Product Introduction

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MP1595A 40G SDH/SONET Analyzer

MP1595A 40G SDH/SONET Analyzer Product Introduction

Anritsu Corporation

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What is MP1595A?

- With the rapid spread of high-speed broadband networks offering triple-play services, FMC, etc., core networks are moving to 40G. Anritsu's MP1595A is a next-generation 40G SDH/SONET Analyzer that builds on Anritsu's broad experience in SDH/SONET Analyzer technologies. It is an all-in-one solution supporting all measurements required for evaluation of 40G SDH/SONET/OTN networks and equipment.
- Supports new 40G I/F while keeping familiar GUI and operability of popular MP1590B for 10G SDH/SONET/OTN equipment
- Adding the MP1595A jitter modules support 40/43G jitter/wander generation and analysis as well as conventional SDH, SONET and OTN frame evaluation.



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What is MP1595A?

- 1-Box Analyzer for STM-256/STS-768, OTU-3
- SDH/SONET/PDH/DSn/OTN support from 1.5Mbit/s to 10.7Gbit/s
- Error and alarm insertion/detection and in-service monitoring
- Jitter and Wander Configurations Available



MP1595A 40G SDH/SONET Analyzer

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USB x 2, PS/2 Keyboard Connectors

Dimensions: 320(W) x 221(H) x 350(D) mm Weight: 14 kg max. (excl. measurement units)

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Supported Bit Rates

- 1.5 Mbit/s 43 Gbit/s
 - G SDH/SONET: STM-0/STS-1 to STM-256/STS-768
 - GOTN: OTU1/OTU2/OTU3
 - **PDH:** E1/E2/E3/E4
 - **DSn:** DS1/DS3
 - **□** Non Frame: Setting supported for all above bit rates

Mapping (40/43G)

40G

□ VC4*256c/STS768c, VC4*64c/STS192c, VC4*16c/STS48c, VC4*4c/STS12c

G Supports Low Order mapping in combination with MU150100A

◆ 43G

🖫 OTU3, ODTU23





Supported Specification ITU-T 0.172/0.173



Wander Measurement	
Measurement Item	

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Error/Alarm insertion and detection

- Monitoring
- APS Measurement
- **Frame memory/capture**
- Through mode
- Delay time measurement
- **Jitter / Wander Measurement**





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Application Examples (1/7)

Error/Alarm Insertion

- Inserts Errors, such as FAS, BIP-8, and B1/B2/B3, as well as Alarms, such as LOF, LOM, AIS
- Supports selection of various insertion timings, such as Rate, Alternative, Single, Burst, All, and Frame
- Specifies error bit insertion position for B1/B2/B3, and BIP-2 errors

Error/Alarm Detection

- Count and Rate results at Result screen
- Monitor generation history at Monitor screen



Error Alarm Monitor Screen



Application Examples (2/7)

□ Insert ITU-T 0.182-compliant Random Errors

Evaluates FEC efficiency using ITU-T 0.182-compliant error signal (errors fitting Poisson distribution)



Application Examples (3/7)

Monitoring Functions

Full Line of Versatile Functions for Network Monitoring

- **Error/Alarm monitor**
- **Frequency monitor**
- G Optical Input level monitor
- **Pointer monitor**
- GH Monitor

Error/Alarm and Pointer Monitors Displayed as Graphical Log

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Frequency	Optical Input Level	Pointer
39,813,118,000.0 Hz - 2,000.0 Hz - 0.1 ppm	Type Line (1530-1565)nm (Pause) Wavelength (C (1530-1565)nm (C (1530-1565)nm (C (1530-1565)nm (C (1530-1565)nm (C (1530-1565)nm (C (1530-156))))))))))))))))))))))))))))))))))))	Type AU
Frequency monitor	Copical	Prove Anno Anno Prove The Theory Hanney Anno Printer monitor PTR.PJC

Application Examples (4/7)

