



2008 Global Test & Measurement
Emerging Company of the Year Award

VePAL CX100/E, CX120/E, CX150/E CATV Signal Analyzers

CATV network testing simplified

VeEX™ VePAL CX100 / CX120 / CX150 (E)¹ are next generation test solutions designed for analog and digital cable TV networks supporting VoIP and Internet service.

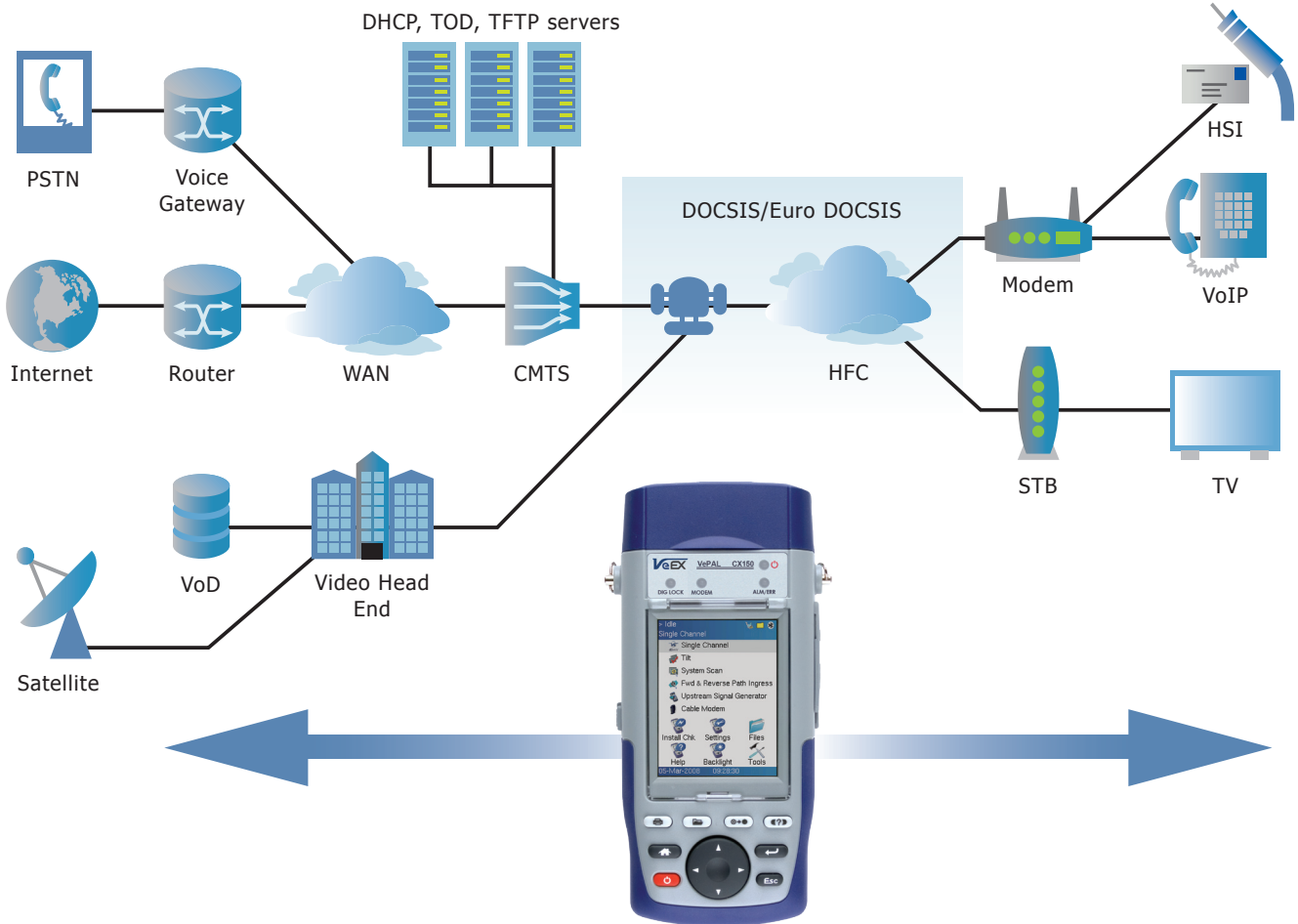
Platform Highlights

- Intuitive presentation of measurements with test graphics
- High resolution color touch-screen viewable in any lighting conditions fitted with protective cover
- Robust, handheld chassis packed with powerful and flexible features for demanding environments and test conditions
- Optimized for field engineers or technicians installing and maintaining CATV networks enabling triple play services
- Ethernet connection for back office applications, workforce management and triple play service verification
- User defined test profiles and thresholds enable fast, efficient and consistent turn-up of services
- USB memory stick and FTP upload support for test result storage/file transfer
- Maintain instrument software, manage test configurations, process measurement results and generate customer test reports using included ReVeal™ PC software
- Extend field testing time using interchangeable LiIon battery pack. Greater battery autonomy provided in standby mode
- Advanced IP connection tests; Ping, trace route, ARP Wiz, web browser, and FTP upload/download
- Optional NetWiz cable diagnosis with network statistics
- Optional VoIP call emulation and MOS performance analysis
- Optional WiFi Wiz site survey with internet connection test

