



Network Master Gigabit Ethernet Tester



Dedicated field test solution for installation and troubleshooting Ethernet links in the access network and mobile backhaul



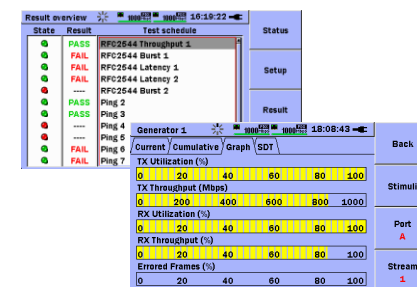
Purpose-built for Testing Ethernet Links

- Perfect solution for installation and commissioning of Ethernet links
 - Compact and handy
- Easy to use
 - Large color screen
 - Test Automator
- Electrical cable test
- Ping test
- Bandwidth verification (RFC2544 and Y.1564 option)
- BER testing
- Traffic generation and reception
- Multistream (option)
- Document your work with PDF and CSV reports



Designed For Highly Portable Field Use

- **Modular**
 - ◆ Field interchangeable modules
- **Highly portable**
 - ◆ Palm-size (190 mm x 98 mm x 48 mm)
 - ◆ Only 700 g
- **Rugged/Sealed design**
 - ◆ No vents or fans
 - ◆ Connector port cover
- **4.3 inch, high resolution color display**
 - ◆ Easy to read indoors or out
- **Dual battery operation**
 - ◆ Rechargeable NiMH or "AA" alkaline



Available 4 x AA Type
NiMH Or **Alkaline**
Dry Batteries

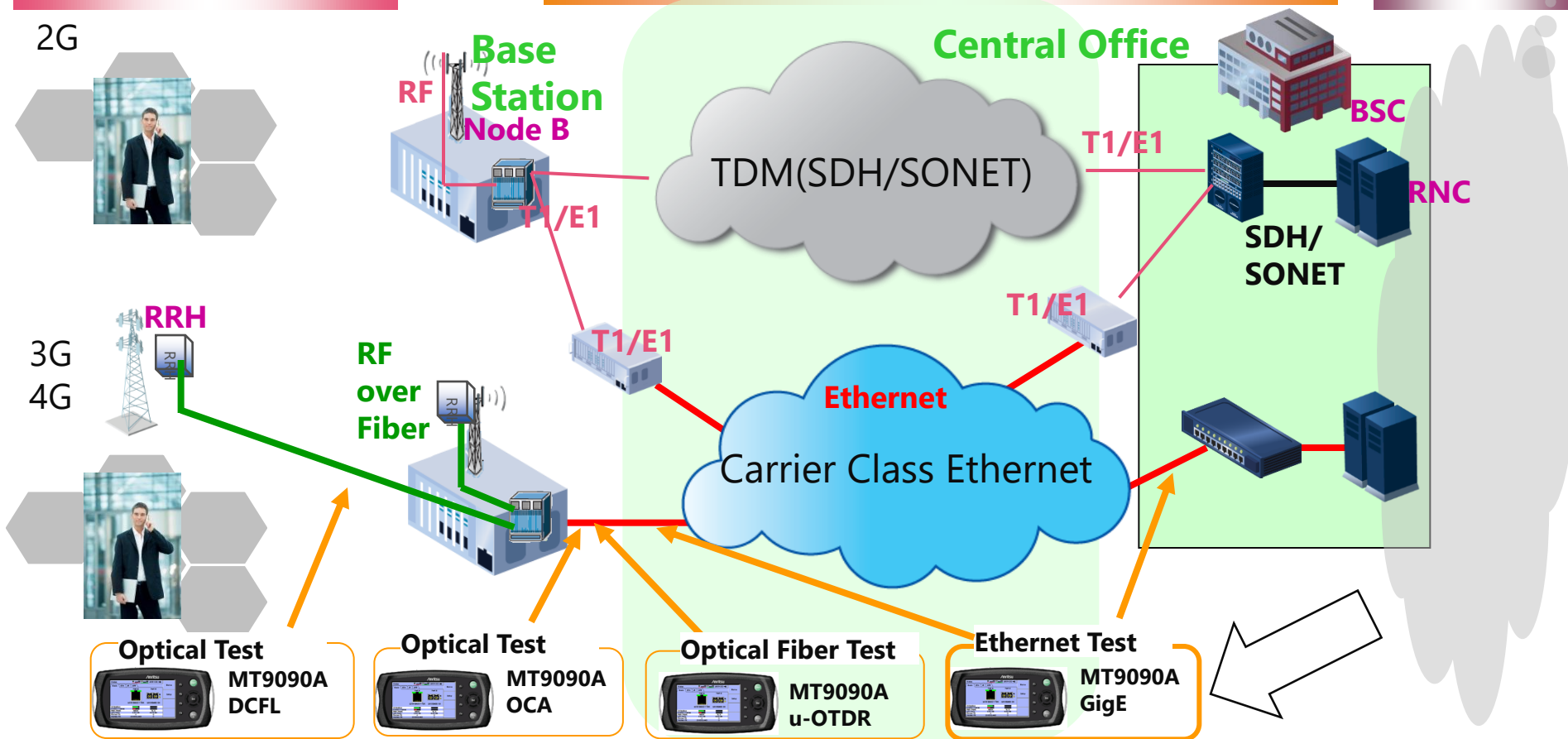


- Mobile backhaul and Carrier Class Ethernet

Cell Sites

Mobile Backhaul

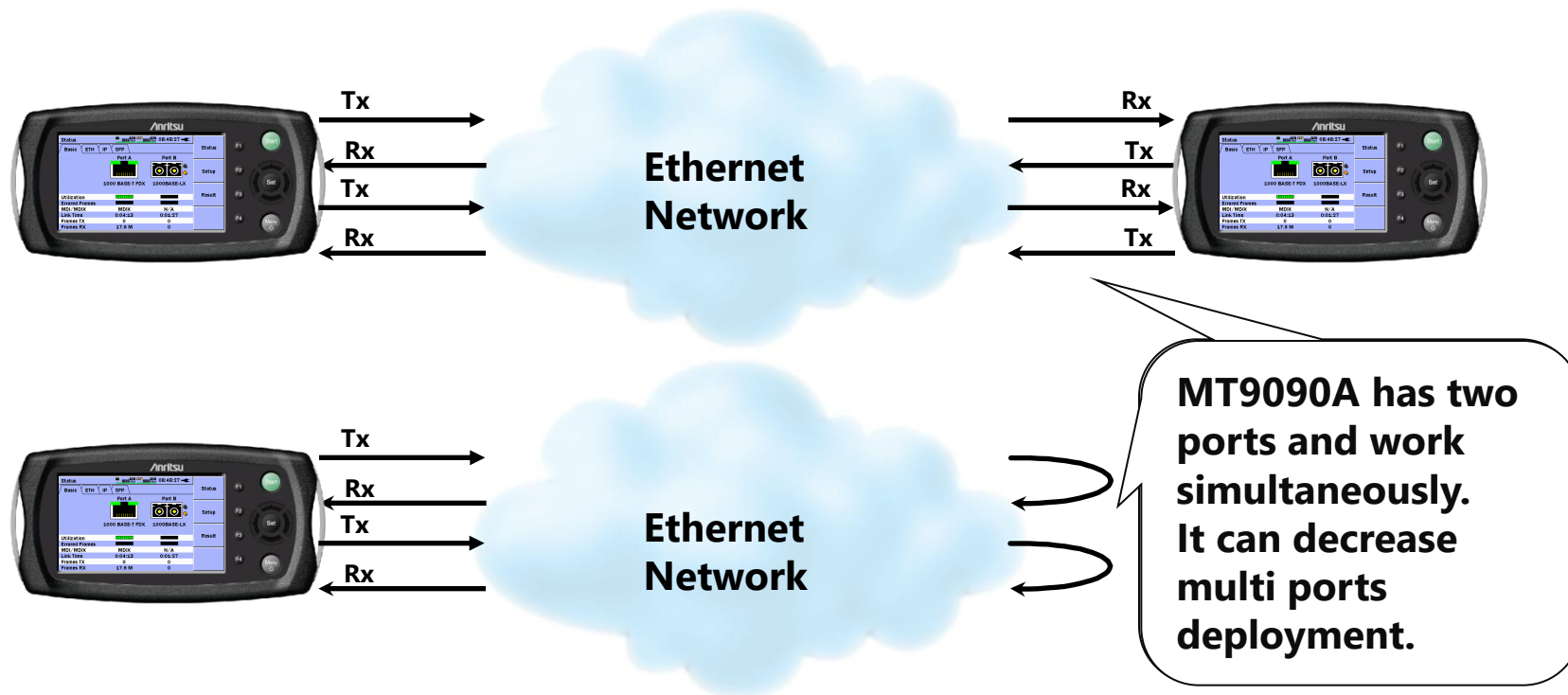
Backbone



Applications – out-of-service testing

Typical applications:

