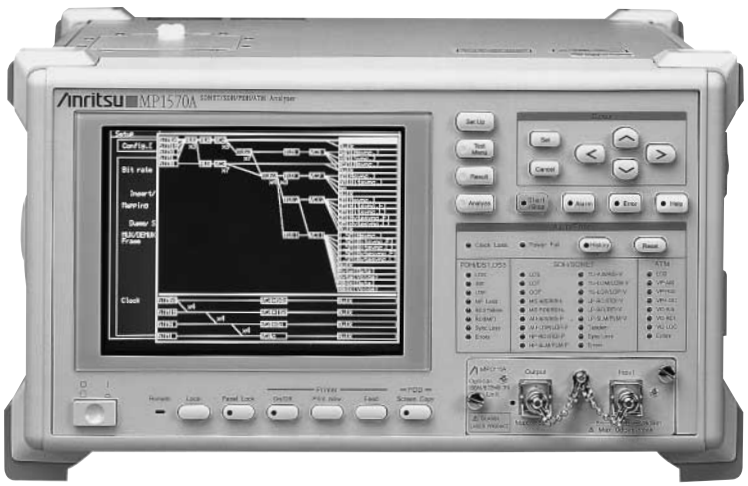
SONET/SDH/PDH/ATM ANALYZER
MP1570A
1.5 Mbit/s to 10 Gbit/s

CE GPIB OPTION

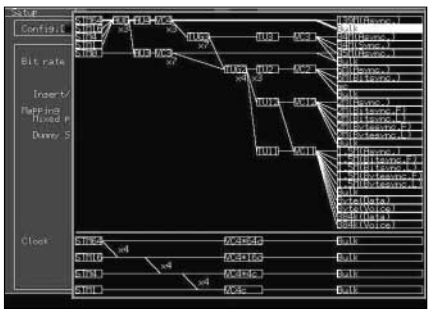
Comprehensive Testing of Core Networks from One Compact Portable Analyzer



The MP1570A analyzer is designed for development, manufacturing, construction, maintenance, and inspection of SDH, SONET, PDH, and ATM equipment and networks.
A variety of plug-in units and options are available that offer the flexibility to the users to configure various analysis systems for different applications.
The MP1570A is scalable from 1.5 Mbit/s to 10 Gbit/s, and has six slots to install the plug-in units required for SDH, SONET and PDH tests at bit different rates. Installing the appropriate combinations of plug-in units can also perform ATM, jitter and wander tests conform to ITU-T O.171/O.172.
The MP1570A conforms to the ITU-T recommendations and Bellcore standards, and supports concatenation mapping, tandem connection, APS measurement, CID measurement and POS measurement. The user can measure 1.5 Mbit/s to 10 Gbit/s signals using a single MP1570A; previously, this required several measuring instruments.
The MP1570A has a built-in printer and a 3.5-inch floppy disk drive as standard output devices to print measurement results, and to save and read measurement data to and from the floppy disk (FD), which can also be read on an external PC. The user can also save screen data to the FD. The MP1570A has a "HELP" key function that explains operations, functions and connections.

SDH, SONET and PDH measurement

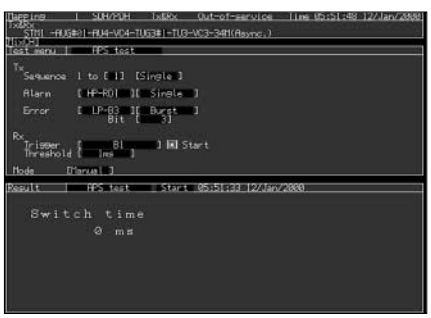
• Measurement at bit rates from 1.5 Mbit/s to 10 Gbit/s
A mapping route to a bit rate of up to 10 Gbit/s can be set.
The MP1570A mainly supports SDH, SONET, and Japanese mapping, European PDH and North American DSn for digital communications. For concatenation mapping, a route can be set from STM-1c/STS-3c up to STM-64c/STS-192c. Furthermore, the MP1570A supports a combination of channels. For example, 64 channels of VC4c/STS3c, 16 channels of VC4-4c/STS-12c, and four channels of VC4-16c/STS-48c (See Figure 1 or Figure 2 in page 165 and 166).



Mapping

• Overhead setting and testing
The user can modify and capture the overhead, and test the overhead portion with overhead change, pointer 64 frames, overhead add/drop and overhead bit errors.

• APS function
The user can test the automatic protection switch (APS) by measuring the equipment switching time accurately in milliseconds. The MP1570A also conforms to ITU-T Rec. G.783 and G.841.



APS test sub-screen

• Mixed payload
At mapping measurement in TUG-3 and AU3, the user can set different mapping for three additional channels other than the target measurement channel.

• Tandem connection
The N1/Z5 and N2/Z6 bytes can be set and measured.

• Various analysis functions
The internal optical power meter and frequency counter allows the user to measure optical power and frequency during error and alarm measurement without changing the connections of the signal cables. The MP1570A can capture any SOH/TOH or POH (1 byte), K1/ K2 byte, or H1/H2 byte in 1023 frames to analyze errors and alarms, and check APS operation.
Measured errors and alarms can be displayed as a graph with a time scale in 1 second, 1 minute, 15 minutes, or 60 minutes.

• Pointer value monitoring
Changes in pointer value can be displayed as a graph with values updated in real time.

• MUX/DEMUX function (option)
When the MUX/DEMUX option is added, the multiplexing structure including the frame alignment signal can be generated, and multiplexer/demultiplexer measurement can be performed.

• Non frame pattern/CID pattern
Frames can be set on/off at all bit rates. CID pattern can generate or analysis at SONET/SDH measurements.

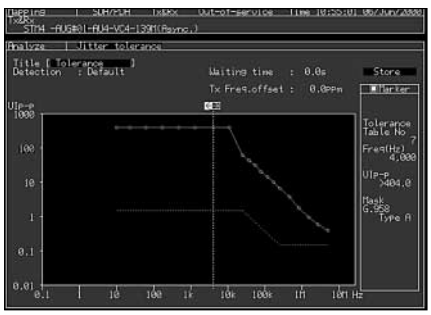
• Through modes
One of the three through modes can be selected: (1) Transparent, (2) Overhead/Overwrite, and (3) Payload/Overwrite. The external DS1/DS3/PDH signal can be added/dropped to/from payload by payload overwrite.

• Enhanced error/alarm simulation
The MP1570A can generate normal and abnormal frames alternately to test the frame synchronization function of terminal equipment. (This is an SDH/SONET FAS error addition function.)

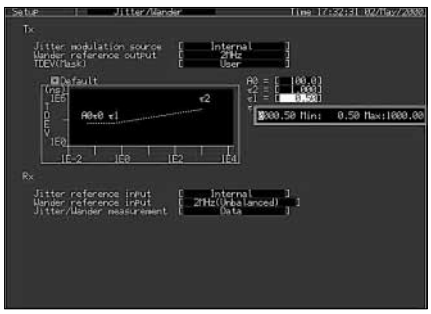
• Easily operated pointer sequence test (combined jitter measurement)
Able to generate the justification pattern conforming to ITU-T G.783 from the transmission equipment side, and simultaneously make the tributary signal offset variable. This makes the combined jitter test possible.

Jitter, wander measurements

The jitter/wander measurement conforming to ITU-T O.171/O.172 exceeds these standards in performance evaluation. Automatic measurements, such as jitter tolerance, jitter transfer, and jitter vs. frequency offset are performed in a short time. Various automatic measurements can be achieved with just one unit.



• Various wander generation functions (option)
Various wander generations for evaluation are available: such as TDEV wander tolerance measurement and TDEV wander transfer characteristics measurement that were regulated by ITU-T, ANSI, Bellcore, and ETSI.

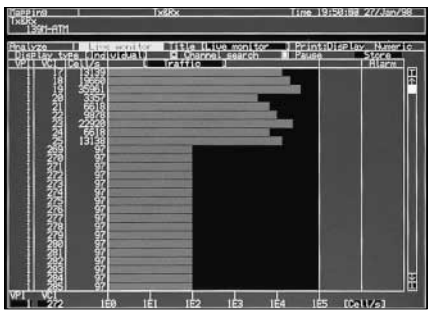


• Wander measurement (option)
Subdivides the bandwidth of the wander measurement into three ranges, and can analyze the wander factor caused by temperature change, pointer, etc. It can also perform measurements conforming to ITU-T O.172.

• Through jitter function (only SONET/SDH)
Able to generate the jitter by through, while monitoring the input jitter quality.

ATM

• Supports ATM from 1.5M to 622M rates
TC layer mappings of 622M, 156M, 52M, 139M, 45M, 34M, 2M and 1.5M are supported along with ATM mappings of O.191, AAL1, AAL2, AAL3/4, and AAL5, which makes the MP1570A ideal for various combinations of layers. The VPI/VCI for 1023 channels can be detected automatically, and the presence/absence of alarms, cell count, and non-conforming cell count can be displayed graphically, for easy comparison of line channel traffic.



• 1- and 2-point CDV in conformance with I.356
When measuring delay in cell traffic, either 1-point CDV or 2-point CDV conforming to ITU-T Rec. I.356 can be selected according to the conditions.

• Simultaneous display of error cells, inserted error cells and lost cells
The error/alarm generation conditions can be displayed both numerically and graphically to give a visual impression of the traffic conditions.

• Traffic monitoring
The constantly changing traffic can be displayed as a graph for the selected-one-channel VPI/VCI.

IP-over-SONET/SDH, IP-over-ATM (option)

Programs IP/PPP at will transmits it, picks PPP packet from capture memory (option), displays it and supports high-speed POS router evaluation. Programs IP in the AAL5 payload at will transmits it, picks the IP packet from the cell capture memory, and displays it. And evaluate router ATM function.

• IP/PPP header setting
Able to set the value of each header optionally when selecting IPv4 or IPv6. Calculates FCS or header checksum automatically.

• PPP packet transmission and real time count
Transmits the three types of packets (can be set separately) by optional sequence (the idle length between each packet can be set simultaneously.). Displays the number of Tx packets and Rx PPP packets at real time.

• PPP packet capture and display
Samples PPP packet from the capture memory, and displays IP header. Detects FCS error and displays it in red.

For product ordering information, see pages 3 – 6

Specifications

• MP0121A 2/8/34/139/156M*1 Unit

Bit rate	2.048, 8.448, 34.368, 139.264 Mbit/s
Level/waveform	Conforms to ITU-T G.703 (with 20 dB monitoring point)
Connectors	BNC (75 Ω, unbalanced), 3-pin Siemens (120 Ω, balanced) 2.048 Mbit/s: HDB3 (balanced/unbalanced) 8.448, 34.368 Mbit/s: HDB3 (unbalanced) 139.264 Mbit/s: CMI (unbalanced)
Clock	Internal (accuracy: ±7 ppm, jitter unit not installed), external (ECL [AC] 50 Ω), received signal
Frame format	Unframed: 2, 8, 34, 139 Mbit/s Framed: 2 Mbit/s (with/without CRC-4 at channels 30/31, G.704), 8 Mbit/s (G.742), 34 Mbit/s (G.751), 139 Mbit/s (G.751), MUX/DEMUX (Option 06)
Test patterns	PRBS: $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, $2^{23}-1$ (O.151) Invert: On/off Word: 16-bit programmable, all 0, all 1
Error addition	Bit (all, test pattern), code, E-bit Timing: Single, rate (1E–3, 1E–4, 1E–5, 1E–6, 1E–7) FAS: n in 16 (n: 1 to 4), all
Alarm addition	LOS, LOF, AIS, RDI, RDI (MF) Timing: All
Measurements	Mode: Single, repeat, manual In-service Errors: Frame, code, CRC-4, E-bit Alarms: Power-fail, LOS, AIS, LOF, MF loss, RDI, RDI (MF) Error performance: G.821 (inc. Annex D), M.2100, G.826 Out-of-service Errors: Frame, code, CRC-4, E-bit, bit Alarms: Power-fail, LOS, AIS, LOF, MF loss, RDI, RDI (MF), sync loss Error performance: G.821 (inc. Annex D), M.2100, G.826
Delay	Measurement cycle: 0.5, 1 s Measurement range: 0 to 1.00 s, timeout Display accuracy: Within ±5 µs, 0 to 999 µs, 1.0 to 999.9 ms, 1.0 s, timeout
LEDs	LOS, AIS, LOF, MF loss, RDI, RDI (MF), sync loss, errors
Monitor	Frame word
Trouble search	Auto search for errors/alarms in all measured channels
Auxiliary interface	Clock sync output, frame sync output, error output