Key Features

- Frequency range support and analysis from 4 to 1000 MHz
- Measure video and power level of NTSC, PAL and SECAM¹ analog video signals
- Carrier to Noise (C/N) and adjacent channel measurement ratio
- Measurement of QAM 64/256 digital signals including deep interleaved modulation
- Pre and Post BER measurements of QAM carriers
- Fast system scan mode of the entire active channel plan
- Installation test procedures with location specific limits
- Single-channel measurements with Min/Max thresholds
- Modulation Error Ratio (MER) measurement to identify transmission quality degradation
- Constellation diagram to assess digital channel quality and indicate impairments
- Tilt measurements to indicate distortion over the frequency spectrum allowing technicians to apply correct equalization
- Forward and Reverse path ingress scan indicate the presence of noise and/or CSO/CTB interference
- Upstream Signal Generation capability (CX120/ CX150/E¹ models only)
- DOCSIS 2.0 modem emulation (CX150 models only)
- Euro-DOCSIS 2.0 modem emulation (CX150E models only) cable diagnostics

Applications

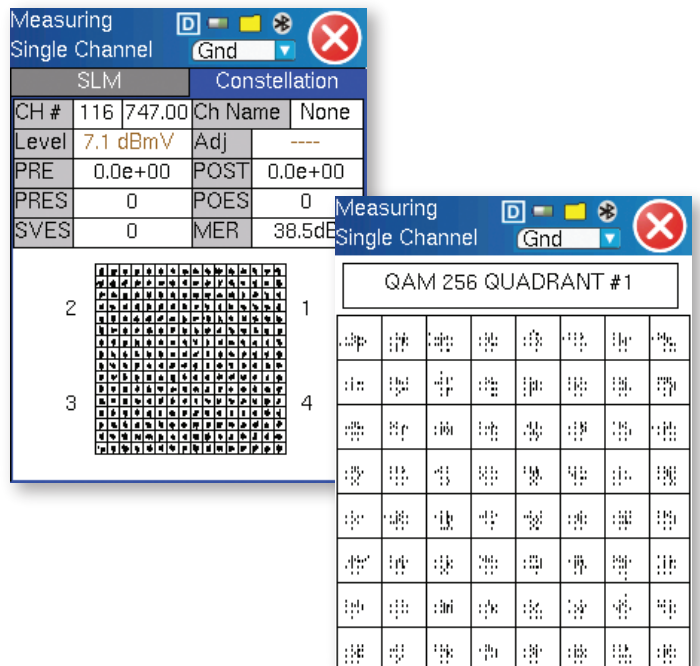
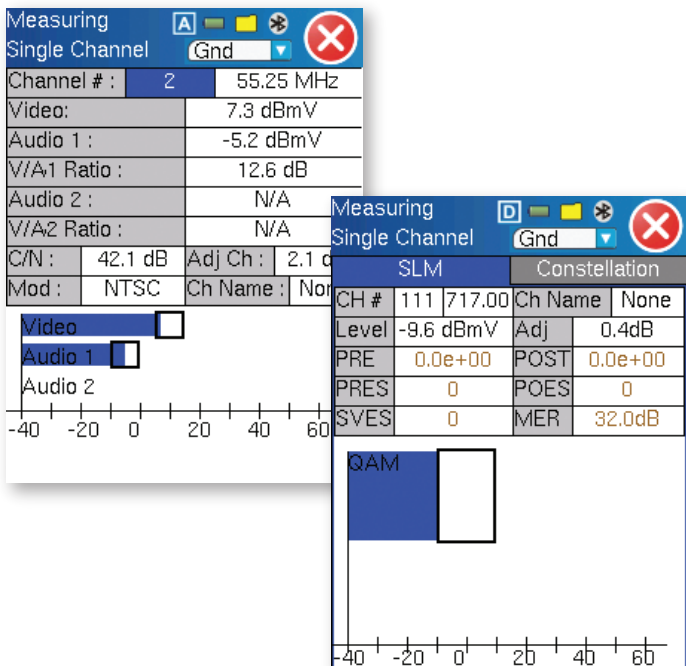


Single channel measurement

Analog and digital carriers are very different in terms of signal content and power distribution and thus require the advanced SLM techniques supported in the CX series. In analog mode, both video and audio levels including the V/A and Carrier to Noise (C/N) ratios are indicated. In digital mode, the average power of the QAM channel is measured, MER and BER performance is displayed. One button test, user programmable thresholds and test point compensation are value added utilities enabling fast, simple and automatic testing of carrier signals.

