Anritsu

APPLICATION NOTE

MP1570A

SONET/SDH/PDH/ATM Analyzer

MEASUREMENT GROUP
ANRITSU CORPORATION

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Anritsu

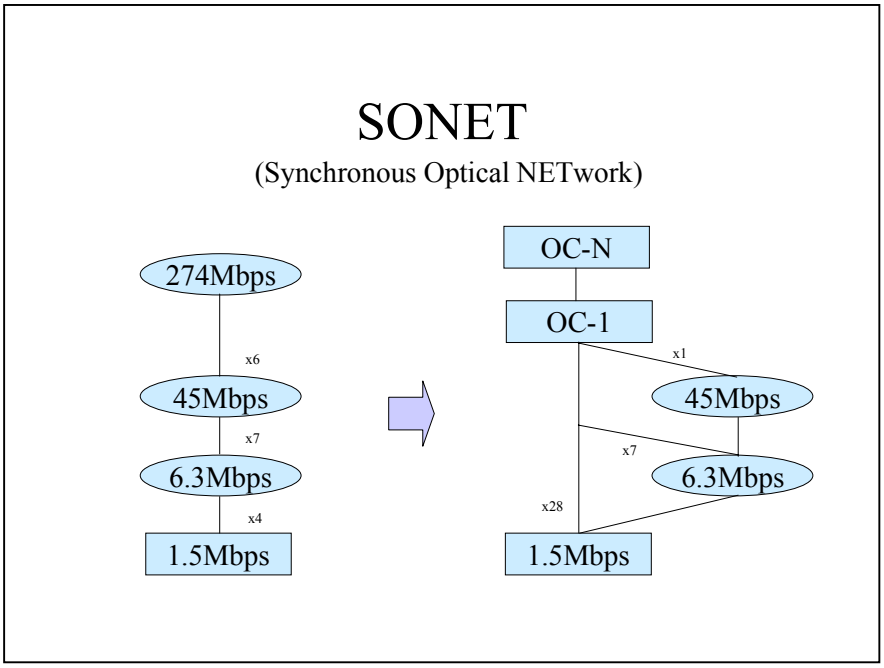
MP1570A
SONET/SDH/PDH/ATM Analyzer

Application note

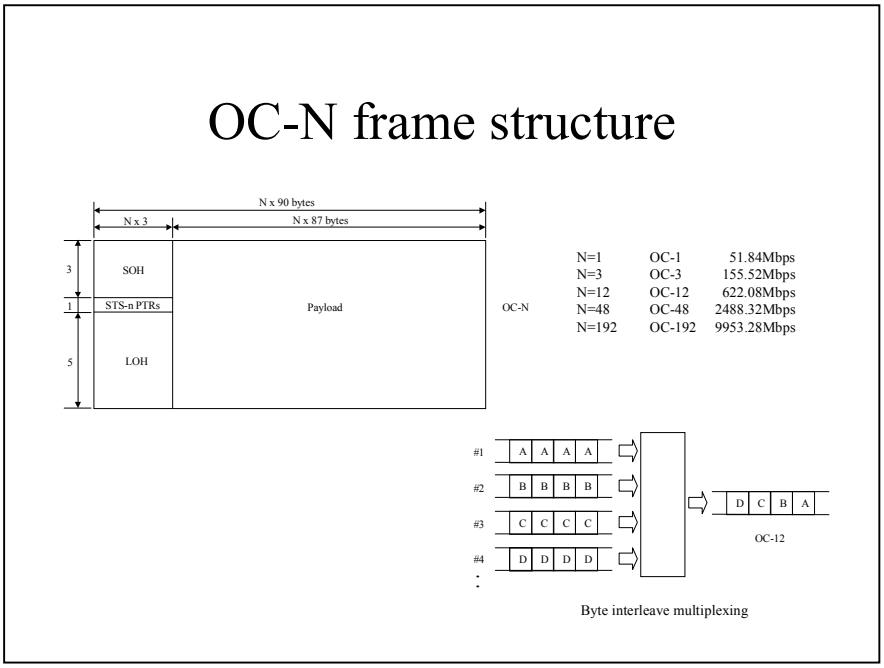
This application note introduces the convenient functions of the MP1570A SONET/SDH/PDH/ATM Analyzer for measuring SONET/SDH systems.

Contents

SONET has been introduced over the last 10 years to unify the various existing digital transmission systems into a common interface worldwide.

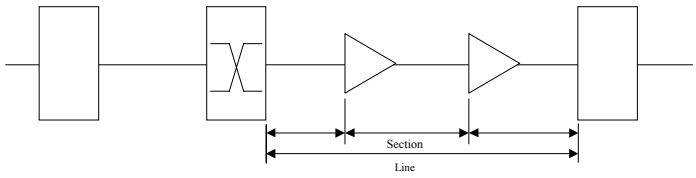


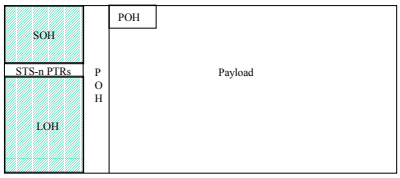
In SONET, the basic OC-1 (52 Mbps) rate is multiplexed and the MP1570A SONET/SDH/PDH/ATM Analyzer can measure up to OC-192.



In SONET, the basic OC-1 (52 Mbps) rate is multiplexed and the MP1570A SONET/SDH/PDH/ATM Analyzer can measure up to OC-192.

TOH





Line OverHead

A1 and A2	Framing bytes used for synchronization
J0	Section Trace used to verify continued connection.
D1-3	Data Communication Channels (DCC)
E1	Orderwire between regenerators.
F1	User channel reserved for user purposes.
B1	Bit Interleaved Parity code using even parity. To provide error performance monitoring at regenerator section.

Section OverHead

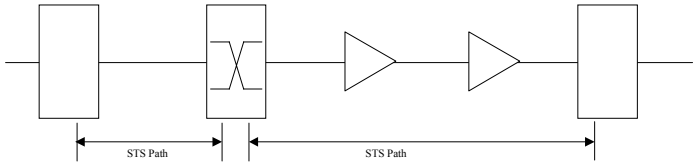
K1 and K2	MPS/APS bytes. Includes the alarm indication for RDI-L.
D4-12	Data Communication Channels (DCC)
E2	Orderwire between multiplexers.
S1	Synchronous status byte used to indicate the quality of synchronization.
M1	REI-L.
B2	BIP. To provide error performance monitoring at multiplexer section.

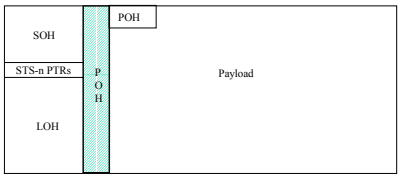
Alarms

LOS	Loss Of Signal
OOF	Out Of Frame
LOF	Loss Of Frame
AIS	Alarm Indication Signal
RDI	Remote Defect Indication

STS POH is the overhead for monitoring the STS path section. The MP1570A SONET/SDH/PDH/ ATM Analyzer can access all STS POH bytes. It can also generate and measure pseudo-alarms and -errors in the STS path section. In addition, it can perform BER measurement of overhead bytes.

STS POH





STS Path OverHead

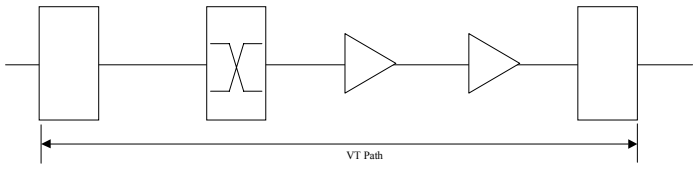
J1	Path Trace used to verify continued connection.
C2	Signal label indicating the STS's composition. I.e. VT, ATM, FDDI, Unequipped (UNEQ).
G1	RDI-S and REI-S.
F2 and F3	Path user channel reserved for user purposes.
H4	Payload position indicator.
K3	Spare.
N1	Network operator byte. Can be used for Tandem Connection Maintenance.
B3	Bit Interleaved Parity code using even parity. To provide error performance monitoring at higher order path.