∗1: Built-in 156M CMI (electrical) interface

• MP0122A 1.5/45/52M*1 Unit, MP0122B 1.5/45/52/52M*2 (1.31) Unit

Bit rate	1.544, 44.736 Mbit/s
Level/waveform	1.544 Mbit/s: ANSI T1.102 (with 20 dB monitoring point), 0/655 ft 44.736 Mbit/s: ANSI T1.102 (with 20 dB monitoring point), 0/450/900 ft
Connectors	BNC (75 Ω, unbalanced), BANTAM (100 Ω, balanced) 1.544 Mbit/s: AMI/B8ZS (balanced), 44.736 Mbit/s: B3ZS (unbalanced)
Clock	Internal (accuracy: ±7 ppm, jitter unit not installed), external (ECL [AC] 50 Ω) received signal
Frame format	Unframed: 1.5, 45 Mbit/s Framed: 1.5 Mbit/s (D4, ESF, Japan ESF*3), 45 Mbit/s (M13, C-bit), MUX/DEMUX (Option 07)
Test patterns	PRBS: $2^{11}-1$, $2^{15}-1$, $2^{20}-1$ (zero suppress), $2^{20}-1$, $2^{23}-1$ (O.151) Invert: On/off Word: 16-bit program, all 0, all 1, 3 in 24 (1.5 Mbit/s)
Error addition	Bit (all, test pattern), code, parity, CRC-6, C-bit, REI Timing: Single, rate (1E–3, 1E–4, 1E–5, 1E–6, 1E–7) FAS (45 Mbit/s): n in 16 (n: 1 to 4), all
X-bit setting	00, 01, 10, 11
Alarm addition	LOS, LOF, AIS, RDI Timing: All
Measurements	Mode: Single, repeat, manual In-service Errors: FAS, code, parity, CRC-6, C-bit, REI Alarms: Power-fail, LOS, AIS, LOF, RDI Error performance: G.821 (inc. Annex D), M.2100, G.826 Out-of-service Errors: FAS, code, parity, CRC-6, C-bit, REI, bit Alarms: Power-fail, LOS, AIS, LOF, RDI, sync loss Error performance: G.821 (inc. Annex D), M.2100, G.826
Delay	Measurement cycle: 0.5, 1 s Measurement range: 0 to 1.00 s, timeout Display accuracy: Within ±5 µs, 0 to 999 µs, 1.0 to 999.9 ms, 1.0 s, timeout
LEDs	LOS, LOF, AIS, RDI, sync loss, errors
Trouble search	Auto search for errors/alarms in all measured channels
Auxiliary interface	Clock sync output, frame sync output, error output

∗1: Built-in 52M B3ZS (electrical) interface
∗2: Built-in 52M B3ZS (electrical) and optical interfaces
∗3: Mounted Option 09 (Japan mapping)

• 52/156/622/2488/9953M (SDH)

Bit rate	51.84, 155.52, 622.08, 2488.32, 9953.28 Mbit/s
Level/waveform	52M (electrical: B3ZS)*1: ANSI T1.102, 0/450 ft 52M (optical): As per MP0122B unit optical interface specifications 156M (electrical: CMI)*2: ITU-T G.703 156M (optical): As per optical 156M/622M unit specifications 622M (electrical/optical): As per optical 156M/622M unit and NRZ unit specifications 2488M (electrical/optical): As per 2.5G unit and 2.5G/10G unit specifications 9953M (electrical/optical): As per 2.5G/10G unit specifications
Clock	Internal (accuracy: ±3.5 ppm, jitter unit not installed), Lock (2 MHz, 1.5 MHz, 64 kHz + 8 kHz, 2 Mbit/s, 1.5 Mbit/s), external (ECL [AC] 50 Ω, 9953M: 1.02 to 0.58 Vp-p, 50 Ω), received signal
Frame	SDH/SONET, CID pattern, non-frame
Mapping	See Fig. 1
Through	Trance parent, over head overwrite, payload overwrite
Test patterns	PRBS: $2^{11}-1$, $2^{15}-1$, $2^{20}-1$ (zero suppress, MP0122A/B installed), $2^{20}-1$, $2^{23}-1$, $2^{31}-1$ (only concatenation mapping 16c/64c, conform to O.151) Invert: On/off Word: 16-bit programmable, all 0, all 1
Error addition	Bit all (all, test pattern), FAS, B1, B2, B3, BIP-2, MS-REI, HP-REI, LP-REI Timing: Single, single (burst) bit (1 to 64000), rate (1E–3, 1E–4, 1E–5, 1E–6, 1E–7, 1E–8, 1E–9) User program AE-B [A: 1.0 to 9.9 (step: 0.1), B: 2 to 10] Alternative: Error frame (0 to 8000), normal frame (1 to 8000)
Alarm addition	LOS, LOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-TIM, HP-RDI, HP-UNEQ, TU-AIS, TU-LOP, TU-LOM, LP-SLM, LP-TIM, LP-RDI, LP-UNEQ, LP-RFI Timing: Single, single (burst) frame Alternative: Alarm frame (0 to 8000), normal frame (1 to 8000), all
Measurements	Mode: Single, repeat, manual In-service/Out-of-service Errors: B1, B2, B3, BIP-2, MS-REI, HP-REI, LP-REI Alarms: Power-fail, LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-TIM, HP-RDI, HP-UNEQ, TU-AIS, TU-LOP, TU-LOM, LP-SLM, LP-TIM, LP-RDI, LP-UNEQ, LP-RFI Error performance: G.826, M2101, M2110, M2120 Preset: Alarm measurement condition
LEDs	LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-SLM, TU-AIS, TU-LOM, TU-LOP, LP-RDI, LP-RFI, LP-SLM, Tandem, sync. loss, errors
Tandem connection	N1 byte (Type 1, Type 2), N2 byte Errors: N2 BIP-2, TC-REI, OEI, IEC Alarms: VC-AIS, ISF, FAS, HP-Incoming-AIS, HP-TC-RDI, HP-ODI, LP-Incoming-AIS, LP-TC-RDI, LP-ODI
Justification	AU pointer, TU pointer, C, C1/C2 Measurement: NDF, +PJC, –PJC, Cons, C, C1/C2
Monitor	SOH, POH, K1/K2, pointer, path trace (TIM alarms detectable), Tandem, payload
Pointer sequence	Signal of opposites polarity, regular with double, regular with missing, double of opposites polarity, 87-3/26-1 (normal, add, cancel), continuous pattern (normal, add, cancel), single pointer adjustment, maximum rate pointer burst, phase transient pointer burst, initialize period polarity, cooldown period
Over head capture	SOH/POH (any 1 byte), H1/H2, K1/K2
Dummy channel setting	Payload: Dummy, copy, mixed payload Setting: POH, pathtrace, SS bit, Tandem
Simultaneous measurement	VC2, VC12, VC11
Trouble search	Auto search for errors/alarms in all measured channels
Delay	Measurement period: 0.5, 1, 2, 5, 10 s Measurement range: 0 to 999 µs, 1.0 to 999.9 ms, 1.0 to 10.0 s, time out Display accuracy: ±5 µs (0.5, 1 s), ±50 µs (2, 5, 10 s)
APS (K1/K2)	Switching time measurement Measurement range: 1 to 2000 ms, >2000 ms Trigger Internal: B1, B2, B3, BIP-2, MS-REI, HP-REI, LP-REI, MS-AIS, AU-AIS, AU-LOP, HP-RDI, TU-AIS, TU-LOM, TU-LOP, LP-RDI, LP-RFI, Bit External: Measures trigger input signal (active high) Threshold: Specify non-error alarm between 1 ms, 10 ms, 100 ms Sequence generation: 2 to 64 word, repeat (8000 frame) Sequence capture: 2 to 64 word, repeat (8000 frame)
Frequency measurement	Range: ±100 ppm, Accuracy: ±3.5 ppm (jitter unit not installed)
Over head test	OH change: SOH/POH 1 byte, K1/K2, RSOH, MSOH, SOH, POH (except B1, B2, B3, BIP-2) PTR 64 frame: AU pointer, TU pointer Timing: Single, repeat (2 to 64) Setting: PTR, NDF, +PJC, –PJC OH BERT: SOH/POH 1 byte (exclude B1, B2, B3, BIP-2), D1-D3, D4-D12 Test pattern: $2^{11}-1$, $2^{15}-1$ OH add/drop: SOH/POH 1 byte, D1-D3, D4-D12 (exclude B1, B2, B3, BIP-2 additional type)
Japan mapping (option 09)	VC11 Signaling (8-multiframe, 64-multiframe setting)
Frame memory/capture	Memory size: 64 frame (156M, 622M, Option 13), 64 frame (MU150008A-01/150009A-01/150010A-01, 2.5G), 26 frame (MU150000A-01, 2.5G/10G)
Insert/extract	Bit rate: 10G (52M, 156M), 2.5G (52M, 156M)
Payload offset	±100 ppm/0.1 ppm step
Auxiliary interface	Clock sync output, trigger input, trigger output, DCC interface (V.11), orderwire, receive clock output

*1: Mounted MP0122A/B, *2: Mounted MP0121A

For product ordering information, see pages 3 – 6

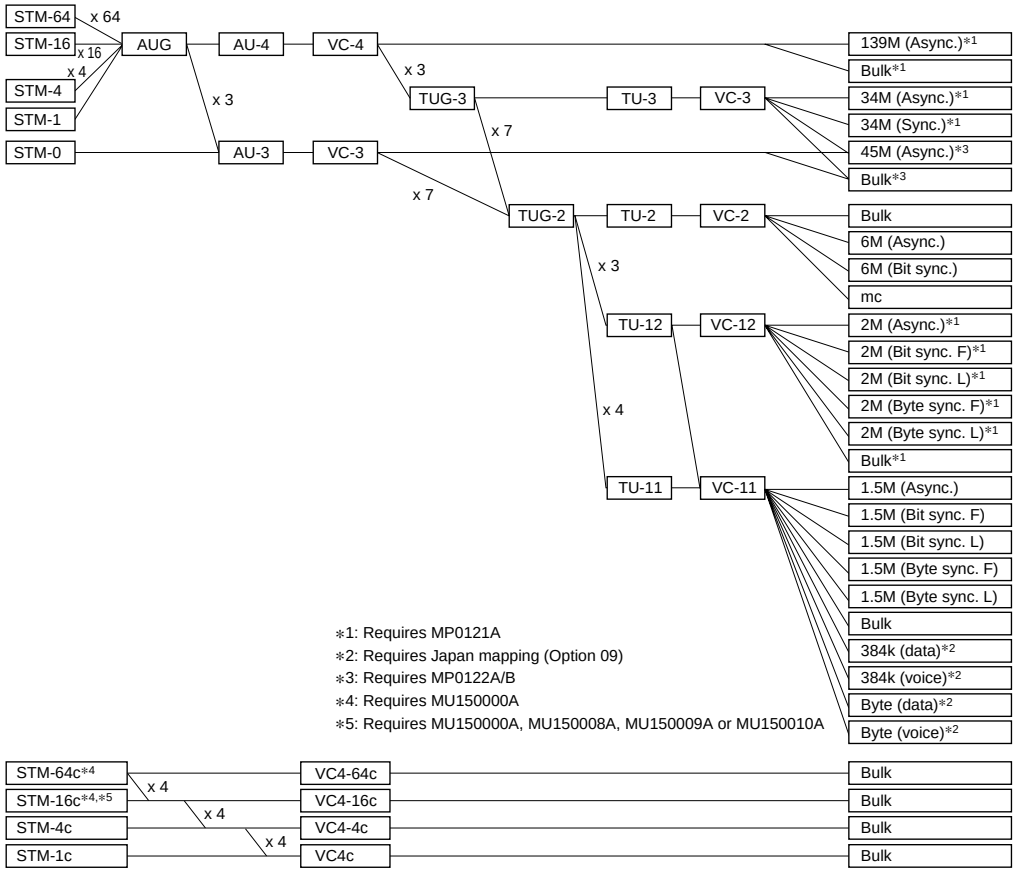


Fig. 1 Mapping structure (SDH)

