Enabling Australia's Field Technicians to build, troubleshoot and maintain better communications networks.

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CN-100
Network Analyzer

CN-100 network analyzers offer an extremely powerful yet cost effective solution for today's complex networking requirements. Test Ethernet or ATM networks with the multi-port CN-100 portable or rack mount chassis which provide a standard platform that is easy to use, reducing training time and the expense of multiple testers. The CN-100's performance and scalability offers the latest traffic generation and analyzing capabilities that support a variety of protocols and media to meet your needs for today and tomorrow.

Applications

- Ideal for Installation & Maintenance, Network Commissioning, Manufacturing, Quality Assurance and Research & Development
- Emulate end equipment or transmission network equipment
- Perform Functional test, regression test and stress test
- Conformance – Verify product meets standards
- Interoperability – Verify product works with other products
- Performance – Verify product works under different traffic conditions
- Fault Finding– Reduce costly recalls of bad equipment

Highlights

- **10 Gigabit Ethernet LAN/WAN Interface Module**
- **10/100/1000 Mbps Dual Media Ethernet Interface Module**
- **ATM Interface Modules**
- **CN-100 Manager Software**
- **Portable or rack-mount Chassis**
- **Full Line Rate Traffic Generation, Monitoring Capture and Analysis**
- **Perform Simultaneous QoS Testing and Capture with detailed Histogram Statistics**

Reduce Cost of Testing

- Multiple interface platform reduces training time and the need for multiple testers
- Lowest cost per test port available- Reduces capital spending
- Cost effective Physical Interface Cards for supporting multiple technologies provide full line rate generation, monitoring, analysis and capture across each port. Software selectable line rates are available for ATM and Ethernet interfaces
- Multiple users can share resources by controlling individual cards or ports on the same chassis, thus saving more money
- Easy-to-use graphical user interface for configuration, data capture, and real-time analysis
- C-library and Command Line Interface available for automated tests
- AUTO TEST- factory or user defined test suites, PASS/FAIL results
- Field upgradeable design architecture allows easy field upgrades for firmware, software and hardware. The upgrades for future enhancements to ensure the life of the product

10 Gigabit Ethernet LAN/WAN Interface Module

The CN100 10 Gigabit Ethernet LAN/WAN Interface Module supports wire-speed 10 Gbps IPv4/v6 traffic generation and analysis. It delivers integrated data plane and control plane traffic generation and analysis for IPv4/v6 routing protocols, L2/L3 MPLS VPNs, multicast, multi-protocol encapsulation and label stacking (including IPv4/v6, MPLS, and stacked VLANs).

Number of Ports: 2 per Interface Module
2-Slots supporting 4 ports of 10 Gigabit Ethernet
Interface: 10 Gigabit Ethernet XFP

Key Features

- Dual port 10 Gbps LAN/WAN support of IPv4/v6 traffic generation and analysis

- 256 unique streams per port, millions of unique flows per stream

- Powerful FPGA for wire-speed packet generation with timestamps, sequence numbers, data integrity signature

- Tracks and analyzes up to 8192 unique streams for real-time latency, inter-arrival time, packet loss, data integrity, and sequence checking

- Real-time per flow statistics display with latency and jitter per traffic class, flow filters can be IP, MAC, VLAN tag, MPLS label and Diffserv

- Framed bit error rate testing for layer 2,3, 4, IPv4,IPv6, TCP,UDP

- 8 Mbyte real-time full line rate capture buffer with decoder, captured data can be replayed

- RFC 2544 and RFC 2889 with graphic results build in GUI software

- Ethernet and ATM internetworking with real-time QoS test

- Support multi-Level VLAN (Q-in-Q) and MPLS

- Multi-users per port: 4 individual users can access CN100 10G tester at the same time when CN100 is fully loaded

- Line loop back (monitor mode), PMA loop back, XGMII loop back

- Remote loop back for remote locations loop back testing

- C and Tcl library allows users to develop custom scripts and integrate the modules into automated test environments