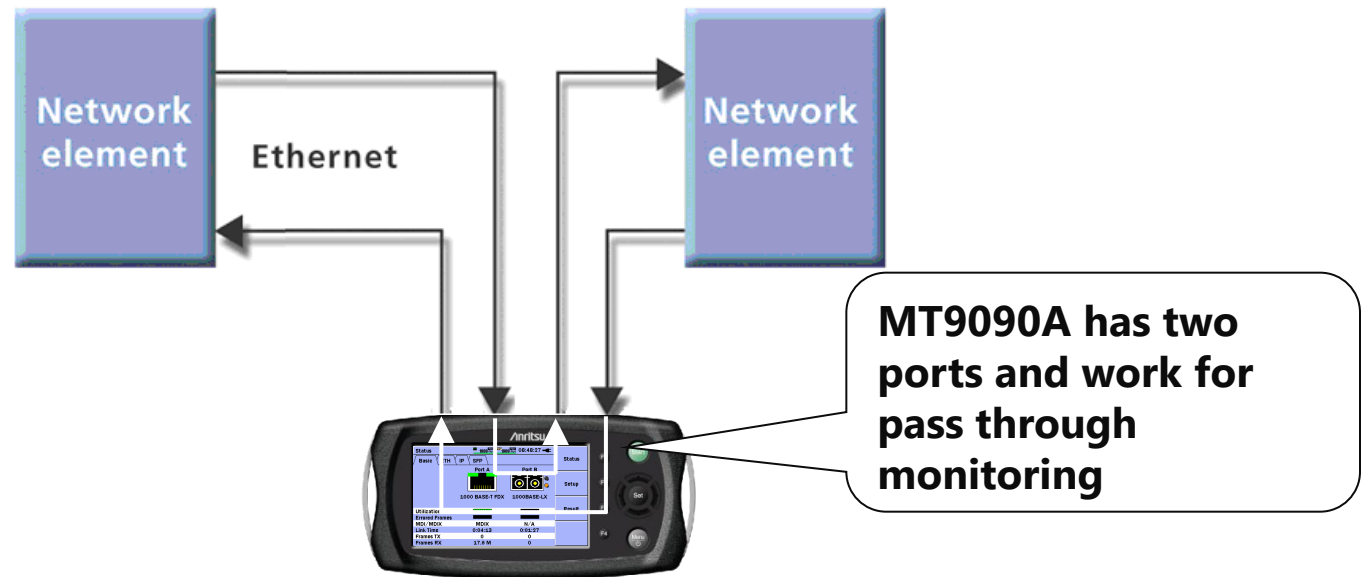
- Installation and commissioning testing.
- QoS verification
- End-to-end testing



Applications – in-service testing

Typical applications with instrument in pass through mode:

- Rapid in-service diagnostics
- In-service troubleshooting
- Live traffic analysis and statistics

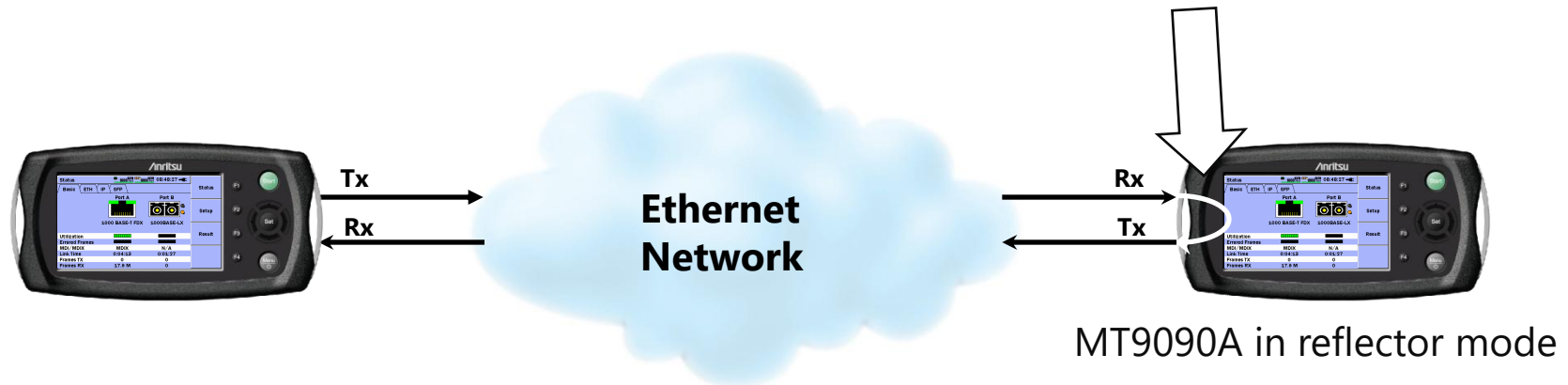


Applications – Loop-back device

Far end loop back for applications like:

- Installation and commissioning testing.
- QoS verification
- End-to-end testing

Instrument in reflector mode



VALUE...without compromise!

Cost-effective installation and maintenance tool

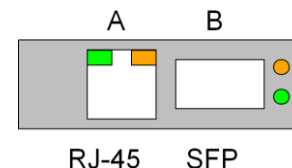
- Soft case, manual, charger, battery are standard
- Complete Ethernet tester with attractive price

User configurable (modular) platform

- 3 configurations
- Optional SFP modules
- SW options

Complete data management

- Automatic result saving
- Internal storage of results
- Easy "drag and drop" transfers to PC
- Data management via Ethernet and Web browser
- Reporting in PDF and CSV format



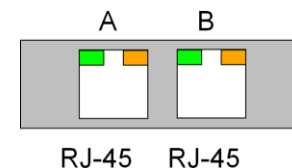
MU909060A1

Ports:

**1xRJ45,
1x SFP**

Highlights:

- **For mixed networks (Optical and Electrical interfaces)**
- **Cost effective**



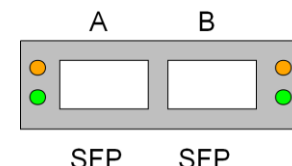
MU909060A2

Ports:

2xRJ45

Highlights:

- **Electrical interfaces only**



MU909060A3

Ports:

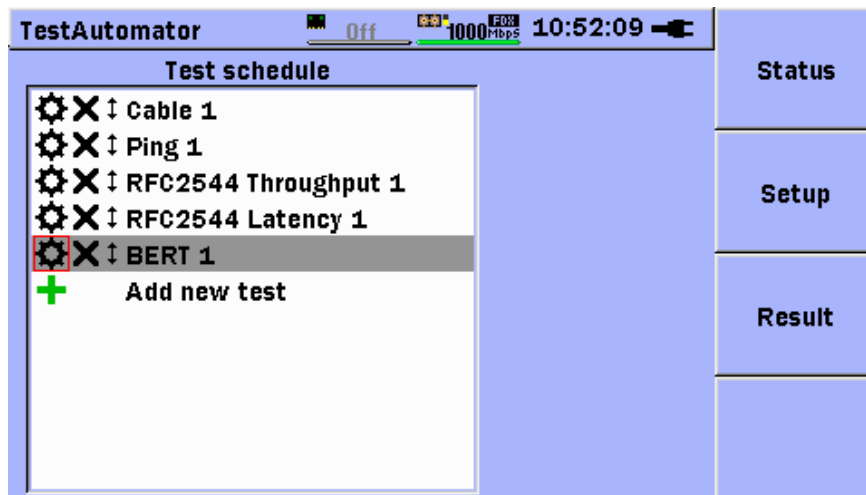
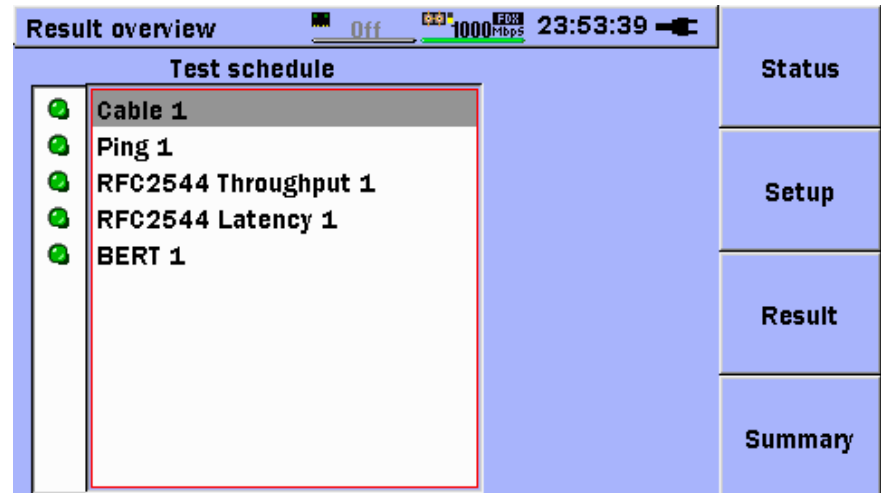
2xSFP