- **52/156/622/2488/9953M (SONET)**

Bit rate	51.84, 155.52, 622.08, 2488.32, 9953.28 Mbit/s
Level/waveform	52M (electrical: B3ZS)*1: ANSI T1.102, 0/450 ft 52M (optical): As per MP0122B unit optical interface specifications 156M (electrical: CMI)*2: ITU-T G.703 156M (optical): As per optical 156M/622M unit specifications 622M (electrical/optical): As per optical 156M/622M unit and NRZ unit specifications 2488M (electrical/optical): As per 2.5G unit and 2.5G/10G unit specifications 9953M (electrical/optical): As per 2.5G/10G unit specifications
Clock	Internal (accuracy: ±3.5 ppm, jitter unit not installed), Lock (2 MHz, 1.5 MHz, 64 kHz + 8 kHz, 2 Mbit/s, 1.5 Mbit/s), External (ECL [AC] 50 Ω, 9953M: 1.02 to 0.58 Vp-p, 50 Ω), received signal
Frame	SDH/SONET, CID pattern, non-frame
Mapping	See Fig. 2
Through	Trance parent, over head overwrite, payload overwrite
Test patterns	PRBS: $2^{11}-1$, $2^{15}-1$, $2^{20}-1$ (zero suppress, MP0122A/B installed), $2^{20}-1$, $2^{23}-1$, $2^{31}-1$ (only concatenation mapping 16c/64c, conform to O.151) Invert: On/off Word: 16-bit programmable, all 0, all 1
Error addition	Bit all (all, test pattern), FAS, B1, B2, B3, BIP-2, REI-L, REI-P, REI-V Timing: Single, single (burst) bit (1 to 64000), rate (1E–3, 1E–4, 1E–5, 1E–6, 1E–7, 1E–8, 1E–9) User program AE-B [A: 1.0 to 9.9 (step: 0.1), B: 2 to 10] Alternative: Error frame (0 to 8000), normal frame (1 to 8000)
Alarm addition	LOS, LOF, AIS-L, RDI-L, AIS-P, LOP-P, PLM-P, HP-TIM, RDI-P, UNEQ-P, AIS-V, LOP-V, LOM-V, PLM-V, LP-TIM, RDI-V, UNEQ-V, RFI-V Timing: Single, single (burst) frame Alternative: alarm frame (0 to 8000), normal frame (1 to 8000), all
Measurements	Mode: Single, repeat, manual In-service/Out-of-service Errors: B1, B2, B3, BIP-2, REI-L, REI-P, REI-V Alarms: Power-fail, LOS, LOF, OOF, AIS-L, RDI-L, AIS-P, LOP-P, PLM-P, HP-TIM, RDI-P, UNEQ-P, AIS-V, LOP-V, LOM-V, PLM-V, LP-TIM, RDI-V, UNEQ-V, RFI-V Error performance: G.826, M2101, M2110, M2120 Preset: Alarm measurement condition
LEDs	LOS, LOF, OOF, AIS-L, RDI-L, AIS-P, LOP-P, RDI-P, PLM-P, AIS-V, LOM-V, LOP-V, RDI-V, RFI-V, PLM-V, Tandem, sync. loss, errors
Tandem connection	Z5 byte (Type 1, Type 2), Z6 byte Errors: Z6 BIP-2, TC-REI, OEI, IEC Alarms: VC-AIS, ISF, FAS, HP-Incoming-AIS, HP-TC-RDI, HP-ODI, LP-Incoming-AIS, LP-TC-RDI, LP-ODI

Continued on next page

Justification	STS pointer, VT pointer, C, C1/C2 Measurement: NDF, +PJC, –PJC, Cons, C, C1/C2
Monitor	TOH, POH, K1/K2, pointer, path trace (TIM alarms detectable), Tandem, payload
Pointer sequence	Signal of opposites polarity, regular with double, regular with missing, double of opposites polarity, 87-3/26-1 (normal, add, cancel), continuous pattern (normal, add, cancel), single pointer adjustment, maximum rate pointer burst, phase transient pointer burst, initialize period polarity, cooldown period
Over head capture	TOH/POH (any 1 byte), H1/H2, K1/K2
Dummy channel setting	Payload: Dummy, copy, mixed payload Setting: POH, pathtrace, SS bit, Tandem
Simultaneous measurement	VT6SPE, VT2SPE, VT1.5SPE
Trouble search	Auto search for errors/alarms in all measured channels
Delay	Measurement period: 0.5, 1, 2, 5, 10 s Measurement range: 0 to 999 µs, 1.0 to 999.9 ms, 1.0 to 10.0 s, time out Display accuracy: ±5 µs (0.5, 1 s), ±50 µs (2, 5, 10 s)
APS (K1/K2)	Switching time measurement Measurement range: 1 to 2000 ms, >2000 ms Trigger Internal: B1, B2, B3, BIP-2, REI-L, REI-P, REI-V, AIS-L, AIS-P, LOP-P, RDI-P, AIS-V, LOM-V, LOP-V, RDI-V, RFI-V, Bit External: Measures trigger input signal (active high) Threshold: Specify non-error alarm between 1 ms, 10 ms, 100 ms Sequence generation: 2 to 64 word, repeat (8000 frame) Sequence capture: 2 to 64 word, repeat (8000 frame)
Frequency measurement	Range: ±100 ppm, Accuracy: ±3.5 ppm (jitter unit not installed)
Over head test	OH change: TOH/POH 1 byte, K1/K2, LOH, SOH, TOH, POH (except B1, B2, B3, BIP-2) PTR 64 frame: STS pointer, VT pointer Timing: Single, repeat (2 to 64) Setting: PTR, NDF, +PJC, –PJC OH BERT: TOH/POH 1 byte (exclude B1, B2, B3, BIP-2), D1-D3, D4-D12 Test pattern: $2^{11} - 1$, $2^{15} - 1$ OH add/drop: TOH/POH 1 byte, D1-D3, D4-D12 (exclude B1, B2, B3, BIP-2 additional type)
Japan mapping (option 09)	VT1.5SPE Signaling (8-multiframe, 64-multiframe setting)
Frame memory/capture	Memory size: 64 frame (156M, 622M, Option 13), 64 frame (MU150008A-01/150009A-01/150010A-01, 2.5G), 26 frame (MU150000A-01, 2.5G/10G)
Insert/extract	Bit rate: 10G (52M, 156M), 2.5G (52M, 156M)
Payload offset	±100 ppm/0.1 ppm step
Auxiliary interface	Clock sync output, trigger input, trigger output, DCC interface (V.11), orderwire, receive clock output

∗1: Mounted MP0122A/B, ∗2: Mounted MP0121A

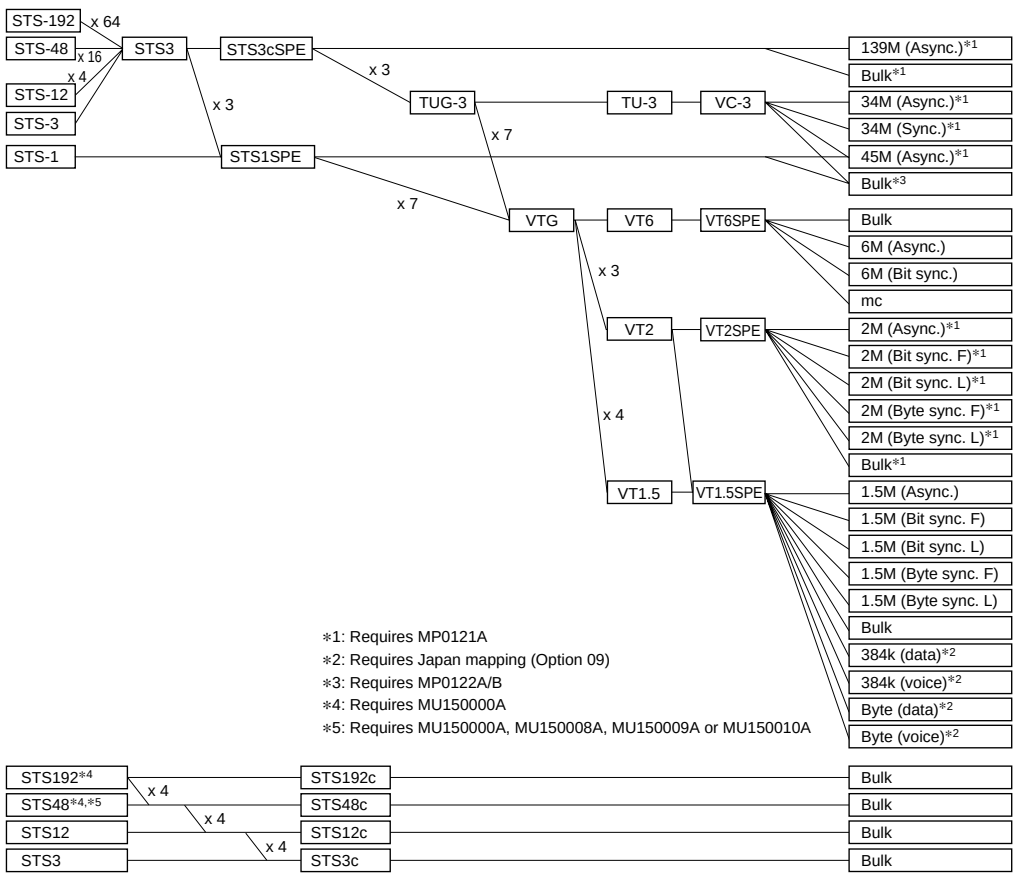


Fig. 2 Mapping structure (SONET)

For product ordering information, see pages 3 – 6

• IP-over-SONET/SDH (Option)*1

Bit rate	155.52, 622.08, 2488.32, 9953.28 Mbit/s
PPP setting (RFC1662)	Flag, address, control: Any settable Protocol: 8/16 bit selectable and any settable FCS: 16/32 bit selectable and auto calculate Information: IPv4/IPv6 selectable and any settable
IPv4 setting (RFC791)	Any setting: Version, IHL, TOS, total length, ID, flags, flagment offset, TTL, protocol, address (source, destination) Header checksum: Auto calculate Data byte: All 0, all 1, 8 bits program, single PRBS 7, user program (max. 65535 byte)
IPv6 setting (RFC1883)	Any setting: Version, priority, flow label, payload length, next header, hop limit, address (source, destination) Data byte: All 0, all 1, 8 bits program, single PRBS 7, user program (max. 65535 byte)
Packet transmission setting	1 to 3 in IP/PPP (independently), IP/PPP sending pattern, packet sending interval (max. 100000 bytes), single/repeat, sending on/off, scramble (X^{43} + 1) on/off, control escape auto insertion, FCS error insertion (single), number of packet count display
Packet receiving/analysis	PPP frame calculation (count), scramble (X^{43} + 1) on/off setting, automatic analysis of control escape. Frame/capture memory (option) required data captured into the capture memory (max. 64 frames*2), IPv4/IPv6 select, IP address filter set

∗1: The frame/capture memory (option) is required.
∗2: Maximum 26 frames at 2488/9953 Mbits when MU150000A is inserted.

• IP-over-ATM (Option)*1

Bit rate	155.52, 622.08 Mbit/s
AAL5 edit pattern	IPv4/IPv6 selectable
IPv4 setting (RFC791)	Any setting: Version, IHL, TOS, total length, ID, flags, flagment offset, TTL, protocol, address (source, destination) Header checksum: Auto calculate Data byte: All 0, all 1, 8 bit program, single PRBS 7, user program (max. 65535 bytes)
IPv6 setting (RFC1883)	Any setting: Version, priority, flow label, payload length, next header, hop limit, address (source, destination) Data byte: All 0, all 1, 8 bits program, single PRBS 7, user program (max. 65535 bytes)
Packet sending	Follow with AAL5 distribution setting
Packet receiving/analysis	Displays the IP packet from the data captured into cell capture memory (maximum 2016 cells), IPv4/IPv6 selectable

∗1: MP0123A ATM Unit is required.

