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SDH/SONET ANALYZER

AP9942B



**New Test Solution for
10Gbit/s DWDM Transmission System**

Ando Electric Co., Ltd

Development of DWDM 10G Transmission System/Cost Reduction of Manufacture!

High quality multi-port measurement system, which inspects the quality of transmission device for 10Gbit/s DWDM transmission system, ADM, OXC etc

■ Outline:

AP9942B SDH/SONET ANALYZER is the measurement instrument which is made for 10 G DWDM transmission line terminal used for DWDM transmission system, ADM, OXC, etc and research, development, manufacture of these system combined.

Because DWDM is the technology, which transmit multi-optical wavelength with one optical fiber, it is possible to evaluate the 10 Gbit/s or 2.5 Gbit/s of multi-optical interface port signals simultaneously. Combine measurement transmitter module with multi-port, it would be possible to carry out the multi-port simultaneous test and get the merit of reducing the evaluation time.

■ Feature:

- Multi-port lump sum test can be carried out
Multi-port configuration for your use → scalable measurement system
(1 transmitter module + 2 receiver modules configuration)
(4 receivers module configuration)
Possible to configure the measurement system with system up of existing VXI module configuration
Possible to configure the measurement system relating function extension and other modules.
- 10 Gbit/s SDH/SONET frame test can be carried out with 1 system
SDH/SONET frame test
Alarm transmission test
BERT test
Mapping test: VC4-64c/STS-192c to VC3/STS1 (concatenation mapping)
APS test
Measurement function of service disruption time
- Drop /Insert function for 10 G bit/s signal (Option)
Adding Drop/Insert module, following function can be operated.
Optical interface signal of low-speed signal (156 Mbit/s to 2.5 G bit/s) can be mapped to 10 G bit/s SDH/SONET frame.
(Detail test can be operated connecting to existing low-speed measurement device)
(Expands the application width mapping the optical signal of various transmitters to 10 G bit/s SDH/SONET frame)
Ex: High-speed router signal, etc
Signal of less than 2.5 G bit/s mapped to 10 G bit/s SDH/SONET frame can be de-mapped to drop interface.
(Monitoring the service signal and used it as drop function)
(Connecting to existing low-speed measurement device, detail test can be operated)
- Reducing the development / manufacturing cost
Using VXI plug & play, configure the transmitter automated evaluation flexibly.

System evaluation by GUI!

Easy view

The measurement display can be customized

Receiver Setting

Clock Setting

Transmitter Setting

Measurement Results



Software environment to reduce development and manufacturing cost

Operate Automated software to test function and performance

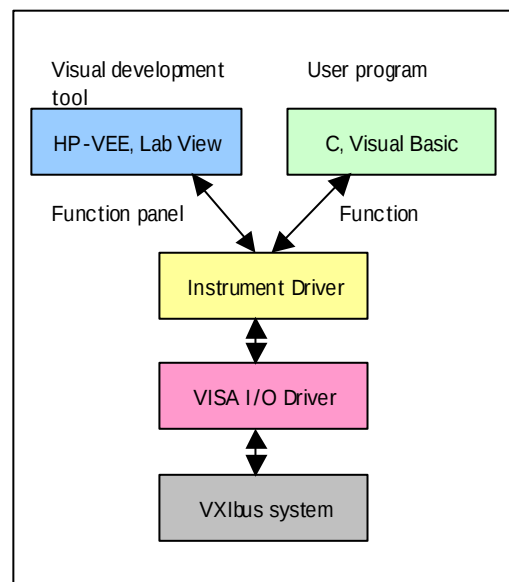
In the 10G SDH/SONET transmission system fields, enormous function and performance test like component test and system test will be required. In addition, when adding transmission system software and hardware, test will be repeated and if you can automate the regular function test, the productivity will be increased.

Software environment

*VXIplug&play Instrument Driver

*Function interface

*UID (Universal Instrument Driver) complied for OS (Windows 95, 98, NT) each development environment (Visual C++, Visual Basic, LabWindows/CVI, LabView, HP-VEE) and various GPIB interface cards has been tested.