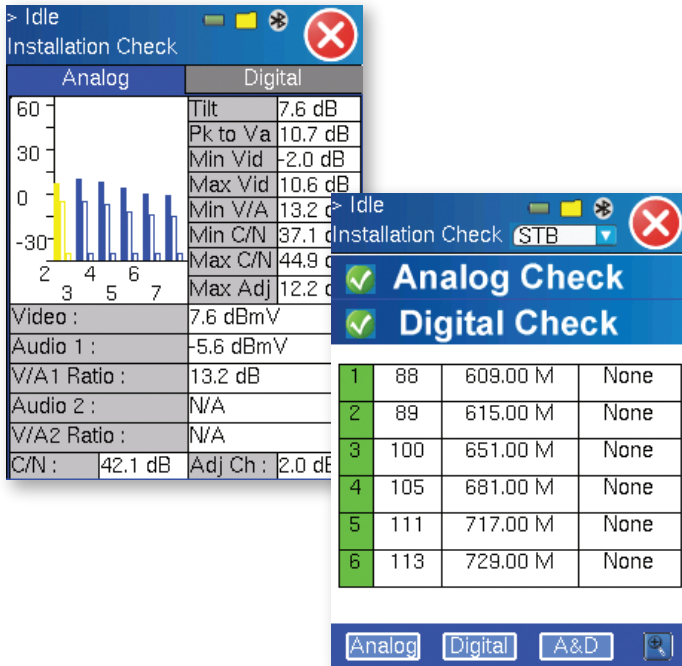
Constellation Mode

Digital pictures do not show signal impairment until it is too late because the margin between acceptable quality and failure is quite small. Constellation diagrams are a visual aid and tool to help detect the presence of noise, coherent interference, phase noise, and gain compression, all of which impact overall signal quality and Modulation Error Ratio (MER). Ideally, each of the 64 or 256 symbols should display a clean dot indicating a perfect QAM signal, therefore the size and shape build up of dots is indicative of problems which contribute to bit errors and even service disruption.



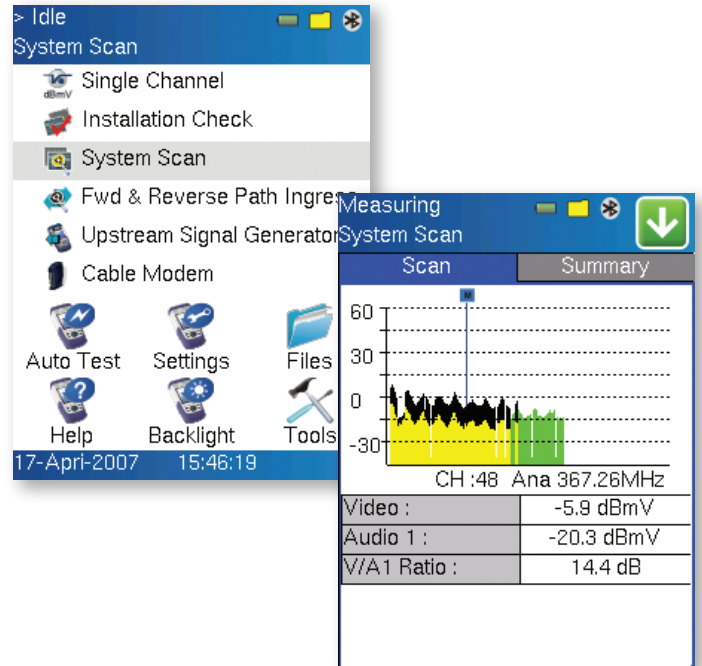
Installation Check

For new installations, up to six analog and six digital channels are checked against preset thresholds. Pass and fail conditions are color coded for easy interpretation and test results are clearly shown. A zoom function provides data measurement in greater detail.