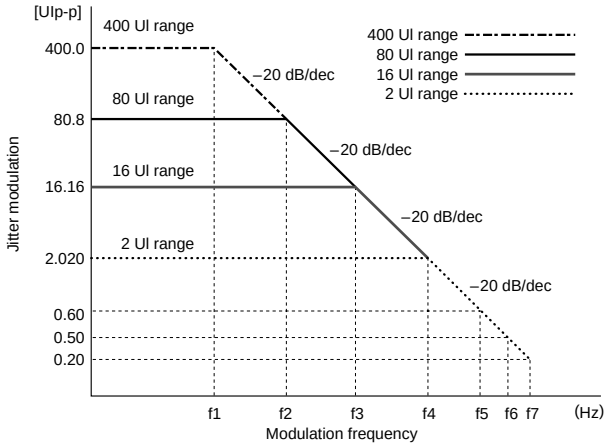
• General

Printer	Internal, external
Internal memory	Measurement settings memory: 10, Graphics memory: 15
Others	FDD, RS-232C (Option 01)*1, GPIB (Option 02)*1, Ethernet (Option 03)*1, video output (Option 04)*1, buzzer, clock, help, screen copy
EMC	EN61326: 1997/A1: 1998 (Class A) EN61000-3-2: 1995/A2: 1998 (Class A) EN61326: 1997/A1: 1998 (Annex A)
LVD	EN61010-1: 1993/A2: 1995 (Installation Category Ⅱ, Pollution degree 2)
Dimensions and mass	320 (W) x 177 (H) x 350 (D) mm, 10 kg approx. (excluding plug-in units and options)
Power	100 to 240 Vac, 47.5 to 63 Hz, ≤500 VA
Temperature	0˚ to +40˚C

∗1: The video output, RS-232C, GPIB and Ethernet options cannot all be used simultaneously.
Only the video output + RS-232C, or video output + GPIB, or RS-232C + GPIB board, or Ethernet board combinations support simultaneous use, so change the board combinations according to the purpose.

• MU150005A/150006A/150007A Jitter Units

Bit rate	MU150005A: 2.048, 8.448, 34.368, 139.264, 155.52, 622.08 Mbit/s MU150006A: 1.544, 44.736, 51.84, 155.52, 622.08 Mbit/s MU150007A: 1.544, 2.048, 8.448, 34.368, 44.736, 139.264, 51.84, 155.52, 622.08 Mbit/s
Jitter generation	Conform to ITU-T O.171/O.172 Modulation frequency: 0.1 Hz to 6 MHz Amplitude: 0 to 404.0 UIp-p Resolution:0.001 UIp-p (2 UI range), 0.01 UIp-p (16 UI range), 0.1 UIp-p (80 UI range), 0.2 UIp-p (400 UI range)



Bit rate (Mbit/s)	f1 (Hz)	f2 (Hz)	f3 (kHz)	f4 (kHz)	f5 (kHz)	f6 (kHz)	f7 (kHz)
1.544	130	630	3.2	25	—	100	—
2.048	300	1.5k	7.5	60	—	240	—
8.448	1.1k	5.5k	28	220	—	880	—
34.368	2.5k	13k	63	500	—	—	5000
44.736	2.5k	13k	63	500	—	—	5000
139.264	9k	45k	230	1800	6000	—	—
51.84	2.5k	13k	63	500	—	—	5000
155.52	7.5k	38k	190	1500	—	6000	—
622.08	3k	15k	75	600	—	—	6000

Accuracy
2 UI range: (±Q% of setting) ±0.02 UIp-p, 16 UI range: (±Q% of setting) ±0.2 UIp-p, 80 UI range: (±Q% of setting) ±1.2 UIp-p, 400 UI range: (±Q% of setting) ±6 UIp-p

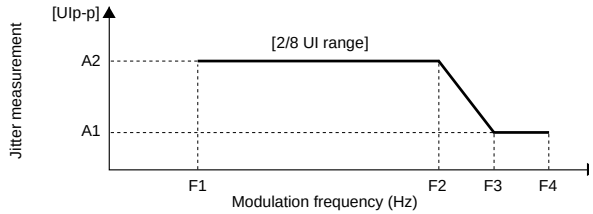
Bit rate (Mbit/s)	Error Q	Frequency range
1.544	±12%	0.1 to 2 Hz
	±8%	2 Hz to 100 kHz
2.048	±12%	0.1 to 10 Hz
	±8%	10 Hz to 240 kHz
8.448	±12%	0.1 to 20 Hz
	±8%	20 Hz to 880 kHz
34.368	±12%	0.1 to 100 Hz
	±8%	0.1 to 500 kHz
	±12%	500 kHz to 5 MHz
44.736	±12%	0.1 to 2 Hz
	±8%	2 Hz to 5 MHz
139.264	±12%	0.1 to 100 Hz
	±8%	0.1 to 500 kHz
	±12%	0.5 to 2 MHz
	±15%	2 to 6 MHz
51.84	±12%	0.1 to 300 Hz
	±8%	300 Hz to 5 MHz
155.52	±12%	0.1 to 500 Hz
	±8%	0.5 to 500 kHz
	±12%	0.5 to 6 MHz
622.08	±12%	0.1 Hz to 1 kHz
	±8%	1 to 500 kHz
	±12%	0.5 to 2 MHz
	±15%	2 to 6 MHz

Continued on next page

Frequency offset	Range: ±999.9 ppm/0.1 ppm steps (jitter off), ±100 ppm/0.1 ppm steps (jitter on/off) Accuracy: ±0.1 ppm after power-on, calibrates after 60 min warm-up, 23˚ ±5˚C
Auxiliary interface	External modulation input, External 5/10 MHz reference input, Jitter clock/Jitter reference output, Wander reference output

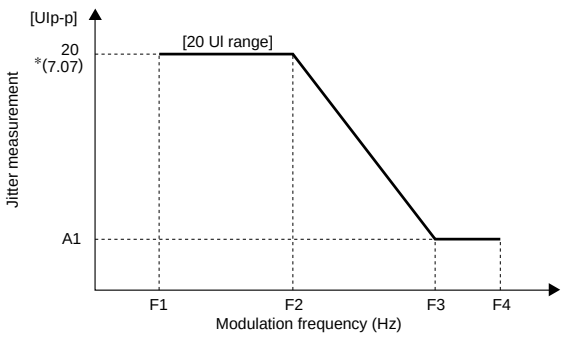
Jitter measurement

Conform to ITU-T O.171/O.172
Modulation frequency: 0.1 Hz to 5 MHz
Amplitude: 0.0 to 400 UI (800 UI: at 622M)
Resolution:
0.001 UIp-p/0.001 UIrms (2 UI range), 0.01 UIp-p/0.01 UIrms (8 UI/20 UI range), 0.2 UIp-p (400 UI range), 0.5 UIp-p (800 UI range)



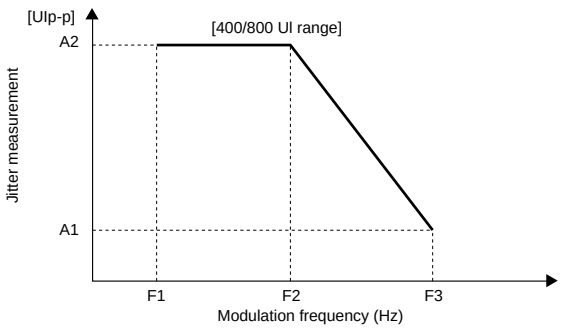
Bit rate (Mbit/s)	A1 (UIp-p)	A2 (UIp-p)		F1* (Hz)		F2 (Hz)		F3 (Hz)	F4 (Hz)
	—	Full	Wide	Full	Wide	Full	Wide	—	—
1.544	0.5	8	2	0.1	10	1.25k	5k	20k	40k
2.048	0.5	8	2	0.1	10	3.75k	15k	60k	100k
8.448	0.5	—	2	—	10	—	50k	200k	400k
34.368	0.5	8	2	0.1	10	18.75k	75k	300k	800k
44.736	0.5	8	2	0.1	10	25k	100k	400k	400k
139.264	0.5	8	2	0.1	10	50k	200k	800k	3.5M
51.84	0.5	8	2	1	10	25k	100k	400k	400k
155.52	0.4	8	2	1	10	25k	100k	500k	1.3M
622.08	0.3	8	2	1	10	75k	300k	2M	5M

*F1 = 100 Hz at RMS



Bit rate (Mbit/s)	A1 (UIp-p)	F1* (Hz)		F2 (Hz)	F3 (Hz)	F4 (Hz)
	—	Full	Wide	—	—	—
1.544	0.67	0.1	1	600	15k	15k
2.048	1.67	0.1	1	1.5k	18k	18k
8.448	1.43	0.1	1	5k	70k	70k
34.368	0.5	0.1	1	8k	300k	300k
44.736	0.5	0.1	1	10k	400k	400k
139.264	0.5	0.1	1	20k	800k	1.2M
51.84	0.5	1	1	10k	400k	400k
155.52	0.4	1	1	10k	500k	1.3M
622.08	0.3	1	1	30k	2M	5M

*F1 = 100 Hz at RMS



Bit rate (Mbit/s)	A1 (UIp-p)	A2 (UIp-p)	F1** (Hz)	F2 (Hz)	F3 (Hz)
1.544	20	400	0.1	10	200
2.048	20	400	0.1	10	200
8.448	20	400	0.1	10	200
34.368	20	400	0.1	10	200
44.736	20	400	0.1	10	200
139.264	20	400	0.1	10	200
51.84	20	400	0.1	10	200
155.52	4	400	0.1	10	1k
622.08	4	800	0.1	10	2k

**: Full band only

Continued on next page

Jitter measurement

Filter:
Conform to O.171/O.172, LP, HP0 + LP, HP1 + LP, HP2 + LP, HP + LP, user

Bit rate (Mbit/s)	HP0 (Hz)	HP1 (Hz)	HP2 (Hz)	HP2' (Hz)	HP (Hz)	LP (Hz)
1.544	10	10	8k	—	12k	40k
2.048	10	20	18k	700	12k	100k
8.448	10	20	3k	80k	12k	400k
34.368	10	100	10k	—	12k	800k
44.736	10	10	30k	—	12k	400k
139.264	10	200	10k	—	12k	3.5M
51.84	10	100	20k	—	12k	400k
155.52	10	500	65k	—	12k	1.3M
622.08	10	1k	250k	—	12k	5M

Accuracy (UIp-p, UI+p, UI-p)
2 UI range: ±R% of reading ±W UIp-p, 20 UI range: ±R% of reading ±W UIp-p, 400 UI range: ±R% of reading ±W UIp-p, 800 UI range: ±R% of reading ±W UIp-p

Fixed error [W]
UIp-p

Bit rate (Mbit/s)	Pseudo-random signal							
	HP1 + LP				HP2 + LP			Bit length
	2 UI	8 UI	20 UI	400/800 UI	2 UI	8 UI	20 UI	
1.544	0.040	0.08	0.22	3.5	0.025	0.05	0.15	$2^{20}-1$
2.048	0.040	0.08	0.22	3.5	0.025	0.05	0.15	$2^{15}-1$
8.448	0.040	—	0.22	3.5	0.025	—	0.15	$2^{15}-1$
34.368	0.040	0.08	0.22	3.5	0.025	0.05	0.15	$2^{23}-1$
44.736	0.040	0.08	0.22	3.5	0.025	0.05	0.15	$2^{15}-1$
139.264	0.040	0.08	0.30	5.0	0.025	0.05	0.15	$2^{23}-1$

Bit rate (Mbit/s)	Clock signal						
	HP1 + LP				HP2 + LP		
	2 UI	8 UI	20 UI	400/800 UI	2 UI	8 UI	20 UI
1.544	0.015	0.03	0.10	1.6	0.010	0.02	0.08
2.048	0.015	0.03	0.10	1.6	0.010	0.02	0.08
8.448	0.015	—	0.10	1.6	0.010	—	0.08
34.368	0.030	0.06	0.18	2.8	0.020	0.04	0.15
44.736	0.030	0.06	0.18	2.8	0.020	0.04	0.15
139.264	0.030	0.06	0.22	3.8	0.020	0.04	0.20

Bit rate (Mbit/s)	SONET/SDH signal							
	HP1 + LP				HP2 + LP			Container
	2 UI	8 UI	20 UI	400/800 UI	2 UI	8 UI	20 UI	
51.84e	0.070	0.14	0.30	5.0	0.050	0.10	0.20	VC3
51.84o	0.070	0.14	0.30	5.0	0.050	0.10	0.20	VC3
155.52e	0.070	0.14	0.30	5.0	0.025	0.05	0.20	VC4
155.52o	0.070	0.14	0.30	5.0	0.050	0.10	0.20	VC4
622.08	0.100	0.20	0.30	10.0	0.050	0.10	0.20	VC4-4c