- Hardware and firmware are field programmable

Traffic Generation

Full line rate traffic generation capabilities include generation of Ethernet frames with various configurable parameters such as bandwidth utilization, frame rate, frame payload and frame length to simulate different network traffic conditions and analyze the performance of the link. Generate 256 streams per port with user configurable parameters including:

- Up to 256 unique streams on a port

- Stream-based, wire-rate traffic generation at all frame sizes with timestamps, sequence numbers and data integrity signatures

- Set packet rate per stream

- Configurable frame gap and burst gap

- Stream length from 40 bytes to 16 kbytes

- Transmit mode: Continuous, burst, multi-burst, continuous-burst, single step, echo, and manually single insertion

- Error generation for CRC, alignment, symbol, integrity, and IP checksum

- Compass data integrity signature frames for QoS testing

- Payload patterns: Fixed, incrementing, decrementing, and random values, user defined payload date

- Varies multiple address fields per stream to create millions of unique flows

- User defined field (UDF): Fixed, increment or decrement by user-defined step, value lists, range lists, cascade, random, and chained

- Supports 802.1p, 802.1q, and 802.3ac VLAN tagged frames

- Supports 802.3x flow control commands

- Ports are completely independent in operation

- Support for ARP/Ping generation and response

- Protocol type: ICMP, IGMP, ARP, RARP, VLAN tagged frames, TCP, UDP, MPLS, IPv4, IPv6, IPv6-TCP, IPv6-UDP real-time frame insertion

- True layer 4 TCP/UDP

Monitoring and Analysis

Comprehensive user-definable filters and triggers provide real-time traffic analysis with link and frame statistics:

- Analyzes up to 8192 unique streams in histograms
- IPv4, IPv6 Frames Received
- Provides real-time analysis of TOS and Diffserv values, giving rates and events per traffic class
- Simultaneously measures packet loss, latency and frame sequencing for each stream, and correlates to traffic load
- Unicast, broadcast, and multicast traffic effects can be analyzed
- 32 MB capture buffer per port, configurable trigger and filter conditions
- Per-port statistics include counters for transmitted / received frames, total bytes, CRC errors, over- and under-sized frames, VLAN tagged frames, MPLS Frames, data integrity, Trigger Frames, IP checksum, signature field, jumbo frames and pause frames
- Detect Errors: CRC, Alignment, Symbol, Integrity and IP Header errors
- ARP Request/Reply, Ping Request/Reply
- Data integrity checking of payload
- IP header checksum verification

Real-Time QoS Tests

LAN QoS tests performed using the Compass Data Integrity Signature, QoS histograms based on stream tracking or overtime buckets are available displaying packet loss, sequence tracking, utilization, and latency per stream. Generate and analyze frames with timestamps, sequence numbers, and data integrity for detailed statistics and payload verification

- Real-time stream base QoS measurement for 8192 streams
- Latency average, minimum, maximum and distributions per stream
- Sequence Tracking, In Sequence, Out of Sequence, Lost Packets
- Measurable packet jitter for average jitter, maximum jitter and last latency
- 64 Real Time flow based QoS statistics test based on traffic discovery

- Flow Mode Filters Selection
  - IPv4 Address (Source/Destination)
  - IPv6 Address (Source/Destination)
  - VLAN Tag
  - MPLS Label
  - DiffServ Value
  - Packet Jitter Full

Bit Error Rate Testing

- Multi-streams and multi-destination address Layer 2, 3 and 4 in frame BERT testing on each port. TX generator and RX checker support PRBS-15,19,23 and fixed patterns
- BERT testing to verify the packets data integrity for each packet per port. The BERT testing support layer 2,3,4, IPv4,IPv6, TCP and UDP
- The test results report bit error rate, dynamic bit error ratio, and static bit error ratio
- Insert Single Bit Errors or a constant error rate 10E-3 or 10E-6
- BERT statistics and rate
  - TX BERT packets, byte, rate
  - RX BERT packets, byte, rate
  - RX error bits
  - Dynamic bit error ratio
  - Static bit error ratio
  - RX BERT bandwidth
  - TX and RX BERT timers

Full Rate/Real Time Capture

32M Bytes real-time full line rate capture with an extensive set of triggers and filters is available for capturing based on source and/or destination MAC and/or IP addresses, Traffic Type and error conditions. Real time capture can immediately display the received frames based on any combination of 32 user defined events. Perform simple decode or export data to a protocol decoder which is available separately.

