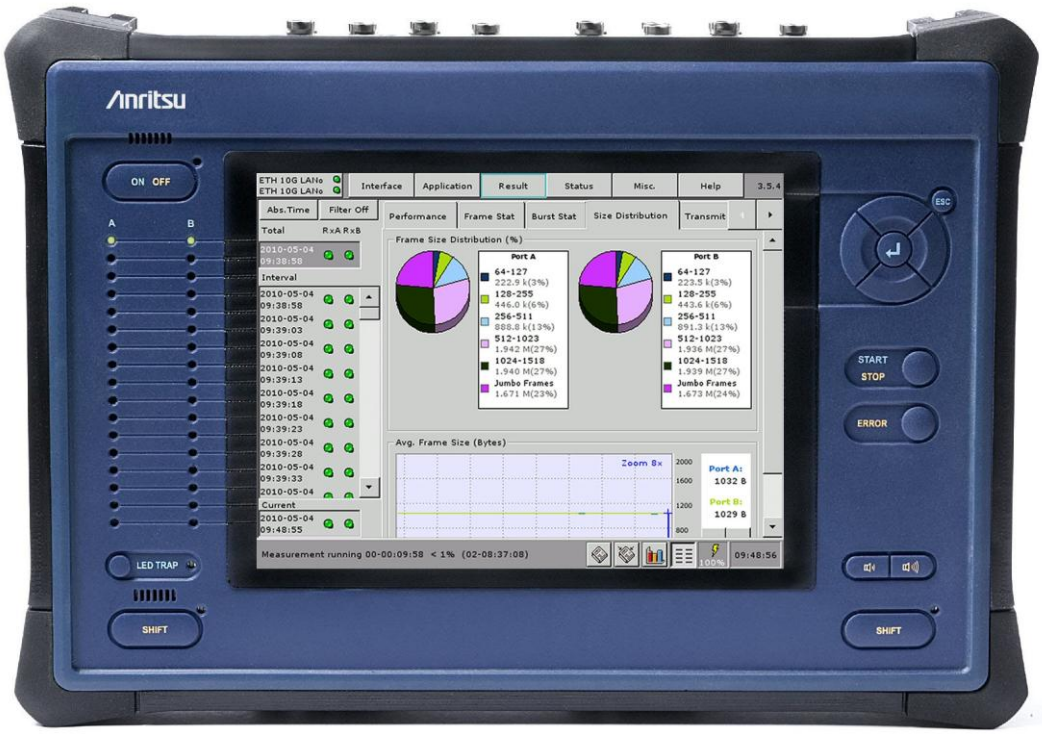
CMA 3000 SPECIFICATIONS

Ethernet



The user-friendly Ethernet tester from 10 Gbps to 10 Mbps

CMA 3000 Ethernet is Anritsu's portable, compact and user-friendly field tester dedicated to Ethernet testing from 10 Gbps to 10 Mbps. The battery-powered, easy-to-use and portable CMA 3000 Ethernet is a comprehensive solution for testing and measuring LAN and WAN communication lines. Add-on options enable the CMA 3000 Ethernet to perform multistream testing and to test stacked VLAN, MPLS and VoIP services.

The CMA 3000 Ethernet comes in two versions: a single port and a dual port version at the 10 Gbps rate. Optional optical modules can be inserted in the 10 G ports. Both versions include a dual-port Ethernet 1000/100/10 Mbps test interface equipped with electrical ports and ports for optional optical interfaces.

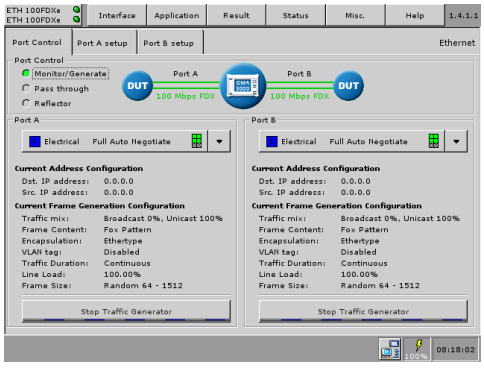


Fig. 1 The operation of the CMA 3000 Ethernet is made easy through an intuitive graphical user interface.

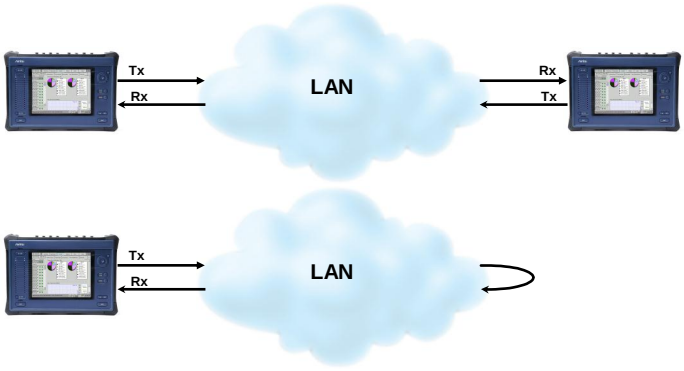


Fig. 2 Out-of-service testing with two instruments or a far-end loop back.

Easy-to-use interface

The intuitive user interface, with a large color LCD display and easy-to-understand graphical symbols allows you to easily read and interpret results of measurements. Using the high-contrast touch-screen display you can easily customize and store both setup and result screens to fit your personal needs and work routines. You can store setups for particular applications in the CMA 3000 Ethernet. To allow quick and easy distribution of standardized test setups within the organization it's also possible to transfer setups to a USB memory stick and subsequently load to other instruments. With the powerful and flexible report generator you can create .pdf files for selected measurement results. With these files you can provide professional documentation of test results to your customers.

The CMA 3000 Ethernet has USB ports and a LAN interface for data transfer and external communication to give you full flexibility whether in the field or in the workshop. Remote operation is facilitated through an optional MS Windows® program simulating the instrument's front panel. With another option the CMA 3000 Ethernet can be remotely controlled with command line scripts, whereby the instrument turns into a fast and reliable tool for automated testing in manufacturing environments.

The CMA 3000 Ethernet can test and analyze Ethernet links at rates from 10 Gbps to 10 Mbps. A 10G WAN PHY option can be added to test and analyze Ethernet traffic encapsulated in OC-192/STM-64 frames.

Transmitters and receivers permit out-of-service testing for installation, commissioning and Quality of Service (QoS) verification while a pass-through mode enables in-service monitoring for both fast troubleshooting and detailed analysis of the live traffic on the line. This makes CMA 3000 Ethernet the ideal instrument for measuring in-service and out-of-service transmission quality.

You can easily read and interpret information from the tested lines off the large color display with easy-to-understand colors and graphical symbols. For fast troubleshooting, the CMA 3000 Ethernet displays alarms and transmission link status on LED indicators.

The instrument is powered by a rechargeable and replaceable intelligent high-capacity LiIon battery. The CMA 3000 Ethernet can also be powered via an external mains adapter for long-term measurements.

Key Features	**Key Applications**

• Single or dual port at the 10G rate
• Dual-port Ethernet 1000/100/10 Mbps test interface
• Supports 10 G LAN PHY
• 10 G WAN PHY option
• Traffic generation capabilities up to full line rate
• Comprehensive statistics
• Automated RFC 2544 testing of:
  ○ Throughput
  ○ Frame loss
  ○ Latency
  ○ Packet jitter
  ○ Burstability
• Simultaneous monitoring of both directions on a line
• IPv4 and IPv6 support
• Service Activation Test option
  ○ Service activation in accordance with ITU-T Y.1564
• Multistream, Stacked VLAN, MPLS and VoIP test option
• Synchronous Ethernet Test option
• IP channel statistics option
• Large color touch-display
• LEDs for immediate line state indications
	• Comprehensive out-of-service testing for:
	  ○ Installation
	  ○ Provisioning
	  ○ Propagation time analysis
	• QoS verification
	• End-to-end testing
	• Rapid in-service diagnostics and troubleshooting
	• Physical line monitoring

Installation, commissioning and QoS verification

For installation, commissioning and QoS verification CMA 3000 Ethernet provides powerful and flexible traffic generation capabilities, allowing you to easily test the network under various conditions, including generation of VLAN tagged traffic. Performance and QoS statistics are presented in tables and graphs facilitating results interpretation. Through preprogrammed thresholds, CMA 3000 Ethernet can isolate abnormal conditions on the tested line.

