

AT2500RQv CATV/QAM/VIDEO SPECTRUM ANALYZER



*The world's only spectrum analyzer with
combined CATV, QAM and Video
measurement capabilities*

Sunrise Telecom Broadband is dedicated to providing our customers with the best test equipment possible. That is why our engineers have created a lightweight, battery powered analyzer designed for CATV headend and field portable applications. It features powerful modular options that allow you to expand measurement capabilities for future technology or individual requirements. Integrating QAM digital measurements and video demodulation into an affordable portable spectrum analyzer such as the Sunrise AT2500RQv is truly a breakthrough from both a cost and performance point of view.

**JUST ANOTHER WAY
WE'RE UNCOMPLICATING CABLE**


SUNRISE TELECOM
B R O A D B A N D

...with high sensitivity and the fastest scan speed of any CATV spectrum analyzer, the AT2500RQv catches ingress others miss

DESIGNED SPECIFICALLY FOR CATV



Easy access to all modes from the Main Menu

Today's broadband network technicians face the challenge of keeping the cable plant operating at peak performance at all times. To diagnose and correct problems, they need to be able to perform sophisticated tests and get accurate results quickly, so an instrument has to be reliable and easy to use.

Designed with PC technology in mind, the Sunrise AT2500RQv is a lightweight, full featured 1.5 GHz spectrum analyzer. This unit is built to withstand the rigors of field use. With its durable, water-resistant ABS plastic housing and wide temperature range, you can use the analyzer in all weather conditions.

The built-in battery with over 2-hour continuous operating time makes working in the field easier. You can also use Sunrise's Windows-based software packages to remotely access the AT2500RQv via Ethernet over any TCP/IP network.

SPECTRUM ANALYZER



Reverse path ingress is easily captured with high speed scan

The 1.5 GHz AT2500RQv has intelligent band select filters that can automatically filter the input signal to prevent overloading, allowing this high sensitivity analyzer to be used to measure low level signals in a fully loaded cable system.

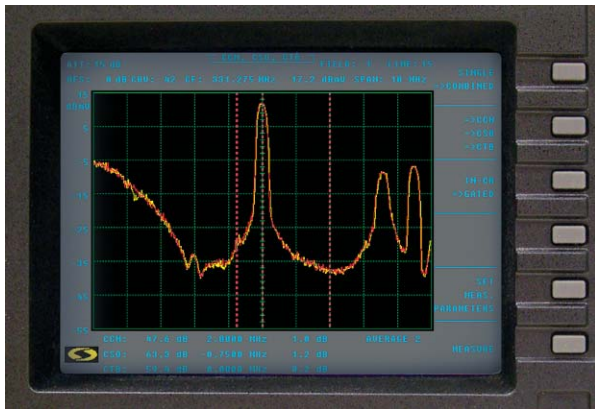
Finding ingress on the reverse path can be a challenge, especially since much of the ingress is either fast transients, lasting only fractions of a second, or system noise. With the fastest scan speed of any CATV spectrum analyzer the AT2500RQv can scan a 50 MHz span in only 2 ms, ensuring all the transient ingress is caught.

The technician never has to worry about calibration because an intelligent AUTO-CALIBRATION system maintains specified accuracy throughout the operating temperature range. Full auto-calibration is achieved within a minute of turning the unit on.

MARK

.....measure CCN, CSO & CTB accurately and in-service.

CATV PACKAGE



Combined CCN, CSO and CTB Tests

All CATV tests, including complete in-service RF testing for Proof-of-Performance, can be executed quickly and accurately and without customer service interruptions:

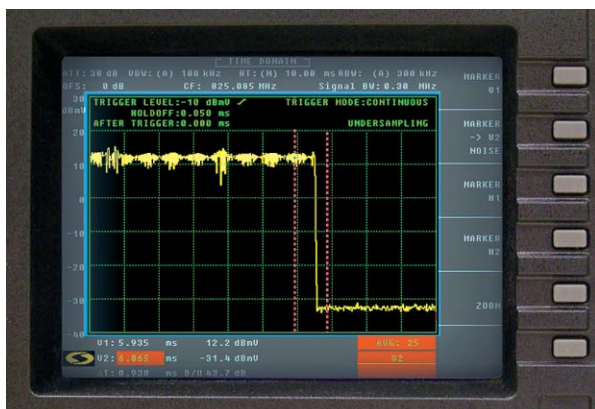
- Carrier Level
- Carrier Frequency
- Hum
- CCN (Carrier to Composite Noise)
- CSO (Composite Second Order)
- CTB (Composite Triple Beat) In-Service Measurement available
- DFI (Discrete Frequency Interference) Measurement Mode
- ICR (In-Channel Response)
- DOM (Depth of Modulation)
- Digital Channel Power

All these tests are easily performed by using the icons shown on the main menu.

CCN, CSO, CTB, DFI, Hum, In-Channel Frequency Response and Depth of Modulation can all be performed in-service with the proper VITS test signal inserter in the very accurate and reliable Gated Mode. With its high sensitivity, the Sunrise AT2500RQv can measure CCN ratios of better than 60 dB with only a 5 dBmV carrier level, eliminating the need for an external amplifier even at test points or subscriber drop levels.

The internal high/low pass preselection filters automatically filter out-of-band energy to provide improved dynamic range for measurements in a fully loaded cable system.

TIME DOMAIN MODULE



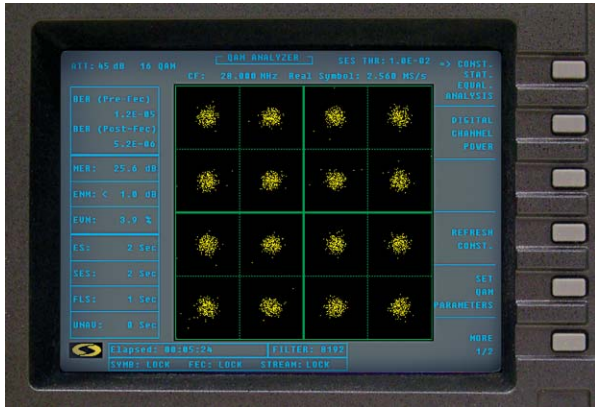
Time Domain Measurement

TDM mode simplifies analysis of upstream cable modem bursty signals and intermittent ingress for quick and accurate measurements. Because today's advanced services can have many different TDMA (Time-Division Multiple- Access) signals assigned to a particular frequency, the TDM module is standard on Sunrise AT2500 Series spectrum analyzers. This Time Domain Module eliminates the guesswork by providing quick and accurate analysis of complex upstream FSK, QPSK, and 16 QAM pulsed amplitude signals.

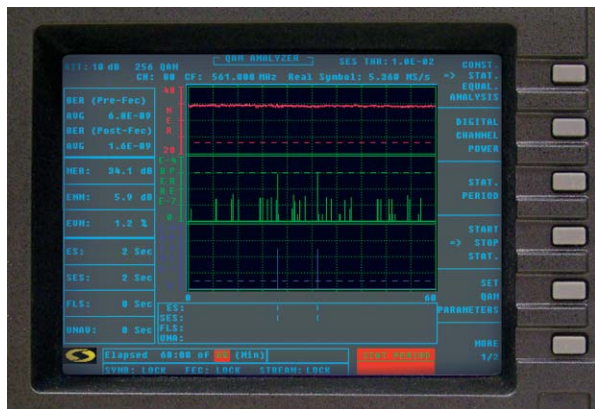
The comprehensive Time Domain Measurement mode fully utilizes the power of the Sunrise AT2500RQv's built-in triggered gating hardware capabilities to capture and isolate a signal source. Each packet of data from a cable modem's TDMA upstream signal can be captured, seen, and measured thanks to flexible control settings such as Trigger Level, Holdoff, Horizontal Sweep Time, delay after trigger, bandwidth correction, averaging, etc. The TDM mode allows fast, simple, and accurate in-service measurements, including an estimated channel power of the upstream DOCSIS channel, S/N of the burst (or D/U), and the burst level of the modems.