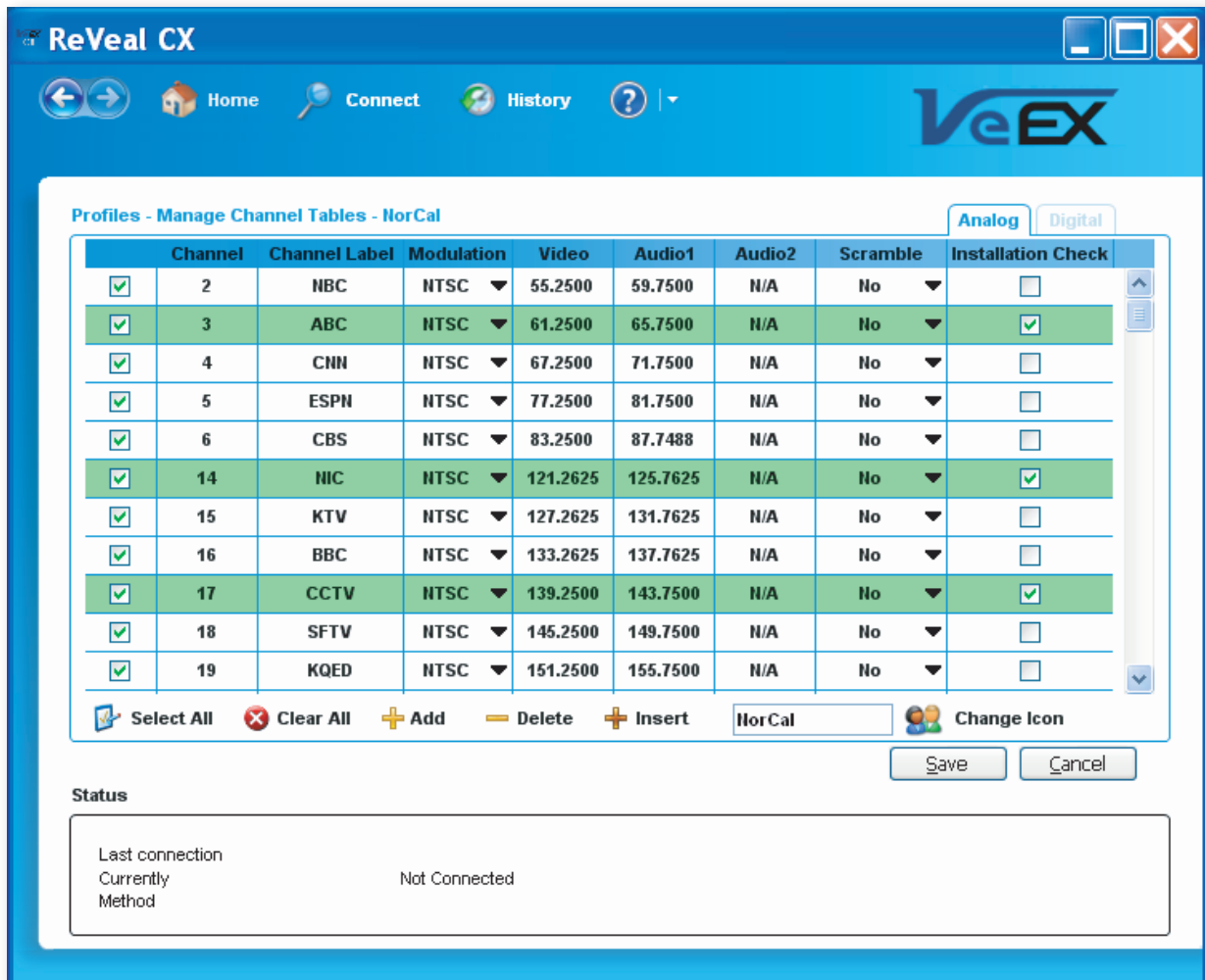
System Scan

In under a minute, all analog and digital channels at the service location are measured. Channel, frequency, modulation and power level measurements and associated signal degradations like tilt can be easily pin pointed using on screen markers. Results are displayed in either graphical or tabular formats.



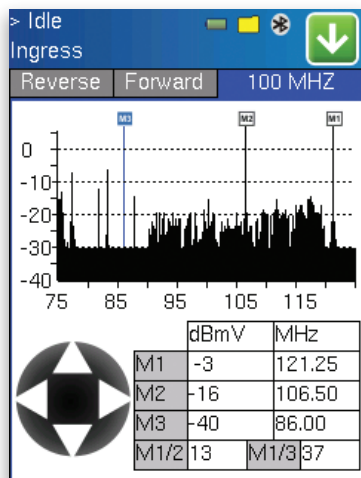
Manage Channel Tables

Up to twenty channel tables can be programmed by using the ReVeal CX software utility. Each channel table has a custom set of channels which is used for the installation check routine. Multiple CX100s can be pre-programmed with the same set of channel tables using ReVeal CX.