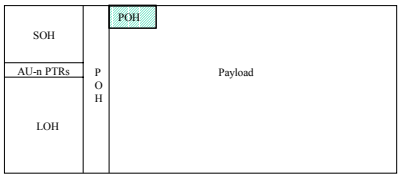
Alarms

LOP	Loss Of Pointer
AIS	Alarm Indication Signal
RDI	Remote Defect Indication

VT POH is the overhead for monitoring STS path sections. The MP1570A SONET/SDH/PDH/ATM Analyzer can access all VT POH bytes. It can also generate and measure pseudo-alarms and -errors in the VT path section. In addition, it can perform BER measurement of overhead bytes.

VT POH





VT Path OverHead

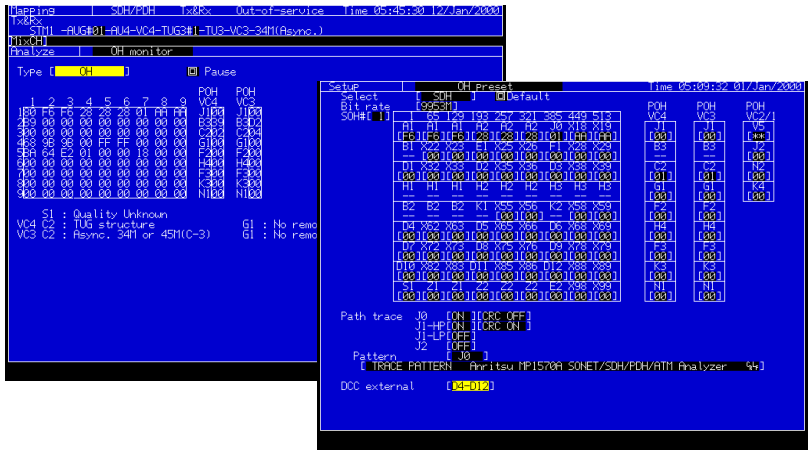
J2	VT path trace used to verify continued connection.
K4	Reserved for future use
N2	Tandem Connection Monitor.
V5	BIP-2, REI-V, Signal label and path status.

Alarms

LOP	Loss Of Pointer
AIS	Alarm Indication Signal
RDI	Remote Defect Indication
RFI	Remote Failure Indication

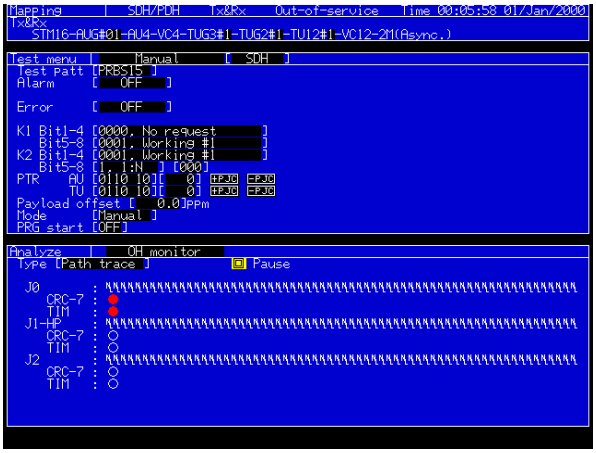
The MP1570A SONET/SDH/PDH/ATM Analyzer can access all the TOH/POH bytes. It can also edit all the TOH bytes (#1~#64) even at OC-192. Monitoring uses an easy-to-understand 9 x 9 matrix display and POH can also be monitored simultaneously. The S1 byte indicating the clock accuracy and the Signal label (C2), etc., can be set and monitored by using a translated mnemonic.

OH preset and monitor



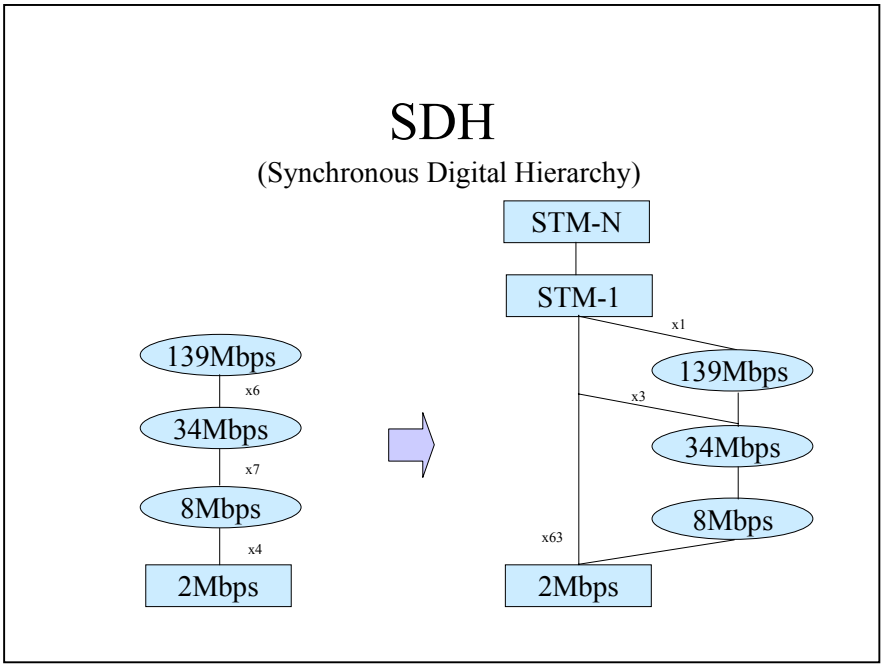
The J1/J2 bytes are used for path tracing to confirm that the correct path is connected. The MP1570A SONET/SDH/PDH/ATM Analyzer can set the trace ID for path tracing. In a 64-byte structure, the last two bytes send and receive the CR/LF ID. At this time, CRC OFF is set.

Path trace

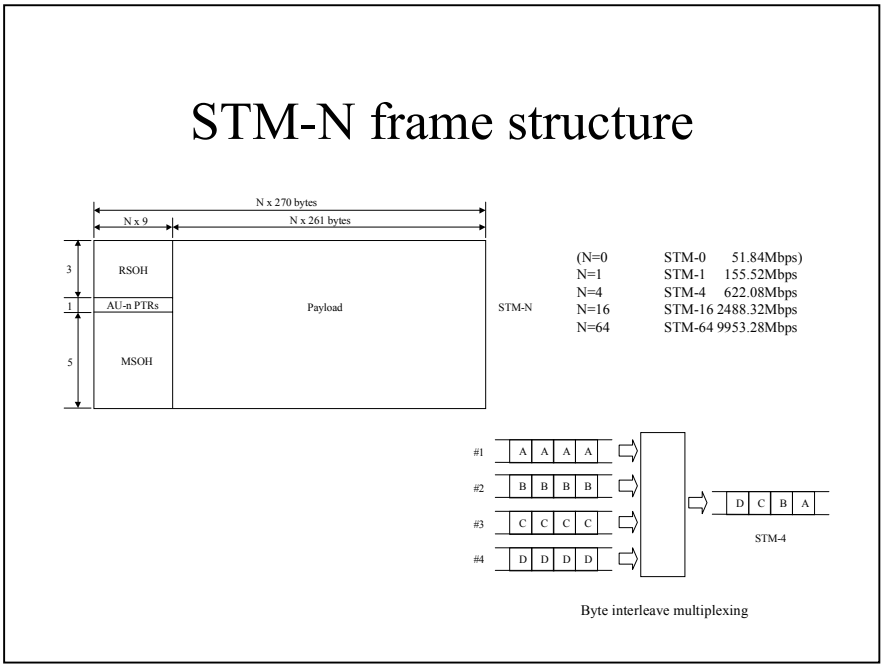


Alarm/Error

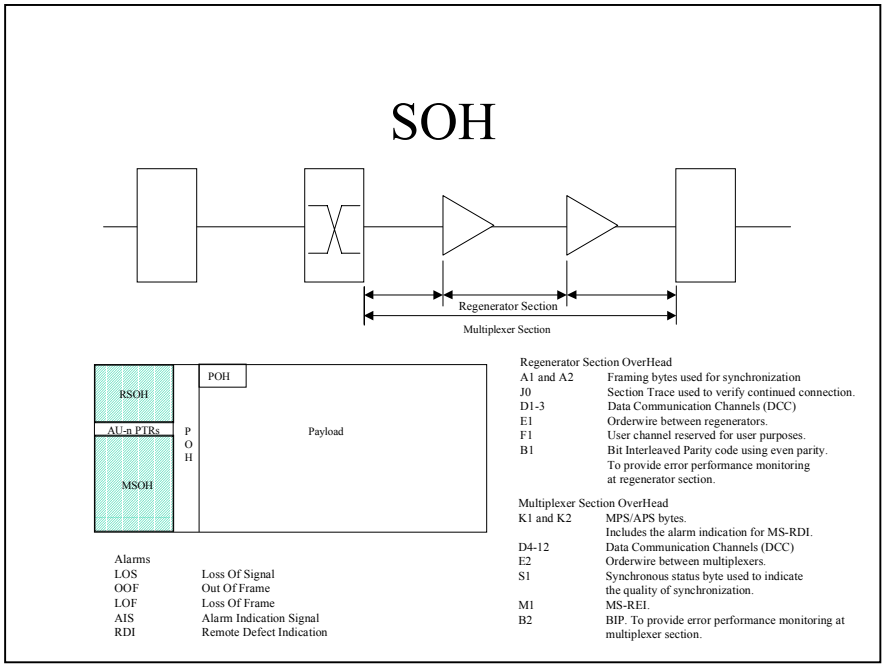
SDH has been introduced over the last 10 years to unify the various existing digital transmission systems into a common interface worldwide.