...the AT2500RQv QAM Analyzer is an essential tool for ensuring that revenue generating digital services remain operational.

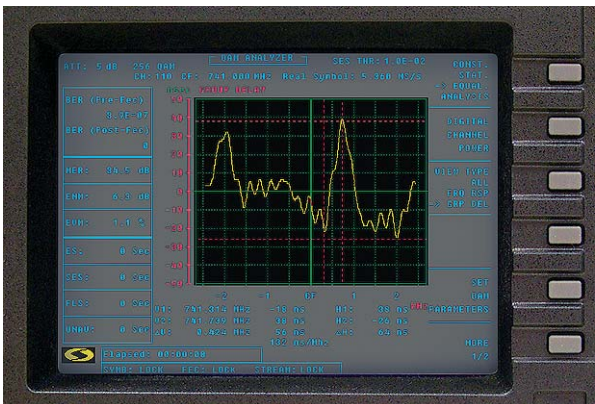
QAM DEMODULATOR OPTION



Constellation display of 16 QAM signal



60 minute statistics screen showing signal impairments over time



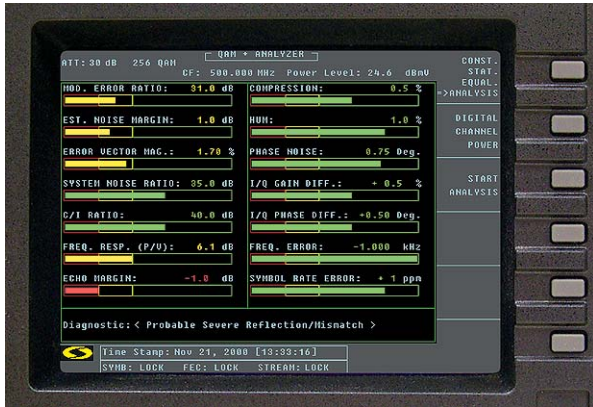
Zoomed Group Delay screen

As digital signals become part of our every day routine, performing accurate digital cable measurements is essential to efficiently install and maintain high quality level of service for your customers. Unlike analog pictures, digital video can appear to operate normally and yet it may be very close to failing. Digital measurements can be the only way to ensure that the system is operating well within limits. The digital channel power measurement allows accurate digital carrier power measurements over a desired bandwidth anywhere between 200 kHz and 1.5 GHz.

The Sunrise AT2500RQv QAM Analyzer demodulates and accurately measures the QAM signals carried through the cable system. It provides the measurement power the field technicians need for the latest 64/256 QAM digital technologies and is very simple to use, making the transition from analog to digital testing a breeze. The AT2500RQv displays Modulation Error Ratio (MER), pre and post Bit Error Rate (BER) and Error Vector Magnitude (EVM).

When paired with the CM1000 unit with an Upstream Signal Generator module, the AT2500 can demodulate a continuous 16 QAM in order to measure and characterize a network's return path performance for VoIP deployments. MER, BER as well as the reverse channel's frequency response and group delay characteristics can be precisely measured.

A statistics logging function is also included to test between 1–60 minutes with date/time reference, storing events of MER, Pre & Post BER, errored seconds, severely errored seconds, frame loss, and system unavailability. Up to 7 days of data can be captured with date/time reference using the WinQAM PC software.



QAM Impairment Analysis (QIA) displays 14 performance measurements on one screen

MER measures the ratio of the average signal power in the ideal constellation to the average error power, and provides a good measure of signal quality. While MER is well established as the best overall “figure of merit” measurement to determine QAM signal quality, it does not indicate the type of impairment affecting a signal. For more in depth analysis to determine the cause of signal impairments, Sunrise developed the patent pending QAM Impairment Analysis (QIA) mode.