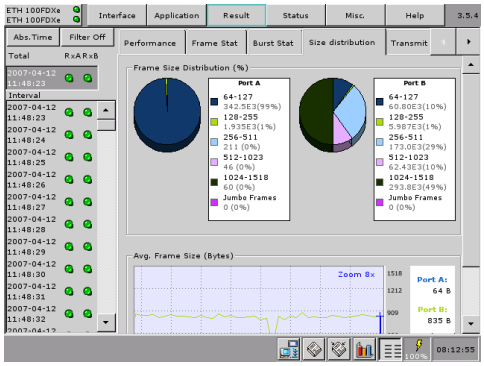


Fig. 3 Statistics are presented in tables and easy to understand graphs.

RFC 2544 analysis

The IETF RFC 2544 “Benchmarking Methodology for Network Interconnect Devices” defines a number of tests to be used for describing the performance characteristics of these network devices. With the CMA 3000 Ethernet, testing of performance parameters, such as throughput and frame loss, latency, packet jitter and burstability in compliance with RFC 2544 is straightforward. CMA 3000 Ethernet automates the testing procedure while still allowing you to configure the test to be as thorough as needed. To get full information on the performance of both sides of a line, the end-to-end test mode allows two CMA 3000 Ethernet to work together in a master-slave setup whereby the user can control both units and inspect the results of the test from both units on the master instrument.

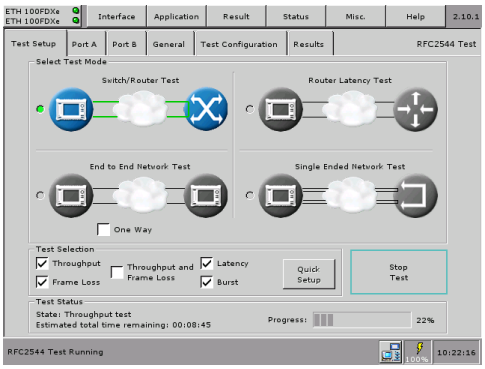


Fig. 4 Intuitive configuration of the RFC 2544 tests

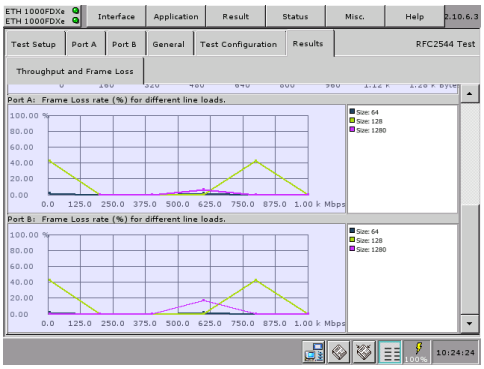


Fig. 5 RFC 2544 results are presented in graphs or tabular format

In-service troubleshooting

For fast troubleshooting the CMA 3000 Ethernet status monitor is always active, providing essential information on the monitored transmission system, including:

- Line alarms on LED indicators with a trap facility
- Display of current line status
- Optical level indication
- Electrical cable test facility
- Indication of main link quality parameters : Utilization, Throughput and Errored frames

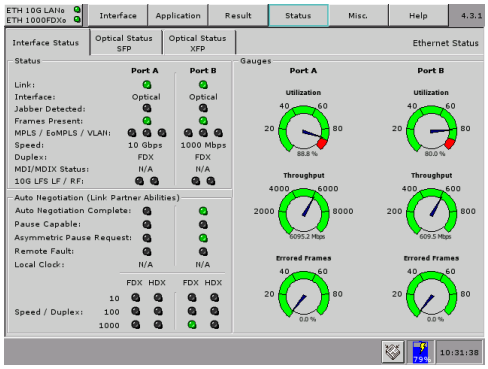


Fig. 6 Interface status indicators for a quick overview of the line's condition.

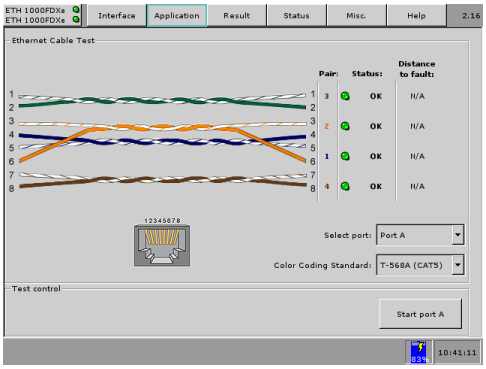


Fig. 7 The CMA 3000 Ethernet cable test facility makes it easy to identify failures on electrical cables like short circuits or breaks of a wire pair. The cable test facility also indicates the distance from the instrument to the fault.

Detailed in-service analysis

CMA 3000 Ethernet can analyze live traffic in details by presenting statistics on the main performance indicators for a monitored line. To facilitate the analysis of data it's possible to define threshold values for a number of parameters. CMA 3000 Ethernet uses the thresholds to color-highlight results outside the acceptable range. This is also indicated on the LEDs of the instrument.

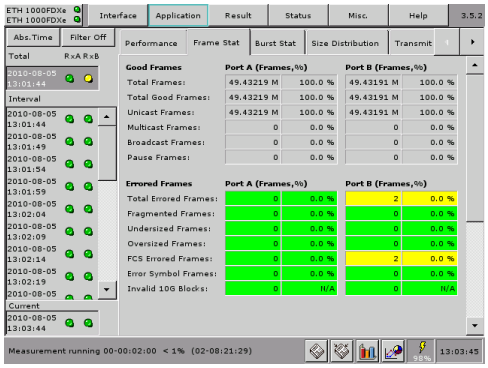


Fig. 8 Tabular presentation of performance statistics.

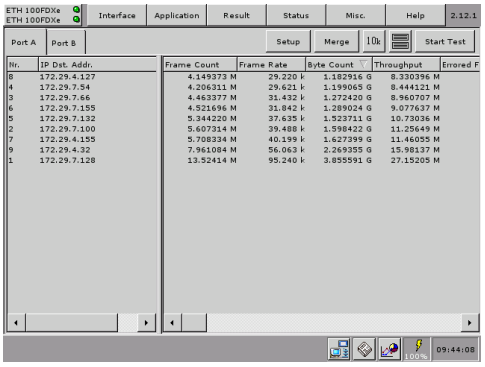


Fig. 9 IP traffic analysis with the IP channel statistics option.

IP channel statistics option

For further analysis of live IP traffic on the Ethernet line CMA 3000 Ethernet can be equipped with the IP channel statistics option. This option provides detailed information on the traffic on the monitored line for up to 232 individual channels, identified by parameters like Ethernet addresses, IP addresses, VLAN tags or MPLS labels. This allows you to identify whether a channel:

- Loads the line heavily
- Sends many errored frames
- Uses the line in an inefficient way

Service Activation Test option

The wide deployment of Ethernet technology for many applications in the access and core of telecom networks has caused a need for new testing standards to be developed. Therefore ITU-T has defined a new recommendation Y.1564, which defines a new methodology for testing multiple Ethernet services simultaneously in a network. The recommendation is designed to allow service providers to assess customer end to end network performance. Y.1564 includes the combination of changing end user traffic profiles with multiple frame sizes and streams which require different traffic priorities through the network. The recommendation also defines testing multiple traffic streams (services) simultaneously, confirming the policing per stream, confirming the transfer time and jitter across the network and confirming the network can manage bursts of traffic for short durations.