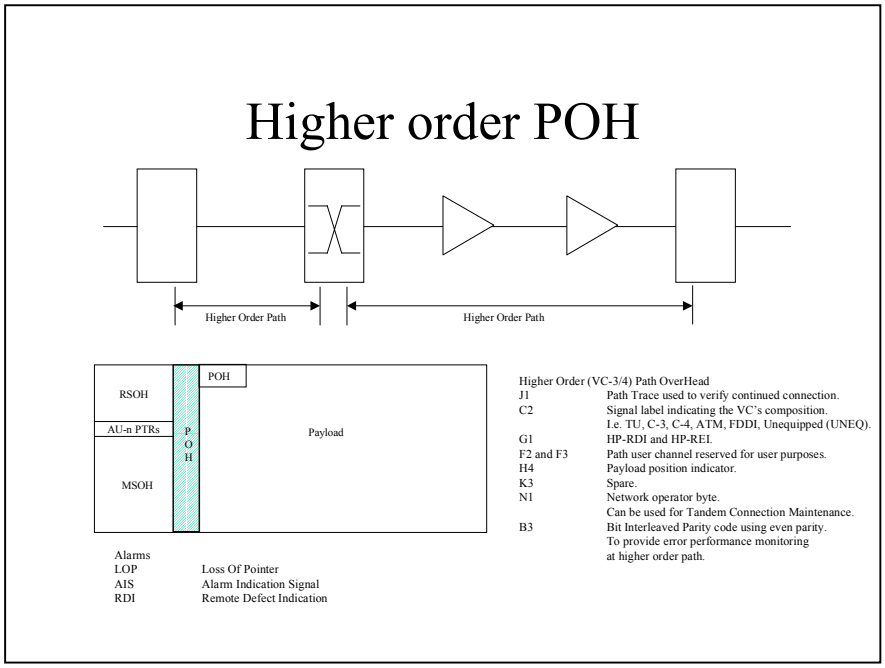
In SDH, the basic STM-1 (156 Mbps) rate is multiplexed and the MP1570A SONET/SDH/PDH/ATM Analyzer can measure up to STM-64.



SOH is the overhead for monitoring the section. The MP1570A SONET/SDH/PDH/ATM Analyzer can access all SOH bytes. It can also generate and measure pseudo-alarms and -errors in the section. In addition, it can perform BER measurement of overhead bytes.

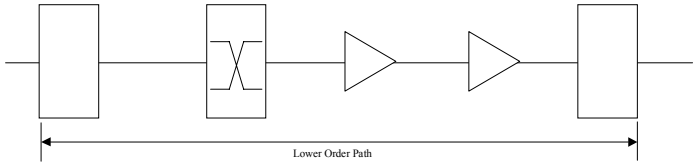


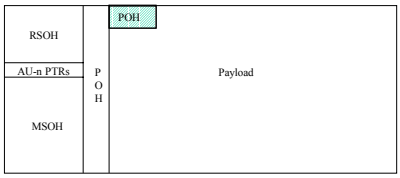
Higher-order POH is the overhead for monitoring the higher-order (AU) path section. The MP1570A SONET/SDH/PDH/ATM Analyzer can access all VC3/4 POH bytes. It can also generate and measure pseudo-alarms and -errors in the HO (AU) path section. In addition, it can perform BER measurement of the overhead bytes.



Lower-order POH is the overhead for monitoring the lower-order (TU) path section. The MP1570A SONET/ SDH/PDH/ATM Analyzer can access all VC1/2 POH bytes. It can also generate and measure pseudo-alarms and -errors in the LO (TU) path section. In addition, it can perform BER measurement of the overhead bytes.

Lower order POH





Lower Order (VC-1) Path OverHead

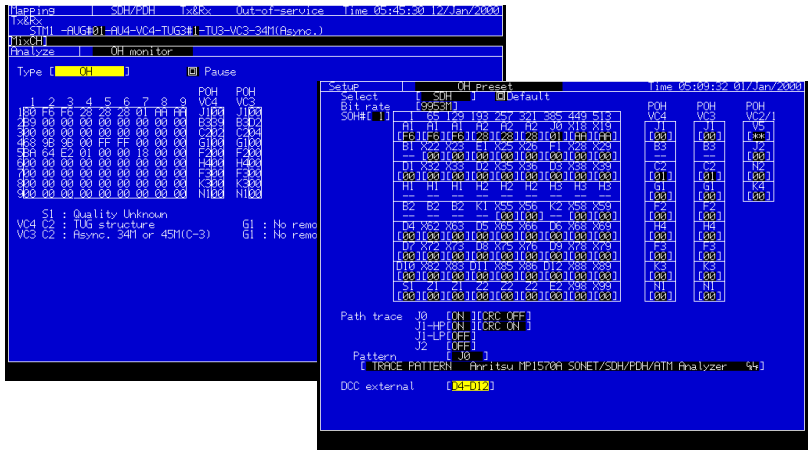
J2	Lower order path trace used to verify continued connection.
K4	Reserved for future use
N2	Tandem Connection Monitor.
V5	BIP-2, LP-REI, Signal label and path status.

Alarms

LOP	Loss Of Pointer
AIS	Alarm Indication Signal
RDI	Remote Defect Indication
RFI	Remote Failure Indication

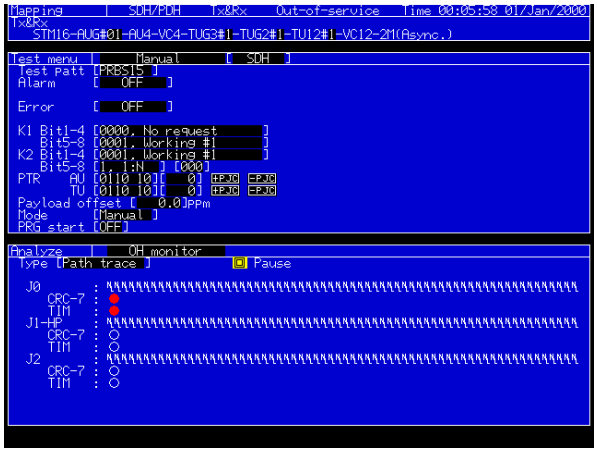
The MP1570A SONET/SDH/PDH/ATM Analyzer can access all the SOH/POH bytes. It can also edit all the SOH bytes (#1~#64) even at STM-64. Monitoring uses an easy-to-understand 9 x 9 matrix display and POH can also be monitored simultaneously. The S1 byte indicating the clock accuracy and the Signal label (C2), etc., can be set and monitored by using a translated mnemonic.

OH preset and monitor



The J1/J2 bytes are used for path tracing to confirm that the correct path is connected. The MP1570A SONET/SDH/PDH/ATM Analyzer can set the trace ID for path tracing. In a 16-byte structure, the header 1 byte sends and receives the CRC7 LF ID. At this time, CRC ON is set and CRC7 errors are also displayed.

Path trace



Alarm/Error

The ITU-T recommendations specify various error performance standards; parameters used by SDH are specified by G.826. The MP1570A SONET/SDH/PDH/ATM Analyzer supports all these error performance standards, and can also perform measurement according to the earlier G.821 specifications.

Error performance

- G.821
- G.826
- M.2100
- M.2101
- M.2110
- M.2120

ITU-T Rec. G.826 specifies four types of events based on the Errored Block. The MP1570A SONET/ SDH/PDH/ATM Analyzer can perform Error Block measurement, as well as perform measurement according to G.826 specifications.

