AT2500RQvPlus

CATV/QAM/Video Spectrum Analyzer

The AT2500RQvPlus is the industry's most complete spectrum analyzer, combining superior QAM analysis and best-in-class analog measurement capability. The enhanced AT-Web automates both the analog and digital proof-of-performance tests, saving time, making tests consistent, and providing excellent documentation.

Today's broadband network technicians face the challenge of keeping the soon to be "all digital cable plant" operating at peak performance at all times. With its enhanced QAM performance, the AT2500RQvPlus allows technicians to quickly perform sophisticated tests and get accurate results at higher MER levels, even on those difficult Annex A QAMs. The VeEX AT2500RQvPlus is a lightweight, full featured 1.5 GHz spectrum analyzer built to withstand the rigors of field use and to perform equally as well in today's sophisticated headend environments.

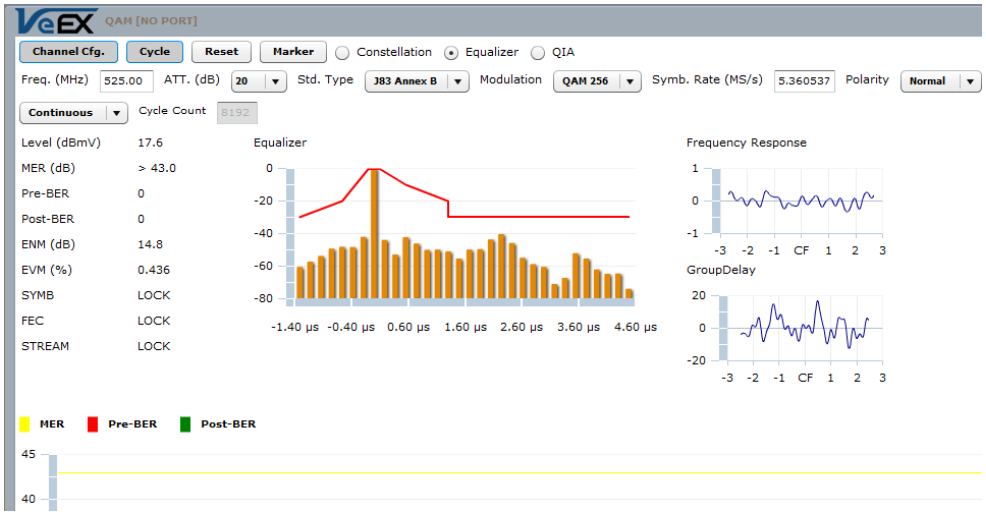
Benefits

- Performs QAM detailed measurements on Annex B & C QAM signals with one button testing on a remote IP connection
- Provides Headend and Hub testing with 43dB MER capabilities
- Detects QAM RF signal impairments before they turn into customer complaints
- Integrated analog and digital measurements, both local and remote, in one analyzer
- Isolates difficult-to-locate problems using comprehensive QAM Impairment Analysis