At PRBS $2^{23}-1$

Bit rate (Mbit/s)	Clock signal						
	HP1 + LP				HP2 + LP		
	2 UI	8 UI	20 UI	400/800 UI	2 UI	8 UI	20 UI
51.84e	0.050	0.10	0.22	3.8	0.030	0.06	0.20
155.52e	0.050	0.10	0.22	3.8	0.030	0.06	0.20
622.08	0.050	0.10	0.22	5.0	0.030	0.06	0.20

Frequency error [R]

Frequency error	Frequency range
±10%	0.1 to 20 Hz
±7%	20 Hz to 300 kHz
±8%	300 kHz to 1 MHz
±10%	1 to 3 MHz
±15%	3 to 5 MHz

Continued on next page

Jitter measurement

UIrms
2 UI range: ±R% ±Y UIrms, 20 UI range: ±R% ±Y UIrms

Fixed error [Y]
UIrms

Bit rate (Mbit/s)	Pseudo-random signal			
	HP + LP			Bit length
	2 UI	8 UI	20 UI	
1.544	0.006	0.02	0.04	$2^{20} - 1$
2.048	0.006	0.02	0.04	$2^{15} - 1$
8.448	0.006	—	0.04	$2^{15} - 1$
34.368	0.008	0.02	0.05	$2^{23} - 1$
44.736	0.008	0.02	0.05	$2^{15} - 1$
139.264	0.008	0.02	0.05	$2^{23} - 1$

Bit rate (Mbit/s)	Clock signal		
	HP + LP		
	2 UI	8 UI	20 UI
1.544	0.004	0.02	0.03
2.048	0.004	0.02	0.03
8.448	0.004	—	0.03
34.368	0.006	0.02	0.04
44.736	0.006	0.02	0.04
139.264	0.006	0.02	0.04

Bit rate (Mbit/s)	SONET/SDH signal			
	HP + LP			Container
	2 UI	8 UI	20 UI	
51.84e	0.010	0.02	0.06	VC3
51.84o	0.010	0.02	0.06	VC3
155.52e	0.010	0.02	0.06	VC4
155.52o	0.010	0.02	0.06	VC4
622.08	0.012	0.03	0.08	VC4-4c

Bit rate (Mbit/s)	Clock signal		
	HP + LP		
	2 UI	8 UI	20 UI
51.84e	0.008	0.02	0.05
155.52e	0.008	0.02	0.05
622.08	0.010	0.02	0.06

At PRBS $2^{23} - 1$

Frequency error [R]

Frequency error	Frequency range
±10%	0.1 to 20 Hz
±7%	20 Hz to 300 kHz
±8%	300 kHz to 1 MHz
±10%	1 to 3 MHz
±15%	3 to 5 MHz

Hit measurement

Count, seconds, % free Seconds

Frequency measurement

Resolution: 0.1 ppm, Display: Hz or ppm (After power-on, calibrates after 60 min warm-up, 23˚ ±5˚C)

Auxiliary interface

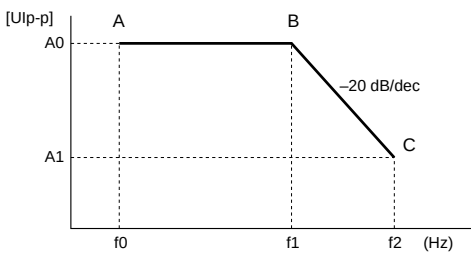
Demodulation output, Clock/Reference input

Jitter auto measurement

Jitter tolerance measurement: Evaluates jitter tolerance point automatically
Jitter sweep measurement: Conforms to high-speed jitter tolerance evaluation for mass production, etc.
Jitter transfer measurement: High dynamic range measurement by selective level method (variable)
Jitter frequency measurement: Measures the mapping jitter automatically
Frequency sweep measurement: Measures the jitter tolerance automatically while changing the offset

Line wander generation

Modulation frequency: 10 µHz to 10 Hz (sine wave)
Amplitude: 0 to 400,000 UI (10 UIp-p steps)



Bit rate (Mbit/s)	f0 (µHz)	f1 (mHz)	f2 (Hz)	A0 (UIp-p)	A1 (UIp-p)
1.544	10	20	10	400,000	800
2.048	10	20	10	400,000	800
8.448	10	200	10	400,000	8,000
34.368	10	400	10	400,000	16,000
44.736	10	400	10	400,000	16,000
139.264	10	2,000	10	400,000	80,000
51.84	10	400	10	400,000	16,000
155.52	10	2,000	10	400,000	80,000
622.08	10	400	10	400,000	16,000

Accuracy: ±Q% of setting ±100 UIp-p

Error Q	Frequency range
±8%	10 µHz to 0.125 Hz
±12%	0.125 Hz to 1 Hz
±15%	1 to 10 Hz

Wander auto measurement

Automatically evaluates the wander of the sine wave by the wander sweep measurement

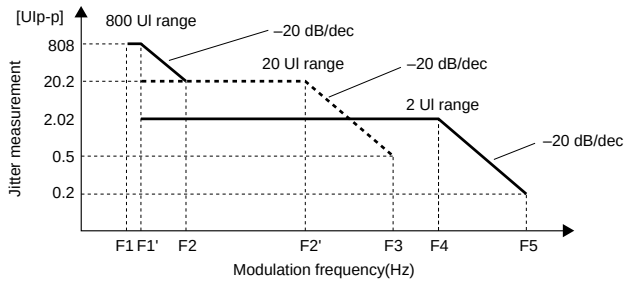
Continued on next page

Reference wander generation (Option 03)	Off: Able to set non-modulated status TDEV mask: The 37 types of TDEV masks that are regulated by ITU-T, ETSI, ANSI, and Bellcore standards are available as default. It is possible to add the wander modulation on the user specified TDEV mask. Transient: It is possible to change the A $(1 - e^{-63.7t})$ phase by the timing of the start. Signal off: It is possible to disconnect the standard signal.
Wander measurement (Option 02)	Conform to ITU-T O.172 Reference input: 2.048M (HDB3, Clock), 1.544M (AMI/B8ZS, Clock), 64k + 8 kHz, 5 MHz, 10 MHz Sampling frequency: 40 Hz, 1 Hz, 0.1 Hz, 5 mHz (select by MX150001B) Measurement range P-P: 0.0 to 2E10 ns, +P/–P: 0.0 to 1E10 ns, TIE: 0.0 to ±1E10 ns Accuracy: Conform to ITU-T O.172 Measurement time: 10 to 1 x 10^8 s (max. 120, 000 s; MP1570A only) Wander application (requires MX150001B Wander Application Software) TIE: Max. 1 x 10^8 s, MTIE: Max. 1 x 10^8 s, TDEV: Max. 1 x 10^6 s Frequency offset: Measurement conforms to ANSI TI.105.09 Frequency drift rate: Measurement conforms to ANSI TI.105.09 MRTIE: The evaluation separated from the wander by a frequency offset Wander tolerance (TDEV) measurement: Evaluation by the various TDEV mask generations Wander transfer (TDEV) measurement: Calibration method by simulation,outputting results by the one measurement

• MU150011A 2.5G Jitter Unit

Jitter generation

Conforms to ITU-T O.172
Frequency: 2488.32 MHz
Modulation frequency: 0.1 Hz to 20 MHz
Amplitude: 0 to 808.0 UIp-p
Resolution: 0.001 UIp-p (2 UI range), 0.01 UIp-p (20 UI range), 0.4 UIp-p (800 UI range)



Bit rate (Mbit/s)	F1 (Hz)	F1' (Hz)	F2* (kHz)	F2'* (kHz)	F3* (MHz)	F4* (MHz)	F5* (MHz)
2488.32	0.1	60	2.5	30	1.2	2	20

*Typical value

Accuracy
2 UI range: (±Q% of setting) ±0.02 UIp-p, 20 UI range: (±Q% of setting) ±0.3 UIp-p, 800 UI range: (±Q% of setting) ±12.5 UIp-p

Bit rate (Mbit/s)	Error Q	Frequency range
2488.32	±12%	0.1 Hz to 5 kHz
	±8%	5 to 500 kHz
	±12%	0.5 to 2 MHz
	±15%	2 to 20 MHz

Frequency offset

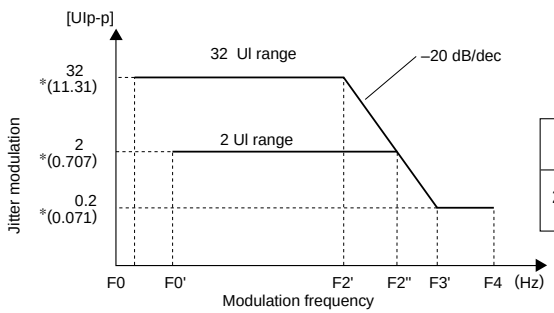
Range: ±100 ppm/0.1 ppm steps (jitter on/off)
Accuracy: ±0.1 ppm (after power-on, calibrate after 60 min warm-up, 23˚±5 ˚C)

Auxiliary interface

External clock input, Jitter reference output

Jitter measurement

Conforms to ITU-T O.172
Frequency: 2488.32 MHz ±100 ppm
Modulation frequency: 10 Hz to 20 MHz
Amplitude: 0.0 to 32 UI
Resolution: 0.001 UIp-p/0.001 UIrms (2 UI range), 0.01 UIp-p/0.01 UIrms (32 UI range)



Bit rate (Mbit/s)		F0 (Hz)	F0' (Hz)	F2' (kHz)	F2'' (kHz)	F3' (MHz)	F4 (MHz)
2488.32	2 UI	–	100	–	100	1	20
	32 UI	10	–	6.25	–	1	20

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Jitter measurement

Conforms to ITU-T O.172
LP, HP0 + LP, HP1 + LP, HP2 + LP, HP + LP

Bit rate (Mbit/s)	HP0 (Hz)	HP1 (Hz)	HP2 (Hz)	HP (Hz)	LP (Hz)
2488.32	10	5k	1M	12k	20M

Accuracy (UIp-p, UI+p, UI–p)
2 UI range: Measurement value ±R% ±W UIp-p, 32 UI range: Measurement value ±R% ±W UIp-p
[MU150008A/150009A/150010A are simultaneously installed, conform to ITU-T O.172]

Fixed error [W]
Input level: –12 to –10 dBm (adds to 0.01 UIp-p/dB at <–12 dBm)

Bit rate (Mbit/s)	SONET/SDH signal				
	HP1 + LP		HP2 + LP		Container
	2 UI	32 UI	2 UI	32 UI	
2488.32	0.100	2.2	0.050	1.40	VC4-16c

Bit rate (Mbit/s)	Clock signal			
	HP1 + LP		HP2 + LP	
	2 UI	32 UI	2 UI	32 UI
2488.32	0.050	0.60	0.030	0.50

At PRBS $2^{23} – 1$

Accuracy (UIrms)
2 UI range: ±R% ±Y UIrms, 32 UI range: ±R% ±Y UIrms

Fixed error [Y]
Input level: –12 to –10 dBm (adds to 0.002 UIrms/dB at <–12 dBm)

Bit rate (Mbit/s)	SONET/SDH signal			Clock signal	
	HP + LP		Container	HP + LP	
	2 UI	32 UI		2 UI	32 UI
2488.32	0.012	0.08	VC4-16c	0.010	0.16

At PRBS $2^{23} – 1$

Frequency error [R]

Frequency error	Frequency range
±7%	5 to 300 kHz
±8%	300 kHz to 1 MHz
±10%	1 to 3 MHz
±15%	3 to 10 MHz
±20%	10 to 20 MHz

Hit measurement

Count, Seconds, % free seconds

Frequency measurement

Resolution: 0.1 ppm, Display: Hz or ppm (after power-on, calibrates after 60 min warm-up, 23˚ ±5˚C)

Auxiliary interface

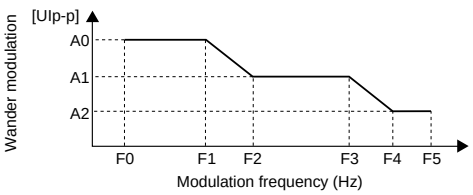
Reference clock input

Auto jitter measurement

Jitter tolerance measurement: Evaluates jitter tolerance point automatically
Jitter sweep measurement: Conforms to high-speed jitter tolerance evaluation for mass production, etc.
Jitter transfer measurement: High dynamic range measurement by selective level method
Frequency sweep measurement: Measures the jitter tolerance automatically while changing the offset