G.826 Events

- Errored Block (EB)
  - A block in which one or more bits are in error.
- Errored Seconds (ES)
  - A 1 second period with one or more errored blocks.
- Severely Errored Blocks (SEB)
  - A 1 second period which contains >30% errored blocks or which contains a Severely Disturbed Period (SDP)
- Background Block Error (BBE)
  - An errored block not part of a SES

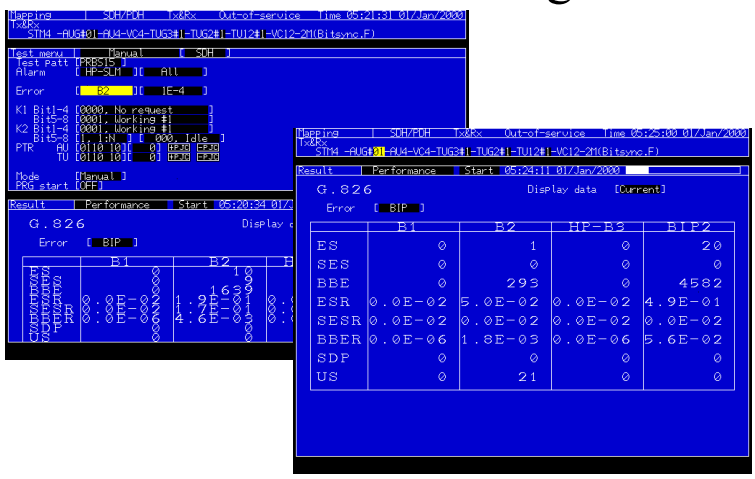
ITU-T G.826 specifies three parameters based on four parameters. The MP1570A SONET/SDH/PDH/ATM Analyzer supports measurement of all three parameters.

G.826 Parameters

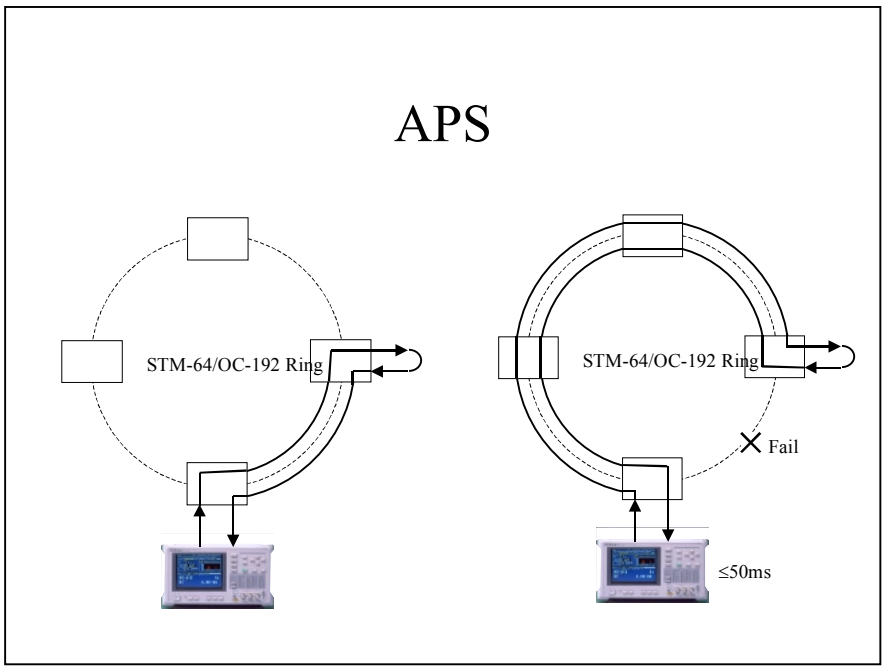
- Errored Second Ratio (ESR)
  - Ratio of ES to total available seconds in fixed measurement interval.
- Severely Errored Second Ratio (SESR)
  - Ratio of SES to total available second in fixed measurement interval.
- Background Block Error Ratio (BBER)
  - Ratio of errored blocks to total blocks in fixed measurement interval excluding all blocks during SES or unavailable time.

Burst can be selected for the error addition timing by the MP1570A SONET/SDH/PDH/ATM Analyzer. This can be used to add an error of two or more bits to one frame; the SDH equipment always counts one Block Error irrespective of this error count.

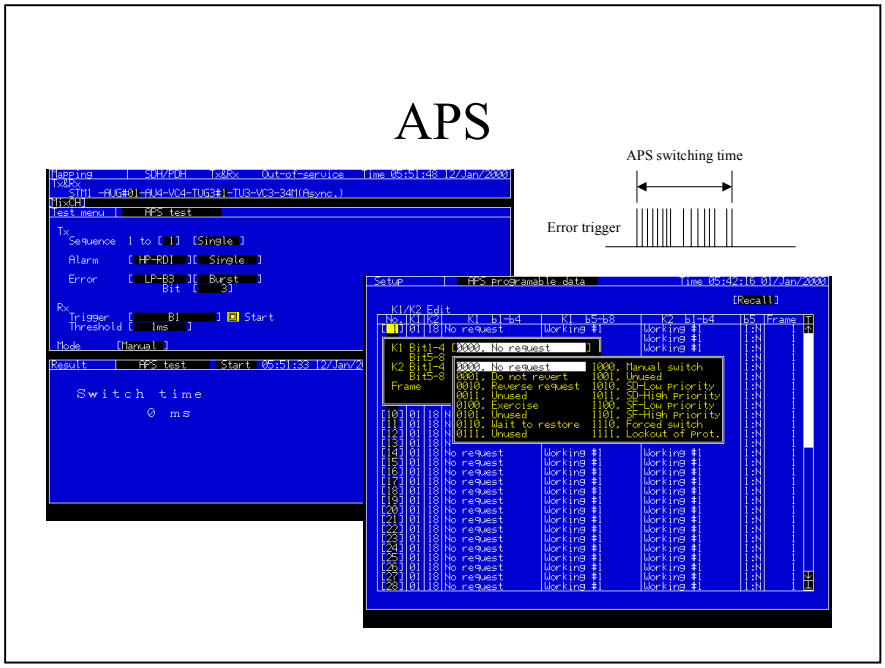
G.826 monitoring



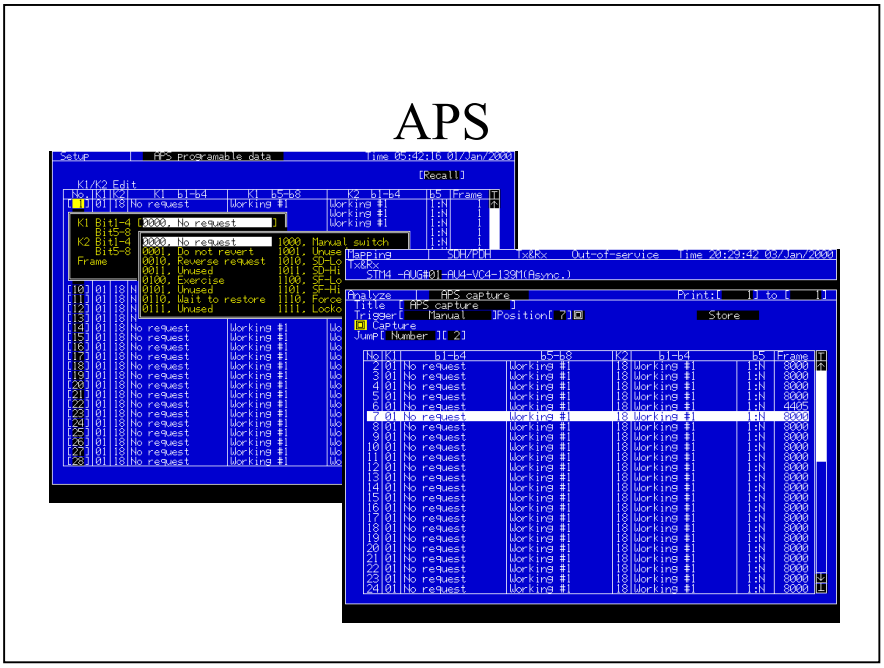
The APS switching time varies according to the momentary interruption caused by the switching method but is specified as 50 ms or less by the ITU-T Rec., etc.



