor is supplied with optical interface as standard).*

HP 81000AI: Diamond HMS-10/HP.
HP 81000JI: SMA.
HP 81000SI: DIN 47526.
HP 81000VI: ST.
HP 81000WI: Biconic.
HP 81000GI: D4.
HP 81000KI: SC.

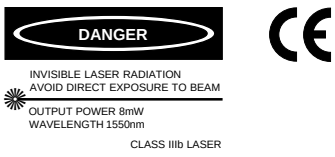
Gain better assistance

Use the HP E4540A distributed network analyzer software to increase the effectiveness of technical support. Now, when you contact your support center for assistance, the technical support team can access your test set and help you to resolve the problem interactively. Or, add this powerful application to a PC or laptop and control your analyzer locally for easy data collection and detailed report generation. This easy-to-use, Windows®-based software requires no programming skills. For more detailed information on the HP E4540A distributed network analyzer software, refer to brochure 5964-2240E.



For more detailed information on the HP 37778A test set, refer to technical specifications 5965-5149E and configuration guide 5965-1683E.

Hewlett-Packard manufacturers the HP 37778A STM-16/OC-48 test set under a quality system approved to the international standard ISO 9001 plus TickIT (BSI Registration Certificate No FM 10987).



For more information on Hewlett-Packard Test & Measurement products, applications or services please call your local Hewlett-Packard sales offices. A current listing is available via Web through AccessHP at http://www.hp.com. If you do not have access to the internet please contact one of the HP centers listed below and they will direct you to your nearest HP representative.

United States:
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Santa Clara, CA 95052-8059
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Hewlett-Packard Canada Ltd.
5150 Spectrum Way
Mississauga, Ontario
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