- Capture mode: capture with first matched frame at beginning, end, or at user defined location, including immediately before and after the matched event frame. Capture all received frames or capture filtered frames
- Up to 32 events with any/and/or combinations can be used to define capture filter criteria

• Capture entire frames, first 64 bytes, last 64 bytes, user defined 64 bytes, raw Signature field data, display frame size, received timestamp, and frame status

Transmit & Receive

• Bandwidth

• Frames

• Bytes

• Signature Frames

• Undersize, Oversize

• Alignment Errors

• Collisions, Late Collisions

• VLAN Frames

• MPLS Frames

• IPv4, Ipv6

• Pause Frames

• IP Header Frames

• Header Errors

• Integrity Errors

• Ping & ARP Request/Replies

• Bert Packets, Bit Errors

Protocol Support

• IPv4, IPv6, UDP, TCP, ARP, ICMP, IGMP, RIP, OSPF and MPLS

RFC2544 and RFC2889 Test

RFC2544 provide Throughput, Frame loss, Back-to-Back, Latency performance test for layer 2 and layer 3. . Graphical test results and test log files provided

• Throughput Test: and Finds the rate at which all transmitted packets are forwarded with zero loss by the system under test

• Latency: Measure the Minimum, Maximum and Average Latency of various frame sizes at the zero loss rate determined by the throughput test

• Frame Loss Test: Measure the packet loss at various input data rates and frame sizes

• Back-to-Back Test (Burst Length Test): Finds the longest burst length - with minimum frame gap - the system under test can sustain without losing frames

RFC2889 provide fully meshed traffic performance test for Forwarding, Congestion control, address caching capability, address

learning rate and error frame filtering. Graphical test results and test log files provided

• Full mesh throughput, frame loss and forwarding rate

• Partially meshed one-to-one, one-to-many, many-to-one, many-to-many

• Forwarding

• Congestion control

• Address caching capability

• Address learning rate

• Error frame filtering

Routing Protocols Generator

• Routing Information Protocol Packets

• Open Shortest Path First Protocol Packets

Internetworking Tests

• The 10G module, in combination with other Compass modules can perform internetworking tests with 10/100/1000 Mbps Ethernet, and ATM modules

• Real time internet transmit and analysis

• CN100 ATM and Ethernet QoS test performed using Compass Data Integrity Signature

• Inter working QoS test and real time statistics can be performed between ATM and Ethernet

• TX and RX frame counters

• Bandwidth utilization & rate

• Latency measurement (Max, Min, Mean)

• Sequence tracking displayed in real time

Optical transceiver types	XFP MSA Transceivers
Laser wavelengths	850nm, 1310nm, 1550nm
10GbE IEEE 802.3ae protocol modes	Serial LAN, WAN
Optical cabling	Multi-mode, single mode fiber
Signal rate	10.3125Gbps LAN, 9.58464Gbps WAN
Minimum / maximum frame size without CRC	42 – 16,384 bytes

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ATM Interface Modules

The ATM interface modules allow full line rate generation, monitoring and capture across each individual port. Dual port ATM interfaces are available for OC-12/OC-3 (software selectable), DS3, and E3 rates. The multi-rate cards provide a high-density, yet cost effective solution for your ATM testing requirements.

Traffic Generation

Traffic generation capabilities allow users to define the complete VC. The data can be specified using the ATM Adaptation Layers (AALs), the resource management (RM) cell and the OAM cell. Set payload content with user-defined data over the entire header and payload. Provision payload scrambling, VCs and Headers. Ability to control the traffic profile over all VCs.

