FROST & SULLIVAN 2008 BEST PRACTICES AWARD
GLOBAL TEST & MEASUREMENT EMERGING COMPANY OF THE YEAR AWARD

FROST & SULLIVAN 2009 BEST PRACTICES AWARD
GLOBAL xDSL TEST EQUIPMENT ENTREPRENEURIAL COMPANY OF THE YEAR AWARD

VePAL CX350

Advanced CATV Analyzer

CATV Network Testing Simplified

VeEX™ VePal CX350 is a portable, fully integrated test solution for legacy Analog and Digital Cable TV networks supporting the next generation DOCSIS/Euro DOCSIS 3.0 cable modem.

Platform Highlights

- Robust, light weight chassis packed with powerful features for demanding test environments
- Linux operating system for stable and consistent platform performance
- Fast system power up time in less than 20 seconds
- Intuitive presentation of measurements in tabular and graphic formats
- High resolution color 7" touch-screen LCD
- Optimized for field engineers or technicians installing and maintaining CATV networks
- Ethernet interface for back office applications, remote control, and workforce management
- USB memory stick and FTP upload support for test result storage / file transfer
- ReVeal™ PC CX software to maintain instrument software, manage location profiles, channel tables and measurement thresholds, process measurement results and generate customer test reports
- Extended field testing time > 6 hours operating time using interchangeable LiIon battery pack/s.
- Ability to lock User interface to prevent unwanted human interference during long term testing
- Web based remote control via 10/100-T Ethernet connection
- Triple Play Test Applications to provision VoIP, IPTV and High speed Internet access via Ethernet or RF DOCSIS port

Key Features

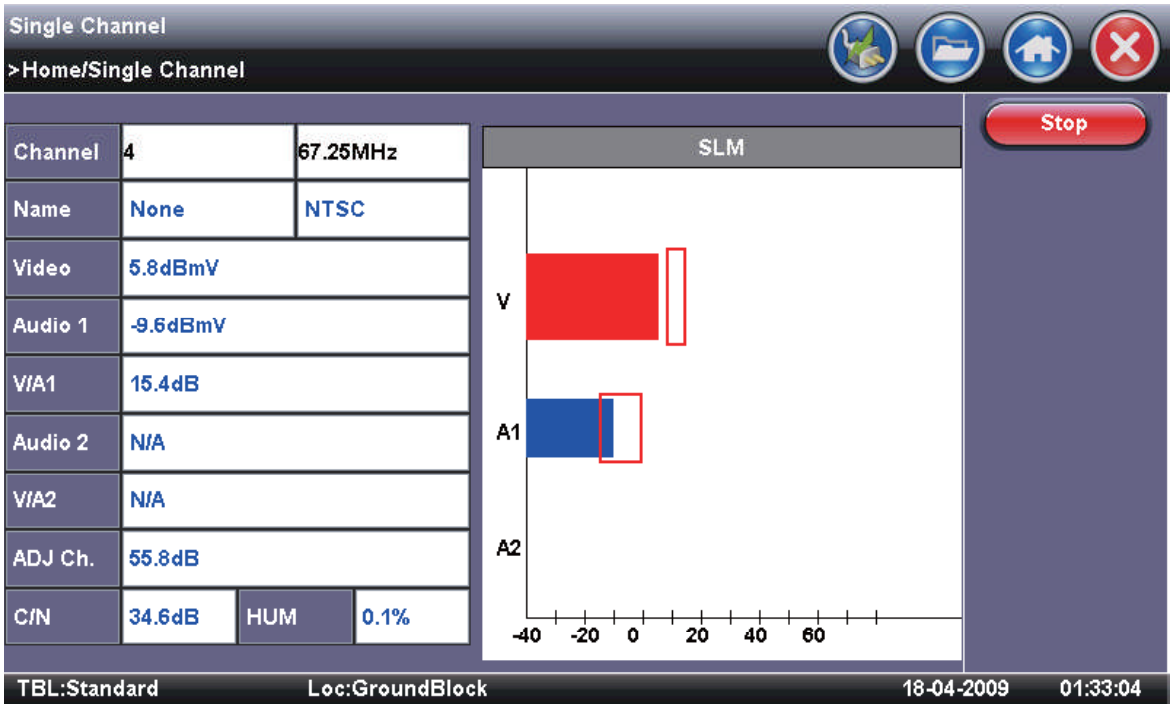
- Frequency range from 5MHz to 1GHz
- Annex A, B and C signal format support
- Video and audio power level measurements
- Advanced single-channel SLM measurements with Min/Max thresholds
- Fast system scan of the active channel plan
- Tilt measurements for distortion versus frequency
- Built-in dual band DOCSIS/Euro DOCISIS3.0 Cable Modem with Baseline Privacy Interface (BPI+) certificate support
- Home Installation Procedure (HIP) with user defined location and measurement specific test limits
- Forward and Return path ingress scan to capture impulse noise and interferers
- Forward and return path QAM signal analysis including deep interleaved modulation support, Pre/Post BER, Constellation diagram, and Equalized / non Equalized MER
- Advanced digital measurement supports Hum, EVM, Phase Jitter, Group Delay, and Frequency response measurements and displays of equalizer taps
- 10/100/1000-T Ethernet port for Cable Modem emulation or can be used as an Ethernet tester for BERT, Throughput and RFC2544 measurements
- USG Generator generates QAM16/64/128, CW, and QPSK signals
- TDR supports up to 2Km/6K feet of standard co-axial cable