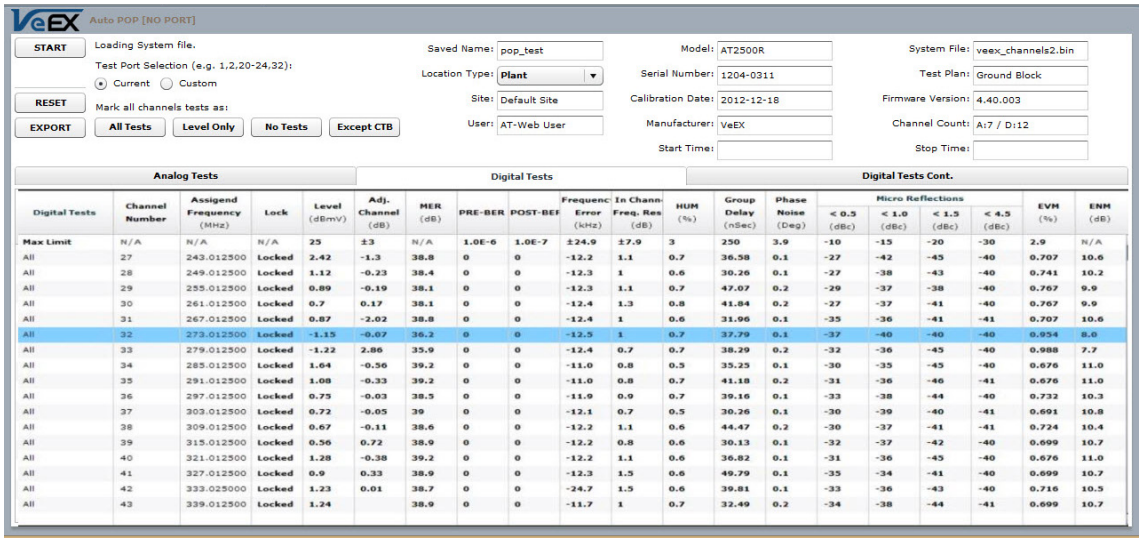
Platform Highlights

- Automated switch control for up to 256 ports
- 43 dB MER range
- One button analog and digital POP (proof-of-performance) tests
- realPOP data management and Report Generator
- Remote operation from any standard web browser
- USB drive capability for file transfer
- Superior QAM demodulation capability and excellent BER performance, featuring MER capability up to 43 dB
- AT2500 AT-Web offers one–button analog and digital proof-of-performance as well as many other features, including remote operation and switch control, all via a simple web connection
- QAM analysis includes constellation, statistics, group delay, frequency response and impairment analysis for Annex A, B and C signals
- 1.5 GHz high sensitivity spectrum analyzer with built-in automatic filter for increased dynamic range
- Automatic Filtering and pre-Amp provides exceptional dynamic range for analog and digital measurements, even on tilted test points
- Complete set of CATV measurements including CCN, CSO, CTB, ICR, DOM, Hum and carrier frequency
- Multiple trace display with detector selection and enhanced markers for added flexibility
- Exclusive HUM measurements on Digital QAM signals

Applications



- Use any one of several modes for troubleshooting your “all digital network”, including Digital Power, Constellation display, Statistic (stats), Equalizer, Frequency Response, Group Delay, MER, EVM, ENM and an all inclusive QAM Impairment Analysis mode for 64 and 256 QAM. This unique set of measurements helps you quickly analyze and repair difficult digital problems with ease
- Export your remote digital measurements to an easily managed standard CSV file
- In addition to Digital Proof of Performance, the AT2500RQv helps you perform your analog proof of performance testing in a minimum amount of time. For example, MER, BER, EVM, ENM, Phase Noise, Group Delay and Reflection measurements on a specific channel are performed with the push of one button
- Troubleshoot upstream or downstream impairments with one of the best CATV spectrum analyzers on the market. The AT2500RQv is a full featured spectrum analyzer focused on the needs of the CATV industry. With its wide frequency control (0 to 1.5 GHz), multiple RBW setting (10, 30, 300 and 1000 kHz), multiple VBW (10, 100 and 1000 kHz) and high dynamic range (70 dB), the AT2500 is able to tackle any RF problem in your HFC network
- Switch inputs instantly via WebRemote with an AT160x RF switch, in order to view any impairment on any node connected to the switch bank or simply use the AT2500RQv in conjunction with the AT160x switches to create and view head-end and hub test points remotely