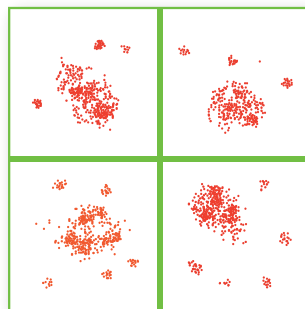
Forward and Reverse Path Scan

Poorly shielded coaxial cable and faulty terminations (CPD) are sources and causes of ingress noise. Ingress is very troublesome for return path communications in CATV networks due to the large number of subscriber generated signals being funneled towards the headend. The combined and amplified interference is quite often responsible for service disruption, therefore the ingress test function is a valuable tool to check the forward and reverse paths for interference and related problems.

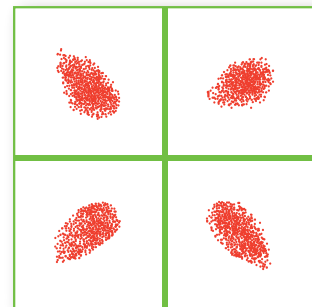


Upstream Signal Generator

A choice of QPSK, 16QAM and CW modulation with various symbol rates are available to assess the bandwidth characteristics of the reverse path used in the DOCSIS upstream to enable two-way services such as internet, VoIP, interactive TV, and gaming. Transmitting a signal into the reverse path at a desired frequency, level and modulation, allows the technician to evaluate phase and amplitude distortions resulting from misalignment in the network. The injected signals can also be used to determine the headroom in the reverse path and whether or not laser clipping occurs due to overloading. When used in conjunction with a QAM CATV spectrum analyzer, MER and related parameters can also be assessed.



Constellation with bit errors



Constellation with laser clipping

CX100 / CX120 / CX150 Feature Comparison

Cable Expert Features	CX100/E	CX120/E	CX150/E
Analog Channel Measurement	✓	✓	✓
Digital Channel Measurement	✓	✓	✓
Digital Channel Constellation	✓	✓	✓
Installation Check	✓	✓	✓
Full System Scan	✓	✓	✓
Forward/Reverse Ingress Scan	✓	✓	✓
Upstream Signal Generator	✗	⊕	✓
Upstream Signal Generator with FEC	✗	⊕	✗
Cable Modem Emulation	✗	✗	✓
reVeal CX Software Management Tool	✓	✓	✓
Reverse Path QAM Analysis	✗	✗	✗
TDR	✗	⊕	✗
IP Test Suit via Cable Modem Port			
Basic Ping Test	✗	✗	⊕
VoIP Expert	✗	✗	⊕
VoIP Call Expert	✗	✗	⊕
Trace Route, ARP, Web/FTP, Web Browser	✗	✗	⊕
IP Test Suit via Chassis ports (10/100-T or USB)			
Basic Ping Test	✓	✓	✓
VoIP Expert	⊕	⊕	⊕
VoIP Call Expert	⊕	⊕	⊕
Trace Route, ARP, Web/FTP, Web Browser	⊕	⊕	⊕
WiFi Wiz	⊕	⊕	⊕
Net Wiz	⊕	⊕	⊕
File Transfer			
USB Memory Stick	✓	✓	✓
Remote FTP File Transfer	✓	✓	✓
via 10/100-T Chassis Port	✓	✓	✓
via Cable Modem Port	✗	✗	✓

Legend: ✓ Standard feature ⊕ Optional feature ✗ Not supported

DOCSIS/Euro-DOCSIS Modem Emulation (CX150/E 1 models)

An integrated cable modem performs fast and accurate DOCSIS and IP connection tests, eliminating the need to carry a separate test modem and laptop computer on service calls. The unit is able to range and register with the Cable Modem Termination System (CMTS) and obtain valid IP addresses from the various network servers (DHCP, TFTP, TOD). Both upstream and downstream parameters including frequency, power, modulation, symbol rates and signal margins are evaluated.

The unique pass through testing capability provides complete CPE emulation empowering the technician to take Triple Play Service testing and troubleshooting to another level – problematic customer equipment can now be identified, isolated and replaced.

The screenshot shows the 'Downstream' section with the following data:

Frequency	759000000
Width	6000000
Modulation	64 QAM
Interleave	32 Taps
Power	8.9 dBm
Symbol Rate	5056941 symbols
SNR	35

The 'IP' configuration section shows:

CM IP:	192.168.20.22
Subnet:	255.255.255.0
DHCP Server:	192.168.19.2
Router IP:	192.168.20.1
TFTP IP:	192.168.19.2
Config File:	USA_1.1.cfg
ToD IP:	192.168.19.2
Client IP:	192.168.18.20
Gateway:	192.168.18.1
Subnet:	255.255.255.0
DNS:	206.13.28.12

Results and Events mode

Results mode displays a systematic, yet intuitive summary of the most significant modem connection parameters. At a mere glance, the technician can quickly identify whether the ranging and/or registration process has failed or passed.