Applications

Analog Channel Measurement

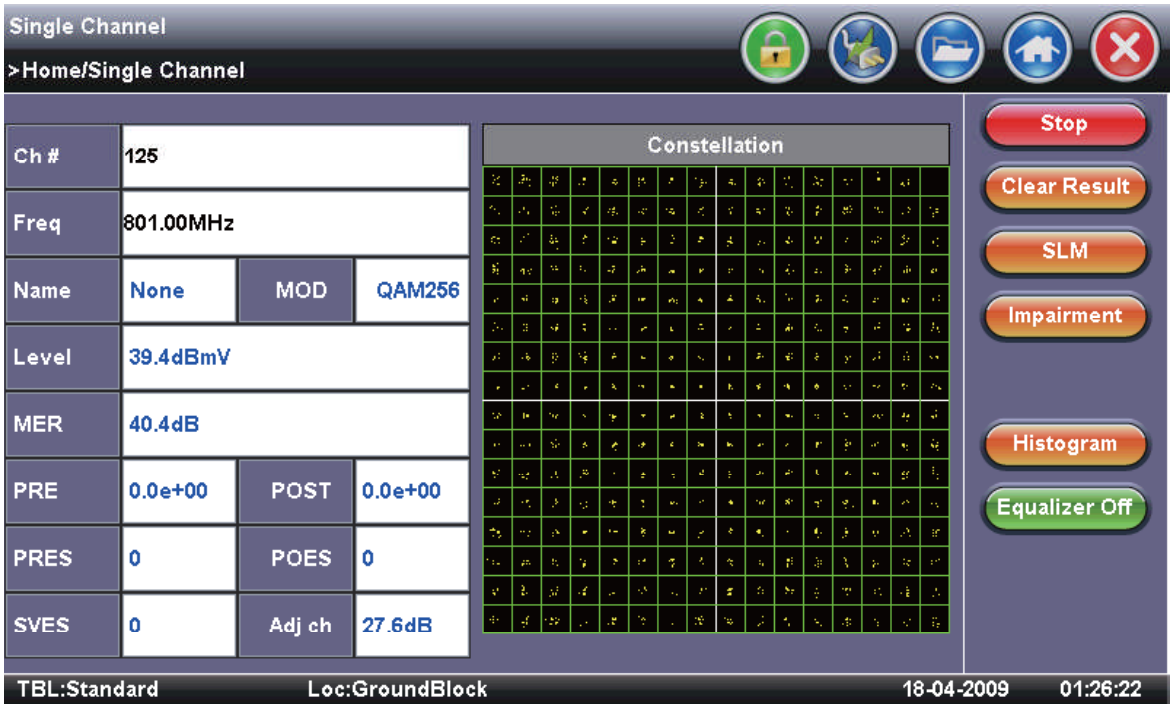
Analog and digital carriers are very different in terms of signal content and power distribution, however the advanced DSP based SLM technology supported in the CX350 accurately measures both signal types.

For Analog signals, video and audio levels including the V/A and Carrier to Noise (C/N) ratios are measured. Single button test, user programmable thresholds and test point compensation enable fast, simple and automatic testing of carrier signals.