Highlights:

- **Optical and Electrical interfaces**

Test Automator

- Easy and quick execution of a series of tests
- Pass/fail indicators makes it easy to use for any skill level, reducing the need for training.



Channel Stats

Identifying the root cause of network issues,

- Filter streams and monitor up to 63 streams,
 - Errored streams,
 - Top talkers,
 - Network attack.
- Select up to three Filter keys,
 - MAC/IP address,
 - VLAN tag,
 - MPLS label,
 - TCP/UDP port,
 - An more.
- Monitoring values,
 - Frames,
 - Errored frames,
 - Frame size distribution.

The screenshot displays the Anritsu Channel Stats interface, which is used for monitoring network traffic. It is divided into three main sections:

- Filter Keys Section:** This section allows users to define filter keys for monitoring. It includes fields for Key 1 (MAC DST), Key 2 (MAC SRC), and Key 3 (IPv4 SRC). The Mode is set to 'Order of Arrival', Sort On is 'First Key', and the Main Counter is 'Frames'.
- Stream List Section:** This section shows a list of monitored streams. The table below represents the data shown in this section:
- Channel Details Section:** This section provides detailed statistics for a selected channel (Channel 2 of 64).

CH	Frames	MAC SRC
1	88.088 k	Overflow
2	900	00:00:00:00:10:1C
3	900	00:00:00:00:10:1D
4	900	00:00:00:00:10:1E
5	899	00:00:00:00:10:1F
6	899	00:00:00:00:10:20
7	899	00:00:00:00:10:21

Channel: 2 of 64	
MAC SRC	00:00:00:00:10:1C
MAC DST	00:00:00:00:00:01
IPv4 SRC	020.020.020.002
Frames	899
Bits	5.846864 M
Errors	0
[64-127]	26
[128-255]	56
[256-511]	155
[512-1023]	335
[1024-Jumbo]	327
[>Jumbo]	0

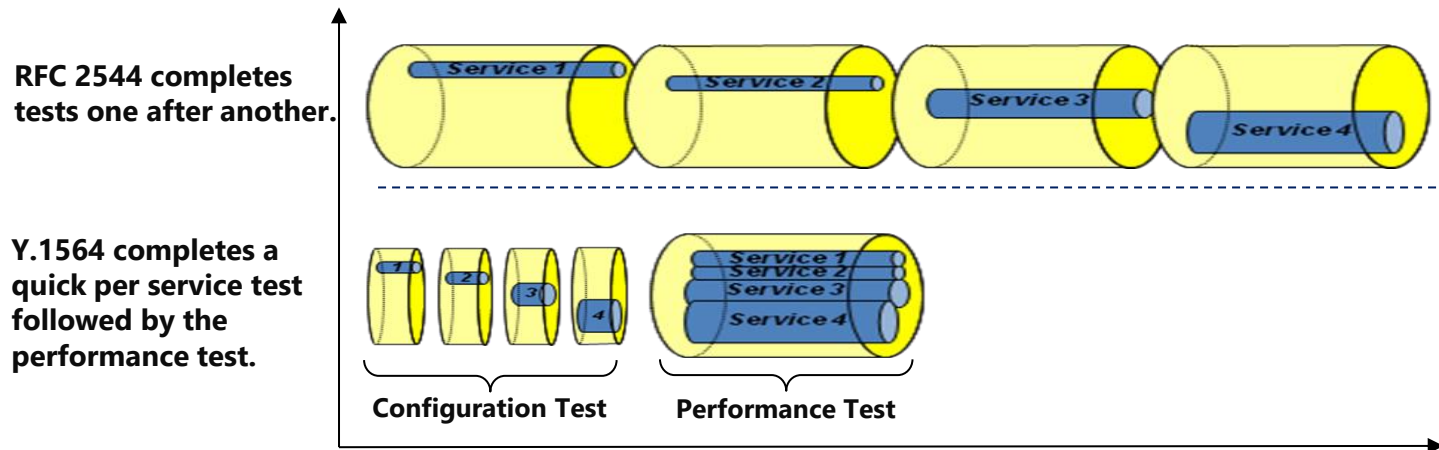
- New methodology to test multiple Ethernet services simultaneously in a network (optional)
- RFC 2544 is the standard commonly used today
 - Originally designed for checking performance of a network device
 - Runs one service at a time,
 - Tests in a serial manner not running all services simultaneously

Comparison of test methodology

Item	ITU-T Y.1564	RFC 2544
Designed for	Service activation	Devices performance
Concurrent services	Multiple services simultaneously	One service at a time
Simulates	A realistic network	One service in a network
Testing time	Short due to simultaneous test / service	Long due to serial nature of test (assuming completed per full standard)
Test result	Directly related to SLA requirements	Link performance limit

ITU-T Y.1564 completes the testing in two phases

- Service Configuration Test
 - Confirm each individual service is configured correctly checking, CIR (Committed Information Rate), EIR (Excess Information Rate), FTD (Frame Transfer Delay), FDV (Frame Delay Variation), FLR (Frame Loss Ratio), CBS (Committed Burst Size), EBS (Excess Burst Size).
- Service Performance Test
 - Transmits one or many Service Configuration Tests simultaneously at the CIR confirming all traffic is able to traverse the network under the full service load over time.



Note: to scale - Y.1564 spaced for graphical representation

Time

Up to 32 services supported

- 3GPP TS 23.203 defines 9 kinds of QoS Class.
MT9090A can simultaneously perform testing on all classes of service.

3GPP TS 23.203 Standardized QoS Class Identifier (QCI) characteristics

QCI	Resource Type	Priority	Packet Delay Budget	Packet Error Loss Rate	Example Services
1	GBR	2	100 ms	10^{-2}	Conversational Voice
2		4	150 ms	10^{-3}	Conversational Video (Live Streaming)
3		3	50 ms	10^{-3}	Real Time Gaming
4		5	300 ms	10^{-6}	Non-Conversational Video (Buffered Streaming)
5	Non-GBR	1	100 ms	10^{-6}	IMS Signalling
6		6	300 ms	10^{-6}	Video (Buffered Streaming) TCP-based (e.g., www, e-mail, chat, ftp, p2p file sharing, progressive video, etc.)
7		7	100 ms	10^{-3}	Voice, Video (Live Streaming) Interactive Gaming
8		8	300 ms	10^{-6}	Video (Buffered Streaming) TCP-based (e.g., www, e-mail, chat, ftp, p2p file sharing, progressive video, etc.)
9		9			

MX909060A ITU-T Y.1564 parameters setup tool

- Create or modify the configuration for the Y.1564 testing on a PC
 - Overview all of parameters in a PC display screen.
 - Copy and paste the services
- Provided with MU909060Ax-007 Y.1564 test option

The screenshot shows the MU909060A Setup Application window. The 'Perform Test' section has 'Test Mode' set to 'End to End Network Test', 'Select Port' set to 'Both Ports', and 'One way Direction' set to 'Slave->Master'. The 'Config Test' section has 'Enable Y.1564 Config' checked, and 'CIR' is set to 'Ramped' with 'Step 1 CIR (K)' at 5, 'Step 2 CIR (K)' at 10, 'Step 3 CIR (K)' at 25, 'Step 4 CIR (K)' at 50, and 'Step 5 CIR (K)' at 75. The 'EIR' section has 'Traffic Police' set to 'M (Mbps)' at 100.000. The 'CBS' section has 'Enabled Services' at 32 and 'Enabled Tests/Steps' at 10. The 'EBS' section has 'Test/Step Time (Sec)' at 5 and 'Estimated Test Time' at 00:53:20. The 'Total CIR (Mbps)' is 300.552. The 'Calculate' button is visible.