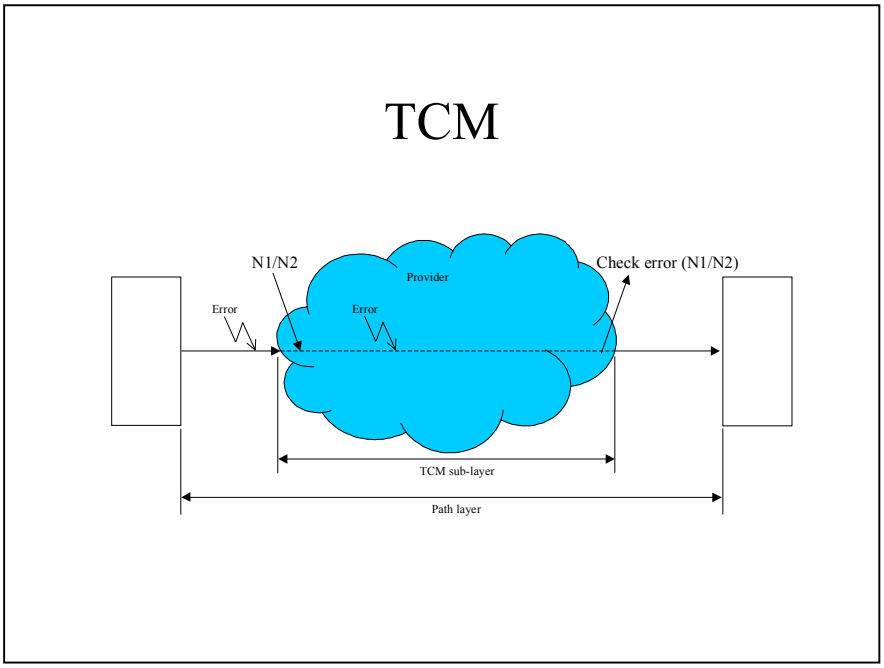
The MP1570A SONET/SDH/PDH/ATM Analyzer can measure the APS switching time based on errors generated at the momentary interruption.



The SONET/SDH equipment communicates alternately using K1/K2 and performs switching, etc., automatically. The MP1570A SONET/SDH/PDH/ATM Analyzer can generate the K1/K2 sequence and can capture the received sequence.



Tandem connection uses the N1/N2 bytes to identify an error generation location when sending via a separate provider.



The N1/N2 bytes are not used just for error monitoring; they also include various functions for sending alarms, etc.

TCM

N1

b1	b2	b3	b4	b5	b6	b7	b8
IEC				TC-RE	OEI	TC-APId,TC-RDI,ODI	

N2

b1	b2	b3	b4	b5	b6	b7	b8
BIP-2		"1"	IncomingAIS	TC-RE	OEI	TC-APId,TC-RDI,ODI	

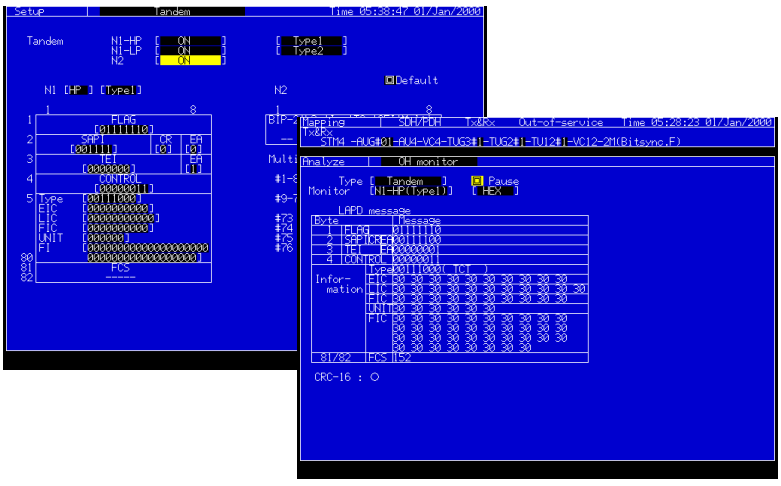
Frame#	Bit7	Bit8
1-8	Frame Aligment Signal:1111111111111110	
9-12	TC-APId byte#1:1C_1 C_2 C_3 C_4 C_5 C_6 C_7	
13-16	TC-APId byte#2:0XXXXXXX	
17-20	TC-APId byte#3:0XXXXXXX	
:	:	
65-68	TC-APId byte#15:0XXXXXXX	
69-72	TC-APId byte#16:0XXXXXXX	
73	Reserved(=0)	TC-RDI
74	ODI	Reserved(=0)
75	Reserved(=0)	Reserved(=0)
76	Reserved(=0)	Reserved(=0)

Alarm
- Incoming AIS
- TC-RDI
- ODI

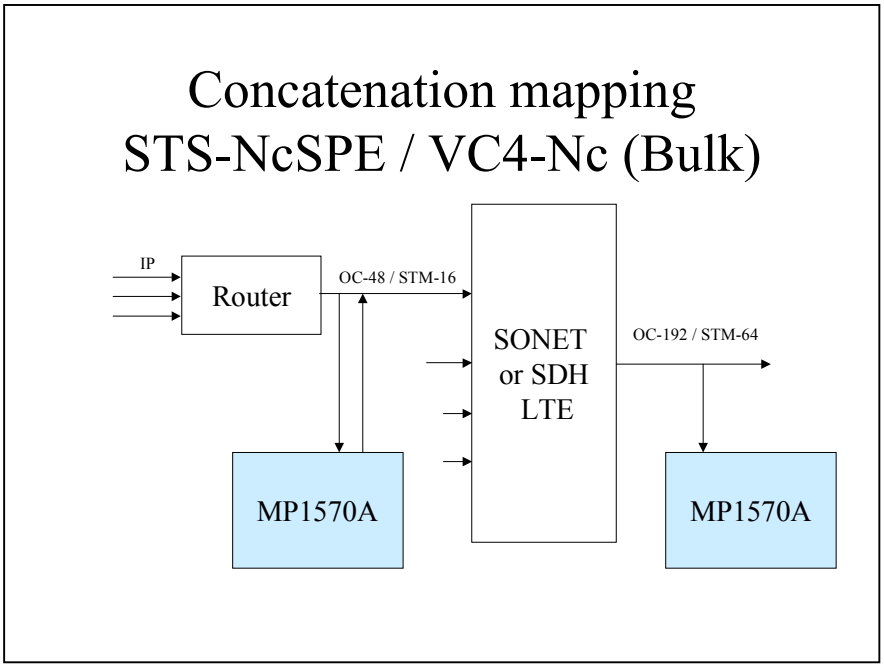
Error
- IEC
- TC-REI
- OEI

In addition to measuring TC errors and alarms dynamically, the MP1570A SONET/SDH/PDH/ATM Analyzer can also set and monitor the TC-APId.

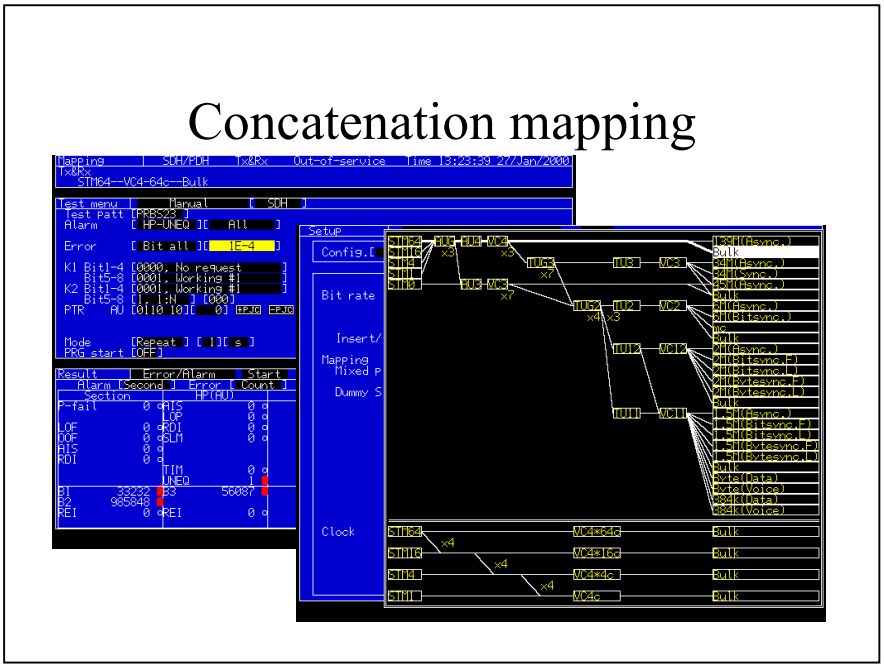
TCM



At IP (Internet Protocol) and ATM cell transmission, the so-called concatenation mapping is sent in a large-capacity container.