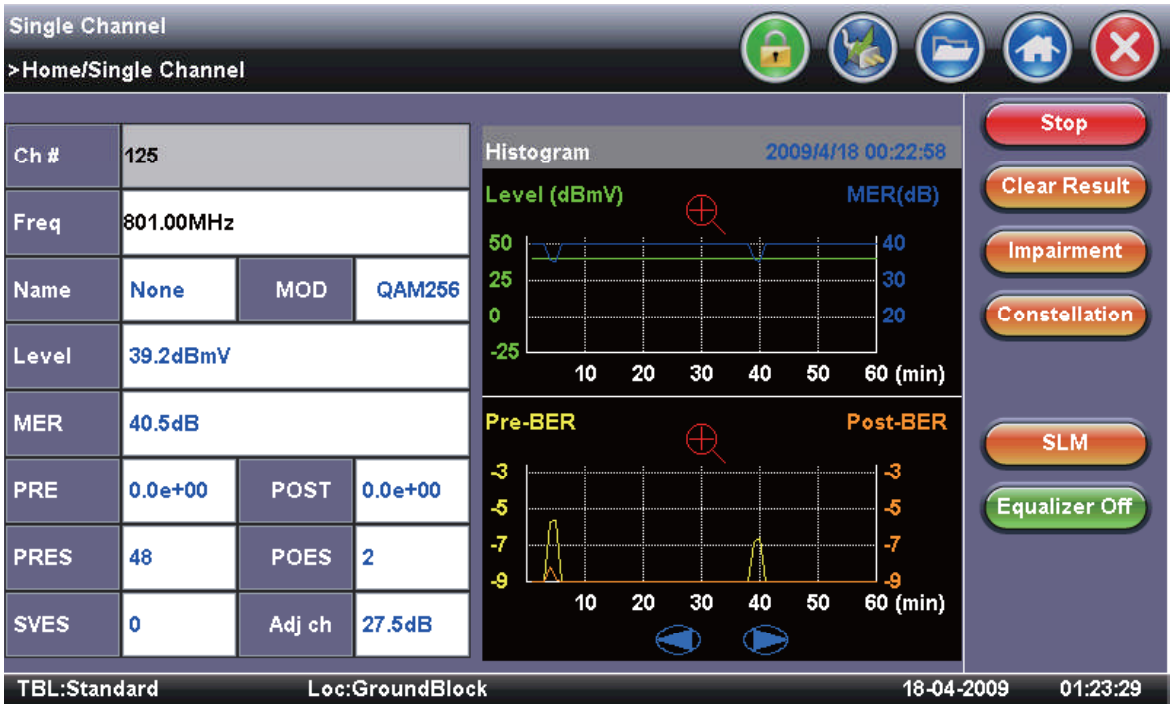
Digital Channel Analysis

For Digital signals, the average power of the QAM channel is measured with Pre/Post BER and MER performance reported. Due to the well known "cliff effect", 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 valuable visual tool to help detect the presence of noise, phase noise, coherent interference, gain compression, laser clipping, and ingress, all of which impact overall signal quality and thus Modulation Error Ratio (MER). Ideally, 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. A reference point's adaptive equalizer state can be saved and recalled in order to make relative MER measurement.



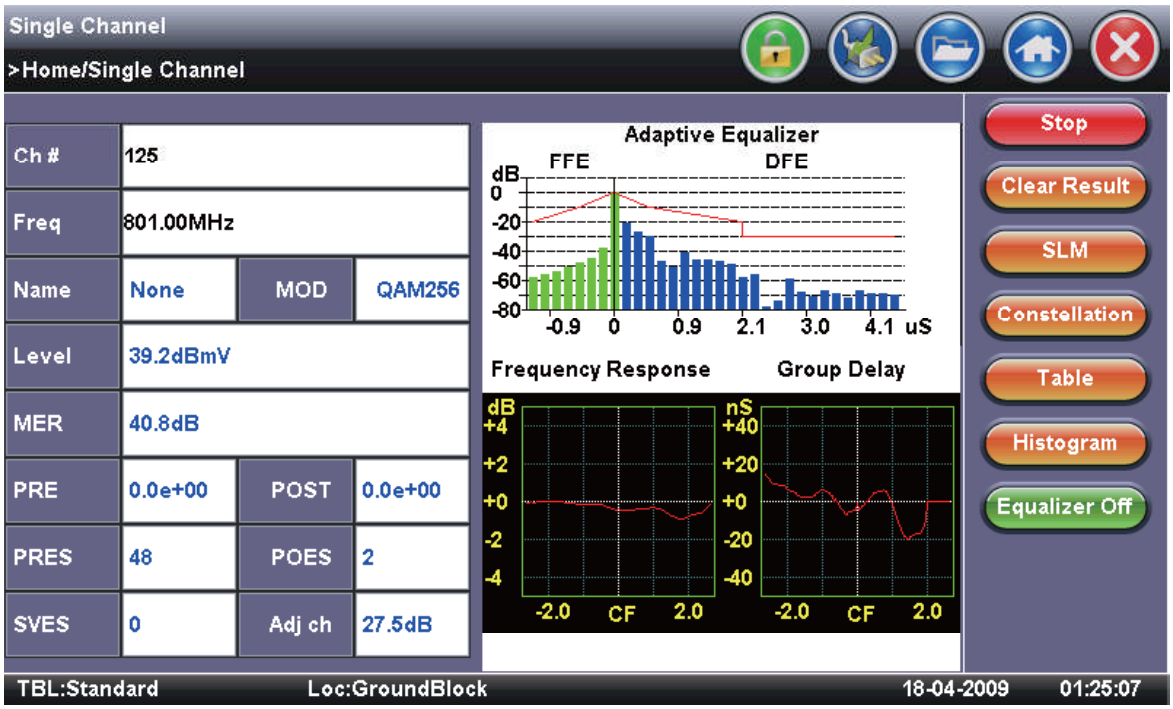
Histogram Analysis

Histograms are a powerful graphic tool to analyze and understand signal impairments that are related to random events like noise and jitter occurring over a period of time. Key QAM test parameters such as Level, MER, Pre/Post BER, Pre/Post ES and SES are recorded simultaneously for up to one hour, and any value deviating from preset minimum/maximum thresholds is reported. A powerful zoom function allows the user to drill down to one second measurement intervals for deeper investigation.