Module configuration image

E8403A VXI Main Frame
VXI-C Size 13 slot

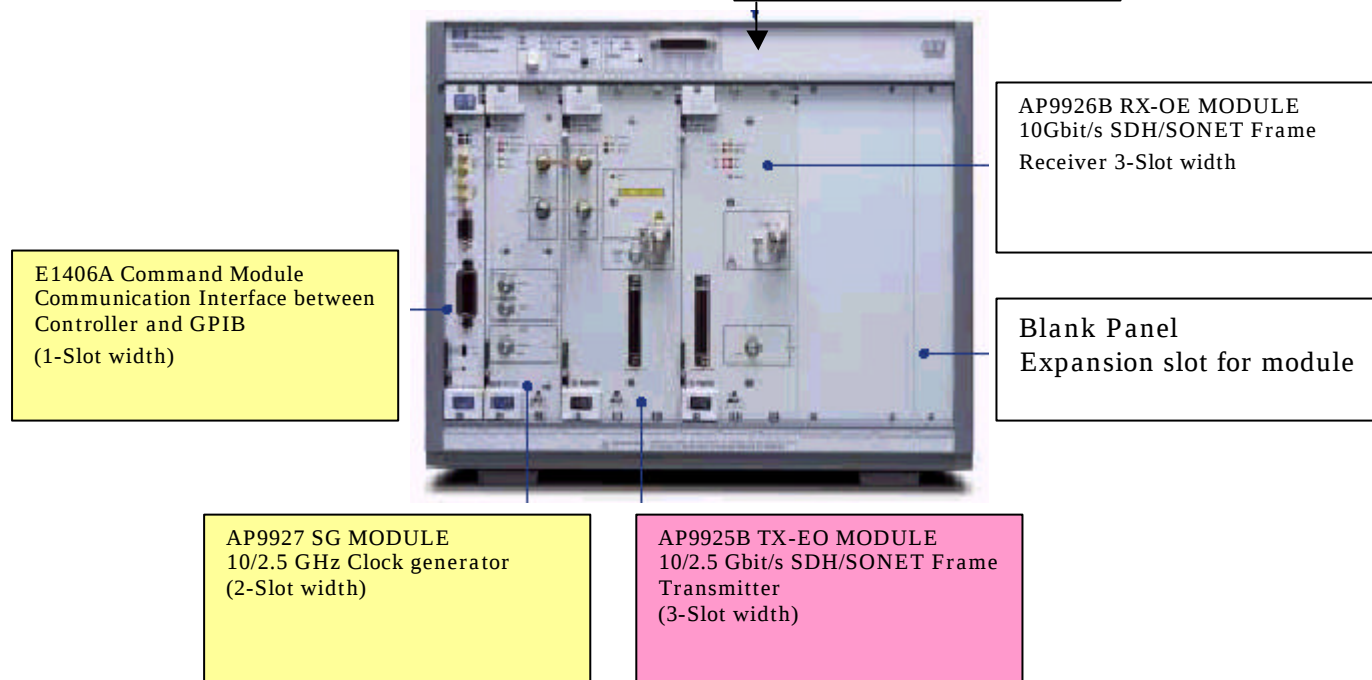


Diagram illustrating a multi-port testing setup for a device under test (DUT). The DUT is connected to a multi-port tester. The tester consists of a central unit with multiple ports, each labeled "O/E/O". These ports are connected to a multi-ported multiplexer (MUX) and a multi-ported demultiplexer (DEMUX). The MUX and DEMUX are both labeled with the symbol λ . The DEMUX is connected to a single input line. The MUX is connected to a single output line. The output line is connected to a single output port labeled "O/E/O". The diagram illustrates the simultaneous testing of multiple ports of the DUT.

■ AP9942B SDH/SONET ANALYZER Basic Configuration

Product view	Model Type/Name	Outline	Notes
	AP9925B TX-EO MODULE	10/2.5 Gbit/s SDH/SONET frame transmitter Alarm Control: LOS, LOF, OOF, Line/MS-AIS, Line/MS-RDI Error injection: B1/B2/B3/BIT Mapping: VC4-64c/STS-192c – VC3/STS-1 Average output power: -1~+1dBm	High Power type: +2dBm or more (Option)
	AP9926B RX-OE MODULE	10Gbit/s SDH/SONET frame receiver Alarm detection: LOS, LOF, OOF, Line/MS-AIS, Line/MS-RDI Error measurements: B1/B2/B3/BIT Receiver sensitivity: <-12dBm (10Gbit/s)	2.5Gbit/s is Option
	AP9927 SG MODULE	Operating Mode: Internal/Insert/Slave/External Clock output: 9.95328Gbit/s, 2.48832Gbit/s	It uses as clock source of AP9925B.
	AP9942B SDH/SONET ANALYZER	Configuration AP9925B TX-EO MODULE AP9926B RX-OE MODULE AP9927 SG MODULE E1406A Command Module E8403A VXI Mainframe	Transmitter Receiver Clock source GPIB interface for PC VXI Module Mainframe

*Note: This product needs PC for GPIB control.