Digital Tests	Channel Number	Assigend Frequency (MHz)	Lock	Level (dBmV)	Adj. Channel (dB)	MER (dB)	PRE-BER	POST-BER	Frequenc Error (kHz)	In Chann Freq. Res (dB)	HUM (%)	Group Delay (nSec)	Phase Noise (Deg)	Micro Reflections < 0.5 (dBc)	< 1.0 (dBc)	< 1.5 (dBc)	< 4.5 (dBc)	EVM (%)	ENM (dB)
Max Limit	N/A	N/A	N/A	25	±3	N/A	1.0E-6	1.0E-7	±24.9	±7.9	3	250	3.9	-10	-15	-20	-30	2.9	N/A
All	27	243.012500	Locked	2.42	-1.3	38.8	0	0	-12.2	1.1	0.7	36.58	0.1	-27	-42	-45	-40	0.707	10.6
All	28	249.012500	Locked	1.12	-0.23	38.4	0	0	-12.3	1	0.6	30.26	0.1	-27	-38	-43	-40	0.741	10.2
All	29	255.012500	Locked	0.89	-0.19	38.1	0	0	-12.3	1.1	0.7	47.07	0.2	-29	-37	-38	-40	0.767	9.9
All	30	261.012500	Locked	0.7	0.17	38.1	0	0	-12.4	1.3	0.8	41.84	0.2	-27	-37	-41	-40	0.767	9.9
All	31	267.012500	Locked	0.87	-2.02	38.8	0	0	-12.4	1	0.6	31.96	0.1	-35	-36	-41	-41	0.707	10.6
All	32	273.012500	Locked	-1.15	-0.07	36.2	0	0	-12.5	1	0.7	37.79	0.1	-37	-40	-40	-40	0.954	8.0
All	33	279.012500	Locked	-1.22	2.86	35.9	0	0	-12.4	0.7	0.7	38.29	0.2	-32	-36	-45	-40	0.988	7.7
All	34	285.012500	Locked	1.64	-0.56	39.2	0	0	-11.0	0.8	0.5	35.25	0.1	-30	-35	-45	-40	0.676	11.0
All	35	291.012500	Locked	1.08	-0.33	39.2	0	0	-11.0	0.8	0.7	41.18	0.2	-31	-36	-46	-41	0.676	11.0
All	36	297.012500	Locked	0.75	-0.03	38.5	0	0	-11.9	0.9	0.7	39.16	0.1	-33	-38	-44	-40	0.732	10.3
All	37	303.012500	Locked	0.72	-0.05	39	0	0	-12.1	0.7	0.5	30.26	0.1	-30	-39	-40	-41	0.691	10.8
All	38	309.012500	Locked	0.67	-0.11	38.6	0	0	-12.2	1.1	0.6	44.47	0.2	-30	-37	-41	-41	0.724	10.4
All	39	315.012500	Locked	0.56	0.72	38.9	0	0	-12.2	0.8	0.6	30.13	0.1	-32	-37	-42	-40	0.699	10.7
All	40	321.012500	Locked	1.28	-0.38	39.2	0	0	-12.2	1.1	0.6	36.82	0.1	-31	-36	-45	-40	0.676	11.0
All	41	327.012500	Locked	0.9	0.33	38.9	0	0	-12.3	1.5	0.6	49.79	0.1	-35	-34	-41	-40	0.699	10.7
All	42	333.025000	Locked	1.23	0.01	38.7	0	0	-24.7	1.5	0.6	39.81	0.1	-33	-36	-43	-40	0.716	10.5
All	43	339.012500	Locked	1.24		38.9	0	0	-11.7	1	0.7	32.49	0.2	-34	-38	-44	-41	0.699	10.7

Specifications

Frequency

Tuning Range: 0 - 1500 MHz
Calibrated Frequency Range: 5 - 1500 MHz
Frequency Reference Aging: ± 1 PPM / yr
Frequency Reference Temperature Stability: ± 1 PPM (0° to 50°C)
Frequency Counter Accuracy: ± 1 PPM ± 1 count
Frequency Counter Resolution: 10 Hz
Single Sideband Phase Noise at 10 kHz
Offset
- -85 dBc/Hz typical
- -83 dBc/Hz minimum

Spans

Max Span: 1500 MHz
Variable Spans: 0.1 to 1500 MHz, user programmable
Zero Span

Sweep Time

Max Span and > 1000 MHz: 30 ms
Other spans ≤1000 MHz: 20 ms to 5s in 2, 5, 10, 20 sequence
Reduced Spans (≤500 MHz, ≤100 MHz, ≤50 MHz): 2, 4, 10 ms
Zero Span Horizontal Time: 0.05 ms to 500 in 1, 2, 5, 10 sequence

Resolution Bandwidth

1 MHz: Selectivity 5.3 to 1, 60 dB/3 dB
300 kHz: Selectivity 3.1 to 1, 60 dB/3 dB
30 kHz: Selectivity 2 to 1, 60 dB/3 dB
10 kHz: Selectivity 2 to 1, 60 dB/3 dB

Video Bandwidth

10 KHz, 100 KHz, 1 MHz: 6 dB /octave

Amplitude

Signal Level Range: -70 dBmV min. +70 dBmV max.
Maximum Safe Input: 68 dBmV 100V AC/DC
Level Accuracy: ±0.75 dB max. 5–1500 MHz
Sensitivity: -65 dBmV
Level Resolution: 0.1 dB
Input Impedance: 75 Ohms
Input Return Loss, Attenuator ≥ 5 dB
- 20 dB typical 14 dB min.