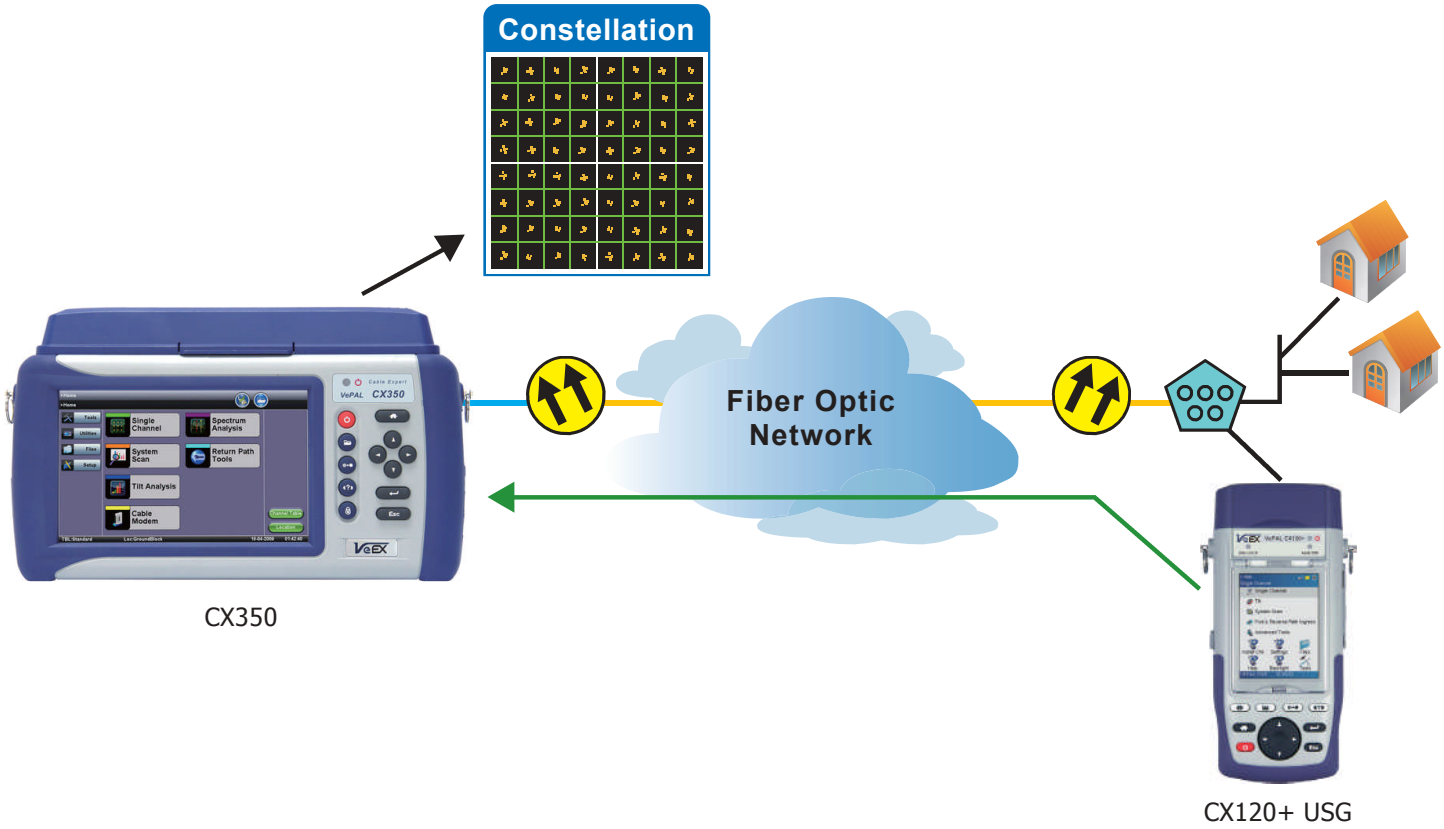
Advanced Digital Channel Analysis

Adaptive Equalizer technology is used to compensate for complex in-channel frequency response impairments caused by micro-reflections, amplitude ripple and group delay occurring in the cable network. The adaptive equalizer table and graph modes are useful tools for trouble-shooting linear distortions which include low frequency AC Hum, and reflections caused by un-terminated co-axial cables. Frequency Response and Group Delay measurements indicate the overall frequency domain performance of the network, while Frequency and Symbol rate error checks if the headend equipment is sending the QAM signal within the specified tolerance.