SRV#	Enable	Service Name	Service Profile	CIR (Mbps)	EIR (Mbps)	SRC IP	DST IP
1	☒	Anritsu	Voice	0.126	2	192.168.200.2	192.168.200.5
2	☒	Network	Video	3.972	5	192.168.200.4	192.168.200.3
3	☒	Master	OFF	4.2	3	192.168.200.6	192.168.200.7
4	☒	Series	OFF	5.6	4	192.168.200.8	192.168.200.9
5	☒	MT9090A	Voice	0.126	2	192.168.200.10	192.168.200.11
6	☒	plus	OFF	1	10	192.168.200.12	192.168.200.13
7	☒	MU909060	OFF	19	0.001	192.168.200.14	192.168.200.15
8	☒	Gigabit	OFF	2	6	192.168.200.16	192.168.200.17
9	☒	Ethernet	Voice	0.126	0.001	192.168.200.18	192.168.200.19
10	☒	Module	OFF	8	3	192.168.200.20	192.168.200.21
11	☒	Y.1564	OFF	7	2	192.168.200.22	192.168.200.23
12	☒	test	OFF	70	1	192.168.200.24	192.168.200.25
13	☒	option	OFF	19	5	192.168.200.26	192.168.200.27
14	☒	Setup	OFF	10	2	192.168.200.28	192.168.200.29
15	☒	Applicat	OFF	15	1	192.168.200.30	192.168.200.31
16	☒	on	Voice	0.126	0.001	192.168.200.32	192.168.200.33
17	☒	Anritsu1	Voice	0.126	2	192.168.200.102	192.168.200.105
18	☒	Network1	Video	3.972	5	192.168.200.104	192.168.200.103
19	☒	Master1	OFF	4.2	3	192.168.200.106	192.168.200.107
20	☒	Series1	OFF	5.6	4	192.168.200.108	192.168.200.109
21	☒	MT9090A1	Voice	0.126	2	192.168.200.110	192.168.200.111
22	☒	plus1	OFF	1	10	192.168.200.112	192.168.200.113
23	☒	MU9090601	OFF	19	0.001	192.168.200.114	192.168.200.115
24	☒	Gigabit1	OFF	2	6	192.168.200.116	192.168.200.117
25	☒	Ethernet1	Voice	0.126	0.001	192.168.200.118	192.168.200.119
26	☒	Module1	OFF	8	3	192.168.200.120	192.168.200.121
27	☒	Y.15641	OFF	7	2	192.168.200.122	192.168.200.123
28	☒	test1	OFF	70	1	192.168.200.124	192.168.200.125
29	☒	option1	OFF	19	5	192.168.200.126	192.168.200.127
30	☒	Setup1	OFF	10	2	192.168.200.128	192.168.200.129
31	☒	Applica1	OFF	15	0.01	192.168.200.130	192.168.200.131
32	☒	on1	Voice	0.126	0.001	192.168.200.132	192.168.200.133

IEEE 802.1ad

- Stacked VLAN or QinQ support (optional),
 - The IEEE 802.1ad standard defines VLAN, (IEEE 802.1q) VLAN stacked inside VLAN's,
 - MT9090 GigE allows three layers of VLAN's.
- Configure RFC2544 (optional) within a stacked VLAN,
- Configure a single stream or MultiStream (optional) within stacked VLAN,
- View results relative to VLAN's
 - Untagged frames,
 - Single VLAN frames,
 - Multiple VLAN frames.
- Apply filters based on stacked VLAN's.

Interface Off 1000 Mbps 10:13:22

General Filter Advanced ☐ Follow Port A

VLAN LLC1 SNAP MPLS

		TPID	PRI	CFI	VID
-	VLAN 1	0x8100	3	☐	2001
-	VLAN 2	0x9100	4	☐	2002
-	VLAN 3	0x9300	5	☐	2003

Back

Next Tab

Port **B**

Stream **1**

Summary Off 1000 Mbps 10:13:00

Event Log Statistics Errors

	Port A	Port B
Total	0	13.392859 M
Unicast	0	13.392858 M
Multicast	0	0
Broadcast	0	1
UnTagged Frames	0	0
Single VLAN Frames	0	0
Multiple VLAN Frames	0	13.392859 M
UnLabeled Frames	0	13.392859 M
Single MPLS Frames	0	0
Multiple MPLS Frames	0	0
Pause Frames	0	0

Back

MPLS Tagging

- Support for MPLS labels (**optional**),
 - The ITEF maintain this standard,
 - MT9090 GigE allows three layers of label tags.
- Configure RFC2544 (**optional**) within a MPLS labels,
- Configure a single stream or MultiStream (**optional**) within MPLS labels,
- View results relative to MPLS labels,
 - Single MPLS frames,
 - Multiple MPLS frames.
- Apply filters based on MPLS labels.

Interface Off 1000Mbps 11:12:02

General Filter Advanced ☐ Follow Port A

VLAN LLC1 SNAP **MPLS**

	LABEL	CoS	TTL
- MPLS 1	1000	7	10
- MPLS 2	2000	4	100
- MPLS 3	3000	0	200

Back

Next Tab

Port **B**

Stream **1**

Summary Off 1000Mbps 14:01:50

Event Log Statistics Errors

	Port A	Port B
Total Frames	0	13.392859 M
Unicast Frames	0	13.392858 M
Multicast Frames	0	0
Broadcast Frames	0	1
UnTagged Frames	0	13.392859 M
Single VLAN Frames	0	0
Multiple VLAN Frames	0	0
UnLabeled Frames	0	2
Single MPLS Frames	0	0
Multiple MPLS Frames	0	13.392857 M
Pause Frames	0	0

Back

ISO layer 6 support

- Support HTTP and FTP transfers,
 - Tests the download speed via HTTP or FTP.
 - Full line rate measurement ability (assuming server capable of it),
- Simple one ended test to allow the user to quickly understand network download limits,
 - Able to connect to standard FTP or HTTP server,
 - Single end single engineer test, offering quick proof of network speed for the Telecom operators customer.

HTTP/FTP Test 1 1000Mbps Off 16:34:25

Port Test Config. Destination Back

Test Mode: FTP Download

Authentication: Setup...

Target Directory: /

Download File Name: testfile.pdf

HTTP/FTP Test 1 1000Mbps Off 16:33:53

Back

AHTTP/FTP Download test res

Measurement started
951745B

Measurement ended
Data connection closed
Connection closed
--- Test ended ---

Summary

Test Mode: FTP
Status: 951.745
File Size: 951.745 kB

Throughput

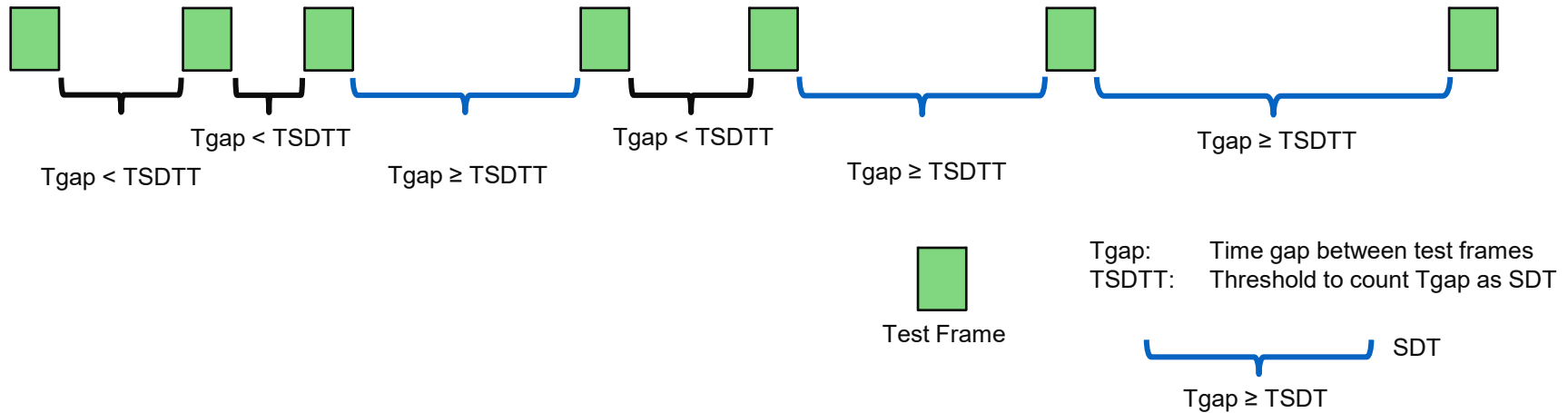
Min: 119.408 [kbps]
Max: 800 [kbps]
Avg: 694.485 [kbps]