Events mode not only logs and displays a time stamped sequence of the CMTS connection process, but also records link failures and modem retrains.

If service activation or fast troubleshooting are your daily priorities, both features will prove to be indispensable.

The 'Events' log shows the following sequence:

Time	Events
14:45:29	Connection Online
14:45:29	Connection InProgress
14:45:29	Registration Pass
14:45:29	Registration InProgress
14:45:29	Configuration File Pass
14:45:29	Time Of Day Pass
14:45:29	Configuration File InProgress
14:45:29	TFTP Pass

The 'Results' summary shows the following status:

Downstream Freq:	759 MHz
Downstream Lock:	Pass
Upstream Sync:	Pass
Downstream Sync:	Pass
Upstream Ranging:	Pass
DHCP:	Pass
Time Of Day:	Pass
TFTP:	Pass
Configuration File :	Pass
Registration:	Pass
Connection:	Online

Advanced IP testing

Complete IP verification is possible using either the DOCSIS or Ethernet test ports. Considering that all Triple Play services are IP centric, a powerful and comprehensive set of IP test capabilities is no longer considered a luxury or a "nice to have" feature. Technicians need to verify network connection during installation and/or service restoration, and thus rely on features such as Ping test, Trace Route, ARP, Web browser, and FTP upload/download to get the system "up and running".

The 'Ping' test results are as follows:

Setup	Result
ST 15:02:31	ET 00:00:10
Destination	www.veexinc.com
PING: PASS	
Sent	10
Received	10
Unreach	0
Missing	0
Round Trip (ms)	
Current	428 Average 29
Max	428 Min 18

The web browser window shows the Google homepage with the URL www.veexinc.com.

IPTV service verification

Designed and optimized for technicians turning up IP video service. Set Top Box emulation (STB) includes registration, IGMP and RTSP signaling for Broadcast and Video on Demand (VOD) applications. Transport stream analysis encompasses data/video/audio bit rates and Program Identification (PID) mapping. Packet jitter and loss, IGMP latency (channel zapping), PCR statistics and Viewer function complete the Video Quality of Service (QoS) application suite.

The 'Searching' interface shows the following data:

Str	PID	Type
1	0	Data
1	66	Data
1	68	Other
1	69	Video

The video player shows a status of 'Decoding, Please Wait' and a 'Stop' button.

Voice over IP testing

Take advantage of the two separate software options offering different test methods to verify and provision your VoIP network. Testing can be performed over the Ethernet and/or DOCSIS test interface depending on the CX model type.

The VoIP Expert generates industry standard wave files to verify MOS and R-Factor values of upstream and downstream paths and includes QOS measurements like packet jitter, packet loss, and delay.

The screenshot shows the VoIP Expert software interface. The main window displays a list of events and a table of test results. The events list shows: 01:39:05 Wait for Client, 01:39:09 Server Pass, 01:39:09 File - Downstream, 01:40:19 File Pass, and 01:40:19 Measuring - Done. The test results table is as follows:

Status	MOS/R	Packets	Events
	UP:	DN:	
	MOS-LQ: 4.18	4.11	
	MOS-CQ: 4.14	4.06	
	R-LQ: 92	89	
	R-CQ: 90	87	
	Burst R: 22	24	
	Gap R: 91	91	

The VoIP Call Expert emulates an IP phone and can place and receive calls using SIP or H.323 protocols. Comprehensive Codec support and call destination options verify voice encoding and translation provisioning. Real time evaluation of subjective voice quality (MOS and R-factor) is made possible using the patented Telchemy test method which has been integrated into all CX series test sets.

The screenshot shows the VoIP Call Expert software interface. The main window displays call setup options: Profile: Save, Mode: IP Phone, Protocol: SIP, Registration: Direct, Address: sip.voipstunt.com, User name: henry, Password: xxxxx, Codec: Auto, and Headphone: On. Below the main window, an 'Info' dialog box displays an incoming call notification: "You have an incoming call: 'voip_mv' <sip:voip_mv@sip.voipstunt.com> Press 'OK' to Accept, Press 'CANCEL' to Hang Up." The dialog has 'OK' and 'CANCEL' buttons. At the bottom of the main window, there is a 'Call' button.

Net Wiz

Ethernet network installation simplified using this basic, yet powerful feature. A built-in TDR identifies distance to short, distance to open, wire cross, and other anomalies associated with CAT-5 structured cabling. "Sniff" the network using the one-touch discovery feature - Identify routers, gateways, printers, PCs and other devices connected to the network within seconds.