- 1024 full-duplex traffic streams can be generated and monitored per port
- Define traffic, AALs, OAM cells, AAL-5 PDUs, O.191 test cells, Quality of Service (QoS), BERT test, RAW cells, user enable/disable Sequence Number and time stamping
- 1024 Virtual connections can encapsulate protocols such as: TCP/IP, PPP ILMI, LANE, PPPoE, PPPoA, MPLS
- IP Over ATM and IP Ping testing
- Define header and payload, predefined payload patterns or user defined cells and PDUs including programmable embedded words in any position
- CRC generated by hardware: AAL-5 generate, CRC 32, O.191 Test Cell generate CRC 16, OAM generate CRC 10
- 1024 streams have independent traffic shaping: Constant Bit Rate (CBR), Variable Bit Rate (VBR), Unspecified Bit Rate (UBR) service categories. Definable Sustained Cell Rate (SCR), Peak Cell Rate (PCR), Maximum Burst Size (MBS), Cell delay Variation Tolerance (CDVT)

Monitoring and Analysis

Real-time traffic monitoring is made easy with comprehensive filters and triggers. Using graphical histograms and charts users can perform easy analysis of real-time traffic.

- Full rate traffic monitor: 1024 Virtual Connections monitored simultaneously including TX, RX, error counters
- Each port accumulates statistics in real time, including the count and rate of cells and frames sent and received.
- Auto-Scan of all active network VPI/VCI up to 16 million.

- Global statistics: transmit cells, receive cells, test cells, OAM cells, BERT cells, Sequence Numbers SN, Filtered cells, Triggered cells, HEC errors, CRC10/16/32 errors, Header match, payload match, Transmit/Receive packets
- Bandwidth Utilization, rate/peak rate, Cells/bits per second
- Extensive Filter and Trigger Capabilities: 32 Header Filters, 2 Payload Filters: Header Bit mask/48 Byte payload mask
- Transmit and Receive BERT cells, OAM cells, AAL5 PDUs 32 Channel Hardware SAR- Segmentation and Reassembly

Physical Layer Testing

Detect and inject Physical and ATM layer alarms and errors including framing and cell delineation testing. Monitor PHY status for alarm and error counters on each port including HEC Correctable and uncorrectable counts, Section LOS, Section LOF, Section BIP (B1), Line AIS, Line RDI, Line REI (FEBE), Line BIP (B2), Path AIS, Path RDI, Path REI (FEBE), Path BIP (B3), Path LOP.

BERT-Bit Error Rate Testing

BERT testing to verify transmission line quality Perform Bit error rate testing on each port to verify transmission line quality. BERT-Bit Error Rate Test patterns: Predefined PRBS 15,20,23 All ones, All zeros. Inject Single Bit Errors or inject a constant error rate 10-3 or 10-6.

Quality Of Service Testing (ITU-T O.191)

Quality of Service testing provides accurate performance measurements on each port. Perform 1-point or 2-point QoS including lost cells, mis-inserted cells, cell transport delay and cell delay variation. Graphical histograms and charts provide easy to read accurate measurements of cell loss, cell delay and error rate.

Real-Time Capture

Full-rate capture can be performed on each of the individual ports. An extensive set of triggers and filters is available for capturing based on header or payload, cell type, data pattern, error conditions and other user definable fields. Turn on or off any variety of Pre-and/or Post-Capture filters/triggers to perform specialized captures to isolate data.