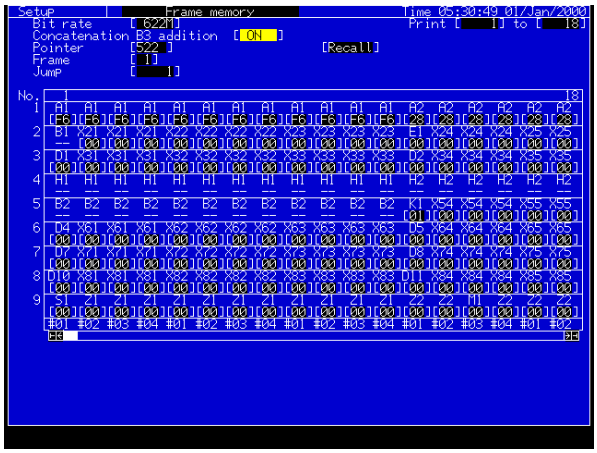


The MP1570A can concatenation mapping to OC-192c/VC4-64c.



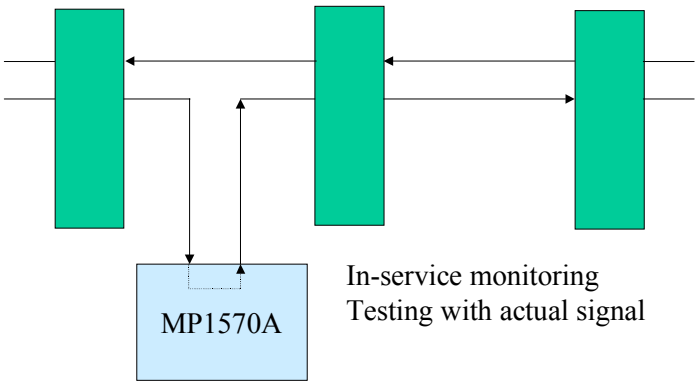
Patterns such as IP over SONET/SDH, etc., can be programmed in the optional frame memory.

Frame memory (Option)



Through is a useful function for in-service monitoring. It can be used for general evaluation of a system actually in use, and can access a single channel to add alarms and errors.

Through



In-service monitoring
Testing with actual signal

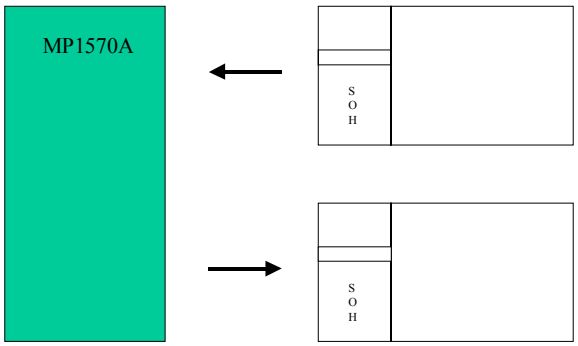
The MP1570A SONET/SDH/PDH/ ATM Analyzer can select various Through configurations, such as Transparent Through, OH Overwrite, and Payload Overwrite; it can access a specific channel and can insert an internally generated test signal.

Through Mode

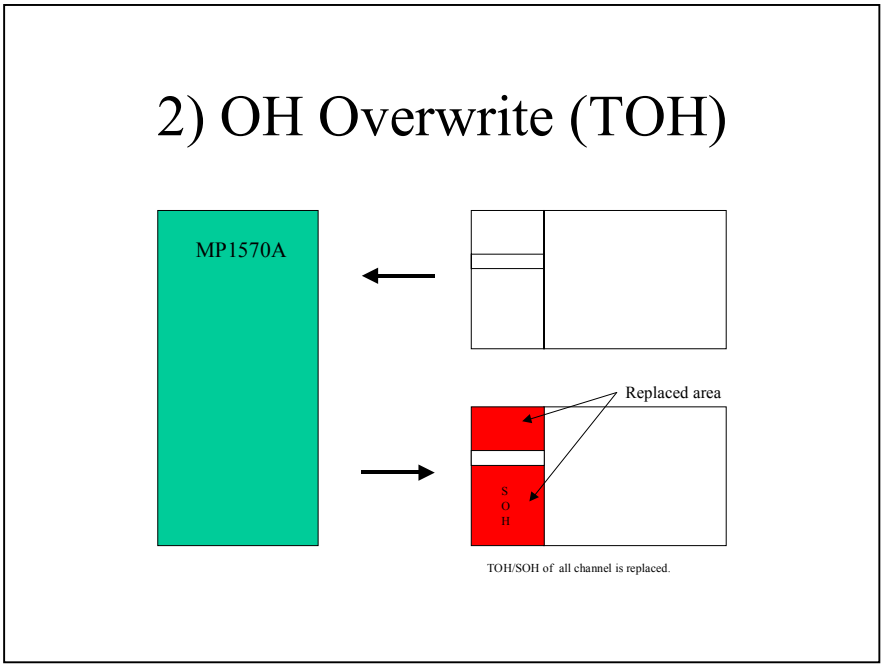
- Transparent Through
- OH Overwrite(TOH)
- OH Overwrite(POH)
- OH Overwrite(ALL)
- Payload Overwrite

Transparent Through is used in the in-service monitoring, etc. The signal received by the MP1570A is output as is without adding any changes. The MP1570A can also perform line signal alarm and error measurement and monitoring.