The Ethernet Service Activation Test option for the CMA 3000 allows the user to conduct tests in accordance with Y.1564 for up to 8 services. The test is typically done with two CMA 3000s performing the Service Activation Test in a Local-Remote setup. It can however also be done with one unit and a far-end loop back device.

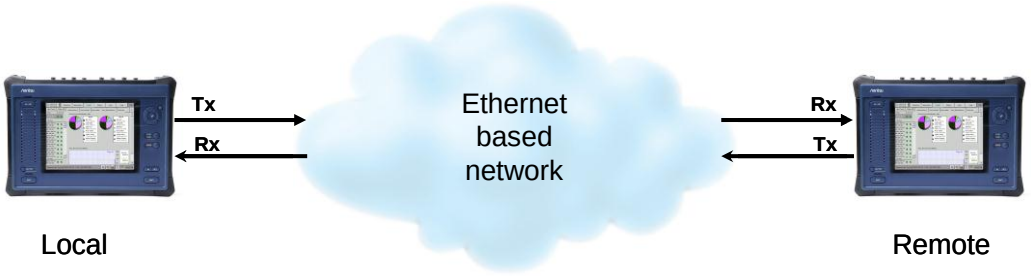


Fig. 10 Two CMA 3000s conducting a Service Activation Test in a Local-Remote setup.

When the service activation test is done in the Local-Remote setup with two CMA 3000s you control the test from the local instrument: It transfers relevant information to the remote unit and after the test is completed you can see results from both units on the local instrument. Easy to understand graphical symbols make it very fast to see if the tests passed. If further analysis is required the information presented can be expanded to show all details of each test.

For measurements of Frame Transfer Delay (FTD) between two CMA 3000s, a GPS add-on option can provide true one-way measurements of Frame Transfer Delay. The GPS option can synchronize the clocks of the two CMA 3000s involved in the measurement, when a GPS signal can be received at the test sites. If GPS synchronization can be achieved prior to moving the units to the test sites the CMA 3000s will hold the synchronization for a period of time, allowing tests to be made with GPS synchronized instruments.

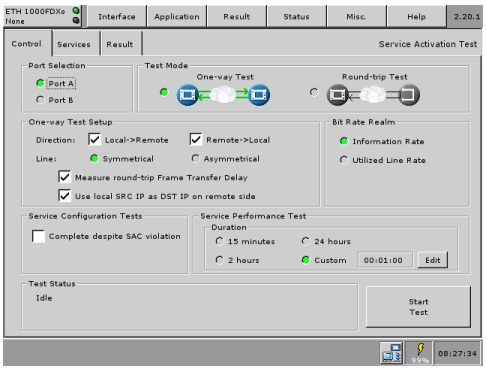


Fig. 11 It is easy to configure the Service Activation Test in the CMA 3000's intuitive User Interface

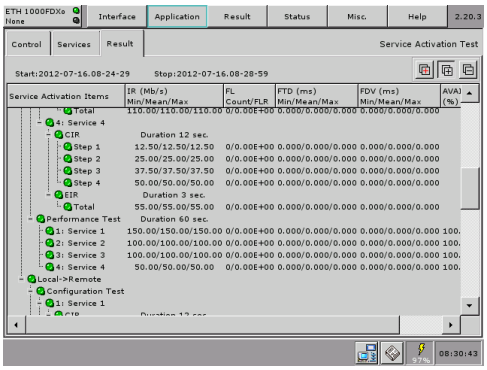


Fig. 12 The Service Activation Test screen gives easy to understand indications on pass/fail of each of the conducted tests.

Synchronous Ethernet Test option

Ethernet is today the dominant technology for data transmission, and legacy networks based on synchronous technology (PDH, SDH/SONET) migrate to packet-switched network based on Ethernet. However, the asynchronous nature of Ethernet provides certain transmission challenges as many existing networks have a strong requirement of frequency synchronization across the entire network. To support this requirement Synchronous Ethernet is introduced.
Two techniques are defined for Synchronous Ethernet:

- Physical synchronization signal forwarding as defined in ITU-T recommendations G.8261, G.8262 and G.8264 (in many cases this is now called SyncE)
- Protocol based synchronization as defined in IEEE1588 v2 (also known as the Precision Time Protocol PTP)

The Synchronous Ethernet Test option for the CMA 3000 allows the user to conduct Test and analysis of both technologies SyncE (ITU-T G.826x) and of IEEE 1588 v2 (PTP) including ITU-T G.8265.1 IEEE 1588 v2 profile for telecommunication.

The SyncE (ITU-T G.826x) functionality includes detection and generation of G.826x Synchronization Status Messages (SSM) for verification of the SyncE network. An alarm will indicate if SSMs are not detected. For detailed analysis the instrument can log SSMs for transfer to a PC via the FrontSim option for decode with Wireshark.

The SyncE (ITU-T G.826x) transmit clock can be synchronized to external clock signal sources to emulate a synchronous Ethernet signal. The transmit clock can be deviated to stress test network devices. Furthermore the CMA 3000 provides an indication of the bit rate of the received Ethernet signal relative to a chosen reference.

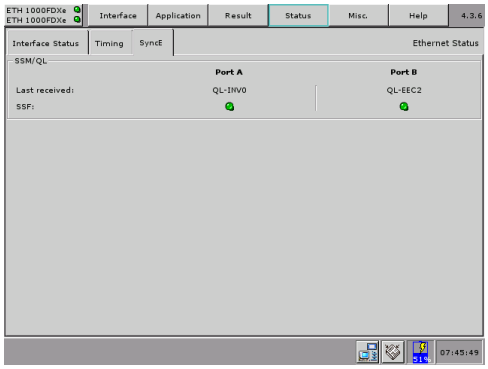


Fig. 13 Read out of the current QL value from the received SSM messages

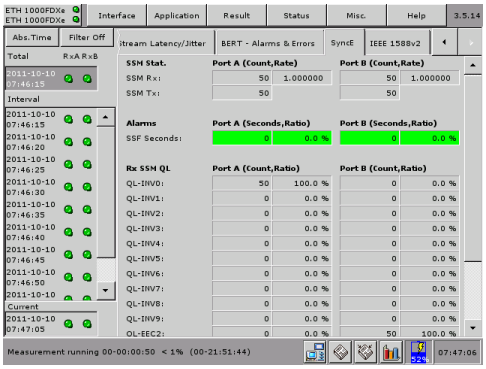


Fig. 14 Comprehensive statistics on SSM QL messages and values

The IEEE 1588 v2 (PTP) functionality includes the CMA 3000 to act as a master using the internal instrument clock or a GPS signal (when present) as clock source. Alternatively the instrument can act in slave mode, including choosing the best master wall clock and constantly adjusting the clock. During a test the user will get comprehensive statistics on IEEE 1588 v2. An alarm is generated if synchronization messages are not received within a certain time.

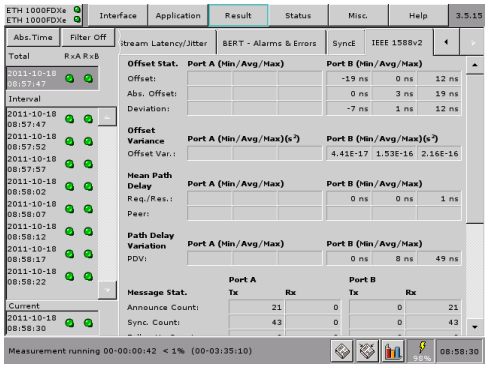


Fig. 15 Comprehensive IEEE 1588 v2 statistics on offset and offset variance, path delay variation, messages and clock state transitions.