Line wander generation

Modulation frequency: 10 µHz to 0.2 Hz (sine wave)
Amplitude: 0 to 57,600 UIp-p (30 UIp-p steps)



Bit rate (Mbit/s)	Amplitude (UIp-p)			Frequency (Hz)					
	A0	A1	A2	f0	f1	f2	f3	f4	f5
2488.32	57600	6480	810	10µ	180µ	1.6m	16m	0.13	0.2

Accuracy: ±Q% ±160 UIp-p

Frequency error	Frequency range
±8%	10 µHz to 0.1 Hz
±12%	0.1 to 0.2 Hz

Auto wander measurement

Wander sweep measurement

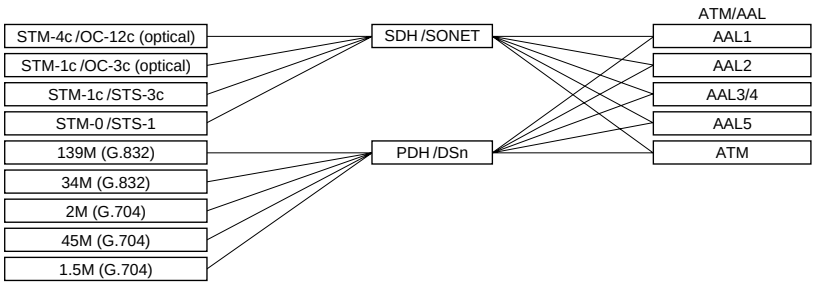
Reference wander generation

Reference wander generation is valid when MU150005A/150006A/150007A Option 03 is mounted.
Off: Able to set non-modulated status
TDEV mask:
The 37 types of TDEV masks that are regulated by ITU-T, ETSI, ANSI, and Bellcore standards are available as default.
It is possible to add the wander modulation to the user specified TDEV mask.
Transient: It is possible to change the A $(1 – e^{-63.7t})$ phase by the timing of the start.
Signal off: It is possible to disconnect the standard signal.

Continued on next page

Wander measurement	Wander measurement is valid when MU150005A/150006A/150007A Option 02 is mounted. Conforms to ITU-T O.172 Reference input: 2.048M (HDB3, clock), 1.544M (AMI/B8ZS, clock), 64k + 8 kHz, 5 MHz, 10 MHz Sampling frequency: 320 Hz, 40 Hz, 1 Hz, 0.1 Hz, 5 mHz (select from MX150001B) Measurement range P-P: 0.0 to 2E10 ns, +P/–P: 0.0 to 1E10 ns, TIE: 0.0 to ±1E10 ns Accuracy: Conform to ITU-T O.172 Measurement time: 10 to 1 x 10^8 s (Max. 120,000 s: MP1570A only) Wander application (requires MX150001B Wander Application Software) TIE: Max. 1 x 10^8 s MTIE: Max. 1 x 10^8 s TDEV: Max. 1 x 10^6 s Frequency offset: Measurement with conform to ANSI TI.105.09 Frequency drift rate: Measurement with conform to ANSI TI.105.09 MRTIE: Evaluation separated from the wander by the frequency variation Wander tolerance (TDEV) measurement: Evaluation by the various TDEV mask generations Wander transfer (TDEV) measurement: Calibration method by simulation, outputting results by the one measurement

• MP0123A ATM Unit

Bit rate	1.544, 2.048, 34.368, 44.736, 139.264, 51.84, 155.52, 622.08 Mbit/s
Mapping	
Traffic pattern	CBR, burst, sawtooth, CBR/PCR with CDV, Poisson
Test patterns	Cell: Single cell PRBS 9, cross cell PRBS 9/15/23, 16-bit word pattern, edit pattern, time stamp O.191: Edit pattern AAL1: Single cell PRBS 9, cross cell PRBS 9/15/23, 16-bit word pattern, edit pattern, time stamp AAL2 (CPS-PDU): Time stamp AAL2 (CPS-PACKET): Single cell PRBS 7, 8-bit word pattern, edit pattern AAL3/4 (SAR-PDU): Time stamp AAL3/4 (CPCS-PDU): Single cell PRBS 9, cross cell PRBS 9/15/23, 16-bit word pattern, edit pattern AAL5: Single cell PRBS 9, cross cell PRBS 9/15/23, 16-bit word pattern, edit pattern
Error addition	Cell: HEC, programmable pattern O.191: Lost cell, misinserted cell, errored cell, SECB AAL1: Lost cell, SNP, PRBS, word AAL2 (CPS-PDU): P, SN, OSF AAL2 (CPS-PACKET): HEC, PRBS, word AAL3/4 (SAR-PDU): SN, CRC10, segment type, LI, abort AAL3/4 (CPCS-PDU): CPI, B/E tag mismatch, BA size, AL, length, PRBS, word AAL5: Frame size, length, CRC32, abort, PRBS, word
Alarm addition	LCD, VP/VC AIS, VP/VC RDI, VP/VC CC, VP/VC loopback cell
PM cell	Error insertion: Lost cell, misinserted cell, BIPV, SECB
Cell editing	O.191, AAL1, AAL2, AAL3/4, AAL5, AIS, RDI, CC, loopback, FM, BR, background (10 ch)
Memorized cell	Possible to send after editing receiver's capture data
Measurement	Mode: Single, repeat, manual Error Cell: Cell count, correctable HEC, uncorrectable HEC, non-conforming cell O.191: Errored cell, lost cell, misinserted cell, SECB AAL1: SAR-PDU count, lost cell, SNP, uncorrectable SNP, PRBS, word AAL2: CPS-PDU count, P, OSF, SN, CPS packet count, CID count, HEC, PRBS, word AAL3/4*: SAR-PDU count, CRC10, MID count (SAR-PDU with selected MID value), SN, ST (segment type), LI, abort, discarded PDU (one of SN error, LI error, abort, COM with ST error, or EOM with ST error), CPCS-PDU count, CPI, B/E tag mismatch, BA size, AL, length, undeliverded PDU (one of CPI error, B/E tag mismatch, BA size error, AL error, or length error), PRBS, word *CRC10 is calculated for all SAR-PDU. The others are calculated for SAR-PDU with specified MID. AAL5: CPCS-PDU count, frame size, length, CRC32, abort, discarded PDU (one of frame size error, length error, CRC32 error, or abort), PRBS, word FM: Lost cell, misinserted cell, BIPV, SECB BR: Lost cell, misinserted cell, BIPV, SECB Alarm: LCD, VP/VC segment AIS, VP/VC end-to-end AIS, VP/VC segment RDI, VP/VC end-to-end RDI, VP/VC segment LOC, VP/VC end-to-end LOC
LED	LCD, VP-AIS, VP-RDI, VP-LOC, VC-AIS, VC-RDI, VC-LOC, errors
Monitor	Live monitor (1023 channel monitor), traffic monitor, cell monitor
Delay measurement	1-point CDV, 2-point CDV
Capture	1 to 2016 cells

For product ordering information, see pages 3 – 6

• MP0131A Add/Drop Unit

Bit rate	1.544, 2.048, 34.368, 44.736, 139.264 Mbit/s
Level/waveform	1.544 Mbit/s: ANSI T1.102, 0/655 ft 44.736 Mbit/s: ANSI T1.102, 0/450/900 ft (0 ft: Drop only) 2.048/34.368/139 Mbit/s: ITU-T G.703
Connector	BANTAM (100 Ω, balanced): 1.544 Mbit/s (AMI/B8ZS) 3-pin Siemens (120 Ω, balanced): 2.048 Mbit/s (HDB3) BNC (75 Ω, unbalanced): 2.048 Mbit/s, 34.368 Mbit/s (HDB3), 139.264 Mbit/s (CMI)
Mapping	See Fig. 3 and 4

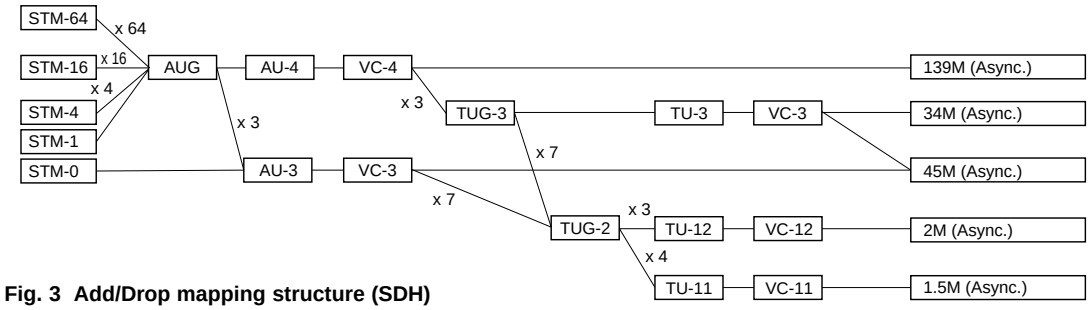


Fig. 3 Add/Drop mapping structure (SDH)

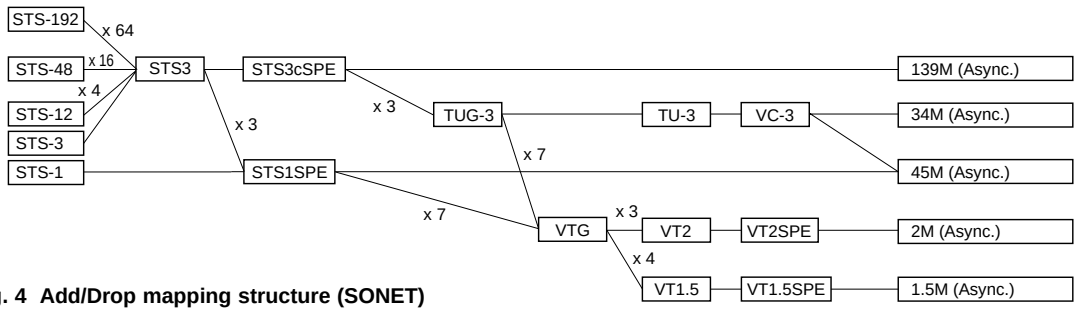


Fig. 4 Add/Drop mapping structure (SONET)

• MP0111A Optical 156M/622M (1.31) Unit

Transmit	Bit rate: 155.52, 622.08 Mbit/s (NRZ) Wavelength: 1310 nm Output level: –11.5 dBm ±3.5 dB Optical safety: IEC 825-1 Class 1, 21CFR1040.10 Class I Connector: FC-PC (SMF)
Receive	Bit rate: 155.52, 622.08 Mbit/s (NRZ) Sensitivity 156M: –33 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) 622M: –28 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) Connector: FC-PC (SMF) Power measurement Measurement range: –30 to 0 dBm (peak power) Accuracy: ≤±1 dB (–20 dBm) Linearity: ≤±1 dB (–30 to 0 dBm)

• MP0112A Optical 156M/622M (1.55) Unit

Transmit	Bit rate: 155.52, 622.08 Mbit/s (NRZ) Wavelength: 1550 nm Output level: –5 dBm ±2 dB Optical safety: IEC825-1 Class 1, 21CFR1040.10 Class I Connector: FC-PC (SMF)
Receive	Bit rate: 155.52, 622.08 Mbit/s (NRZ) Sensitivity 156M: –33 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) 622M: –28 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) Connector: FC-PC (SMF) Power measurement Measurement range: –30 to 0 dBm (peak power) Accuracy: ≤±1 dB (–20 dBm) Linearity: ≤±1 dB (–30 to 0 dBm)

• MP0113A Optical 156M/622M (1.31/1.55) Unit

Transmit	Bit rate: 155.52, 622.08 Mbit/s (NRZ) Wavelength: 1310/1550 nm Output level 1.31 µm: –11.5 dBm ±3.5 dB, 1.55 µm: –5 dBm ±2 dB Optical safety: IEC825-1 Class 1, 21CFR1040.10 Class I Connector: FC-PC (SMF)
Receive	Bit rate: 155.52, 622.08 Mbit/s (NRZ) Sensitivity 156M: –33 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) 622M: –28 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) Connector: FC-PC (SMF) Power measurement Measurement range: –30 to 0 dBm (peak power) Accuracy: ≤±1 dB (–20 dBm) Linearity: ≤±1 dB (–30 to 0 dBm)