The screenshot shows the Net Wiz software interface. The main window displays a network diagram with a phone and a laptop connected to a network. The diagram shows two open connections: [3,6] Open, 11m and [1,2] Open, 11m. Below the diagram, a 'Searching' dialog box displays network discovery results for a device. The results are as follows:

Summary	Devices	Networks
Attribute:		PING OK
IPAddr:	192.168.0.69	
Mac:	00-18-63-00-02-82	
GroupName:		
Machine Name:		
Attribute:		PING OK
IPAddr:	192.168.0.1	
Mac:	00-18-39-96-de-f8	
GroupName:		
Machine Name:		

WiFi Wiz

All CX series products adopt an USB WiFi adaptor to make 802.11 b/g Wireless installations a simple task. Scan for existing and available networks or perform signal strength and quality measurements to determine the best location for a new Wireless Access Point.

The IP Ping capability finally ensures the wireless network is properly installed and configured.

The screenshot shows the WiFi Wiz software interface. The main window displays a list of scanned WiFi networks. The results are as follows:

Connection	Scan	SSID
<input type="radio"/>	ABC	BSSID: 00-00-12-AA-BB-CC Ch:6 Enc:WEP Type:IF
<input checked="" type="radio"/>	veex	BSSID: 00-00-12-AA-BB-DD Ch:6 Enc:TKIP Type:IF
<input type="radio"/>	xyz	BSSID: 00-00-12-AA-BB-EE Ch:1 Enc:WEP Type:AD
<input type="radio"/>	1234	BSSID: 00-00-12-AA-BB-FF Ch:11 Enc:AES Type:IF
<input type="radio"/>	Manual Connect	

Below the main window, a 'WiFi Up' dialog box displays connection options for the selected network. The options are as follows:

Connection	Scan	SSID
SSID	BCD	
BSSID	00-00-12-AA-BB-ZZ	
Channel	11	
Encryption	Disable	
Type	Infrastructure	
Signal	63%	
Link Quality	50%	

Specifications

Measurements

Frequency Range: 4 to 1000MHz

Level Input Range: -40dBmV to +55dBmV

Level Accuracy: ±2.0dB typical

Amplitude Resolution: 0.1dB

Downstream Modulation: 64/256 QAM Annex A¹/B/C

Digital Lock Range²: -15dBmV to +50dBmV

C/N Accuracy: ±2.0dB typical

MER: 21 to 40 dB (±2.0dB typical)

Downstream BER Range: 1.0×10^{-9} to 9.0×10^{-3}

Input Impedance: 75 Ohms

Single Channel Measurements

Analog signal measurements: Video and audio power level, video to Audio ratio, adjacent channel delta, C/N ratios

Digital signal measurements: QAM power level, MER, Pre/Post BER, Constellation, Deep Interleave, Adjacent channel delta

Installation Check

Measurement locations: Tap, Ground Block, Set-Top Box.

Analog Measurements: up to 6 channels per channel table including tilt, peak-to-valley, min/max video level, min/max video to audio ratio, min/max C/N ratio, max adjacent channel delta

Digital Measurements: up to 6 channels per channel table including tilt, peak-to-valley values, min/max QAM level, min/max MER, max adjacent channel delta

System Scan

Scan on all channels in the active channel plan

Analog Measurements: Video and audio power levels, video to audio ratio, tilt, peak-to-valley, min/max video level, min/max video to audio ratio

Digital Measurements: QAM power level, tilt, peak-to-valley values, min/max QAM level

Cable Modem⁵

Supports DOCSIS or Euro DOCSIS¹ 1.0/1.1/2.0

Downstream/Receiver

Modulation: QAM64 and QAM256

Frequency Range: 88 to 860MHz / 108 to 862MHz⁵

Bandwidth: 6MHz / 8MHz⁵

Input Signal level: -15² to +15dBmV

Upstream/Transmitter

Modulation: QPSK, QAM16/32/64/128

Frequency range: 5 to 42MHz / 65MHz¹

Output Signal Level: +8 to +58 dBmV (QPSK)

+8 to 55 dBmV (QAM16)

+8 to +54 dBmV (QAM32)

+8 to 53 dBmV (S-CDMA)

Forward and Reverse Path Ingress Scan

Reverse scan range: 4 to 42MHz / 65MHz¹

Forward scan range: 54 / 108¹ to 1000MHz

Band width: 250 KHz

Attenuation range: 0 to 50dB, 10dB/step

Upstream Signal Generator³

Modulation: QPSK, QAM 16/64/256, CW

Output signal level: 5 to 58dBmV⁴

Frequency range: 4 to 42MHz / 65MHz¹, 1MHz step

QAM-16/64/256 modulation with continuous FEC⁶

Advance IP test suit

Ping, trace route, ARP wiz, FTP/Web tests. These tests are done via the chassis 10/100-T port or via Cable Modem emulation⁵