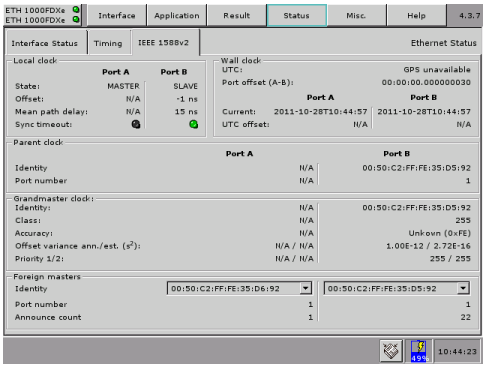


Fig. 16 Detailed information on IEEE 1588 v2 clock status

For quick analysis and troubleshooting of the IEEE 1588 v2 (PTP) signaling the CMA 3000 can log information on the transferred messages and present in on the built-in screen. For detailed analysis the instrument can log PTP message for transfer to a PC via the FrontSim option for decode with Wireshark.

Ethernet Multistream option

The Ethernet multistream option for the CMA 3000 Ethernet allows the user to test a congested networks ability to transport high priority traffic rather than lower priority traffic. The user can activate up to 8 streams per port with different priority settings on the Ethernet line and detect how they are affected by frame loss through the network. With the multistream option you also get information on packet jitter and latency per stream, issues that can cause problems for services like VoIP.

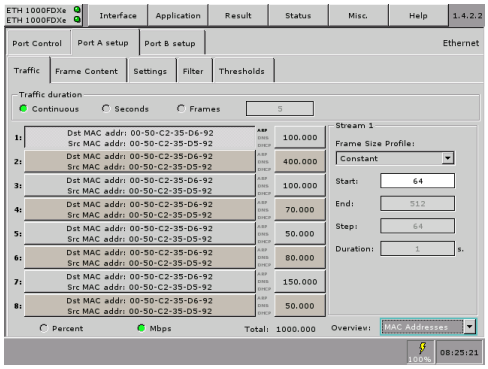


Fig. 17 The CMA 3000 Ethernet gives an easy overview of the up to 8 streams that it can generate.

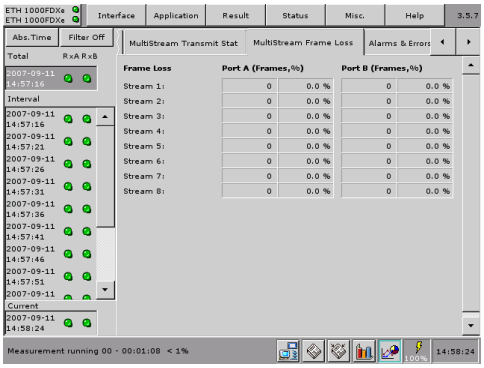


Fig. 18 Information on frame loss in shown for up to 8 streams in one screen to make it easy to compare how the streams are transported through the network.

Stacked VLAN option

Stacked VLAN (Q-in-Q) is increasingly used in several types of Ethernet based networks. With a CMA 3000 Ethernet equipped with the Stacked VLAN options the user has a powerful tool for testing such networks. The Stacked VLAN option supports up to 8 levels of VLAN tags.

MPLS option

MPLS (Multi Protocol Label Switching) allows efficient routing of traffic in packet based networks. With a CMA 3000 Ethernet equipped and the MPLS option the user has a powerful tool for testing this type of traffic. Up to 8 levels of MPLS labels can be inserted. The MPLS option also supports EoMPLS (Ethernet over MPLS) also known as PWE3 (Pseudo Wire Emulation Edge-to-Edge), which defines transport of layer 2 protocol across an MPLS network.

VoIP test options

With a CMA 3000 Ethernet equipped with VoIP options the field technician can use the same instrument for testing VoIP services and the basic Ethernet transport system.

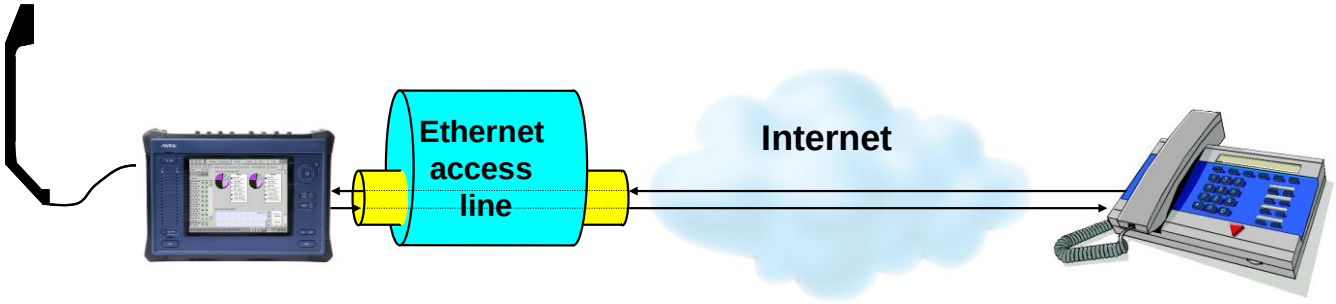


Fig. 19 Basic VoIP connectivity is verified by calling another party using the CMA 3000 Ethernet VoIP functionality.

For VoIP testing the instrument can establish a call and answer incoming calls. By connecting an analog telephone to the CMA 3000 Ethernet the user can make a conversation with the called/calling party. Statistics collected during the call will inform the user on the performance of the communication line used for the call. Based on this an add-on option can present voice quality information in terms of Mean Opinion Score (MOS) and R-factor values for one call at the time.

To make a realistic test case the instrument can generate or receive up to 8 calls simultaneously. These calls can be made on one or both test ports in the Ethernet option. If the instrument is also equipped with the Ethernet Multistream option, each of the 8 calls can be assigned to a stream, f.inst. allowing individual configuration of priority for the calls.

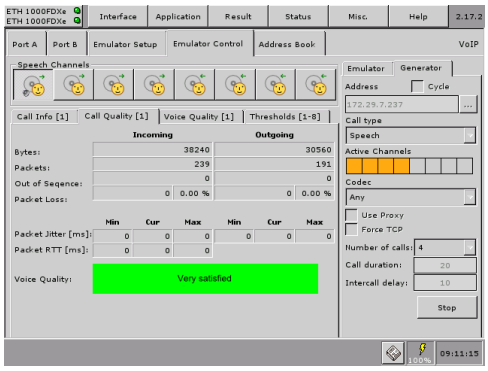


Fig. 20 A total of 8 VoIP calls can be generated through the CMA 3000 Ethernet's two test ports. The voice quality evaluation is presented for one call if the Voice Quality Measurement option is installed.

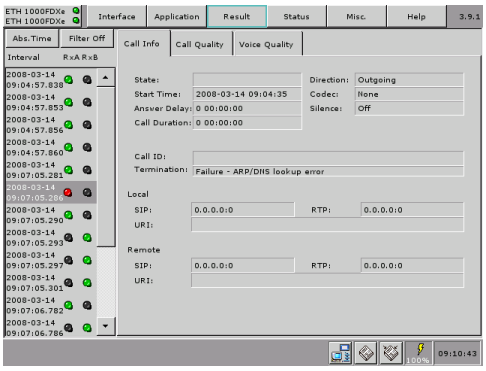


Fig. 21 VoIP call records are stored in memory when a measurement is active. Unsuccessful calls are highlighted with a red indicator in the left column.

10 G WAN PHY option

When the 10G interface is equipped with a 10G WAN PHY option the CMA 3000 Ethernet can be used for test and analyze of Ethernet traffic encapsulated in OC-192/STM-64 frames. The instrument provides powerful statistics for analysis of the transmission-error performance of a line together with information on pointer operations. G.826, G.828/G.829 or M2101 error-performance parameters are calculated for the measurement. When generating a 10 G WAN PHY the instrument provides you with great flexibility for injecting errors, alarms and overhead byte changes into the transmitted signal.