Operation, Administration and Maintenance (OAM)

Perform OAM tests and Insert OAM cells on live traffic with our programmable OAM cells. OAM cells used for alarm surveillance, performance monitoring and troubleshooting. Programmable OAM cell insertion of F4/F5 End-to-end, Loop back, segment management, AIS, RDI, Continuity Check, activation/deactivation, loop back test. OAM cell capture, decode and perform CRC 10 check.
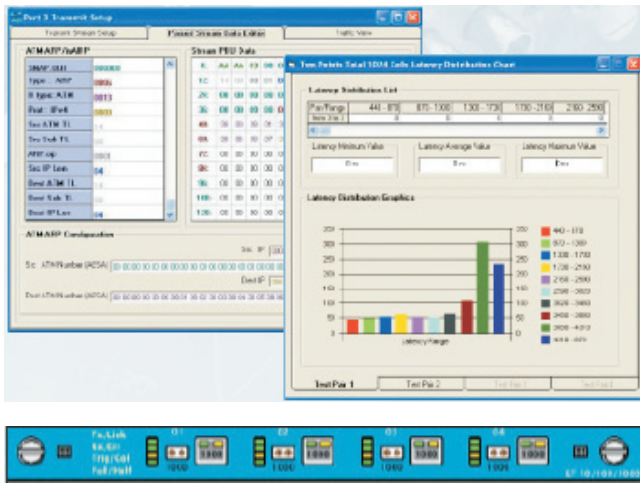
CN-100 Manager Software

The CN-100 manager software tool allows multiple users to be connected to one chassis and control the CN-100 locally or remotely via a 10/100 Ethernet LAN. The CN-100 Manager can be used to load redefined tests or user-defined tests with full access to traffic generation, monitoring, QoS statistics and histograms, and full-line rate capture. Save test results with detailed trending and report generation.

ATM Interface Modules

OC-12c/OC-3c (STM-4/STM-1) Single Mode Software selectable 622 Mbps/155 Mbps	2-Ports/1-Slot
OC-12c/OC-3c (STM-4/STM-1) Multimode Software selectable 622 Mbps/155 Mbps	2-Ports/1-Slot
OC-12c/STM-4 Single Mode 622 Mbps	2-Ports/1-Slot
OC-12c/STM-4 Multimode 622 Mbps	2-Ports/1-Slot
OC-3c/STM-1 Single Mode 155 Mbps	2-Ports/1-Slot
OC-3c/STM-1 Multimode 155 Mbps	2-Ports/1-Slot
155 Mbps UTP-5 CAT 5	2-Ports/1-Slot
DS3 45 Mbps	2-Ports/1-Slot
E3 34 Mbps	2-Ports/1-Slot

Compass 10G Ethernet LAN/WAN Module Specifications

General Specifications	Description
Number of port per module	2
Number of port per chassis	4
Optical transceiver types	Pluggable XFP MSA
Laser wavelengths	850nm, 1310nm, 1550nm
Optical cabling	Multi-mode, single mode fiber
10Gbe IEEE 802.3ae protocol modes	Serial LAN, WAN
Signal rate	10.3125Gbps LAN. 9.58464Gbps WAN
Needs external PC	Yes
Remote GUI (Operation)	CN100 Manager
Daisy Chain	Up to 4 CN100 chassis
LAN port control	10/100
Auto-negotiation	Yes
Hardware and firmware field-programmable	Modules can be upgraded on site in its chassis as new features and technologies become available.
Multi users per port	Individual Port level control, 2 user per 10G module, Four users per chassis with two 10G cards

Transmit Generator Specifications

Transmit Engine	Built in FPGA logic for wire-speed packet generation with timestamps, sequence numbers, data integrity signature.
Number of streams generate per port	256
Transmit mode	Continuous, burst, multi-burst, continuous-burst.
Min / Max frame size without CRC	48 -16,384 bytes, fixed, stepped or random
Load units	Frames/second, or % of line rate
Set packet rate per stream	Yes
UDF (User Defined Field) per stream	2, 4 Bytes each with anywhere in the stream can be fixed, increment, decrement and random.
Flows per stream	2, 4 Bytes each, MAC source/destination, IP source/destination, port source/destination, UDF
Error generation	CRC, Alignment, Symbol, integrity and IP checksum
Stream Encapsulations	Ethernet II, 802.3, VLANs, stacked VLANs, MPLS label stack, mixed VLANs / MPLS labels, IPv4, IPv6, ICMP, TCP, UDP, user defined frame.
Transmit counters	Total frame, total byte, Tx rate per stream, Tx Ave. bandwidth, signature frames, IPv4, IPv6, ARP request/replies, Ping request/replies,
Number of flows	Millions per stream
Jumbo frames	16k Bytes