□ APS (Automatic Protection Switch) Measurement

Measures equipment circuit switching time with 0.1-ms resolution using any Error/Alarm as trigger

🎉 📃 🌛 Run/Stop 🗦 Alarm	n 🕑 Error 📴 🕅		🗂 History <u>H.Reset</u>	A
🖳 Test menu 🔽	APS test			
APS test Mode				
Test Mode Swit	ching time	•		
Тх Туре	К1/К2	•]	
Sequence 1 to	1 Single	•	► Start	
Alarm	LOF	-	All •	
Error	OFF	•		
Rx Measureme Trigger	nt Repeat Bit error	•]	
			Link Err. Tria	32

APS Measurement Setting Screen

🕻 📃 🕨 Run/Stop 🕨 Alarm 🔛 Error 🛛 🖽 🕅	F History <u>H.Reset</u>
Result APS test	
APS test	
Error free period 10ms	
Measurement:Repeat	
Switch time	
	35.1 ms
Мах	35.1 ms OK
Min	20.1 ms
Average	23.7 ms
	Link Err Trig

APS Measurement Results Screen

Application Examples (5/7)

Frame Memory/Capture Function (MU150140A-10)

- Demonstrates usefulness when collecting fault data to reproduce problem
- Frame Memory Function
 - G Set all bytes except B1, B2, HP-B3/B3-P, and Pointer
 - G Set max. of 16 STM-256/STS-768 frames
 - G Set max. of 256 OTU3 frames
- Frame Capture Function
 - G Set any Error/Alarm as trigger
 - G Capture max. of 16 STM-256/STS-768 frames
 - **□** Capture max. of 256 OTU3 frames



Frame Memory Screen

6		B R	un/Stop) 	Narm	🕨 Er	ror	⊞)	1					Г	Histo	<u>۲</u>	Reset	Log E		3 4
An 🛛	alyze	٣			Fran	ne cap	ture(O	IN)	•											
ram	ie ca	pture																		
											Tri	gger	Man	ual			-			
		٩	Cap	ture							F	rame	Man Ext	ual erna	1		≜ ig	ger		
								_					SM- SM-	BIP8 BEI						
	Disp	blay	frame	Tr	igge	r•		1 J	ump		1 7	rigge	ODU PM-	-AIS BIP8						
	1				5					10			РМ-	BEI			-			20
	FAS	FAS	FAS	FAS	FAS	FAS	NFAS	SM	SM	SM	GCC 8	GCC 0	MFA	s=0			•			
1	F6	F6	FG	28	28	28	FD	00	С9	00	00	00	00	00	00	00	FB	63	39	DA
	RES	RES	RES	TCM	TCM6	TCH6	TCH6	TCN5	TCN5	TCM5	TCM4	TCM4	TCM4	FTFL	RES	JC				
2	00	00	00	00	00	С9	01	00	С9	01	00	С9	01	00	00	00	CE	4C	87	в5
	TCR3	TCM3	TCM3	TCM2	TCH2	TCH2	TCH1	TCH1	TCN1	PH	PM	PM	EXP	EXP	RES	JC				
3	00	С9	01	00	С9	01	00	C9	01	00	С9	01	00	00	00	00	E3	40	F8	31
	6001	6001	GCC2	GCC2	APS	APS	APS	APS	RES	RES	RES	RES	RES	RES	PSI	NJO				
4	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	89	93	04	FB
	H4 4																			b 111

Frame Capture Screen



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Application Examples (6/7)

Through Mode Functions

Transparent Mode

G Monitors circuit quality by outputting looped-back received signal

Emulates actual circuit by inputting random errors

OH Overwrite Mode

Goverwrites OH part of received signal with OH specified at MP1595A and outputs signal

☐ Inserts various Errors/Alarms into in-service circuit



Transparent Mode

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Overwrite Mode



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Application Examples (7/7)