Progress

Summary

Service Disruption Time (SDT),

- Measuring the time between frames looking for larger gaps than normal in the traffic flow and the configured thresholds.
- Network quality for time-severe streams like voice and video can be measured.
- Total time of SDT and the number of the counted gaps displayed.



Thresholds

Set alarm levels on the unit,

- Configure thresholds for different areas including,
 - Frame rate,
 - Utilization,
 - Throughput,
 - Errors,
 - Frame loss,
 - SDT.

Results shown,

- During the test graphically with green or red lines indicating the settings,
- In the overview window with Pass Fail results.
- Exceeded thresholds are recorded in the Event log.

The screenshot shows the 'Thresholds' configuration screen for 'Generator 1'. The interface includes a top status bar with 'Off', '1000 Mbps', and a timestamp of '08:34:17'. Below this, there are tabs for 'Frame Size', 'Destination', and 'Thresholds'. The 'Thresholds' tab is active, showing 'Current' and 'Average' settings for 'Use' and 'Log'. A 'Frames/Sec' threshold is set to '> 150000000'. Below this, there are tabs for 'Current', 'Cumulative', 'Graph', and 'SDT'. The 'Current' tab is active, showing 'TX Utilization (%)' and 'TX Throughput (Mbps)' with graphical progress bars. Below these, there is a 'Result overview' section with a table showing test results for 'RFC2544 Throughput 1', 'RFC2544 Latency 1', and 'RFC2544 Burst 1'. The 'Summary' section at the bottom shows a list of events, including 'Test started', 'Generator test started', 'violation: current throughput percentage (76)', 'violation: current utilization percentage (100)', 'Generator test stopped', and 'Test stopped'. The interface also includes a right-hand sidebar with buttons for 'Back', 'Stimuli', 'Status', 'Setup', and 'Back'.

State	Result	Test schedule
●	PASS	RFC2544 Throughput 1
●	PASS	RFC2544 Latency 1
●	FAIL	RFC2544 Burst 1

Time	Description
08:34:37	Wed Sep 01 2010 Test started
08:34:37	Generator test started
08:34:40	violation: current throughput percentage (76)
08:34:44	violation: current utilization percentage (100)
08:34:48	Generator test stopped
08:34:51	Wed Sep 01 2010 Test stopped

Trace Route

- Trace to an end IP address viewing all IP addresses it passes to reach the end destination,
 - Configure,
 - Number or attempts per IP,
 - Maximum number of hops,
 - Number of pings per host,
 - Timeout per ping.
- Results are seen for each host passed, the number of received and lost pings to/from each host.
- A quick simple and effective way to find the location of network failure.

Trace Route 1			1000Mbps	Off	08:59:46	Back
Port A Trace Route Results						
Hop #	Host IP	Rcvd/Lost	Summary			
3	[202.42.33.5]	3/0				
4	[192.169.32.154]	3/0				
5	[203.120.91.4]	3/0				
6	[203.192.168.209]	3/0				
7	[202.147.15.157]	3/0				
8	[202.147.50.161]	3/0				
9	[206.223.116.150]	0/3				
10	[216.115.107.85]	2/1				
11	[67.195.128.247]	3/0				
12	[98.137.149.56]	1/2				

Trace Route 1

1000Mbps

Off

14:31:15

Back

Port A Trace Route Results

Hop #	Min Time [ms]	Max Time [ms]	Avg Time [ms]
3	7.236	20.473	11.784
4	38.359	87.368	63.739
5	9.096	61.834	28.936
6	9.745	27.046	15.702
7	10.960	42.418	23.349
8	183.278	183.739	183.487
9	*	*	*
10	185.206	185.951	185.491
11	185.359	187.435	186.283
12	186.164	187.489	186.898

Summary

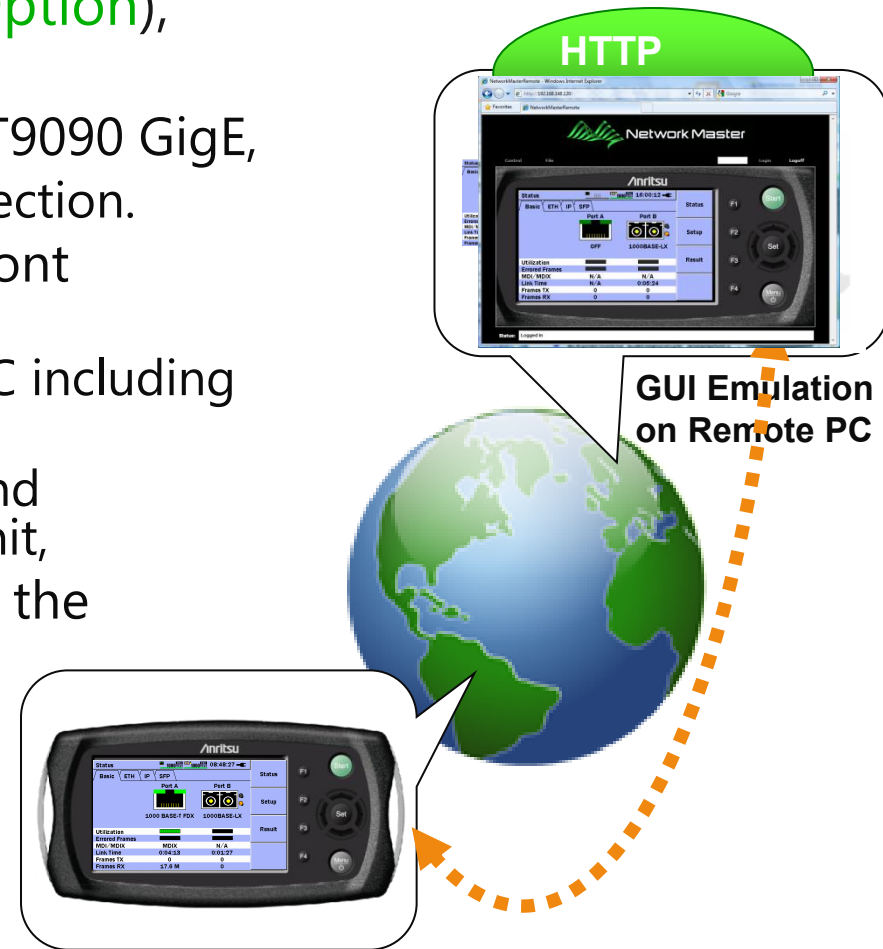
Remote GUI and Language support

Remote control the unit via any PC (**Option**),

- No software required on the PC,
- Connect via web browser to the MT9090 GigE,
 - Uses port 80 to initiate the connection.
- Control the unit as if its sitting in front of you,
 - MT9090 GigE appears on your PC including control buttons,
 - Control the unit using buttons and menu's the same as the actual unit,
- Upload configuration settings from the PC to the MT9090 GigE,
- Download results files and reports from the MT9090 GigE to your PC.