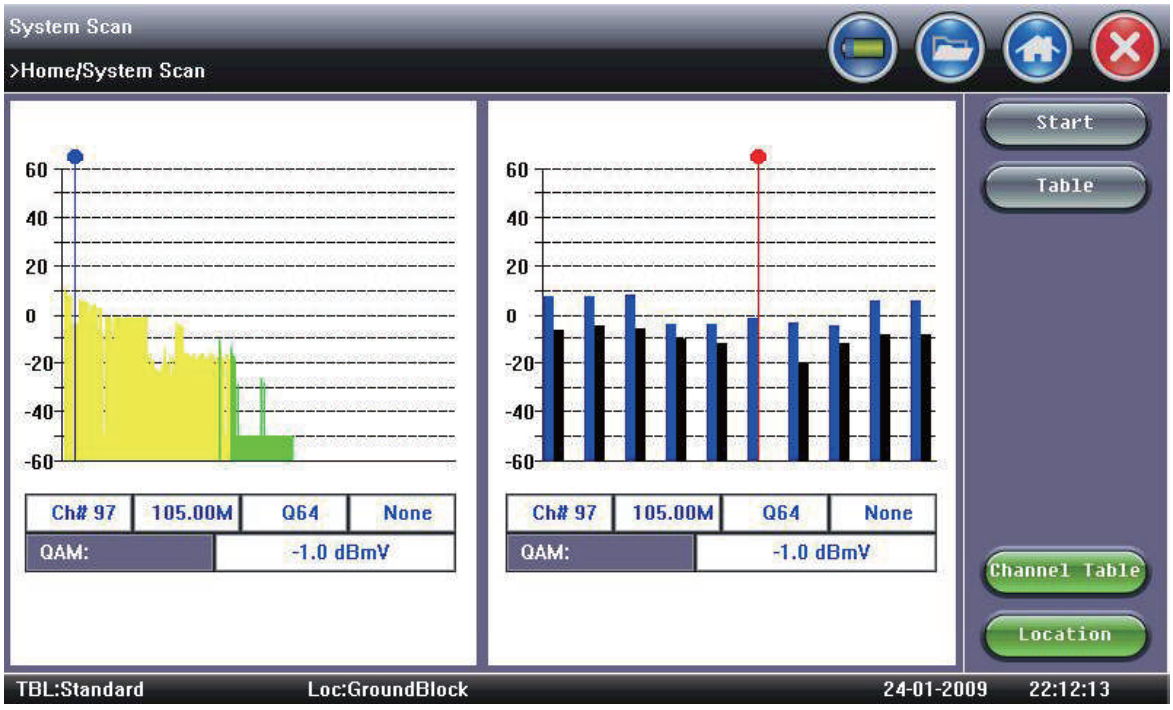
Reverse Path QAM Analysis

The upstream digital signal is carefully analyzed for level, MER, pre/post BER, and errored seconds. Advanced measurements can be performed in either Equalized or Un-equalized modes, where group delay, phase jitter, and frequency response are reported. The CX120+ handheld Signal Level Meter (SLM) equipped with Upstream Generator (USG) is a recommended companion device to generate a QAM-16/64/128 signal from a distant location.



System Scan

Within seconds, all Analog and Digital channels at the service location are measured. Signal parameters including Channel, Frequency, Modulation and Power level measurements and related performance such as Tilt can be easily pin pointed using on screen markers. Results are displayed in both graphical or tabular formats.



DOCSIS/Euro-DOCSIS 3.0 Modem Emulation

An integrated dual band DOCSIS/Euro DOCSIS 3.0 cable modem performs fast and accurate 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). Upstream and downstream signal parameters such as frequency, power, modulation, symbol rates and signal margins are all evaluated.

A unique pass through function offers the technician complete CPE emulation capabilities to take Triple Play Service testing and troubleshooting to new level up to a speed exceeding 160 Mbps – problematic customer equipment can now be identified, isolated and replaced.

Built-in Gigabit Ethernet engine, when paired with an MPX100 Ethernet probe, allows asymmetrical throughput test for both upstream and downstream simultaneously up to 1G bps.

Installation Check

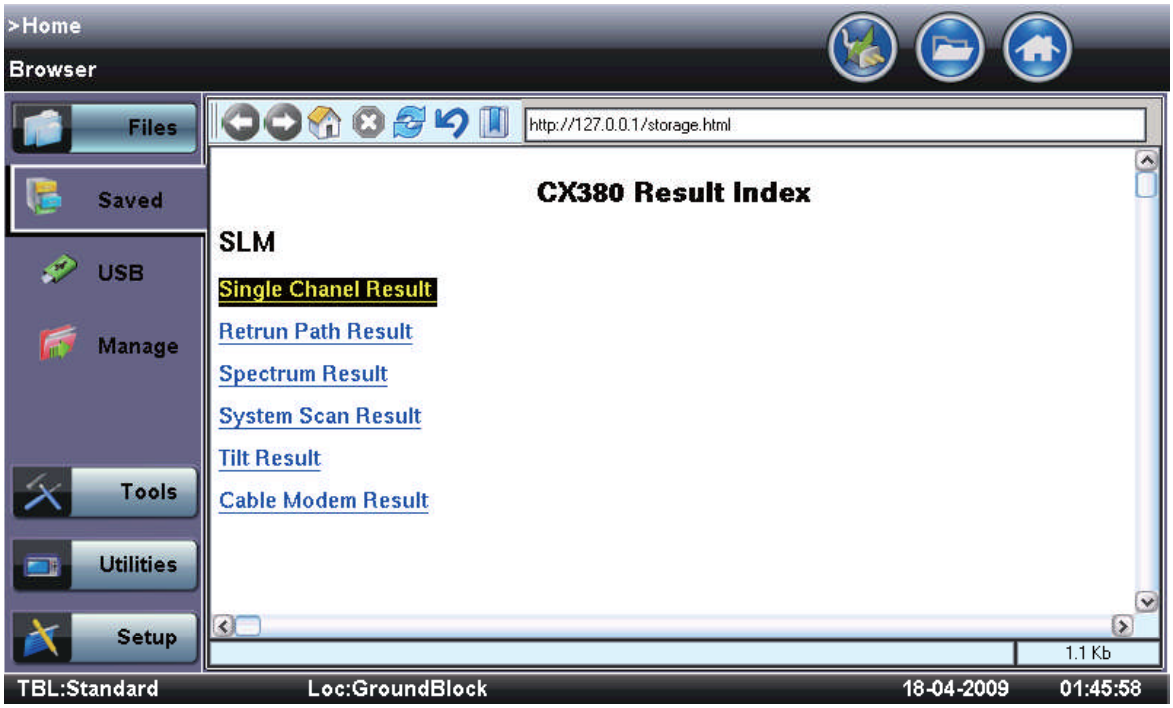
For new installations, up to 16 analog and 16 digital channels are checked against preset thresholds. Pass and fail conditions are color coded for easy interpretation and test results are clearly displayed.