Input Return Loss, Attenuator = 0 dB
- 16 dB typical 10 dB min.

Noise Figure, 5–1500 MHz
- 8 dB typical 11 dB max.

Internally generated CTB
- Better than 70 dB (79 channel loading at Full Scale, Att <20dB Pre-amp ON, Filter AUTO ON)

Internally generated CSO
- Better than 70 dB (79 channel loading at Full Scale, Att<20dB Pre-amp ON, Filter AUTO ON)

Vertical Scale: 10, 5, 2 dB / div 70 dB full scale
Reference Level Range: +70 / -10 dB
Attenuator: 0–65 dB 5 dB steps

CATV Measurement Specifications

Channel Selection: Frequency, Channel Video, Channel Audio
Channel Plans: Custom plans, NTSC (EIA, HRC, IRC), PAL (B/G, I, D) or other. Maximum of 350 signals (analog, digital, FM, upstream, test, etc.) PC-based and internal complete channel plan editor
Tuning Range: 0 MHz to 1.5 GHz
Calibrated Operating Range: 5 MHz to 1.5 GHz
TV Channel Amplitude Range: -40 dBmV to +65 dBmV ± 0.75 dB for S/N > 30 dB
TV Visual Frequency
- Accuracy: Carrier Frequency, ± 1
- PPM Resolution: 10 Hz

Visual/Aural Delta Frequency
- Range: 1–10 MHz
- Accuracy: ± 200 Hz
- Resolution: 10 Hz
- Visual/Aural Delta Amplitude: ± 0.75 dB for S/N > 30 dB

FM Deviation
- Range: ± 150 kHz, de-emphasis 75 µsec
- Accuracy: ± 2 kHz, 1–75 kHz, ± 5 kHz to 150 kHz

HUM/Low Frequency Disturbances
- Modes: CW or Video (In-Service) Range 1– 10 %
- Accuracy: ± 0.5 % from 1 to 5%, ± 1% from 5 to 10%

Modulation Depth
- AM Range: 40 to 95%
- Resolution: 0.1%
- Accuracy: ± 1.5% (CCN > 40 dB)
- Signal type: Use VITS line with white reference

In-Channel Frequency Response
- Range: ± 10 dB
- Resolution: 0.1 dB
- Accuracy: ± 0.25 dB
- Signal Type: Use VITS line with full amplitude CATV multiburst signal, ghost canceling reference signal or video sweep

Carrier-to-Composite Noise Ratio
- Optimum Signal Range: +5 dBmV to +10 dBmV, noise measured with 0 dB Attenuation
- Maximum CCN: 60 dB with ± 1 dB accuracy, 65 dB with ± 3 dB
- Accuracy: ± 0.25
- Resolution: 0.1 dB

CSO/CTB
- Optimum Signal Range: 0 dBmV to +10 dBmV, beat measured with 0-5 dB attenuation
- Maximum: CSO/CTB 70 dB with ± 1.5 dB accuracy, 77 dB with ± 4 dB accuracy, Resolution 0.1 dB

Digital Measurement QAM 16/64/256 Specifications

Modulation

Modulation Type: 16/64/256 QAM ITU-T J.83 Annex A, B & C (DVS, DVB, DOCSIS, EuroDOCSIS)
Interleave Capability: In Annex B, up to 128 x 4; In Annex A/C, 12 x 17
Constellation Display: 16, 64 and 256 QAM, Full constellation with zoom capability
Adaptive Equalizer Display
Number of Taps: 8 feed-forward; 24 feedback
Adaptive Equalizer Control: On, Freeze, Variable, Off
Scale: +10 to -80 dBc
Frequency response over signal bandwidth: +5 to -5 dB
Group delay over signal bandwidth: -1000 to 1000 nSec

Digital Carrier Average Power Measurement

Amplitude Range: -30 to +65 dBmV
Resolution: 0.1 dB
Absolute Accuracy: ± 1.5 dB
Measurement Range: 200 kHz to 1500 MHz

Modulation Error Ratio (MER)