Expanded Language support including,

- English, Italian, Chinese (**Simplified & Traditional**), Portuguese, Spanish, German, Korean and French and Japanese

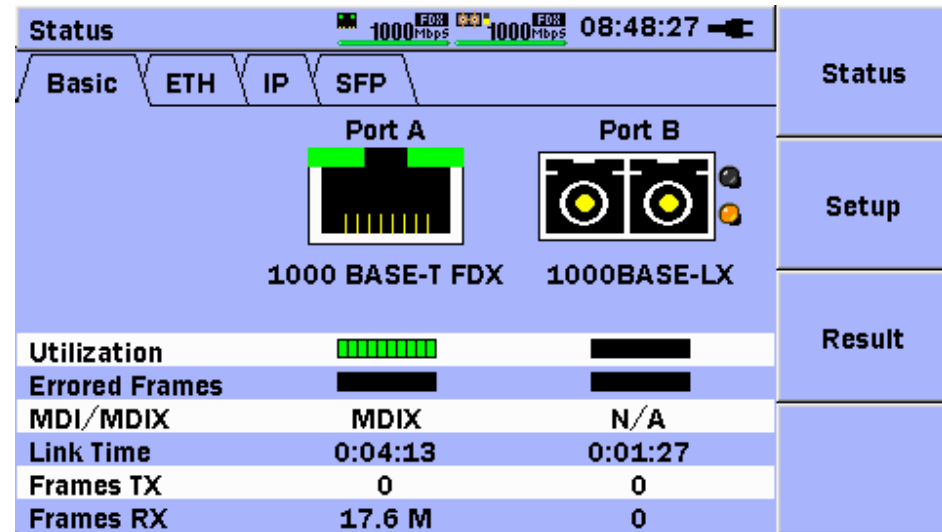
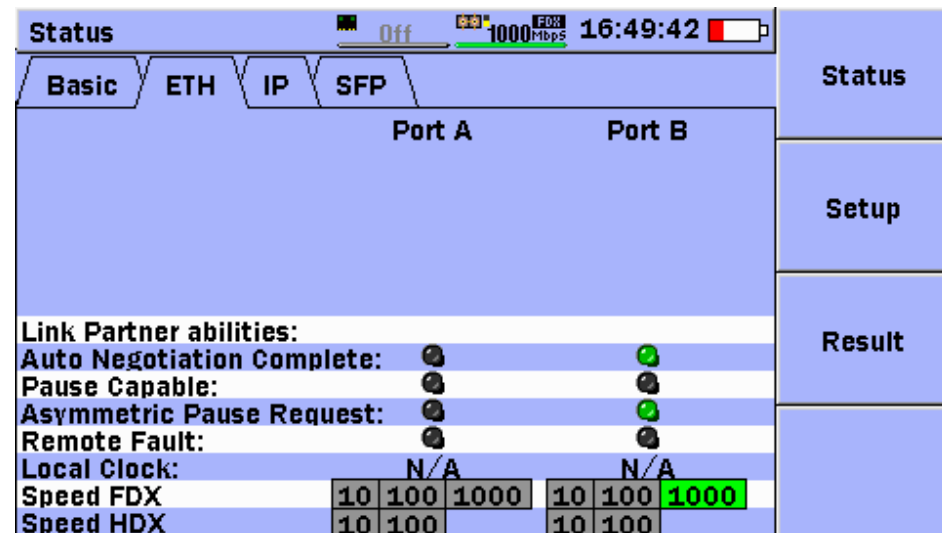


- Interfaces
 - 10/100/1000 Mbps Electrical, 100/1000 Mbps Optical
 - FDX / HDX (10/100 El.)
- Modes
 - Ethernet – general Ethernet tester
 - Reflector – act as loop-back device for another tester
 - Pass Through mode – live traffic analysis
- Encapsulations
 - EtherType II (DIX v.2), IEEE 802.3 with 802.2(LLC1), IEEE 802.3 with SNAP
- VLAN tagging
- Configurable Ethernet (MAC) and IP source and destination addresses (supports IPv4 and IPv6), UDP/TCP port numbers and DSCP/TOS byte

Check connection

Status screens

- Give quick overview on:
 - Port status
 - Autonegotiate results
 - IP addresses used
 - Optical modules:
 - Tx and Rx levels
 - Wavelength
 - Max. reach from Tx
 - Ethernet compliance
 - Vendor name



Cable test feature for electrical Ethernet (MU909060A1/A2)

Some problems on an electrical Ethernet connection are basic:

- Short circuits of a wire pair
- Breaks of a wire pair

The cable test facility makes it easy to identify such failures.

The cable test facility also indicates the distance from the instrument to the fault

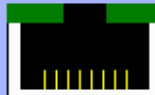
Cable Test1

On

1000Mbps

10:28:36

Back



Port A

No Link:

- Cable attached

Pair	3	2	1	4
Pin	1/2	3/6	4/5	7/8
Status	Open	Open	Open	Open
Rx/Tx	.	.	.	.
Polarity	.	.	.	.
Length (m)	2.4	3.2	3.2	2.4
Amp	0.86	0.86	0.86	0.86
Skew (ns)	.	.	.	.

Summary

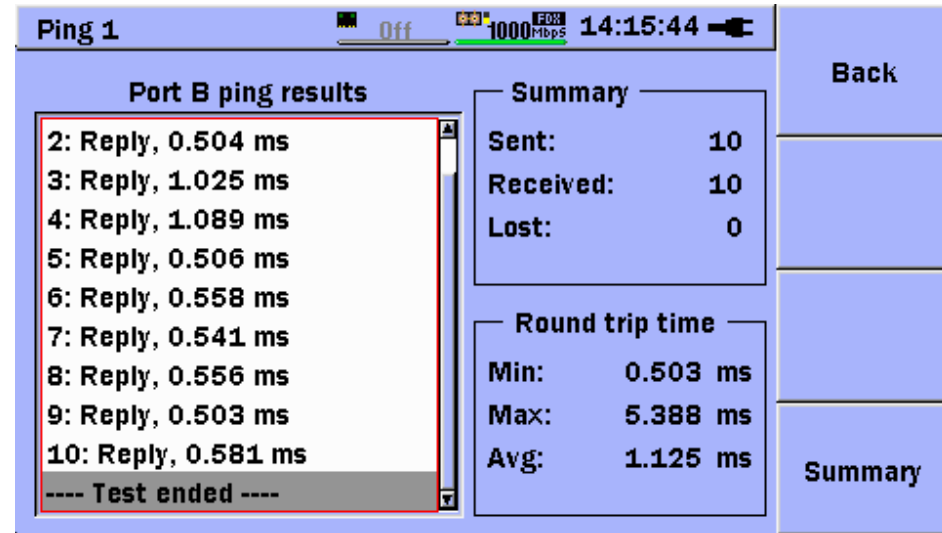
Ping test

Ping test applications

- Installation and commissioning
- Troubleshooting and maintenance

Well-known tool for testing:

- Continuity
- Connectivity
- Response time



RFC 2544 Test option

- RFC 2544 defines tests to be used for describing the performance characteristics of these network devices
- Typically used for bringing into service
- Tests include measurement of:
 - Throughput
 - For selected layer
 - Frame Loss
 - Latency
 - Packet jitter
 - Burstability

Throughput 1		Off	1000Mbps	14:12:27	Back
Repetition:Step 1: 1 1: 2	Tx (Port B)				
	Tx Utilization(Mbps)		1000.0000		
	Tx Frame Size(bytes)		64		
	Tx Total Frames		14.880952 M		
	Tx Frame Rate(Fps)		1.488095 M		
	Rx (Port B)				
	Rx Total Frames		14.880952 M		
	Rx Utilization(%)		100.0000		
	Rx Throughput(Mbps)		857.1433		
	Rx Frames Lost Min		0		
	Rx Frames Lost Max		0		
	Rx Frames Lost Avg		0		
	Rx Lost Rate Min(%)		0.0		
Rx Loss Rate Max(%)		0.0			
Rx Loss Rate Avg(%)		0.0			
					Summary

Layered throughput analysis

User selects layer for which throughput is calculated

- To get throughput as perceived by a customer

Frame representation										Throughput Calculation	UDP or TCP must be activated
IFG	Pre-amble	MAC header	VLAN (opt)	LLC (opt)	SNAP (opt)	IP header	UDP/TCP	PAYLOAD	CRC	Data Layer	
IFG	Pre-amble	MAC header	VLAN (opt)	LLC (opt)	SNAP (opt)	IP header	UDP/TCP	PAYLOAD	CRC	Network Layer	
IFG	Pre-amble	MAC header	VLAN (opt)	LLC (opt)	SNAP (opt)	IP header	UDP/TCP	PAYLOAD	CRC	Link Layer	
IFG	Pre-amble	MAC header	VLAN (opt)	LLC (opt)	SNAP (opt)	IP header	UDP/TCP	PAYLOAD	CRC	Physical Layer no preamble	
IFG	Pre-amble	MAC header	VLAN (opt)	LLC (opt)	SNAP (opt)	IP header	UDP/TCP	PAYLOAD	CRC	Physical Layer	
Included in throughput calculation											