IFG adjustments	Yes
MPLS support Multi-Labels	8 labels
Stacked VLAN support	8 tags
User defined payload	48 to 16 kbytes
Pause frames	Yes
ICMP/Ping	Measure Ping round time delay.
IGMP	IGMP Version 1,2,3 Join, Leave and Query

Receive Tracking and Analysis Specifications

Receive Engine	Built in FPGA logic for wire-speed packet filtering, capturing, real-time latency and inter-arrival time for each packet, data integrity, and sequence checking
Receive triggers	2 per stream, 6 Bytes, can be on / off / or / and
In-Line Network Monitoring	In-line with the network and can passively monitor at full wire speed
Receive statistics and counters	Total frames, total bytes, Rx rate per stream, Rx Ave. bandwidth, signature frames, IPv4, IPv6, VLAN, MPLS, Bert frames, CRC, Alignment, symbol, IP header checksum, integrity, sequence errors, oversize, undersize frames, trigger, pause frame, ARP request/replies, Ping request/replies.

Real-time Rx flow base QoS test

Number of QoS flows on Real-Time Display	64
Real-time analysis sequence tracking	In sequence, out of sequence, lost frame
Real-time analysis latency	Min, Max, Average
Real-time analysis filter	IP, MAC address, VLAN tag, MPLS label, DiffServ

Layer 2 and 3 QoS test

Number of streams tracks and analyzes per port	8192
Test types	Sequence + latency, latency distribution, sequential original packet, sequence tracking, sequence + jitter.
Latency Measurements	20 ns resolution
Iteration setup	Manual, fixed period, fixed burst.
Latency histogram	10 intervals, 100 ns
Size sequence	128,256,512,1024,1280,1514 Bytes
Tx utilization mode	Manual, increment, decrement, min, max, step.

Routing protocol generator

RIP	
OSPF	

Capture and decode Specifications

Capture buffer size	32M byte per port
Capture data replay	Yes
Capture configuration and events	Capture buffer can be configured base on user defined trigger and filter conditions. 4 capture modes: start, stop, filter match, center position. 32 capture events
Real-time decodes control plane and data plane	Ethereal format can be imported or exported

Bit Error Rate Test

BERT test	Framed bit error rate test for layer 2,3 and 4. IPv4,IPv6, TCP and UDP frame.
BERT test patterns	3 Pseudo-random patterns: PRBS-15,20,23 and user defined fixed 4 bytes data
BERT statistics and counters	Tx Bert frames, Tx Bert rate. Rx Bert frames, Rx Bert rate, Rx error bits, Rx error bits rate, dynamic bit error rate, static Bert rate, Rx Bert bytes, Rx Bert byte rate, Rx Bert bandwidth, TX elapse timer, Rx elapse timer
Single bit error insertion	Single bit error insertion to the real time traffic
Tx error rate	No error, error rate 1.0E-3, error rate 1.0E-6

RFC 2544 and RFC 2889

RFC 2544 test	Throughput, frame loss, back-to-back, latency test
Test parameters	Duration, number of trials, max rate %, initial utilization, loss tolerance, number of frames for frame loss test, granularity

RFC 2889 test

Test type	Forwarding, congestion, address capability, learning rate, filtering
Traffic type	One to one, one to many, many to one, many to many, fully meshed, congestion, addressing
Traffic load	Binary search, increment, fixed, decrement.
Traffic result and report	Graphic (3D, line), log file, text file
Frame size	Standard, increment (min, man, step)

Remote test automation

Tcl/Tk application library	Yes
C and C+ Libraries	Yes

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