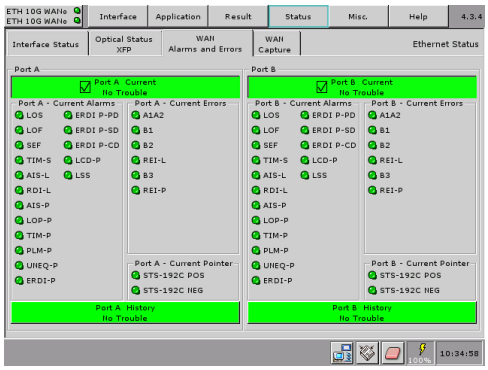


Fig. 22 A quick overview of the alarm and error status on the line.

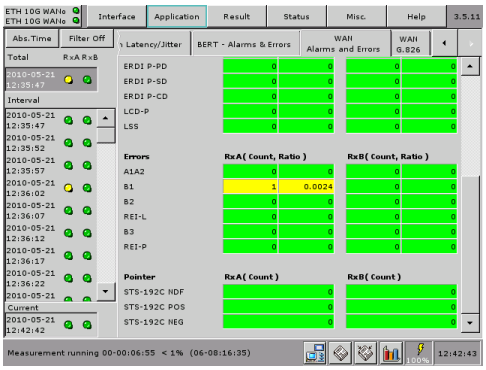


Fig. 23 Statistics for analysis of the transmission-error performance.

Fig. 24 Programming of 10G WAN PHY overhead bytes.

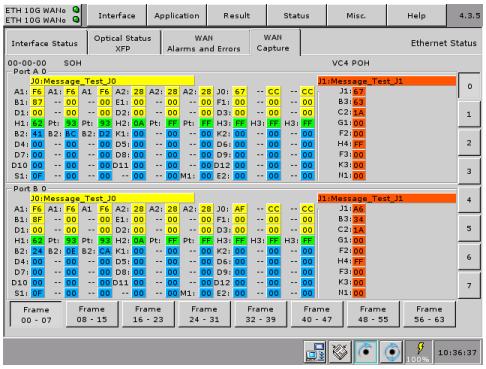


Fig. 25 Capture of 10G WAN PHY overhead bytes.

Specifications

Ethernet test interfaces

Interfaces

- Optical line interfaces 1 or 2 ports 10 Gbps, user-selectable optical modules: 850 nm (SR), 1310 nm (LR) and 1550 nm (ER)
  NB: Correct functioning can only be guaranteed with optical modules purchased from Anritsu for the CMA 3000 Ethernet.
- Optical line interfaces 2 ports 1000 Mbps, user-selectable optical modules: 850 nm (SX), 1310 nm (LX) and 1550 nm (ZX) or 100 Mbps 1310 nm (FX or LX)
  NB: Correct functioning can only be guaranteed with optical modules purchased from Anritsu for the CMA 3000 Ethernet.
- Electrical line interfaces 2 ports (in addition to the optical ports) 10/100/1000 Mbps RJ45 (unshielded and shielded twisted pair cables, category 5, 5E, and 6)
- **Safety measures for laser products:** Optical modules for the CMA 3000 comply with optical safety standards in IEC 60825-1.
- Specification of optical modules purchased from Anritsu for the CMA 3000 Ethernet (each with 1 transmitter and 1 receiver) with LC connectors (specifications may be subject to change without further notice):

Description (approx. distance)	Min. input sensitivity and wavelength		Output power and wavelength	
10GBASE- SR 850 nm Multi mode (0.3 km)	-11.1 dBm	850 nm Center	Between -6.5 dBm and - 1.5 dBm	Between 840 nm and 860 nm
10GBASE - LR 1310 nm Single mode (10 km)	-14 dBm	Min. 1260 nm Max. 1600 nm	Between -6 dBm and -1 dBm	Between 1290 nm and 1330 nm
10GBASE - ER 1550 nm Single mode (40 km)	-16 dBm	Min. 1260 nm Max. 1600 nm	Between -1 dBm and 2 dBm	Between 1530 nm and 1565 nm
10GBASE - ER 1550 nm Single mode (80 km)	-23 dBm	Min. 1260 nm Max. 1575 nm	Between 0 dBm and 4 dBm	Between 1530 nm and 1565 nm
1000BASE-SX 850 nm Multi mode (0.5 km)	-17 dBm	Min. 770 nm Max. 860 nm	Between -9.5 dBm and -3 dBm	Between 830 nm and 860 nm
1000BASE-LX 1310 nm Single mode (10 km)	-20 dBm	Min. 1260 nm Max. 1580 nm	Between -9 dBm and -3 dBm	Between 1285 nm and 1343 nm
1000BASE-ZX 1550 nm Single mode (80 km)	-24 dBm	Min. 1260 nm Max. 1580 nm	Between 0 dBm and 5 dBm	Between 1500 nm and 1580 nm
100BASE-FX 1310 nm Multi mode (2 km)	-31 dBm	Min. 1270 nm Max. 1600 nm	Between -20 dBm and -15 dBm	Between 1280 nm and 1380 nm
100BASE-LX 1310 nm Single mode (10 km)	-31 dBm	Min. 1270 nm Max. 1620 nm	Between -15 dBm and -8 dBm	Between 1261 nm and 1360 nm

Ethernet test configurations

- Monitor/generate
- Pass-through
- Reflector

Ethernet measurements

Supported encapsulations (frame formats)

- EtherType II (DIX v.2)
- IEEE 802.3 with 802.2 (LLC1)
- IEEE 802.3 with SNAP

Traffic generation

- Variable line rate traffic generation, up to full line rate
- Line load profile: Constant or ramp
- Traffic duration: Continuous, programmable number of seconds or frames
- Adjustable frame size from 44 bytes to 16000 bytes
- Frame sizes may be set to constant, stepped or random length
- User-defined traffic mix of unicast and broadcast frames
- User-defined VLAN ID and VLAN priority
- Fixed or incremented IP identifier
- Configurable IP and Ethernet source and destination addresses (supports IPv4 and IPv6 addressing). Fixed, DHCP, DNS.
- Generate pause frames
- Respond to pause frames

	• Answer incoming ARP and ping requests (On/Off) • User programmable DSCP/TOS byte • User programmable UDP/TCP address • Automatic TCP connect (user selectable) • UDP check sum: automatic or fixed (null). TCP check sum: automatic • Optional Ethernet (MAC) address swapping (reflector mode)
Receiver settings	• User-defined expected preamble length (3 to 15 bytes) • User-defined IFG lower threshold (8 to 15 bytes) for Ethernet 10/100/1000 Mbps • User-defined Jumbo frame size upper limit (1519 to 16000 bytes)
Error generation	• IFG for Ethernet 10/100/1000 Mbps, FCS, Preamble, Error symbol • Wrong IP checksum, fragmented IP, UDP with zero checksum • PRBS bit error, BERT sequence error
Alarm generation	• No link, Remote fault
Cable test	Identifies failures on electrical cables like short circuits or breaks of a wire pair and indicates the distance from the instrument to the fault. • Max distance: 110 m, accuracy: +/- 3 m.
RFC 2544 installation and commissioning	Switch/router test and Single ended network test modes: • Throughput • Frame loss • Latency or packet jitter • Back-to-back frames (burstability) End to end network test mode (two CMA 3000 Ethernets or CMA 3000s in a master-slave setup) • Throughput • Frame loss • Back-to-back frames (burstability) Router latency test mode: IP ping based latency test or packet jitter For RFC 2544 throughput measurement the user can choose to make the measurement for: • Utilization layer • Physical layer • Physical layer excl. preamble • Link layer • Network layer • Data layer • Average or maximum values
BER test	Generation and detection of test patterns. Count of errors in received test pattern. Pattern generation: Unframed, framed with IP header or framed with IP header and TCP/UDP header Detection of sequence errors and loss of sequence synchronization. Frame loss count and frame loss seconds Throughput measurement results are calculated for: • Utilization layer • Physical layer • Physical layer excl. preamble • Link layer • Network layer • Data layer • Min, avg. and max. values are presented Test patterns supported: • PRBS 9, PRBS 11, PRBS 15, PRBS 20, PRBS 23, PRBS 29, PRBS 31, HF test pattern, CRPAT, JTPAT, SPAT, 55 Hex, Fox, 16 bit user programmable User-defined resolution: 1, 2, 5, 10, 15, 30s, 1, 5, 10, 15, 30 min, 1, 2, 4, 6, 12 hour
Service disruption measurement	Service disruption measurement that can be activated as a part of the BER test • Max. and avg. service disruption time, resolution 0.1 µsec • Number of service disruptions