Throughput 1

On 1000Mbps 10:43:44

Back

Destination
Frame Size
Line Load
Advanced

Throughput test 1 Throughput calc. layer

Miscellaneous
☒ Trans
☐ Inclu
☐ Accu

Throughput Calculation Layer:

Throughput Type: Average

Physical layer
Physical layer (w.out preamble)
Link layer
Network layer
Data layer

Packet jitter measurement

- Packet jitter and latency can be a significant problem for services like Voice over IP
- Packet jitter can be measured in the RFC 2544 tests together with latency

Latency 1		Off	1000Mbps	14:16:18	Back
		Tx (Port B)			
Repetition:Step	Tx Utilization(Mbps)		900.0000		
	Tx Frame Size(bytes)		64		
1: 1	Tx Total Frames		13.392857 M		
1: 2	Tx Frame Rate(Fps)		1.339285 M		
		Rx (Port B)			
		Rx Total Frames		13.392857 M	
		Rx Utilization(%)		90.0001	
		Rx Throughput(Mbps)		771.4293	
		Rx Jitter Min(us)		0.0	
		Rx Jitter Max(us)		0.0	
		Rx Jitter Avg(us)		0.0	Summary
		Rx Latency Min(us)		1.5	
		Rx Latency Max(us)		1.5	
		Rx Latency Avg(us)		1.5	

RFC 2544 Router Latency test

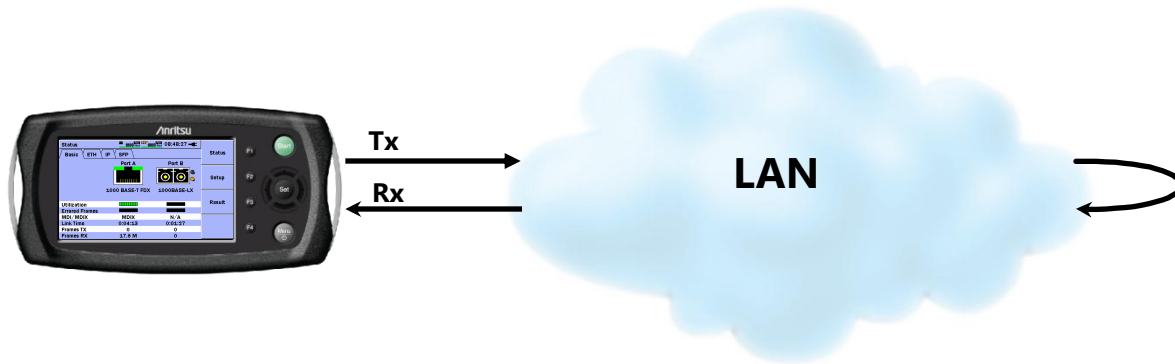
Network layer latency testing from the Network Master without use of a reflector

- Based on ping requests

Latency 1		Off	1000Mbps	11:06:43	Back
Repetition:Step		Tx (Port B)			
1: 1		Tx Utilization(kbps)			2.0000
		Tx Frame Size(bytes)			64
		Tx Total Frames			29
		Tx Frame Rate(Fps)			2.000000
		Rx (Port B)			
		Rx Total Frames			58
		Rx Utilization(%)			0.0019
		Rx Throughput(kbps)			2.5698
		Rx Jitter Min(us)			1631.8
		Rx Jitter Max(us)			15553.9
		Rx Jitter Avg(us)			6638.3
		Rx Latency Min(us)			1.5
		Rx Latency Max(us)			15555.4
		Rx Latency Avg(us)			15555.4
					Summary

Why the RFC 2544 end-to-end test?

- Typical test setup with one instrument and reflection or loop-back is OK for symmetrical links:



- For Ethernet links carried over asymmetrical connections (xDSL, WIMAX) throughput tests will only reflect the performance of the direction of the link with lowest capacity.
- For symmetrical the typical test setup will not identify transmission performance differences between the two directions in a link

RFC 2544 end-to-end test

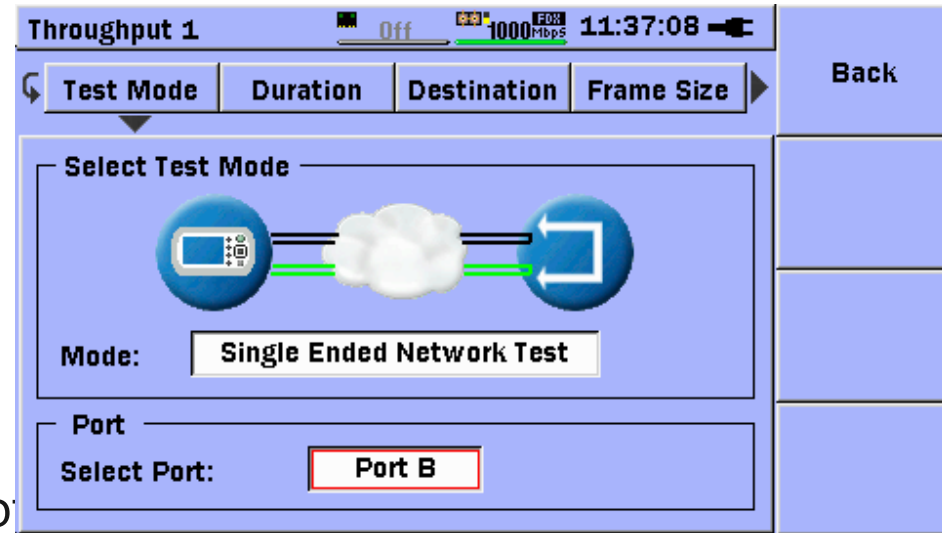
RFC 2544 end-to-end test with primary/secondary relation

- Needed for test of Ethernet links carried over asymmetrical connections
- Will identify transmission performance differences between the two directions in a link
- The user sets up the test in the primary instrument which exchanges setup and result with the remote secondary instrument.
- Test of Throughput, Frame Loss and Burstability



RFC 2544 setup

- Graphical overview of the selected test mode
 - Throughput and Burst tests:
 - Switch/Router test
 - Single-ended network test
 - End-to-end
 - Latency tests:
 - Switch/Router test
 - Single-ended network test
 - Router latency
- Versatile test condition setup – supports from very thorough testing to fast testing with a limited number of



BER tests

- Traditional test of physical connection
- Generation and detection of test patterns
 - Framed with IP header and maybe UDP/TCP header Count of errors in received test pattern
 - Unframed
- Count of:
 - Pattern errors
 - Sequence errors
 - Loss of sequence synchronization.
 - Frame loss
 - Frame loss seconds
- Errors or alarms may be inserted into the test traffic

BERT 1		<div><div></div><div>Off</div><div>1000Mbps</div></div>		14:16:34		<div><div></div><div></div></div>	
						Back	
Port B Results							
Pattern Bit Count		7.04306 G					
Pattern Errors		0					
Pattern Errors(%)		0.00000					
Seq. Errors		0					
Seq. Sync. Lost		0					
Frame Loss		0					
Frame Loss Seconds		0					

Generator/Monitor tests

- Generation of Ethernet traffic
- Configuration of streams if multistream option is installed
- Monitor-only for analyzing live traffic

Generator 1 Off On 08:38:00 ■

Mode/Duration Generator Destination Back

Generator Mode: Generator+Monitor

Duration Mode: Seconds Value: 10 Seconds

Stimuli

Port A

Generator 1 Off On 08:38:26 ■

Generator Destination Payload Back

Stream Line Load OFF %

Frame Size [Bytes] Profile: Constant

Start: 100 Step: 50 End: 500 Duration: 1 s

Total line load : 0.0000% with 0 of 8 streams active

Stimuli

Port A

Stream 1

Ethernet Summary

Statistics:

- Total frames
- Unicast, Multicast
Broadcast breakdown
- Frames with various
errors

Event log

- Information on major
events during the
execution of a test
sequence

Summary Off 1000Mbps 14:16:56			Back
Event Log	Statistics		
	Port A	Port B	
Total	0	77.385955 M	
Unicast	0	77.385924 M	
Multicast	0	0	
Broadcast	0	31	
FCS Errors	0	0	
Fragmented	0	0	
Oversized	0	0	
Undersized	0	0	
Collisions	0	0	
Preamble violations	0	0	
IFG violations	0	-	
Severe IFG violations	-	0	

Summary Off 1000Mbps 14:18:08			Back
Event Log	Statistics		
Time	Description		
14:07:16	Ping test started		
14:07:53	Ping test stopped		
14:07:53	RFC2544 Throughput test started		
14:08:23	RFC2544 Throughput test stopped		
14:08:23	RFC2544 Latency test started		
14:08:53	RFC2544 Latency test stopped		
14:08:53	BERT test started		
14:09:15	BERT test stopped		
14:09:17	Mon Feb 09 2009 Test stopped		

Multistream option

- With Multistream option the instrument can generate up to 8 streams on the Ethernet link
 - Individual settings of traffic load and header information for the streams, including VLAN priority, DSCP/TOS byte and TCP/UDP port numbers for each stream.

The screenshot displays two configuration windows from the Anritsu instrument. The top window, titled 'Generator 1', shows the 'Generator' tab selected. It features a 'Stream Line Load' slider set to 50.0000%, a 'Frame Size [Bytes]' section with 'Profile' set to 'Constant', 'Start' at 100, 'End' at 500, 'Step' at 50, and 'Duration' at 1 second. A summary bar at the bottom indicates 'Total line load : 100.0000% with 2 of 8 streams active'. The bottom window, titled 'Interface', shows the 'Advanced' tab selected with 'Follow Port A' unchecked. The 'TCP' protocol is selected, and the following fields are all set to 0: 'Source Port', 'Destination Port', 'Sequence number', 'Ack. number', 'Reserved', and 'Flags'. Both windows have a sidebar on the right with buttons for 'Back', 'Stimuli', 'Port B', and 'Stream 1'.

Field	Value
Stream Line Load	50.0000 %
Profile	Constant
Start	100
End	500
Step	50
Duration	1 s
Total line load	100.0000% with 2 of 8 streams active

Field	Value
Source Port	0
Destination Port	0
Sequence number	0
Ack. number	0
Reserved	0
Flags	0

Multistream option

- With Multistream option the instrument shows frame loss for the defined up to 8 streams making it easy to see if high priority traffic has lower frame loss than low priority traffic

Generator results		 Off  1000  14:12:05 	Back
Tx results			
Tx Total Frames	10.412095 M		
Tx Total Bytes	1.041209 G		
Tx Broadcast Frames	0		
Tx Broadcast Bytes	0		Stimuli
Rx results			
Rx Total Frames	10.412095 M		
Rx Total Bytes	1.041209 G		
Rx Errored Frames	0		Port B
Frame loss			
Frames lost	0		
Frame loss(%)	0		Stream 1

Generator results		 Off  1000  14:12:22 	Back
Tx results			
Tx Total Frames	10.412095 M		
Tx Total Bytes	1.041209 G		
Tx Broadcast Frames	0		
Tx Broadcast Bytes	0		Stimuli
Rx results			
Rx Total Frames	10.412095 M		
Rx Total Bytes	1.041209 G		
Rx Errored Frames	0		Port B
Frame loss			
Frames lost	0		
Frame loss(%)	0		Stream 2

Report generation (PDF and CSV)

- PDF: De facto standard document format
- Customer logo can be inserted
- Comments on the test can be added
- CSV: Easily editable format

The screenshot shows the Anritsu report window titled "RFC2544 Throughput 1 - Result" with a timestamp of 2010-10-08 16:36:00. It contains two tables: "Port B TX" and "Port B RX". Below the report, the same data is shown in an Excel spreadsheet format, demonstrating the CSV export functionality.

Port B TX

Repetition:Step	Total frames	Utilization [Mbps]	Frame rate [FPS]	Frame Size [Bytes]
1 : 1	14.88095 M	1000.0000	1.488095 M	64
1 : 2	2.349624 M	1000.0000	234.962 k	512
1 : 3	812.743 k	1000.0000	81.274 k	1.518 k

Port B RX

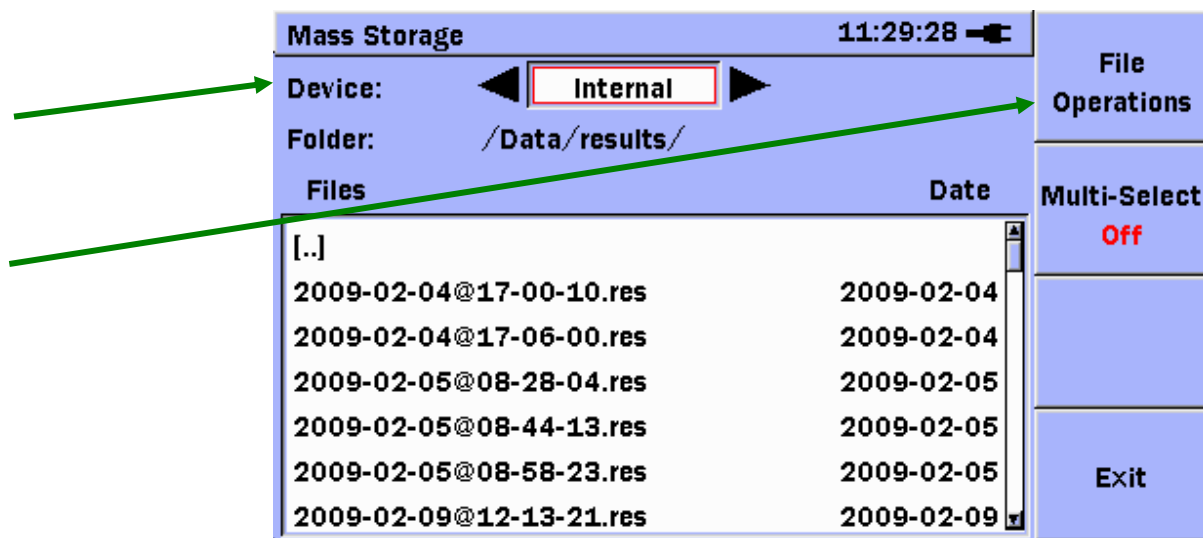
Repetition:Step	Total frames	Throughput [Mbps]	Utilization [%]	Frames lost / Loss rate [%]		
				Min	Max	Avg
1 : 1	14.88095 M	857.1433	100.0000	0 / 0.0	0 / 0.0	0 / 0.0
1 : 2	2.349624 M	977.4461	100.0000	0 / 0.0	0 / 0.0	0 / 0.0
1 : 3	812.743 k	992.2052	100.0000	0 / 0.0	0 / 0.0	0 / 0.0

Excel CSV Export (S51)

	A	B	C	D	E	F	G
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							

Internal Storage

- Save and Load Setups
- Load Results
 - Results are automatically saved when a test stops
- Print screen
- Mass Storage Functions
 - Select location
 - Internal or USB
 - File operations
 - Copy
 - Delete
 - Rename
 - Create folders
- Integrated soft keyboard for entering of text/names
- Storage of PDF reports



- Inspection microscope for optical fiber connectors
- 75% of network failure comes from poor connector quality
- All software pre-loaded in MT9090A

G0306C VIP

- ◆ 7 kinds of tips are with the scope
- ◆ 400x images displayed

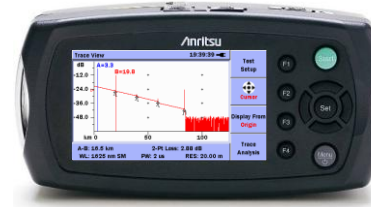


MT9090A series lineup

Weighing only 700 to 800 g (2 lbs.), Anritsu's pocket-size MT9090A Network Master series makes child's play of daily network installation and maintenance. Its innovative GUI design uses a 4.3-inch high resolution display for easy viewing both indoors and in direct sunlight.



GigE
10M/100M/Gigabit Ethernet Tester



uOTDR
OTDR for FTTH