■ Option for AP9942B SDH/SONET ANALYZER

Option	Outline	Note
PC Controller	A PC controller equipped with GPIB interface (not supplied) is required to use this system.	Operating system Windows 95/98/NT CPU speed: Pentium more than 200MHZ Hard disc volume: Need more than 200MHZ RAM volume: More than 64 MB
GPIB Interface	PCMCIA type (National Instruments)	Tested by National Instrument & HP products. (VISA Complied)
2.5Gbit/s option for an AP9926B	2.5Gbit/s Optical receiver Interface	Factory option
AP9928 1.5M BITS MODULE	BITS input: 1.544Mbit/s, Bantam 100Ω Clock output: 155.52MHz	Synchronization clock for BITS Operate with an AP9927
AP9929 2M MTS MODULE	MTS input: 2.048MHz, BNC 75Ω Clock output: 155.52MHz	Synchronization clock for MTS Operate with an AP9927
AP9932 DROP MODULE	De-mapped signal from AP9926B can be outputted to the external interface	Interface Optical 1.3μm, STM16/OC48 –STM1/OC3
AP9933 INSERT MODULE	Input interface to be mapped into AP9925B SDH/SONET transmit frame	Interface Optical 1.3/1.55μm, STM16/OC48 –STM1/OC3

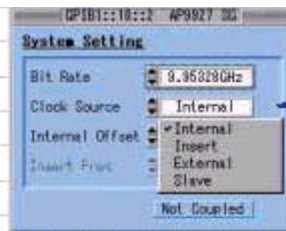
Measurement panel sight viewing! Easy operation and quick reporting

Basic panel

TX & RX setting and measurement results can be displayed

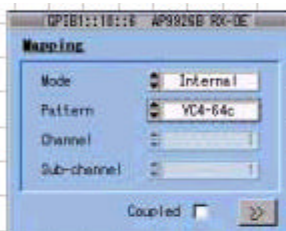
Bit rate selection

Set bit rate & Sync mode



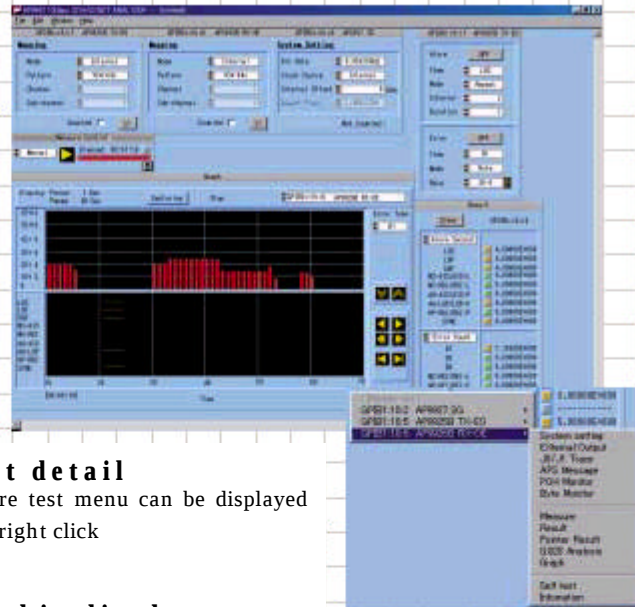
Set Mapping

Specify the test channel and mapping



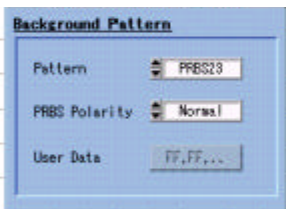
Set detail

More test menu can be displayed by right click



Set Background Pattern

Set user pattern or Prbs



Graphic display

For long term measurement



Enlargement

To enlarge measured results



Error performance function (G.828)