Ping test	For connectivity and configuration check • Round Trip Time (RTT) • Supports IPv4 and IPv6 addressing • Answer incoming Ping requests (On/Off)
Traceroute	Trace the IP route over the IP network • User-defined max no. of hops (1 to 255) Information per hop: Min/avg/max ping time and no. of ping time outs
Reflector mode	The following parameters are user selectable: • Swap all MAC addresses or one specific MAC address • Swap IP addresses • Swap port numbers on UDP/TCP frames • Force ACK on TCP frames Maximum internal delay when instrument is in reflector mode: 0.5 µsec @10Gbps, 2.8 µsec @1Gbps, 20 µsec @100 Mbps, 185 µsec @10 Mbps

Results	
Status	• Link status • Remote fault • Signal present • Jabber detected • Frames present • Speed • Full or half duplex • Interface type • Local clock (Ethernet 1000) • Pause capable and Asymmetric pause request (not Ethernet 10Gbps) • Link partner capabilities • Indicators for Utilization, throughput and errored frames CMA 3000 Ethernet indicates the signal level for optical Ethernet interfaces
Resolution	User-defined resolution for statistical measurements: 1, 2, 5, 10, 15, 30s, 1, 5, 10, 15, 30 min, 1, 2, 4, 6, 12 hour
Performance statistics	• Max/min/avg utilization • Max/min/avg throughput • Max/min/avg frame rate • Max/min/avg Latency • Max/min/avg Packet jitter
Frame statistics	• Total frames • Total valid frames • Unicast/multicast/broadcast frames • Number of pause frames • Total errored frames • Fragmented frames • Number of oversized and undersized (runts) frames • Number of FCS errored frames • Error symbol frames (not Ethernet 10Gbps)/Code violation frames (Ethernet 10Gbps) • Number of collisions (10/100 Mbps half duplex) • Preamble violations • IFG violations (Ethernet 10/100/1000 Mbps) • False carrier • 10G LFS LF (local fault) • 10G LFS RF (remote fault)

Burst statistics	• Total frames in bursts • Max/min/avg burst size
Frame distribution statistics	• Total valid/good frames • 64 - 127 byte frames • 128 - 255 byte frames • 256 - 511 byte frames • 512 - 1023 byte frames • 1024 - 1518 byte frames • Total number of jumbo frames • Max/min/avg frame size
Filters	Up to 8 filter conditions can be defined. Each condition can filter on: • IP or MAC source address • IP or MAC destination address • Broadcast address • IEEE OUI value • Encapsulation type • VLAN ID and VLAN tag priority • MPLS • TPC/UDP source and destination port • User-defined pattern at a defined offset
Adjustable thresholds	• Utilization • Throughput • Collision rate • Unicast frames • Multicast frames • Broadcast frames • Pause frames • Errored frames • Undersized frames (runts) • Oversized frames • FCS errored frames • IFG violations (Ethernet 10/100/1000 Mbps) • Preamble violations
DHCP	• Show source IP address assigned by DHCP • Show current lease expire time • Show IP addresses of primary and secondary DNS server when obtained by DHCP

Ethernet Stacked VLAN option	
Number of VLAN tags	Up to 8 VLAN tags can be set by the user Only 1 level of VLAN is supported in ping, traceroute and RFC2544 router latency tests
Parameters per VLAN tag	• EtherType 0x8100 (802.1Q), 0x88a8 (802.1ad), 0x9100 or 0x9200 • User-defined VLAN ID, CFI and VLAN priority
Status	Indicator for detection of VLAN tagged frames
Statistics	Available information: • Number of VLAN tagged frames • Max. number of VLAN layers detected

Ethernet Multistream option	
Number of streams	Up to 8 streams per port can be activated
Parameters per stream	• Encapsulation (frame format) • Line rate traffic load, up to full line rate • Configurable IP and Ethernet source and destination addresses (supports IPv4 and IPv6) • User-defined traffic mix of unicast and broadcast frames • Adjustable frame size from 44 bytes to 16,000 bytes • Frame sizes may be set to constant, stepped or random length • User programmable VLAN ID and VLAN priority, DSCP/TOS byte and UDP/TCP address In stream 1 a BER test can be made
Statistics	Available information per stream: • Frame loss count/rate • Throughput • Latency • Packet jitter • Frames and bytes received and transmitted

IP channel statistics option	

Statistics	The statistics are provided for up to 232 channels, identified by user-defined combinations of:
	• IPv4, IPv6 or MAC address
	• VLAN ID or MPLS label
	• Protocol information
	• IP next header (protocol)
	• TPC/UDP ports
	Traffic Capacity:
	• 10 Mbps line speed, 100 Mbps line speed and 1 Gbps line speed: 100% line load
	• 10 Gbps line speed:
	  ○ With average frame size 530 bytes (or higher) and the longest burst of short frames (64 bytes) is 84: 100% line load
	  ○ For all frame sizes: The traffic capacity is up to 2.20 Mframes per second when the longest burst of short frames (64 bytes) is 84.
	  ○ If the above conditions are not fulfilled, frames will be discarded from the IP Channel statistics. A special counter will show the number of frames discarded from the IP Channel statistics.
	Available information per channel:
	• Frame count/rate
	• Throughput
	• Byte count
	• MPLS frames
	• Jumbo frames
	• Errored frames and errored frame rate
	• Errored throughput
	• Errored byte count
	• Frame/packet size distribution
	• IP header bytes
	• IP fragments
	• TTL threshold violations
	• IP packet count, rate
	• IP bytes
	• IP throughput
	• IP header errors
	• TCP/UDP bytes
	• TCP/UDP packet count, rate, throughput, TCP/UDP errored packets

Service Activation Test option	
Service Activation Test	Service Activation Test in accordance with ITU-T recommendation Y.1564 • Test up to 8 services • Color-Aware and Non-Color-Aware in combinations (IP DSCP or VLAN PCP) • Supported Ethernet interfaces: 10 Gbps, 1 Gbps, 100 Mbps, 10 Mbps • Test modes: One-way (uni- or bi-directional, symmetrical or asymmetrical), Round-trip • Test port: A or B • Verification against Service Acceptance Criteria: Information Rate, Frame Transfer Delay, Frame Delay Variation, Frame Loss Rate, Availability Optional GPS timing synchronization
Service Configuration Test	• Subtests for: Committed Information Rate, Excess Information Rate, Traffic Policing, Committed Burst Size, Excess Burst Size • Step duration: 1 sec to 60 sec (user programmable) • Number of steps: 1 to 10 (user programmable) • Slope: rising or falling • Results: Pass/Fail indication, IR (Min/Mean/Max), FL (Count/FLR), FTD and FDV (Min/Mean/Max/ Current (during measurement))
Service Performance Test	• All services tested simultaneously at CIR • Duration 15 min, 2 hours, 24 hours or user programmable • Results: Pass/Fail indication, IR (Min/Mean/Max), FL (Count/FLR), FTD and FDV (Min/Mean/Max/ Current (during measurement)), AVAIL (%), Unavail (sec)