• MP0105A CMI Unit

Transmit	Bit rate: 155.52 Mbit/s, Level: 1 ±0.1 V, Connector: BNC (75 Ω)
Receive	Bit rate: 155.52 Mbit/s Level: 1 ±0.1 V (0 to 12 dB, with $\sqrt{f}$ auto correction and monitor function) Connector: BNC (75 Ω)

• MP0108A NRZ Unit

Transmit	Bit rate: 155.52, 622.08 Mbit/s Level: ECL Connector (data, clock): SMA (50 Ω)
Receive	Bit rate: 155.52, 622.08 Mbit/s Level: ECL (–2 V) Connector (data, clock): SMA (50 Ω)

• MP0122B 1.5/45/52/52 (1.31) Unit

Optical interface

Transmit	Bit rate: 51.84 Mbit/s (NRZ) Wavelength: 1310 nm Output level: –11.5 dBm ±3.5 dB Optical safety: IEC 825-1 Class 1, 21CFR1040.10 Class I Connector: FC-PC (SMF)
Receive	Bit rate: 51.84 Mbit/s (NRZ) Sensitivity 52M: –33 to –8 dBm (test pattern: PRBS 2^{23} – 1, BER 10^{-10}, +10˚ to +40˚C) Connector: FC-PC (SMF) Power measurement Measurement range: –30 to 0 dBm (peak power) Accuracy: ≤±1 dB (–20 dBm) Linearity: ≤±1 dB (–30 to 0 dBm) Monitor input Level: 0.1 to 1.0 Vp-p (AC), Connector: SMA (50 Ω)

• MU150008A/150009A/150010A 2.5G Unit

Bit rate	2488.32 Mbit/s (NRZ)
Optical output	Wavelength: 1310 nm (MU150008A), 1550 nm (MU150009A), 1310/1550 nm (MU150010A) Output level: –4 dBm ±3 dB Optical safety: IEC825-1 Class 3A, 21CFR1040.10 Class IIIb Connector: FC-PC (SMF)
Optical input	Sensitivity Narrow: –28 to –9 dBm (BER 10^{-10}, +10˚ to +30˚C), –27 to –9 dBm (BER 10^{-10}, 0˚ to +30˚C) Wide: –20 to –9 dBm (BER 10^{-10}, +10˚ to +40˚C) Connector: FC-PC (SMF) Power measurement Range: –30 to –9 dBm (peak power) Accuracy: ≤±2 dB (–20 dBm) Linearity: ≤±2 dB (–30 to –9 dBm)
Electrical I/O	Transmit (NRZ) Level: ECL (–2 V), Connector (data, clock): SMA (50 Ω) Receive (NRZ) Level: ECL (–2 V), Connector (data, clock): SMA (50 Ω) Monitor input Level: 0.1 to 1.0 Vp-p (AC), Connector (data): SMA (50 Ω)
Auxiliary interface	External clock input, receive clock output, sync. output

• MU150000A 2.5G/10G Unit

Bit rate	9953.28, 2488.32 Mbit/s (NRZ)
Electrical I/O	Transmit (NRZ) Level Data H: 0 to –0.2 V, Data L: –0.85 to –1.4 V Clock H: 0 to –0.2 V, Clock L: –0.85 to –1.3 V Connector (data, clock): SMA (50 Ω) Receive (NRZ) Level Data: 0.65 to 1.4 Vp-p, Clock: 0.65 to 1.3 Vp-p Connector (data, clock): SMA (50 Ω)
Auxiliary interface	External clock input, internal clock output, receive clock output,156M sync. output

• MU150001A/B Optical 10G Tx (1.55) Unit

Bit rate	9953.28, 2488.32 Mbit/s (Option)
Optical output	Wavelength: 10G: 1550 nm band 2.5G: 1310 nm band (Option 01), 1550 nm band (Option 02), 1310/1550 nm band (Option 03) Output level: –4 dBm ±3 dB Optical safety: IEC825-1 Class 3A, 21CFR1040.10 Class IIIb Connector: FC-PC (SMF)
Electrical input	Data input H: 0 to –0.2 V, L: –0.85 to –1.4 V Clock input H: 0 to –0.2 V, L: –0.85 to –1.3 V Connector: SMA 50 Ω

• MU150002A Optical 10G Rx (Narrow) Unit

Bit rate	9953.28, 2488.32 Mbit/s (Option 01)
Optical input	Sensitivity 10G: –13 to –3 dBm (BER 10^{-12}, NRZ, mark ratio: 1/2, PRBS: 2^{31} – 1) 2.5G: –29 to –10 dBm (BER 10^{-11}, NRZ, mark ratio: 1/2, PRBS: 2^{23} – 1) (Option 01) Connector: FC-PC (SMF) Power measurement Range:–16 to 0 dBm (10G, average power), –30 to –10 dBm (2.5G, average power) Accuracy: ≤±2 dB (10G, –10 dBm), ≤±2 dB (2.5G, –20 dBm) Linearity: ≤±2 dB (10G, –16 to 0 dBm), ≤±2 dB (2.5G, –30 to –10 dBm)
Electrical output	Data output: 0.65 to 1.4 Vp-p Clock output: 0.65 to 1.3 Vp-p Connector: SMA 50 Ω

• MU150031A/C Optical 10G Tx (1.55) High Power Unit

Bit rate	MU150031A: 9953.28 Mbit/s MU150031C: 9953.28 Mbit/s, 2488.32 Mbit/s
Optical output	Wavelength: 1525 to 1565 nm Output level: +2 dBm ±2 dB Optical Safety: IEC825-1 (Class 3A), 21CFR1040.10 (Class IIIb) Connector: FC-PC (SMF)
Electrical input	Data input H: 0 to –0.2 V, L: –0.85 to –1.4 V Clock input H: 0 to –0.2 V, L: –0.85 to –1.3 V Connector: SMA (50 Ω)

• MU150061A/B Optical 10G Tx (1.31) Unit

Bit rate	MU150061A: 9953.28 Mbit/s MU150061B: 9953.28 Mbit/s, 2488.32 Mbit/s
Optical output	Wavelength: 1290 to 1330 nm Output level: +3 dBm ±2 dB Optical Safety: IEC825-1 (Class 3A), 21CFR1040.10 (Class IIIb) Connector: FC-PC (SMF)
Electrical input	Data input H: 0 to –0.2 V, L: –0.85 to –1.4 V Clock input H: 0 to –0.2 V, L: –0.85 to –1.3 V Connector: SMA (50 Ω)

• MU150017A/B Optical 10G Rx (Wide) Unit

Bit rate	MU150017A: 9953.28 Mbit/s ±100 ppm MU150017B: 9953.28 Mbit/s ±100 ppm, 2488.32 Mbit/s ±100 ppm
Optical output	Wavelength 10G: 1550 nm band, 2.5G: 1310/1550 nm band (MU150017B) Sensitivity: –11 to –3 dBm (10G BER10^{-12}, NRZ, VC4-64c, scramble: on, mark ratio: 1/2, PRBS 2^{23} – 1 –15 to –3 dBm (2.5G BER10^{-12}, NRZ, VC4-16c, scramble: on, mark ratio: 1/2, PRBS 2^{23} – 1 Connector: FC-SPC (SMF) Power measurement Range: –16 to –2 dBm (10G, average power), –36 to –2 dBm (2.5G average power) Accuracy: ≤±2 dB
Electrical input	Data output: 0.7 to 1.3 Vp-p Clock output: 0.65 to 1.3 Vp-p Connector: SMA (50 Ω) Output phase: Variable output clock phase according to output data (10G only)

For product ordering information, see pages 3 – 6

Unit	Slot 1	Slot 2	Slot 3	Slot 4/5	Front
MP0121A 2/8/34/139/156M Unit	√				
MP0122A 1.5/45/52M Unit	√*	√			
MP0122B 1.5/45/52/52M (1.31) Unit	√*	√			
MP0123A ATM Unit			√		
MU150005A 2/8/34/139M, 156/622M Jitter Unit				√	
MU150006A 1.5/45/52M, 156/622M Jitter Unit				√	
MU150007A 2/8/34/139M, 1.5/45/52M, 156M/622M Jitter Unit				√	
MP0111A Optical 156/622M (1.31) Unit					√
MP0112A Optical 156/622M (1.55) Unit					√
MP0113A Optical 156/622M (1.31/1.55) Unit					√
MU150008A 2.5G (1.31) Unit		√			
MU150009A 2.5G (1.55) Unit		√			
MU150010A 2.5G (1.31/1.55) Unit		√			
MU150011A 2.5G Jitter Unit			√		
MP0131A Add/Drop Unit	√	√			
MU150000A 2.5G/10G Unit				√	
MU150001A/B Optical 10G Tx (1.55) Unit			√		
MU150002A Optical 10G Rx (Narrow) Unit		√			
MP0105A CMI Unit					√
MP0108A NRZ Unit					√
MU150031A/C Optical 10G Tx (1.55) High Power Unit			√		
MU150061A/B Optical 10G Tx (1.31) Unit			√		
MU150017A/B Optical 10G Rx (Wide) Unit		√			

Note: The same model name units can not be used simultaneously with inserted them in to the plural slots. Only one unit is usable at a time.

*: MP0122A/B can not insert in to slot 1 when MP0123A is inserted in to Slot 3

Ordering information

Please specify model/order number name and quantity when ordering.

Model/Order No.	Name	
	Main frame	
MP1570A*1	SONET/SDH/PDH/ATM Analyzer	
	Standard accessories	
	AC power cord:	1 pc
Z0169	Printer paper (5 rolls/pack):	1 pack
F0079	Fuse, 10 A:	2 pcs
B0329G	Front cover:	1 pc
Z0486	Side cover:	1 pc
J0907Q	Remote interlock cord (for MU150001A/B, MU150008A, MU150009A, MU150010A, MU150031A/C, MU150061A/B):	1 pc
J0908	Remote interlock terminator (for MU150001A/B, MU150008A, MU150009A, MU150010A, MU150031A/C, MU150061A/B):	1 pc
E0008A	Optical output control key (for MU150001A/B, MU150008A, MU150009A, MU150010A, MU150031A/C, MU150061A/B):	2 pcs
J0747A	Fixed optical attenuator (5 dB, for MU150017A/B):	1 pc
J0747B	Fixed optical attenuator (10 dB, for MU150002A):	1 pc
J0900A	Coaxial cable (AA-165-200), 20 cm (for MU150011A):	2 pcs
J0635A	Optical fiber cable (FC · PC-FC · PC), 1 m (for MU150002A, MU150008A, MU150009A, MU150010A, MU150017A/B):	1 pc
MX150001B	Wander (MTIE, TDEV) Measurement Application Software (supplied with MU150005A-02, MU150006A-02, MU150007A-02):	1 pc
W1719AE	MP1570A operation manual (Vol. 1 Basic operation for SDH):	1 copy
W1720AE	MP1570A operation manual (Vol. 1 Basic operation for SONET):	1 copy
W1721AE	MP1570A operation manual (Vol. 2 Remote control):	1 copy
W1722AE	MP1570A operation manual (Vol. 3 ATM measurement):	1 copy
W1723AE	MP1570A operation manual (Vol. 4 2.5G/10G measurement):	1 copy
W1724AE	MP1570A operation manual (Vol. 5 Add/Drop function):	1 copy
W1725AE	MP1570A operation manual (Vol. 6 Jitter/wander measurement, for MU150005A/150006A/150007A):	1 copy
W1726AE	MP1570A operation manual (Vol. 7 2.5G jitter/wander measurement, for MU150011A):	1 copy
W1763AE	Wander (MTIE, TDEV) APPLI SOFT manual (supplied with MX150001B):	1 copy
J1002A	Semi-rigid cable (for MU150001A/B, MU150031A/C, MU150061A/B):	2 pcs
J1002B	Semi-rigid cable (for MU150002A, MU150017A/B):	2 pcs
J1002C	Semi-rigid cable (for MU150000A):	3 pcs
	Plug-in units	
MP0121A	2/8/34/139/156M Unit	
MP0122A	1.5/45/52M Unit	
MP0122B*2	1.5/45/52/52M (1.31) Unit	
MP0123A	ATM Unit	
MU150008A*2	2.5G (1.31) Unit (with optical power meter)	
MU150009A*2	2.5G (1.55) Unit (with optical power meter)	
MU150010A*2	2.5G (1.31/1.55) Unit (with optical power meter)	
MP0131A	Add/Drop Unit	
MU150000A	2.5G/10G Unit	
MU150001A*2	Optical 10G Tx (1.55) Unit (2 km transmission)	
MU150001B*2	Optical 10G Tx (1.55) Unit (40 km transmission)	
MU150002A*2	Optical 10G Rx (Narrow) Unit (with optical power meter)	
MP0111A*2	Optical 156M/622M (1.31) Unit (with optical power meter)	
MP0112A*2	Optical 156M/622M (1.55) Unit (with optical power meter)	
MP0113A*2	Optical 156M/622M (1.31/1.55) Unit (with optical power meter, 1.31/1.55 switchable)	
MU150017A	Optical 10G Rx (Wide) Unit	
MU150017B	Optical 2.5G/10G Rx (Wide) Unit	
MU150031A	Optical 10G Tx (1.55) High Power Unit	
MU150031C	Optical 2.5G/10G Tx (1.55) High Power Unit	
MU150061A	Optical 10G Tx (1.31) Unit	