Equalized and Un-Equalized MER measurements

The adaptive equalizer does a great job of improving MER of a QAM signal, but it is also important to know how hard the system is working to ensure adequate margin for system degradation. The adaptive equalizer in the CX350 can be turned off to make troubleshooting marginal amplifiers, ingress, CPD and related impairments easier.

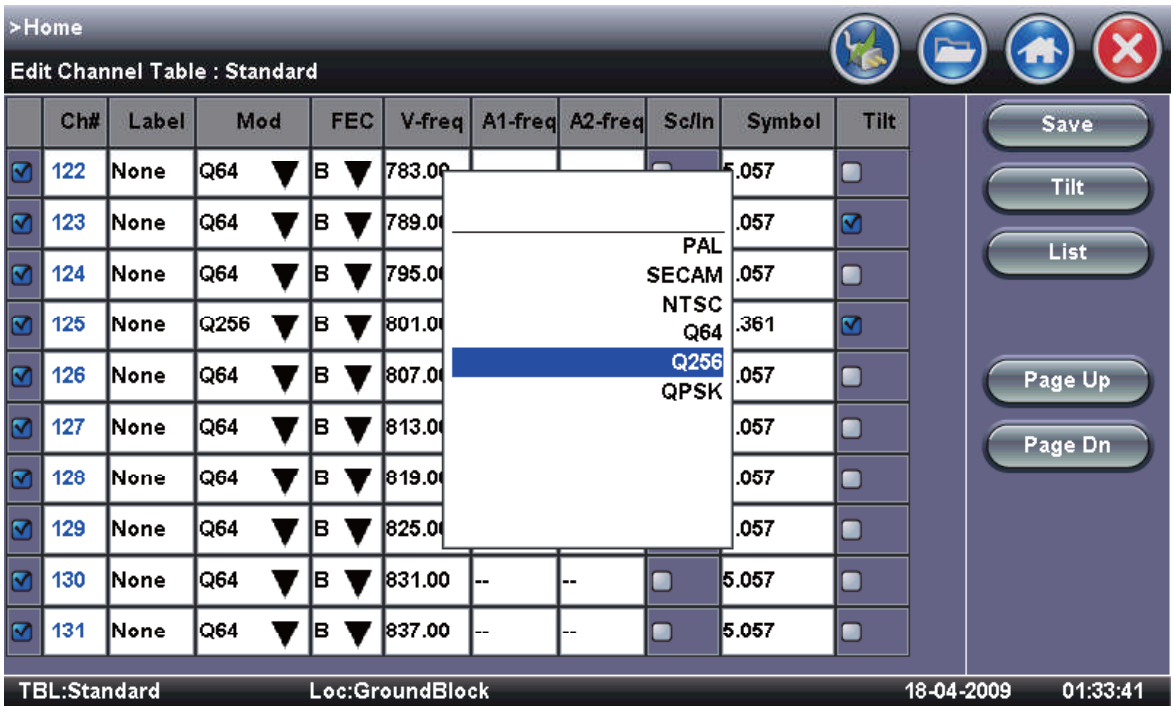
Test Results

A significant number of test results and test profiles can be stored on an internal SD card with storage capacities ranging from 2Gbyte to 64Gbyte. Test results can be viewed in HTML format on screen or transferred to a PC using USB memory stick, Ethernet connection or FTP upload. Test results can also be viewed and printed by Web-Browser. The ReVeal CX300 PC software included with each instrument can be used to manage test results, perform PDF or CSV file conversion, or generate customized test reports.