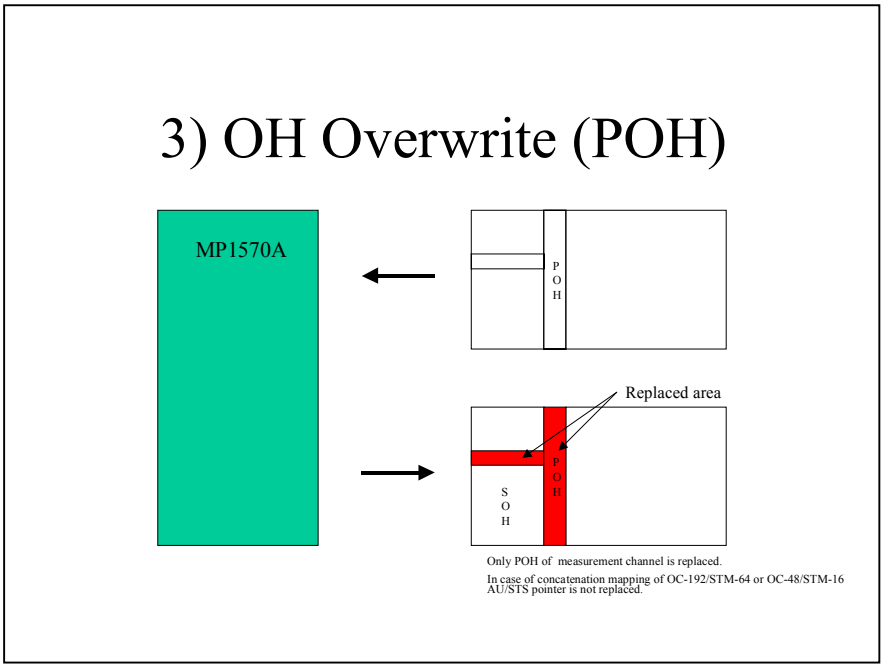
1) Transparent Through



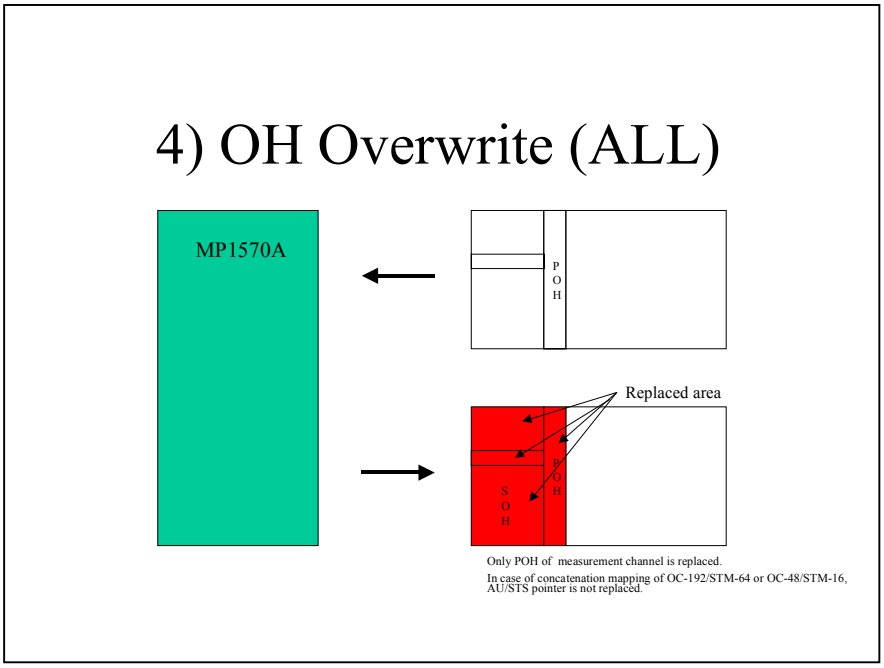
When using the TOH/SOH overwrite modes, SOH/RSOH and LOH/MSOH can be overwritten by a pattern that is generated in the MP1570A SONET/SDH/PDH/ATM Analyzer.



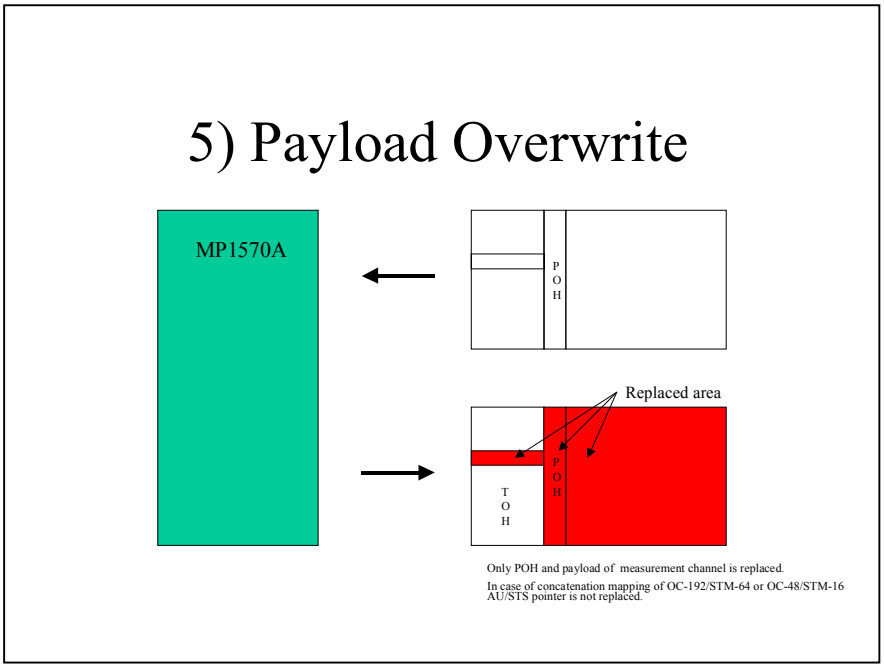
In the POH overwrite mode, the POH is changed to an internally generated pattern. The delay at POH overwrite is detected and the STS/Au pointer is replaced automatically.



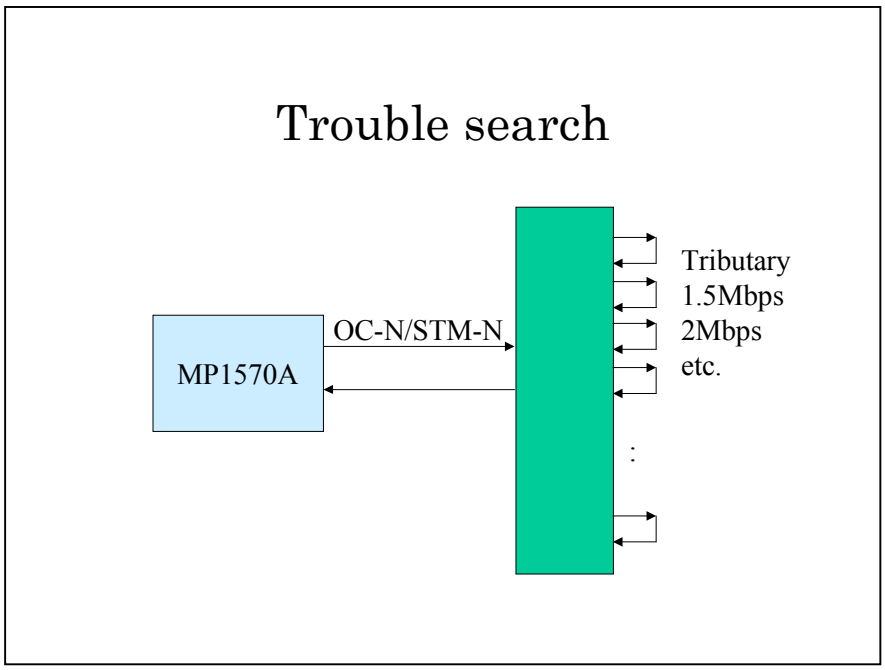
Both the SSOH/TOH and POH can be overwritten.



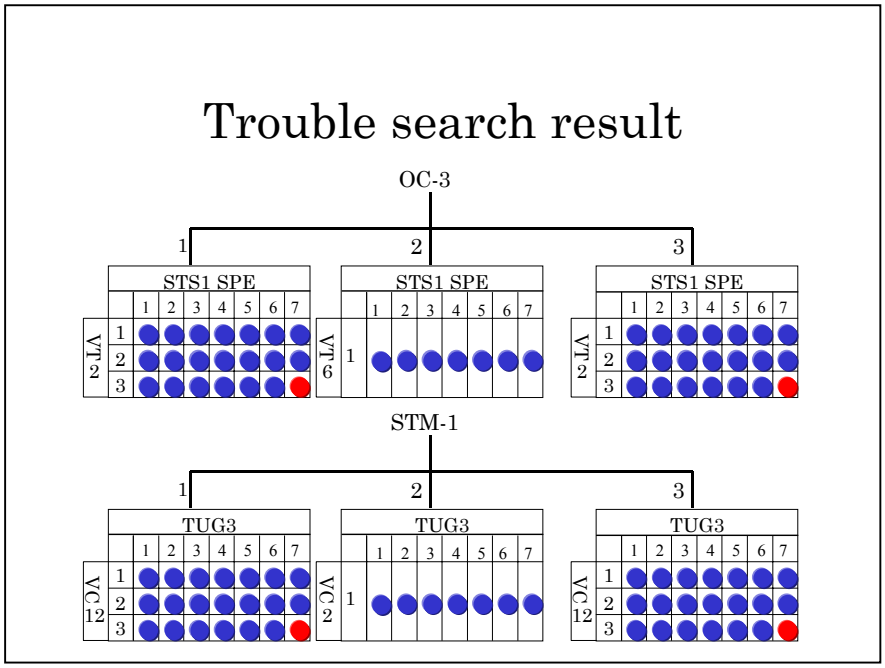
The payload can also be overwritten. A test signal can be inserted into the selected channel and BER measurement can be performed. The pointer is adjusted automatically according to the delay, thereby eliminating concerns about delay-related errors.