VoIP Expert

Provides VoIP Metrics

- MOS and R-factor measurement
- Packet Statistics: packet loss, jitter, delay

VoIP Call Expert

VoIP Call setup with VoIP USB adaptor

Supports SIP and H.323 Protocol

Codec: G.711U, G.711A, Auto

IPTV

Provides true STB emulation

Supports IGMP/RTSP signaling, MPEG2/4, H.264 encoding, RTP/VC1/MPEG-TS transport streams

Packet Statistics: packet loss, jitter, delay, PID mapping

Video/Audio rates

Channel zapping for quick and complete installation check

WiFi Wiz

Supports 802.11 b/g

SSID detection, Infrastructure, Ad-hoc, and encryption

Signal strength and qualify site survey

IP connection verification

Net Wiz

Available on 10/100-T chassis port

Detect distance to open/short, wire cross, impedance mismatch

Network device discovery

Auto ping verification

Cable Expert

General Specifications

Size	210 x 100 x 55 mm (H x W x D) (8.25 x 3.75 x 2.25 in)
Weight	Less than 1 kg (less than 2.2 lbs)
Battery	LiIon smart battery 2400 mAh 10.8VDC
AC Adapter	Input: 100-240 VAC, 50-60 Hz Output: 15VDC, 3.5A
Operating Temperature	-10°C to 50°C (14°F to 122°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95% non-condensing
Display	3.5" QVGA 320x240 full color touch screen
Ruggedness	Survives 1.5 m (5 ft) drop to concrete on all sides
Water-resistance	Water resistant - may be used in heavy rain
Interfaces	USB 2.0 Host and Client, RJ45 10/100T Ethernet, Bluetooth 2.0 (optional)
Languages	Multiple languages can be supported

Note:

- 1 Annex A
- 2 Typical range with QAM-64 modulation.
- 3 CX120 and CX150/E
- 4 CW typical
- 5 CX150/E
- 6 CX120/E only



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Ordering Information

CX100:

Z02-01-001P	VePAL CX100 Handheld SLM Test Set, Annex B
Z02-01-002P	VePAL CX100E Handheld SLM Test Set, Annex A
Z02-01-010P	VePAL CX100DB Handheld SLM Test Set, Annex A+B

CX150:

Z02-01-003P	VePAL CX150 Handheld SLM Test Set, Annex B
Z02-01-004P	VePAL CX150E Handheld SLM Test Set, Annex A
Z02-01-011P	VePAL CX150DB Handheld SLM Test Set, Annex A+B

CX120:

Z02-01-006P	VePAL CX120 Handheld SLM Test Set, Annex B
Z02-01-007P	VePAL CX120E Handheld SLM Test Set, Annex A
Z02-01-013P	VePAL CX120DB Handheld SLM Test Set, Annex A+B

Interfaces/Test Options

499-05-054	CX180/CX120 Remote Sweep and View
499-05-072	Advanced Management
499-05-073	Home Installation Process
499-05-074	ReVeal CX Server Package (Software only)
499-05-075	ReVeal CX Server Maintenance Contract (require per year after the first year)

Additional Options

499-05-001	Web Browser (require advanced IP option)
499-05-002	NetWiz
499-05-003	Remote Control
499-05-007	VoIP Expert
499-05-008	IPTV Expert
Z88-00-001G	WiFi Wiz, incl. USB WiFi Adaptor
Z88-00-001P	VoIP Call Expert, incl. VoIP USB Adaptor & Earplug
Z88-00-005G	Advanced IP, incl. Ethernet Cable

Recommended Accessories

407-0833-001G	Coaxial Connector Female to Female F Type
407-0834-001G	Coaxial Connector Female to Male F Type
F01-00-001G	Coaxial Cable Male to Male F Type 2 m (6 ft)

Replacement Items

405-02-001G	Screen Protector
A01-00-001G	AC Adaptor
A02-00-001G	Car Adaptor
B02-03-001G	Battery Pack
C01-00-001G	Carrying Case (Basic)
C02-00-002G	Carrying Pouch
C03-00-001G	Shoulder Strap
F02-00-001G	Ethernet Cable RJ45 to RJ45 2 m (6 ft)
F04-00-001G	Power Cord - US 2 m (6 ft)
F04-00-002G	Power Cord - EU 2 m (6 ft)
F04-00-003G	Power Cord - UK 2 m (6 ft)
Z77-00-001G	Stylus (pack of 5)



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