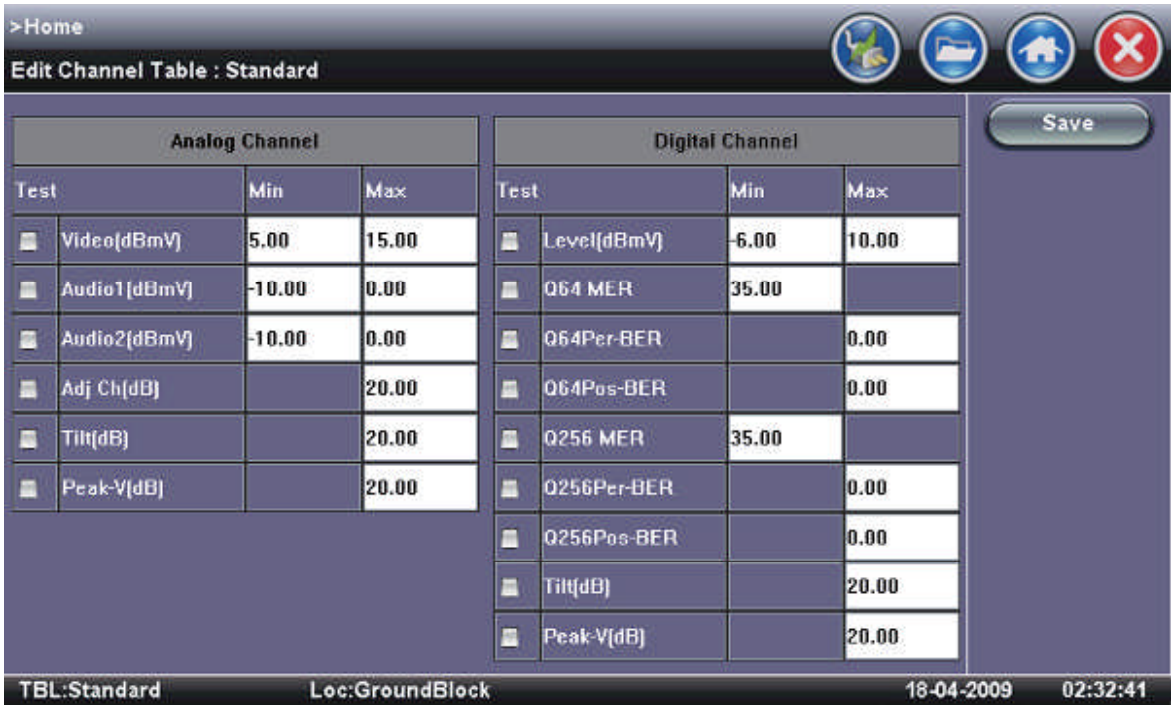
Managing Channel Tables

Up to twenty channel tables can be programmed or edited on the test set directly or using the ReVeal CX PC software included as a standard accessory. A channel table consists of a custom set of channels which is used for the installation check routine. Multiple CX350's can be pre-programmed or cloned using the same set of channel tables.



Managing Measurement Thresholds

Analog and Digital measurement thresholds can be programmed or edited on the test set directly or using the ReVeal CX PC software included as a standard accessory. Measurement thresholds consist of a custom set of limits which is used for the installation check routine.



Advanced IP testing

Complete IP verification is possible using either the DOCSIS or 10/100BaseT Ethernet management port. 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".

Voice over IP testing

Take advantage of the three separate software options each offering different test methods to verify and provision your VoIP network. Testing can be performed over the Ethernet and/or DOCSIS test interface.

The VoIP Check - simulates a VoIP call to the nearest router or CMTS and measures the round trip MOS score and related VoIP parameters.

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

delay.

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.

Remote Control

An IP connection allows complete remote control of the instrument from virtually any location. The user can either use a PC equipped with VNC client and Web-Browser or ReVeal CX300 PC software to connect to the unit's 10/100BaseT LAN management port. The Web-Browser based remote control is a powerful and convenient tool for remote trouble shooting. In remote control mode, both local and remote users can view and operate the unit at the same time with identical user interface.

Specifications

General

Input Impedance: 75 Ohm

Frequency Range: 5MHz to 1000MHz

Signal Level Meter

Analog Channel Measurements

Level Range: -45dBmV to +55dBmV

Level Accuracy: +/- 1.5dB

Level Resolution: 0.1dB

Video Standards: NTSC, PAL, SECAM

Channels: Video, Audio 1 and Audio 2, V/A1, V/A2 and Adjacent Channel, HUM, C/N

Digital Channel Measurements

QAM Downstream Analysis

Level Range: -45dBmV to +55dBmV

Level Accuracy: +/- 1.5dB

Level Resolution: 0.1dB

Modulation : QAM-64/256, J.83 Annex A/B/C

Symbol Rate: 1 to 7Msps programmable

Constellation Display: QAM-64/256 with zoom function

MER Range: 21 dB to 40dB, +/- 1.5dB Typical

Pre & Post BER Range: 1.0x10-9 to 9.0x10-3

Minimum QAM Locking Level: -15 dBmV

Errored Seconds (ES) and Severely Errored Seconds (SES)

Histogram Analysis: MER, Pre/Post BER, ES, SES up to 60 minutes by minute and by second

Advanced Digital Measurements (option)*

DFE and FFE gain/tap

Group Delay Peak to Peak (ns)

Frequency Response Peak to Peak (dB)

Maximum AC (dB)

Phase Jitter (degrees)

Symbol Rate Error (ppm and Hz)

Frequency Error (ppm and Hz)

HUM (%)

Error Vector Magnitude (EVM) %

Carrier to Noise (C/N)

Carrier to Ingress (C/I)

Other Measurements

System Scan: 30 seconds per channel table (typical)

Tilt: up to 10 channels

Programmable Pass/Fail Thresholds: 10 sets

Programmable channel tables: 20 tables

QAM Return Path Analysis (option)

Modulation: QPSK, QAM16/64/128

Symbol Rate: 1.28Msps, 2.56Msps, and 5.12Msps

Minimum QAM Locking Level: -15dBmV typical

Constellation diagram

MER Range: 22 to >40dB, +/- 1dB

Adaptive Equalizer Display

Pre & Post BER Range: 9 x 10^{-3} to 9 x 10^{-9}

Errored and Severely Errored Seconds

Cable Modem

DOCSIS & Euro DOCSIS 1.0/1.1/2.0/3.0 compliance

Cable Modem Receiver (Downstream)

Demodulation: QAM-64/256

Frequency Range: 50 to 1002MHz

Maximum Speed: 160Mbps

Channel Bonding: Up to 4 channels

Bandwidth:

- 6MHz DOCSIS
- 8MHz Euro DOCSIS
- 6/8MHz DOCSIS and Euro DOCSIS dual band (option)

Input Signal Level: -15dBmV to +15dBmV

Cable Modem Transmitter (Upstream)

Modulation: QPSK, QAM-8/16/32/64/128

Frequency range: 5 to 85MHz (edge-edge DOCSIS)

Channel bonding: Up to 4 channels

Bandwidth (TDMA/S-CDMA): 1600, 3200 and 6400 kHz

Output Signal Level (depending on modulation rate):