Range: 22 to 40 dB
Accuracy: ± 0.5, 22 to 30 dB; ±1, 30 to 38 dB; ±1.7dB, 38 to 43 dB
Error Vector Magnitude (EVM) Range: 0.65% to 4.1%

Bit Error Rate (BER)

1 second period BER before and after R-S Decoding

- Range: 0 to 1.0 x 10^{-4}
- User-selectable time rest period: 1 to 60 minutes

Estimated average BER, before and after R-S Decoding

- Range: 0 to 1.0 x 10^{-4}
- User-selectable time period: 1 to 60 minutes, 7 days with ReVeal WinCOM remote control software

Resolution: 1s

Estimated Noise Margin

Range: 1 to 12 dB
Accuracy: ± 0.5, 22 to 30 dB; ±1, 30 to 38 dB; ±1.7dB, 38 to 40 dB

Data Logging

User-selectable time period : 1 to 60 minutes, 7 days with ReVeal WinCOM remote control software MER, Pre and Post BER, errored seconds, severely errored seconds, Frame Loss, system unavailability time
Resolution: 1s

Symbol Rate

Range: 1 to 7 MS/s

Analog Video Measurements

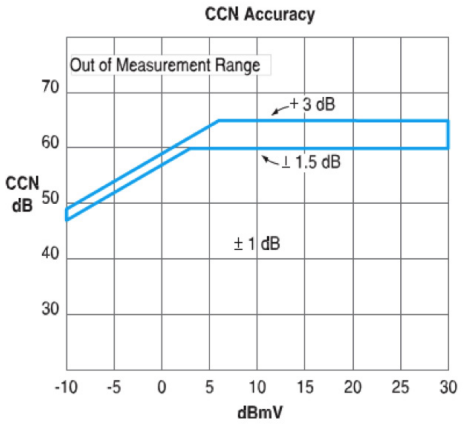
Function: Available features
Waveform Monitor: 1, 2 or 3 user selectable lines plus x 10 zoom of one line Vertical scale of 20, 10 or 5 IRE /div., reference offset Horizontal and vertical markers, Average 1 to 50 Luminance, chrominance and noise weighting filters
Vectorscope: One selectable line, vector gain adjustment and phase rotation
Measurements

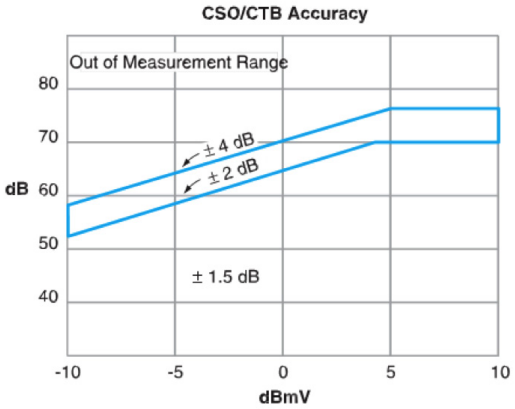
- Differential gain and phase
- Luminance to chrominance delay and gain
- Depth of modulation and modulation linearity
- Signal-to-noise unweighted and weighted
- FFC limits pass/fail indicator

Measurement setup: the type of video test signal determines the available measurements; markers allow positioning the sampling location

Video Measurements

Differential Phase: ± 1.5° typical ± 3° maximum
Differential Gain; ± 1% typical ± 2% maximum
Luminance to Chrominance Delay: ± 20 nsec typical ± 40 nsec maximum
Luminance to Chrominance Gain: ± 1.5% typical ± 3% maximum
Depth of Modulation: ± 1% typical ± 2% maximum
Modulation Linearity: ± 1 IRE typical ± 2 IRE maximum
Signal to Noise (unweighted): ± 2 dB typical ± 4 dB maximum
Signal to Noise (weighted): ± 2 dB typical ± 4 dB maximum





Standard Accessories

Carrying Case
User Manual
WinCom II data management software
Power Supply 16V, 4A
Null Modem Serial Cable for PC to AT2500RQ connection
Calibration Certificate

General

Size (H x W x D)	7 x 12 x 14 in (177.8 x 304.8 x 355.6 mm)
Weight	19.6 lbs (8.6 kg) minimum with battery
Display Type	TFT Active Matrix Color LCD
Display Size	6.4 in (162.5 mm)

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