Continued on next page

Model/Order No.	Name
MU150061B	Optical 2.5G/10G Tx (1.31) Unit
MU150005A	2/8/34/139M, 156/622M Jitter Unit [jitter generation/ measurement only (requires MP0121A)]
MU150006A	1.5/45/52M, 156/622M Jitter Unit [jitter generation/ measurement only (requires MP0122A/B)]
MU150007A	2/8/34/139M, 1.5/45/52M, 156/622M Jitter Unit [jitter generation/measurement only (requires MP0121A or MP0122A/B)]
MU150011A	2.5G Jitter Unit [jitter generation/measurement only (requires MU150008A/150009A or MU150010A)]
MP0105A	CMI Unit
MP0108A	NRZ Unit
	Options
MP1570A-01*3	RS-232C
MP1570A-02*3	GPIB
MP1570A-03*3	Ethernet
MP1570A-04*3	VGA output
MP1570A-06	MUX/DEMUX (2/8/34/139 Mbit/s, for MP0121A)
MP1570A-07	MUX/DEMUX (1.5/45 Mbit/s, for MP0122A/B)
MP1570A-08	45M-2M MUX/DEMUX (requires MP0121A and MP0122A/B)
MP1570A-09	Japan mapping (requires MP0122A or MP0122B)
MP1570A-10*1	SDH
MP1570A-11*1	SONET
MP1570A-13	Frame memory capture (156M/622M, 64 frame)
MP1570A-14	IP-over-SONET/SDH (requires MP1570A-13)
MP1570A-15	IP-over-ATM (requires MP0123A)
MP1570A-22	K1/K2 overwrite through
MU150005A-02	Wander measurement
MU150006A-02	Wander measurement
MU150007A-02	Wander measurement
MU150005A-03	Wander reference output
MU150006A-03	Wander reference output
MU150007A-03	Wander reference output
MU150008A-01	Frame memory capture (2.5G, 64 frame)
MU150009A-01	Frame memory capture (2.5G, 64 frame)
MU150010A-01	Frame memory capture (2.5G, 64 frame)
MU150000A-01	Frame memory capture (2.5G/10G, 26 frame)
MU150001A/B-01	2.5G (1.31)
MU150001A/B-02	2.5G (1.55)
MU150001A/B-03	2.5G (1.31/1.55)
MU150002A-01	2.5G
MU150002A-04	Available for 10G (1.31)
MP0111A/0112A-37	FC connector (replaceable, 2 sets)
MP0111A/0112A-38	ST connector (replaceable, 2 sets
MP0111A/0112A-39	DIN connector (replaceable, 2 sets)
MP0111A/0112A-40	SC connector (replaceable, 2 sets)
MP0111A/0112A-43	HMS-10/A connector (replaceable, 2 sets)
MP0113A-37	FC connector (replaceable, 3 sets)
MP0113A-38	ST connector (replaceable, 3 sets)
MP0113A-39	DIN connector (replaceable, 3 sets)
MP0113A-40	SC connector (replaceable, 3 sets)
MP0113A-43	HMS-10/A connector (replaceable, 3 sets)
MP0122B-37	FC connector (replaceable, 2 sets)
MP0122B-38	ST connector (replaceable, 2 sets)
MP0122B-39	DIN connector (replaceable, 2 sets)
MP0122B-40	SC connector (replaceable, 2 sets)
MP0122B-43	HMS-10/A connector (replaceable, 2 sets)
MU150008A-37	FC connector (replaceable, 2 sets)
MU150008A-38	ST connector (replaceable, 2 sets)
MU150008A-39	DIN connector (replaceable, 2 sets)
MU150008A-40	SC connector (replaceable, 2 sets)

Model/Order No.	Name
MU150008A-43	HMS-10/A connector (replaceable, 2 sets)
MU150009A-37	FC connector (replaceable, 2 sets)
MU150009A-38	ST connector (replaceable, 2 sets)
MU150009A-39	DIN connector (replaceable, 2 sets)
MU150009A-40	SC connector (replaceable, 2 sets)
MU150009A-43	HMS-10/A connector (replaceable, 3 sets)
MU150010A-37	FC connector (replaceable, 3 sets)
MU150010A-38	ST connector (replaceable, 3 sets)
MU150010A-39	DIN connector (replaceable, 3 sets)
MU150010A-40	SC connector (replaceable, 3 sets)
MU150010A-43	HMS-10/A connector (replaceable, 3 sets)
MU150001A/B-37	FC connector (replaceable, 1 set)
MU150001A/B-38	ST connector (replaceable, 1 set)
MU150001A/B-39	DIN connector (replaceable, 1 set)
MU150001A/B-40	SC connector (replaceable, 1 set)
MU150001A/B-43	HMS-10/A connector (replaceable, 1 set)
MU150002A-37	FC connector (replaceable, 1 set)*4
MU150002A-38	ST connector (replaceable, 1 set)*4
MU150002A-39	DIN connector (replaceable, 1 set)*4
MU150002A-40	SC connector (replaceable, 1 set)*4
MU150002A-43	HMS-10/A connector (replaceable, 1 set)*4
MU150017A/B-37	FC connector (user replaceable, 1 set)
MU150017A/B-38	ST connector (user replaceable, 1 set)
MU150017A/B-39	DIN connector (user replaceable, 1 set)
MU150017A/B-40	SC connector (user replaceable, 1 set)
MU150017A/B-43	HMS-10/A connector (user replaceable, 1 set)
MU150031A/C-37	FC connector (user replaceable, 1 set)
MU150031A/C-38	ST connector (user replaceable, 1 set)
MU150031A/C-39	DIN connector (user replaceable, 1 set)
MU150031A/C-40	SC connector (user replaceable, 1 set)
MU150031A/C-43	HMS-10/A connector (user replaceable, 1 set)
MU150061A/B-37	FC connector (user replaceable, 1 set)
MU150061A/B-38	ST connector (user replaceable, 1 set)
MU150061A/B-39	DIN connector (user replaceable, 1 set)
MU150061A/B-40	SC connector (user replaceable, 1 set)
MU150061A/B-43	HMS-10/A connector (user replaceable, 1 set)
	Maintenance service*5
MP1570A-90	Extended three year warranty service
MP0121A-90	Extended three year warranty service
MP0122A-90	Extended three year warranty service
MP0122B-90	Extended three year warranty service
MP0123A-90	Extended three year warranty service
MU150005A-90	Extended three year warranty service
MU150006A-90	Extended three year warranty service
MU150007A-90	Extended three year warranty service
MU150008A-90	Extended three year warranty service
MU150009A-90	Extended three year warranty service
MU150010A-90	Extended three year warranty service
MU150011A-90	Extended three year warranty service
MU150000A-90	Extended three year warranty service
MU150001A-90	Extended three year warranty service
MU150001B-90	Extended three year warranty service
MU150002A-90	Extended three year warranty service
MP0111A-90	Extended three year warranty service
MP0112A-90	Extended three year warranty service
MP0113A-90	Extended three year warranty service
MP0105A-90	Extended three year warranty service
MP0108A-90	Extended three year warranty service
MU150017A/B-90	Extended three year warranty service
MU150031A/C-90	Extended three year warranty service
MU150061A/B-90	Extended three year warranty service

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Model/Order No.	Name
	Application equipment
MP1777A	10 GHz Jitter Analyzer
MP9677B	E/O, O/E Converter
MU967701A	Clock Recovery Unit (9.95328 Gbit/s)
MP1580A	Portable 2.5G/10G Analyzer
MU150018A	2.5G/10G Jitter Unit (for MP1580A)
	Optional accessories
MN9320A	Optical Channel Drop Unit (OCD)
MX150001B	Wander (MTIE, TDEV) Measurement Application Software (supplied with MU150005A-02/150006A-02/150007A-02)
J0796A	ST connector (replaceable, with protective caps, 1 set)
J0796B	DIN connector (replaceable, with protective caps, 1 set)
J0796C	SC connector (replaceable, with protective caps, 1 set)
J0796D	HMS-10/A connector (replaceable, with protective caps, 1 set)
J0796E	FC connector (replaceable, with protective caps, 1 set)
J0162A	Balanced cable, 1 m (Siemens 3p-Siemens 3p)
J0162B	Balanced cable, 2 m (Siemens 3p-Siemens 3p)
J0845A	Balanced cable, 6 ft (BANTAM 3P/BANTAM 3P)
J0775D	Coaxial cable (BNC-P620 · 3C-2WS · BNC-P620, 75 Ω), 2 m
J0776D	Coaxial cable (BNC-P-3W · 3D-2W · BNC-P-3W, 50 Ω), 2 m
J0898A	Conversion cable (M-1PS · BANTAM 3P), 1 m
J0898B	Conversion cable (M-1PS · BANTAM 3P), 2 m
J0635A	Optical fiber cable, 1 m (SM, FC-SPC connector both ends)
J0635B	Optical fiber cable, 2 m (SM, FC-SPC connector both ends)
J0635C	Optical fiber cable, 3 m (SM, FC-SPC connector both ends)
J0660A	Optical fiber cable, 1 m (SM, SC connector, both-ends)
J0660B	Optical fiber cable, 2 m (SM, SC connector, both-ends)
J0660C	Optical fiber cable, 3 m (SM, SC connector, both-ends)
J0756A	Optical fiber cable, 1 m (SM, ST connector, both-ends)
J0756B	Optical fiber cable, 2 m (SM, ST connector, both-ends)
J0756C	Optical fiber cable, 3 m (SM, ST connector, both-ends)
J0747A	Fixed optical attenuator (5 dB)
J0747B	Fixed optical attenuator (10 dB)
J0747C	Fixed optical attenuator (15 dB)
J0747D	Fixed optical attenuator (20 dB)
J1049A	Fixed optical attenuator, SC (5 dB)
J1049B	Fixed optical attenuator, SC (10 dB)
J1049C	Fixed optical attenuator, SC (15 dB)
J1049D	Fixed optical attenuator, SC (20 dB)
J1050A	Fixed optical attenuator, ST (5 dB)
J1050B	Fixed optical attenuator, ST (10 dB)
J1050C	Fixed optical attenuator, ST (15 dB)
J1050D	Fixed optical attenuator, ST (20 dB)
J0322B	Coaxial cable (11SMA · SUCOFLEX104 · 11SMA), 1 m
J0008	GPIB cable, 2 m
A0006	Head set
B0453B	Blank panel (for front slot)
B0454C	Blank panel (for slot 1 to 3)
B0454D	Blank panel (for slot 4/5)
B0448	Soft case
B0336C	Carrying case

∗1: Must specify SDH (Option 10) or SONET (Option 11) when ordering depends on your system. The option price is included in the MP1570A. These two options can be installed simultaneously. But in this case, one option price is charged.
∗2: Specify the connector to be supplied as the standard connector when ordering the above options. If the connector is not specified the FC connector (MP0111A/0112A/0113A/0122B-37, MU150008A/150009A/150010A/150001A/150001B/150002A-37) is supplied as standard.
∗3: The video output, RS-232C, GPIB and Ethernet options cannot all be used simultaneously. Only the video output + RS-232C, or video output + GPIB, or RS-232C + GPIB board, or Ethernet board combinations support simultaneous use, so change the board combinations according to the purpose.
∗4: With Option 01, 2 sets
∗5: Please ask your local Anritsu Field Office or Sales. Representative for price and availability.

The units for MP1552A/B and MP1555A/B can be used with MP1570A.