Delay Time Measurement

Supports measurement of network transmission delays with µs resolution



×	Run/Stop	👂 Alarm 🌗 Erro	· 🖽 🕷		🗆 History 🔥 H.Reset 🔤 🖶 🤶	7
🛃 Result		Delay			Start 💽 13:11:40 12/Apr/2007	7
Delay						
	Delay	/ time				
	-					
	•		10 µs	Min	10 µs	
				Max	10 µs	

Delay Time Measurement Results

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Other Applications

- OH BERTS Test
- OH Sequence Capture Function
- Pointer Generation Functions
 - NDF, ±Justification, Increment, Decrement
- Path Trace Function



Convenient Functions

Report Function

Outputs settings and results in HTML format



Remote GUI

Remote operation from PC via LAN using same GUI as main frame



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40/43G Jitter/Wander Measurement

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Background

□ Why should jitter be measured?

The spread of 40G networks across many business sectors is driving the need for reliable jitter measurements to assure the interoperability of the various types of network equipment.



Required Test Items

What test is required?

ITU-T and Telcodia define the Jitter/Wander specifications to secure interoperability.

- Jitter Tolerance (G.783,G.825, GR-253, G.8251)
- Jitter Generation (G.7833, GR-253, G.8251)
- Jitter Transfer (G.783, G.825, G.8251)
- Wander Measurement (0.172)

Equipment



Jitter generation standards of network equipment

Equipment	Stondard	Dit roto	Jitter limit	Jitter limit
Equipment	Stanuaru	Dit-rate	Wide-band jitter (Ulpp)	High-band jitter (Ulpp)
OTN	ITU-T G.8251	STM-256	1	0.15
SDH	Telcordia GR-253	OC-768	1.2	0.15
SDH	ITU-T G.783	STM-256	0.3	0.15

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Key feature

- □ All-in-one STM-256, OC-768 and OTU3 optical interfaces
- Anritsu makes a contribution for cutting the test time of equipment and module.
 - ♦ Jitter measurement time: 1/2 ($120sec \rightarrow 60sec$)
 - ♦ Jitter transfer measurement time: 1/5 (230sec → 40sec)
 - Cutting the MTIE measurement time in 1/3
- **Excellent performance by digital phase detector circuit**
 - Good repeatability and jitter sensitivity
 - Wide dynamic range (range free)
- □ Signal Analysis function for R&D and DVT
- **Wander tolerance measurement**
- **Simple & easy to use GUI**

In this document, all of capabilities with options are also described.

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Key feature - All-in-one STM-256, OC-768 and OTU3 optical interfaces -

- The MP1595A new Jitter/Wander solution supports STM-256, OC-768 and OTU3 optical interfaces in one box and supports both Jitter/Wander measurement and SDH/SONET/OTN frame measurement.
- □ No need to change the connection every test items.



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Key feature - High-reliability jitter testing 1 -

- The MP1595A new Jitter/Wander solution performs the internal phase detector and frequency band filter by digital processing circuit instead of conventional analog circuit.
- This contributes high-reliability jitter testing. Moreover, the expanded measurement dynamic range (up to 64UI) eliminates range switching.



Analog PLL and filter is traditional method, but there are some disadvantages.

- Variability of analog filter of each equipment
- Temperature dependence
- Low detection sensitivity of phase detector



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Key feature - High-reliability jitter testing 3 -

Why is digital detection and parallel filter method better?

- High repeatability and reduction in test time of by digital filter
- High detection sensitivity
- Wide dynamic range



Anritsu original

- Parallel jitter measurement can cuts your inspection time
 - Maximum three type of filter can be measured simultaneously.
 - Can confirm the result of jitter measurement each filter in one screen. Easy to compare the jitter amount in each frequency band.