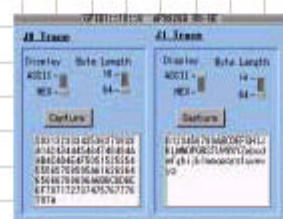
J0/J1 Trace message monitor

Receive frame byte monitor

SOH/POH and Payload can be monitored for detail testing

G.828 Analysis

MS-REI/REI-L	GP180:9:6
ES	4.00000E+000
SES	3.00000E+000
SEP	1.00000E+000
SD	1.19750E+004
BSE	7.99000E+002
ESR	5.8835E-002
ESR	4.41170E-002
BREI	1.53654E-003
UAS	0.00000E+000
GPI	1.47059E-002

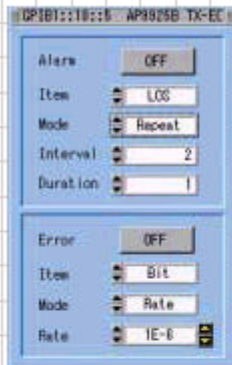


Receive frame byte monitor

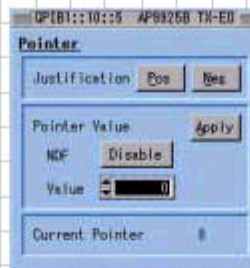
Time	SOH	POH	Payload
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0.000000	00	00	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Set Alarm/Error

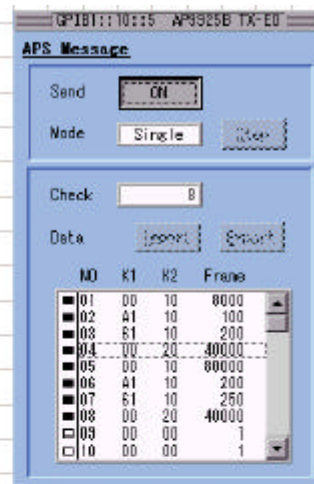
Alarm and Error can be transmitted at same time

**Pointer setting**

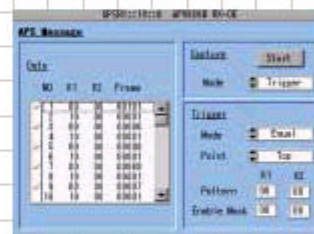
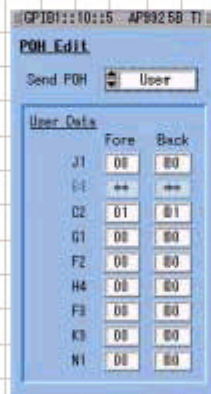
Set POS, NEG, Justification

**APS testing**

APS sequence can be programmed and receive APS message by using capture function.

**SOH EDIT**

Overhead edit function

**POH EDIT****Service disruption Test**

Service disruption test measures error burst length for measurement of protection switching times.



■ Specifications

AP9925B TX-EO MODULE

Environmental

Operating temperature : 5 to +35 ° C

Storage temperature: -20 to +60 ° C

Humidity: 30 to 85%RH

EMC: Meets EN50082-1

Physical

Size: 3-slot, C-size VXI module

Weight: 4.5Kg

Power Dissipation: 105W typical

Operating Modes: SONET/SDH

OC-192/STM-64, OC-48/STM-16

Optical Output

Wavelength: 1528nm to 1563nm,
1557nm typical

Fiber output power: 0dBm±1dBm

Option: +2dBm or more

Connector: FC/PC(standard)

Option: SC, ST, DIN etc

Payload Mode

1. **R-SOH&M-SOH Mode (AP9942)**

2. **R-SOH Mode (AP9940)**

3. **Mapping Mode**

SONET: STS-1, STS-Xc (X=3, 12, 48, 192)

SDH: VC-3, VC-4, VC-4-Nc (N=4, 16, 64)

■ Payload pattern

$2^{31}-1$, $2^{23}-1$, $2^{20}-1$, $2^{15}-1$, $2^{11}-1$,
 $2^{10}-1$, 2^9-1

Inverted or Non-inverted

■ Byte pattern

All ones, All zeros, User program pattern

■ External STS/STM input

Connect with AP9933 INSERT MODULE (STS-X/STM-X)

■ Mixed payload

Foreground and Background payload

CID Stressing

CIDstress: Consecutive 1's test to ITU-T G.958 Appendix 1.

TOH/SOH/POH Byte Access

Allows user-defined value in the range 00H to FFh to be programmed into any TOH/SOH/POH(except B1/B2/B3bytes).