- QAM level range: +17 to +58dBmV
- QPSK level range: +17 to +61dBmV
- Auto level adjustment controlled by CMTS in 1dB steps

Upstream Signal Generator (USG) (Option)

Modulation: CW, QPSK, QAM-16/64/128 Annex A/B

Symbol Rate: 1.28Msps, 2.56Msps, 5.12Msps fixed

Frequency Range: 5 to 42MHz / 65MHz

Level Range: 8 to 58dBmV

Level Accuracy: +/- 1dB

Level adjustable step: +/- 1dB

Frequency resolution adjustment: 250kHz/Step

Frequency accuracy : 5ppm

Settling time: less than 5ms

Forward Error Correction (FEC): Continuous

Forward and Reverse Path Ingress Scan

Reverse scan range: 5 to 42MHz / 65MHz

Forward scan range: 54 / 108 to 1000MHz

Range : -45 to 55dBmV

Dynamic Range: 50dB

RBW: 125, 330, 1000 KHz

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

Advanced IP Testing (Option)

Ping, Trace Route, ARP, FTP Upload/Download, Web test, and Web-browser performed via the 10/100-T management port or via Cable Modem port

VoIP Testing (Option)

VoIP Check

Simulates VoIP call to nearest router/CMTS

Round Trip MOS score

VoIP Expert

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 Protocols

Codec: G.711U, G.711A, Optional G.723, G729

General Specifications

Size	290 x 140 x 66 mm (W x H x D) (11.40 x 5.50 x 2.60 in)
Weight	Less than 2.5 kg (less than 5.5 lbs) (including battery)
LED	Battery and power status
Key pad	Power, Navigation and Function keys
Battery	LiIon smart battery,5200 mAh,10.8VDC
Battery Operating time	>4 hours continuous
AC Adapter I/P:	Input: 100-240 VAC, 50-60 Hz Output: 15VDC, 6A
Operating Temperature	0˚C to 45˚C
Storage Temperature	-20˚C to 70˚C
Humidity	5% to 95% non-condensing
Display	7" full color touch screen
Ruggedness	Survives 1 m drop to concrete on all sides
Interfaces	10/100T Ethernet RJ45, USB 2.0 , 10/100/1000-T Ethernet RJ45
Languages	Multiple languages can be supported on request

Ordering Information

Z02-00-009P	VePAL CX350 CATV Signal Analyzer (Including Annex A and Annex B SLM)

Hardware Options

Z66-00-023P	TDR Option
Z66-00-027P	DOCSIS 3.0 CM Annex B
Z66-00-028P	DOCSIS 3.0 CM Annex A
Z66-00-029P	DOCSIS 3.0 CM Annex A+B
Z66-00-030P	DOCSIS 2.0 CM Annex B
Z66-00-031P	DOCSIS 2.0 CM Annex A
Z66-00-032P	DOCSIS 2.0 CM Annex A+B
Z66-00-033P	USG (USG CW, QAM16/64/128 with FEC option)

** DOCSIS 2.0 and 3.0 CM are mutually exclusive

Test Options

499-05-039	Reverse Path QAM Signal Analysis
499-05-054	Remote Return Path Sweep and View
499-05-072	Advanced Management
499-05-073	Home Installation Process
499-05-125	10/100/1000T BERT, Throughput, RFC2544, Loopback
499-05-126	RP Balancing (require QAM16/64/128 with FEC option)

CX Software Solutions

499-05-074	ReVeal CX Server Package (Software only)
499-05-075	ReVeal CX Server Maintenance Contract (require per year after the first year)
499-05-120	VoIP Server Software (Software Only) - VX1000
499-05-127	VoIP Server Software (Software Only) - Mini VX1000

Additional Options (via USB, 10/100 Base-T Management Port)

499-05-001	Web Browser (require advanced IP option)
499-05-002	NetWiz
499-05-008	IPTV Expert
499-05-102	VoIP Check
Z33-00-001	VoIP Expert, incl. VoIP Check
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

F01-00-001G	Coaxial Cable Male to Male F Type 2 m (6 ft)

Replacement Items

407-0833-001G	Coaxial Connector Female to Female F Type
407-0834-001G	Coaxial Connector Female to Male F Type
A01-00-003G	AC Adaptor
B02-06-001G	Battery Pack
C01-00-003G	Carrying Case
C03-00-001G	Shoulder Strap
F02-00-001G	Ethernet Cable RJ45 to RJ45 2 m (6 ft)
F04-00-004G	Power Cord - US 2 m (6 ft)
F04-00-005G	Power Cord - EU 2 m (6 ft)
F04-00-006G	Power Cord - UK 2 m (6 ft)
Z77-00-001G	Stylus with String (Pack of 5)
Z77-00-007G	Coaxial Connector Female to Female F Type (Pack of 10)
Z77-00-008G	Coaxial Connector Female to Male F Type (Pack of 10)

Messkom Vertriebs GmbH
Awarenring 38
85419 Mauern

Tel: 08764 / 948 430
Fax: 08764 / 948 433

Email: info@messkom.de
URL: www.messkom.de

VeEX Inc.
2255, Martin Ave., Suite G,
Santa Clara, CA 95050, USA
Tel: +1.408.970.9090
Fax: +1.408.970.9099
www.veexinc.com
customers@veexinc.com

D05-00-035P A00 2009/05