Current UIp-p	0.220	Мах UIp-p	0.280
Current UIp+	0.110	Max UIp+	0.141
Current UIp-	0.110	Max UIp-	0.139
Current UIrms	0.016	Max UIrms	0.020
HP1': 80 kHz - LP: 3	320 MHz		
Current UIp-p	0.240	Max UIp-p	0.301
Current UIp+	0.122	Max UIp+	0.151
Current UIp-	0.118	Max UIp-	0.150
Current UIrms	0.017	Max UIrms	0.022
HP2: 16 MHz - LP: 3	320 MHz		
Current UIp-p	0.134	Мах Шр-р	0.148
Current UIp+	0.065	Max UIp+	0.076
Current UIp-	0.069	Max UIp-	0.072
Current Illems	0.009	Max UIrms	0.010

Jitter Measurement Screen

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Key feature - Reduction of measurement time 2 -



Evaluation of tree Jitter band width at the same time

- When the jitter on client side (G.783) is evaluated, the influence level can be confirmed to network side (G.8251).
- When the jitter on network side (G.8251) is evaluated, the influence level can be confirmed to client side (G.783)



Key feature - Reduction of measurement time 3 -



Jitter Generation Measurement

- ◆ The parallel filter specified by ITU-T, Telcordia can cut the Jitter Measurement time in half (120sec → 60sec).
- Pass/Fail judgment by each filter.



Jitter Tolerance Measurement

Two types of Jitter tolerance measurement are available.

Tolerance Measurement

Measure the maximum jitter tolerant value of DUT.

Fast Tolerance Measurement

Simple test of tolerance. OK/NG judgment for the specification line.



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Key feature - Fast automatic measurement 2 -

Jitter Transfer Measurement

Two types of Jitter Transfer Measurement are available. **Normal Measurement**

Measure the transfer performance by one frequency point.

Fast Transfer Measurement

By using Anritsu unique compound signal, cut the jitter transfer measurement time



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Key feature - Fast automatic measurement 3 -



Given Set Transfer Measurement by multi point jitter modulation

- Fast Jitter Transfer Measurement is a unique method to reduce the test time by combining of two or more sinusoidal waves at the same time.
- ◆ Cutting the Jitter Transfer Measurement time in 1/5 (230sec → 40sec)





Various analysis for the DVT and the trouble shoot

This option displays the demodulated jitter signals in time and frequency sequences. This is used for operations such as component analysis of jitter signals.



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Wander Measurement

Wander Generation and Measurement

□ The wander signal modulated by sinusoidal can be generated. Various type of display are available (TIE, MTIE, TDEV)

Wander Tolerance and Transfer Measurement

□ The wander TDEV tolerance and transfer measurement by applying to both test signal and reference clock signal based on 0.172.



Key feature - Wander Measurement -



The measurement time is shortened to 1/3 (one time) by the MTIE synthesis wander generation function based on 0.172.



Key feature

- Demod. Output (option) and Spectrum Analysis (option)
 - Outputs demodulated jitter analog waveform.
 - In addition, it displays spectrum analysis results on the MP1595A screen without a spectrum analyzer.
- **1/4, 1/16 Clock Output**
 - Outputs 1/4 and 1/16 clock synchronized with Tx clock.
 - This can be used with a sampling scope as a Tx waveform confirmation trigger because this clock is free of jitter modulation.
- 1/64 Clock Output
 - Outputs 1/64 clock synchronized with Tx clock.
 - This can be used as a clock source for a DUT requiring a reference clock because this clock is free of jitter modulation.
- Wideband clock offset
 - ±100 ppm Tx clock offset. In addition, the Rx side supports jitter analysis up to ±100 ppm, supporting DUT frequency tolerance tests.



Key feature - Simple & easy to use GUI -

Setting and result of measurement are shown in one screen.
 The intuitive GUI makes operation easy.



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Modules (1/2)

MU150140A 40G Unit

- 40/43G PPG/ED Unit
- Installed in Slots 5 and 6
- Required for 40/43G measurements

MU150141A 40G Optical Unit MU150141B 40/43G Optical Unit

- 40/43G Optical I/F Unit
- Installed in Slot 4
- At least one required for 40G measurements
- MU150141B required for 43G measurement



MU150140A



MU150141A/B

*MU150141A/B and MU150147A cannot both be installed simultaneously.