SPE/AU Pointer control

Mode: POS, NEG, New Pointer

Alarm Generation

LOS, LOF, OOF, Line/MS-AIS, Line/MS-RDI, AU-AIS, AU-LOP, HP-RDI

Mode: Off, Single, Repeat, All

Error Add

B1, B2, L-REI/MS-REI(M1), B3, HP -REI, BIT(INFO)

Single: Single error

Rate: $m \cdot 10^{-n}$ ($m=1 \sim 9, n=3 \sim 12$)

J0/J1 message

16/64 repeating sequence

APS Sequencer

Mode: off, Step, Single, Repeat

Off: The static K1/K2 values are transmitted.

Single: K1/K2 sequencer is transmitted once only. (1 to 64 message)

Repeat: K1/K2 sequencer is transmitted repeatedly.

AP9926B RX-OE MODULE

Environmental

Operating temperature : 5 to +35 ° C

Storage temperature: -20 to +60 ° C

Humidity: 30 to 85%RH

EMC: Meets EN50082-1

Physical

Size: 3-slot, C-size VXI module

Weight: 4.8Kg

Power Dissipation: 120W typical

Operating Modes: SONET/SDH

OC-192/STM-64, OC-48/STM-16 (Option)

Optical Input

Wavelength: 1500nm to 1600nm

Sensitivity: -12dBm for BER1*10⁻¹²
-28dBm at 2.5Gbit/s

Max Input Power: -3dBm(10Gbit/s)

-10dBm(2.5Gbit/s)

Connector: FC/PC(Standard)

Option: SC, ST, DIN etc

Payload Mode

1. **R-SOH&M-SOH Mode (AP9942)**

2. **R-SOH Mode (AP9940)**

3. **Mapping Mode**

SONET: STS-1, STS-Xc (X=3, 12, 48, 192)

SDH: VC-3, VC-4, VC-4-Nc (N=4, 16, 64)

■ Payload pattern

$2^{31}-1$, $2^{23}-1$, $2^{20}-1$, $2^{15}-1$, $2^{11}-1$,
 $2^{10}-1$, 2^9-1

Inverted or Non-inverted

■ Byte pattern

All ones, All zeros, User programmed

■ External STS/STM output

Connect with AP9932 DROP MODULE (STS-X/STM-X)

SDH/SONET Frame monitor

Allows the values of the TOH/SOH/POH and payload of the selected test channel can be monitored and displayed.

SPE/AU Pointer Analysis

Pointer value, POS/NEG/NDF, missing NDF can be measured.

Alarm detection

LOS, LOF, OOF, Line/MS-AIS, Line/MS-RDI, AU-AIS, AU-LOP, HP-RDI

Error Detection

B1, B2, L-REI/MS-REI(M1), B3, HP-REI, BIT(INFO) G.826/G.828

Service Disruption Test

Service disruption test measures error burst length for measurement of protection switching times.

Results: Longest burst length, Shortest

burst length, last burst length

Accuracy: $\pm 0.01\% \pm 30\mu s$

Resolution: 1 μs

Range: 2S

APS Capture

Mode: Manual, Triger

Capture data: K1/K2 byte

Capture sequence: Up to 64 conditions.

Measurements

Mode: Manual, Single, Repeat

Manual: Start/Stop

Single/Repeat: User-defined timed

gating period from 1 to 999 seconds, 1 to 999 minutes or 1 to 999 hours.

Data logging function

AP9927 SG MODULE

Environmental

Operating temperature : 5 to +35 ° C

Storage temperature: -20 to +60 ° C

Humidity: 30 to 85%RH

EMC: Meets EN50082-1

Physical

Size: 2-slot, C-size VXI module

Weight: 3.5Kg

Power Dissipation: 57W typical

Operating Mode:

Interface rate:

2.48832GHz, 9.95328GHz

Timing source:

Internal :

Frequency accuracy: $\pm 4.6\text{ppm}$

Frequency offset: $\pm 20\text{ppm}$

Insert :

155.52MHz, 622.08MHz, 2.48832GHz

Slave :

155.52MHz

External : 2.48832GHz, 9.95328GHz

Clock output

Frequency: 2.48832GHz, 9.95328GHz

Level: +4dBm(Nominal)

Connector: APC-3.5

Trigger output

Waveform: 156MHz Square wave

Duty cycle: 50% $\pm$ 5% (Nominal)

Connector: SMA

HP E8403A VXI Mainframe

Detail specifications of E8403A VXI mainframe can be found on the Internet at:

<http://www.tm.agilent.com>

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