Ethernet MPLS option	
MPLS supported	MPLS unicast is supported (EtherType 0x8847) Support for MPLS in BERT, RFC 2544 (exculding router latency) Tests and general statistics MPLS can only transport VLAN and VoIP if EoMPLS is activated
Number of MPLS headers	Up to 8 MPLS headers can be set by the user
Parameters per MPLS headers	User-defined label, Exp and TTL fields in the MPLS header
EoMPLS support	An EoMPLS (Ethernet over MPLS) or PWE3 (Pseudo Wire Emulation Edge-to-Edge) label (the RFC4448 Control word) can be added.
Status	Indicator for detection of MPLS frames and EoMPLS
Statistics	Available information: • Number of MPLS frames and EoMPLS frames • Max. number of MPLS layers detected

Synchronous Ethernet Test option	
Timing Functionality	Timing sources (selectable): • Internal, Ethernet port A, Ethernet port B (dual port version required at 10 Gbps) , 2MHz signal, E1 PDH signal, IEEE 1588 clock A, IEEE 1588 clock B or a signal from an optional GPS receiver. Frequency deviation of +/- 100ppm in 1ppm steps. The frequency deviation of received Ethernet signals can be measured against a chosen reference timing source.
SyncE (G.826x) functionality:	Specify quality level (QL) of the transmitted Ethernet signal. Analysis of QL indicated in received Ethernet signal. An alarm is raised on missing QL indications. SyncE results: SSM Rx count and rate, SSM Tx count, Indicated QL statistics and SSF seconds. ESMC messages can be captured and exported in a Wireshark compatible format with the FrontSim option. In pass-through mode, the quality level indicated in ESMC messages can be changed on the fly to a given value in both directions independently.

IEEE 1588v2 functionality	Each port of the Ethernet interface can act as a timing master or a timing slave independently. Supported modes: Multicast (native PTP) and Unicast (G.8265.1). When acting as master in Unicast (G.8265.1) mode one slave is accepted at a time; other slaves are ignored. If the slave requires 32, 64, or 128 Sync messages per second the IEEE 1588-2008 paragraph 7.7.2.1 concerning 90% confidence interval is not followed. Configurable parameters (per port): Clock identity, Port number, Priority 1. Priority 2, Domain number, Clock class, Slave only mode, Time source, Encapsulation, Announce receipt timeout, Clock accuracy, Clock step mode, Announce interval, Sync interval, Minimum delay request interval and Unicast duration. A UTC time offset to be used when acting as clock master can be specified. For G.8265.1: Support of stacked VLAN and MPLS (other options required). IEEE 1588 clock results: Clock state, Announce count, Sync count, Follow-up count, Delay request count, Delay response count, Delay follow-up count, Peer delay request/response/response-follow-up counters, Min-/max-/average offset, Min-/max-/average offset deviation, Min-/max-/average offset variance, Min-/max-/average mean path delay, Min-/max-/average peer mean path delay, Min-/max-/average path delay variance, Min-/max-/average path delay variation. With a GPS signal present the offset from UTC time is calculated. The offset time between the two clocks is always shown. Parent clock results: Identity and Port number. Grand-master results: Identity, Class, Accuracy, Priority 1, Priority 2, Announced- and observed offset variance. Foreign master clock result (up to five clocks per port): Identity, Port number and Announce count. Logged IEEE 1588 events: Clock state transitions, State transition events, Faults and Changes in grand-master clock. IEEE 1588 messages can be captured and exported in a Wireshark compatible format with the FrontSim option. In pass-through mode the CMA 3000 acts as an end-to-end transparent clock in one-step mode.

VoIP Call emulation options	
Emulation modes	The instrument supports Client/Terminal emulation.
Supported protocols (options)	• SIP RFC 3261 • RTP/RTCP RFC 3550 and RFC 3551 • ITU-T H.323 Full connect • ITU-T H.323 Fast connect The VoIP call emulation options run on IP v4 only.
Settings	The following settings are user selectable: • Calling alias • IP address DHCP/static and Subnet mask • Gateway address and DNS server • DSCP/TOS byte • MAC address • VLAN ID and VLAN priority • RTCP on/off • Silence ringing signal SIP specific parameters (requires SIP call emulator): • Proxy/registrar address and port, User name, password, Registrar expire time H.323 specific parameters (requires H.323 call emulator): • Gate Keeper Mode (No Gate Keeper, Auto Discover Gate Keeper, Static Gate Keeper • Gate Keeper address and port, User name, password, H.245 tunneling
Supported Voice Coding	The following Voice codings are supported: • µ-law/A-law (G.711) • ACELP 5.3, MPC-MLQ 6.3 kbps (G.723.1) • ADPCM 16/24/32/40 kbps (G.726) (only with SIP call emulator) • LD-CELP 16 kbps (G.728) • CS-ACELP 8 kbps (G.729 a,b) • GSM FR, GSM EFR • Fixed codec preference list

	User selectable • Silence suppression (depends on selected codec) • Jitter buffer delay • Source: Voice conversation (optional telephone), tone, pre-recorded speech signal
Simultaneous calls	Up to 8 calls can manually be generated at a time
Call generator	Up to 8 simultaneous calls can automatically be generated repeatedly.
Call emulation logs	The following information is provided for each call: • IP address/Alias, RTP ports, Answer delay, Duration of call, Encoding (codec), Silence suppression On/Off • Call progress and error messages with 1 msec resolution
Call statistics	• Throughput sent/Throughput received as Bytes and Packets • Out of sequence packets. • Packet loss • Packet jitter (msec, (min/cur/max) • Packet Round Trip Time (RTT) (msec, (min/cur/max)
DTMF detection	Received in-band DTMF (tone signal in the audio stream) can be recorded for one speech channel. DTMF detection can be enabled and disabled.
Voice quality (optional)	Voice quality measurement on one call at the time: • Uses Telchemy's algorithms for achievement of MOS and R-factor values at live traffic end points: • MOS: Conversational, Listening, P.862 estimate, Maximum with selected codec • R-factor: Conversational, Listening, G.107 estimate, Listening during Burst and Gap periods, Maximum with selected codec • Voice quality evaluation summary, based on user defined thresholds
VoIP measurements	When a measurement is running Call emulation logs, call statistics are stored pre call that terminated during the measurement. DTMF information and the optional Voice quality information are stored for calls where they were measured. In addition there is a summary for all calls terminated during the measurement with information on: • Total number of calls. Number of Incoming, Outgoing, succeed, failed calls • Call duration (min/avg/max). Answer delay (min/avg/max) • Throughput sent/Throughput received as Bytes and Packets (min/avg/max/total) • Out of sequence packets. (min/avg/max/total) • Packet loss (min/avg/max/total) • Packet jitter (msec, min/max) • Packet Round Trip Time (RTT) (msec, min/max)
Phone Interface	Interface for connection of an analog telephone AC impedance: Approx. 600Ω. The phone will be supplied with a constant current of approx. 20 mA The phone supports receiving and transmitting speech signals. Connector: RJ11 (1x6) Female