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Modules (2/2)

- **MU150100A 10G/10.7G Unit**
 - 1.5 Mbit/s to 10.7 Gbit/s Unit
 - Installed in Slots 1 and 2
 - Required for measurement at less than 10.7G and when using Low Order Mapping at 40G
 - Add/Drop function is disable.
- MU150135A 10/10.7G Optical Unit
 - 10/10.7G Optical I/F Unit
 - Installed in Slot 3
 - Required when using 10/10.7G optical I/F at MU150100A
 - Requires XFP sold separately





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Modules for Jitter/Wander

MU150147A 40/43G Jitter/Wander Unit

- ◆ 40/43G generation and analysis of Jitter/Wander and O/E
- For Slot 1-3



MU150149A 40/43G Optical Unit (TX)

- ◆ 40/43G E/O
- For Slot4



Module configuration

Module configuration



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Modules & Software

Model/Order No.	Name	Note
Main Frame		
MP1595A	40G SDH/SONET Analyzer	
Units/Modules		
MU140140A	40/43G Unit	
MU150141A/B	40/43G Optical Unit	
MU150147A	40/43G Jitter Unit	MU150147A is not compliant with the CE marking EMC (electromagnetic compatibility) regulations.
MU150149A	40/43G Optical Unit(TX)	MU150149A is not compliant with the CE marking EMC (electromagnetic compatibility) regulations.
MU150100A	10/10.7G Unit	
MU150135A	10/10.7G Optical Unit (XFP)	Requires XFP module (sold separately).
Option	-	
MP1595A-01	RS-232C	
MP1595A-02	GPIB	
MP1595A-03	LAN	
MP1595A-004	Clock Source Output for Jitter/Wander	The Jitter and wander measurement must need MP1595A-004/104.
MP1595A-104	Clock Source Output for Jitter/Wander Retrofit	The Jitter and wander measurement must need MP1595A-004/104.
MU150140A-05	OTU3	
MU150140A-06	ODTU23	Requires separate MU150140-05 OTU3 option.
MU150140A-10	Frame Memory/Capture (40/43G)	
MU150147A-001	39.813Gbit/s	MU150147A must need MU150147A-001 and MU150147A-002.
MU150147A-002	43.018Gbit/s	MU150147A must need MU150147A-001 and MU150147A-002.
MU150147A-007	Fast Jitter Transfer Measurement	
MU150147A-008	Demod Signal Analysis	
MU150147A-009	Demod Output	
MU150147A-010	Wander Measurement	
MU150147A-011	Wander Generation	
MU150100A-01	Wavelength 1.31 µm	
MU150100A-02	Wavelength 1.55 µm	
MU150100A-03	Wavelength 1.31/1.55 µm	
MU150100A-04	Optical Output Power Adjustable	
MU150100A-05	OTU1/OTU2	
MU150100A-07	10/10.7G Minus Option	MU150100A-07 factory installed only. MU150100A-07 and MU150100A-09 cannot both be installed simultaneously.
MU150100A-08	10.3G	External clock source is required.
	less set/Extra st	MU150100A-07 factory installed only. MU150100A-07 and MU150100A-09 cannot both be installed
IVIU150100A-09		simultaneously.
Software		
MX159501A	40G SDH/SONET Analyzer Control Software	
MX159508A	Jitter/Wander Measurement Software	Jitter and wander measurement requires MX159508A.

Note

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	077			(7 pors) (4 gN)	Cance) (B tuy) (9 wxyz) (D) (5 jal) (6 mm) (A)	
Screen Copy ECH SDH Alarm Panel Lock LOS	EIP Second * Error Count * Displa 0 • Sync. 0 •	00 00:00:00	CH setting	Objecto Run/Str	2 abc 3 det 4	Tree View
Local LOF OOF AS RDI						History (H.Rest)
				C Test Pa		

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