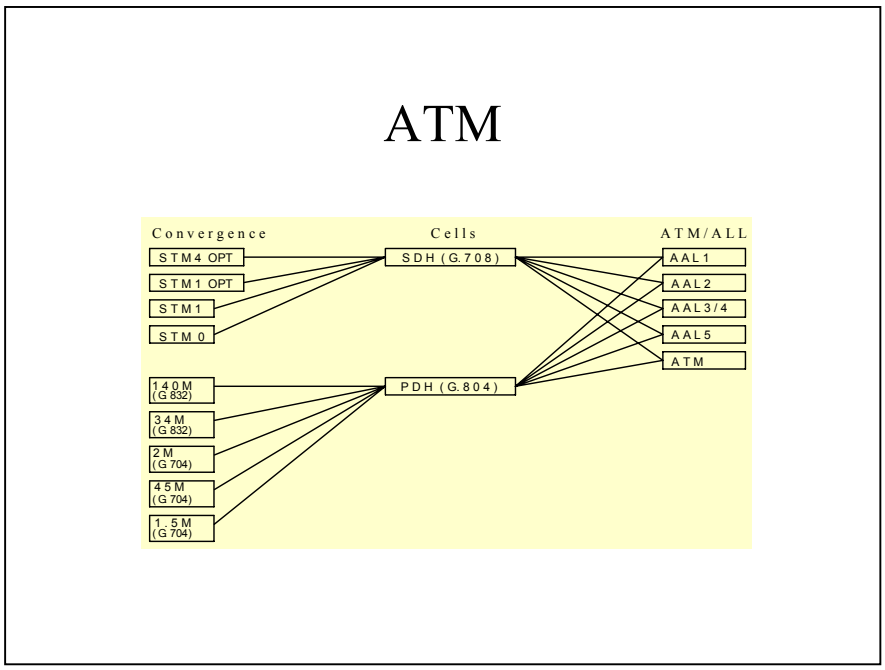
Usually, an extremely long time is required for continuity testing of terminal equipment with many tributary channels. The MP1570A SONET/SDH/PDH/ATM Analyzer automatically scans each channel to find channels with errors. Detection is performed automatically even if there is a mixture of tributary channels with different bit rates; part of the channels can be measured simultaneously, which greatly reduces the testing time.



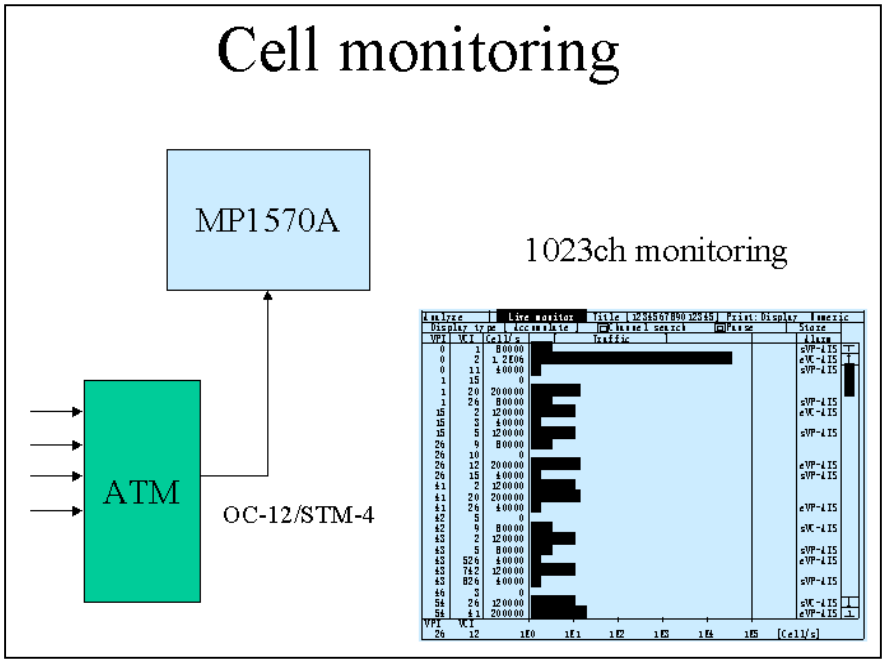
The test results are displayed as a matrix.



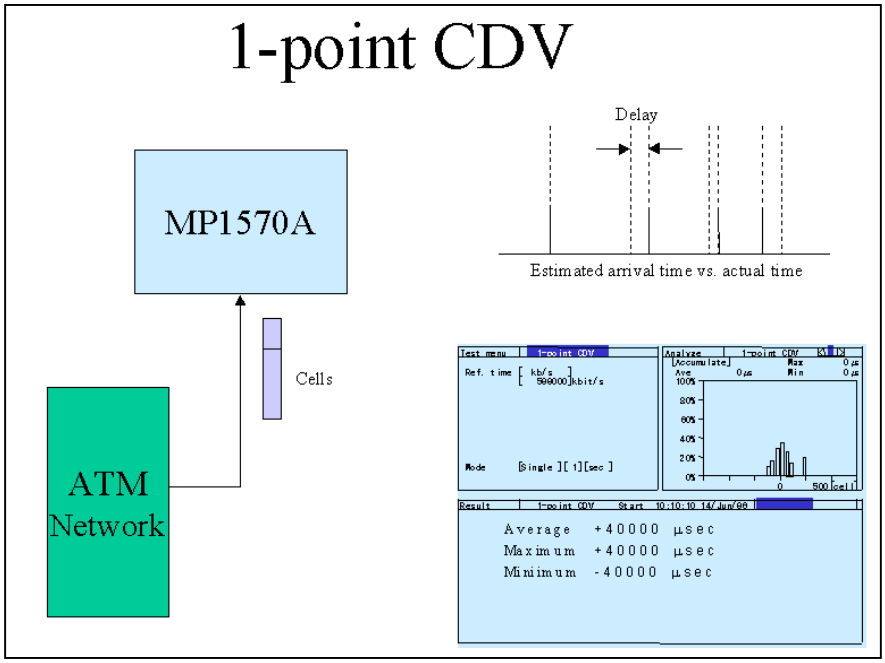
ATM technology offers flexible transmission capacities, various service configurations and excellent OAM functions, etc., and it is ideal for IP over ATM and as the backbone for next-generation mobile communications. The MP1570A SDH/SONET/PDH/ATM Analyzer offers ATM testing at up to 622 Mbps. 100% cell generation is possible even at 622 Mbps, and it can be used for load test of the equipment. Furthermore, all AAL types are supported.



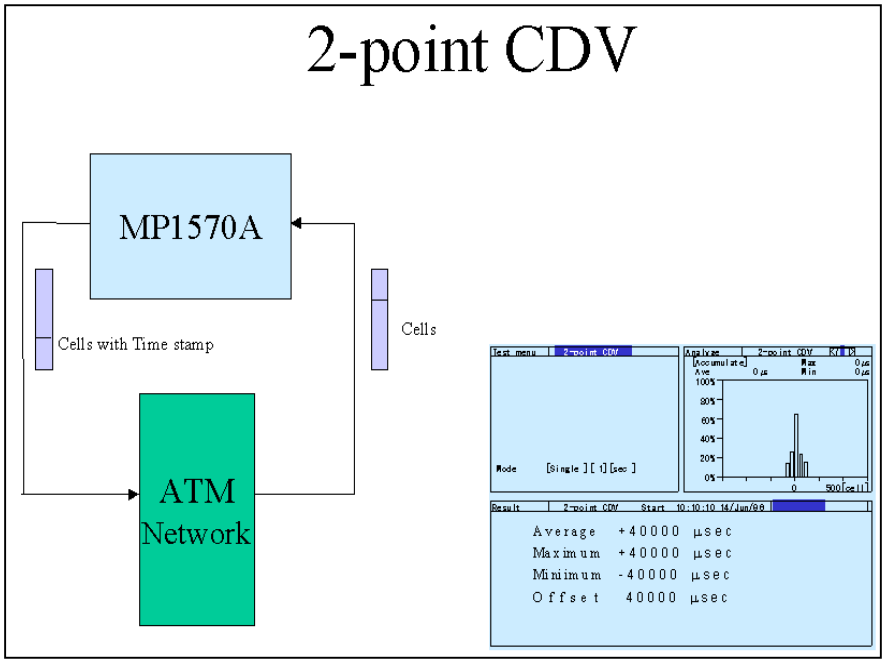
At maintenance of ATM equipment, it is sometimes difficult to identify the channel to be tested. When the Live Monitor function is used for this purpose, the VPI/VCI of up to 1023 channels can be detected and the number of cells and alarms on each channel can be measured simultaneously. A filter can be set based on these results to perform detailed measurement of target channels.



At 1-point CDV delay time measurement, the CBR cell delay (variation) is measured. The measured actual arrival time is compared to the estimated arrival time. The results indicating the cell delay trend are displayed as a graph.



2-point CDV delay measurement measures the delay time (variation) from cell sending to receive. The time stamp attached to the cell at the send side and the actual receive time are compared. The results indicating the cell delay trend are displayed as a graph.



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Specifications are subject to change without notice.

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