10G WAN PHY option

WAN modes	10GigE (normal), WAN-PHY with Mixed-frequency test pattern, Square wave pattern, PRBS 31 pattern
Terminology	SONET or SDH
Error insertion	SONET Terminology: • A1A2, B1, B2, REI-L, B3, REI-P SDH Terminology: • A1A2, B1, B2, MS-REI, B3, HP-REI
Alarm insertion	SONET Terminology: • LOS, LOF, SEF, TIM-S, AIS-L, RDI-L, AIS-P, LOP-P, TIM-P, PLM-P, UNEQ-P, ERDI P-PD, ERDI P-SD, ERDI P-CD SDH Terminology: • LOS, LOF, OOF, MS-AIS, MS-RDI, MS-TIM, AU-AIS, AU-LOP, HP-PLM, HP-UNEQ, HP-TIM, HP-RDI, LCD
Error measurement	SONET Terminology: • A1A2, B1, B2, REI-L, B3, REI-P SDH Terminology: • A1A2, B1, B2, MS-REI, B3, HP-REI G.826, G.828+G.829 or M.2101.1(M.2100) error performance parameters are calculated
Alarm detection	SONET Terminology: • LOS, LOF, SEF, TIM-S, AIS-L, RDI-L, AIS-P, LOP-P, TIM-P, PLM-P, UNEQ-P, ERDI P-SD, ERDI P-CD, ERDI P-PD, LCD-P, LSS SDH Terminology: • LOS, LOF, OOF, MS-AIS, MS-RDI, MS-TIM, AU-AIS, AU-LOP, HP-PLM, HP-UNEQ, HP-TIM, HP-RDI, LCD, LSS
Overhead byte functionality	Generation of overhead bytes, defined by the user Capture and display of current overhead bytes
Pointer operation monitor	Positive movements, Negative movements, NDF

User Interface	
Display	8 ¼ " active TFT display with VGA resolution (640x480 pixels) and touch screen
LEDs	34 bi-color LEDs (with text on display)

Service interfaces	
USB data Interface	Two USB 1.1 ports. Connector type A. CMA 3000 Ethernet will operate as host
Ethernet Interface	Ethernet 10/100. One RJ45 connector
V.24 data Interface	DTE. Connector: 9 pin, D-sub, Male

Other interfaces	
Built-in loudspeaker	• The built-in loudspeaker monitors speech in both directions of a voice channel • Output level: user-controlled from front panel • A 3.5 mm diameter jack provides ear phone access to the audio signal. The built-in loudspeaker is disconnected when a headset is plugged in
Compact Flash	The instrument is equipped with one Compact Flash socket

Miscellaneous

Battery	10.8 V rechargeable and replaceable intelligent LiIon battery • Operating time: Typically 1.5 hours • Charging time: Typically 5 to 6 hours Indicator for remaining capacity: % and hours/minutes
Mains adapter	Input: 100-240 V AC, 50-60 Hz Output: 18 V DC, max. 3.4 A
Mechanical	The CMA 3000 Ethernet consists of a base unit and a 10G module attached to the back of the base unit. • Dimensions: o Base unit approx. 23 x 33 x 7.5 cm (HxWxD) o 10G module approx. 10 x 30.7 x 4.3 cm (HxWxD) Weight: Approx. 4.4 kg
Environmental	Operating temperature: 0°C to +40°C Storage temperature: -25°C to +60°C The CMA 3000 Ethernet is CE-marked and complies with EN 300 386, EN 61326-1 and EN 61010-1
Standard accessories	• User's Guide • LiIon battery • Mains adapter with mains cable • Stylus
Options	• 10 Gbps, 1 Gbps and 100 Mbps optical modules • 10G WAN PHY option • Ethernet Service Activation Test option • Synchronous Ethernet Test option • Ethernet multistream option • Ethernet stacked VLAN option • Ethernet MPLS option • IP over Ethernet measurement option • VoIP Call emulation options • FrontSim (remote operation) option • Remote Control – Scripting option
Additional accessories	• Carrying case • Carrying soft bag • Instrument carrying strap • Extra LiIon battery • Stand-alone battery charger • Telephone set • Measurement cables
Service products	• Factory calibration


Anritsu
ON OFF
A
B
LED TRAP
SHIFT
ESC
START
STOP
ERROR
SHIFT
ETH 10G LANo
ETH 10G LANo
Interface
Application
Result
Status
Misc.
Help
3.5.4
Abs.Time
Filter Off
Performance
Frame Stat
Burst Stat
Size Distribution
Transmit
Total
RxA RxB
Interval
Current
Frame Size Distribution (%)
Port A
64-127
222.9 k(3%)
128-255
446.0 k(6%)
256-511
888.8 k(13%)
512-1023
1.942 M(27%)
1024-1518
1.940 M(27%)
Jumbo Frames
1.671 M(23%)
Port B
64-127
223.5 k(3%)
128-255
443.6 k(6%)
256-511
891.3 k(13%)
512-1023
1.936 M(27%)
1024-1518
1.939 M(27%)
Jumbo Frames
1.673 M(24%)
Avg. Frame Size (Bytes)
Zoom 8x
Port A:
1032 B
Port B:
1029 B
Measurement running 00-00:09:58 < 1% (02-08:37:08)
09:48:56

- **United States**

Anritsu Company
1155 East Collins Blvd., Suite 100, Richardson,
TX 75081, U.S.A.
Toll Free: 1-800-267-4878
Phone: +1-972-644-1777
Fax: +1-972-671-1877

- **Canada**

Anritsu Electronics Ltd.
700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

- **Brazil**

Anritsu Electrônica Ltda.
Praça Amadeu Amaral, 27 - 1 Andar
01327-010 – Bela Vista - São Paulo - SP - Brasil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

- **Mexico**

Anritsu Company, S.A. de C.V.
Av. Ejército Nacional No. 579 Piso 9, Col. Granada
11520 México, D.F., México
Phone: +52-55-1101-2370
Fax: +52-55-5254-3147

- **United Kingdom**

Anritsu EMEA Ltd.
200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

- **France**

Anritsu S.A.
12 avenue du Québec, Batiment Iris 1-Silic 612,
91140 VILLEBON SUR YVETTE, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

- **Germany**

Anritsu GmbH
Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

- **Italy**

Anritsu S.r.l.
Via Elio Vittorini, 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

- **Sweden**

Anritsu AB
Borgarfjordsgatan 13A, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

- **Finland**

Anritsu AB
Teknobulevardi 3-5, FI-01530 VANTAA, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

- **Denmark**

Anritsu A/S (Service Assurance)
Anritsu AB (Test & Measurement)
Kay Fiskers Plads 9, 2300 Copenhagen S, Denmark
Phone: +45-7211-2200
Fax: +45-7211-2210

- **Russia**

Anritsu EMEA Ltd.
Representation Office in Russia
Tverskaya str. 16/2, bld. 1, 7th floor.
Russia, 125009, Moscow
Phone: +7-495-363-1694
Fax: +7-495-935-8962

- **United Arab Emirates**

Anritsu EMEA Ltd.
Dubai Liaison Office
PO Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suit 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

- **India**

Anritsu India Private Limited
2nd & 3rd Floor, #837/1, Binnamangla 1st Stage,
Indiranagar, 100ft Road, Bangalore - 560038, India
Phone: +91-80-4058-1300
Fax: +91-80-4058-1301

- **Singapore**

Anritsu Pte. Ltd.
60 Alexandra Terrace, #02-08, The Comtech (Lobby A)
Singapore 118502
Phone: +65-6282-2400
Fax: +65-6282-2533

- **P.R. China (Shanghai)**

Anritsu (China) Co., Ltd.
Room 2701-2705, Tower A,
New Caohejing International Business Center
No. 391 Gui Ping Road Shanghai, 200233, P.R. China
Phone: +86-21-6237-0898
Fax: +86-21-6237-0899

- **P.R. China (Hong Kong)**

Anritsu Company Ltd.
Unit 1006-7, 10/F., Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong, P.R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

- **Japan**

Anritsu Corporation
8-5, Tamura-cho, Atsugi-shi, Kanagawa, 243-0016 Japan
Phone: +81-46-296-1221
Fax: +81-46-296-1238

- **Korea**

Anritsu Corporation, Ltd.
502, 5FL H-Square N B/D, 681
Sampyeong-dong, Bundang-gu, Seongnam-si,
Gyeonggi-do, 463-400, Korea
Phone: +82-31-696-7750
Fax: +82-31-696-7751

- **Australia**

Anritsu Pty. Ltd.
Unit 21/270 Ferntree Gully Road, Notting Hill,
Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

- **Taiwan**

Anritsu Company Inc.
7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817