QIA mode calculates and displays:

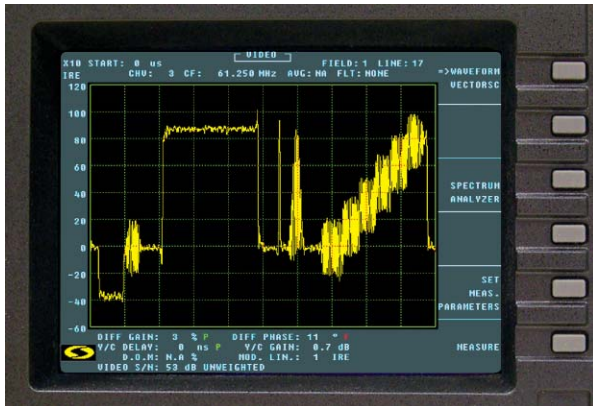
- MER
- EVM
- C/I (Carrier to Interference)
- Echo margin
- Compression
- I/Q gain difference
- I/Q phase difference
- Phase noise
- Noise margin
- System noise ratio
- Frequency response
- Symbol rate error
- Hum
- Carrier offset

...QIA provides important insight into the source of digital impairments.

DIGITAL FEATURES

- 16/64/256 QAM DIGITAL MEASUREMENTS
- ITU-T J.83 ANNEX A, B & C COMPLIANT (DVS, DVB, DOCSIS, EURODOCSIS)
- HIGH RESOLUTION CONSTELLATION DISPLAY WITH ZOOM
- DATA LOGGING MODE OVER 1-60 MINUTES
- ADAPTIVE EQUALIZER DISPLAY WITH IN CHANNEL FREQUENCY RESPONSE AND GROUP DELAY
- RETURN PATH TESTING AND QUALIFICATION FOR VoIP
- MODULATION ERROR RATIO (MER) MEASUREMENT
- PRE AND POST BIT ERROR RATE TESTING (BER), REAL TIME AND AVERAGE
- AUTO ATTENUATOR SEARCH TO INSURE OPTIMUM QAM MEASUREMENTS
- POLARITY AUTO SEARCH FOR IF OR UP CONVERTED CARRIER FREQUENCIES
- QAM IMPAIRMENT ANALYSIS MODE
- DUAL BAND 6 & 8 MHZ IF FILTERS AVAILABLE
- ASI MPEG TRANSPORT STREAM OUTPUT AVAILABLE

NTSC VIDEO DEMODULATOR OPTION



Waveform Monitor Display of NTC 7 composite test signal



Vectorscope Display of color bars

The video demodulator option displays a specific video line and field to allow the cable operator to measure important video performance characteristics in either waveform monitor mode or vectorscope mode.

The waveform monitor mode demodulates and displays 1, 2 or 3 video lines with zoom, markers and various video filters (luminance, chroma and noise weighting). FCC required color and video tests such as differential gain and phase, Y/C gain and delay, depth of modulation, modulation linearity and video S/N (weighted and unweighted) can be performed at the touch of a button in this mode.

The vectorscope display presents color bar signals on the screen with adjustable gain and phase rotation to simplify verifying and adjusting analog TV channel modulators. The vectorscope graticule has targets for red, blue, green, cyan, magenta and yellow for easy reference.

...measure key video performance characteristics in either waveform monitor mode or vectorscope mode.

SPECIFICATIONS

FREQUENCY

Frequency range: 0 MHz–1.5 GHz
 Calibrated frequency range: 5 MHz–1.5 GHz
 Frequency Reference:
 Aging: ± 1 PPM/Yr
 Temperature Stability: ± 1 PPM (0°C to 50°C)
 Frequency counter:
 Accuracy: ± 1 PPM ± 1 count
 Resolution: 10 Hz
 Stability (Noise sidebands offset from CW signal):
 -85 dBc / Hz @ ± 10 kHz offset typical

SPAN

Frequency Span:
 Range: Variable from Max Span 1500 MHz to 100 kHz & Zero Span
 Accuracy: < 2 PPM
 Sweep Time:
 Range: 2ms, 4ms, 10ms, 20ms, 50ms, 100ms, 200ms, 500ms, 1000ms, 2000ms, 5000ms
 Stability: < 2 PPM
 Sweep Trigger: Free Run, Pwr Lock and TV Frame
 Resolution Bandwidth:
 Range: 1 MHz, 300 kHz, 30 kHz & 10 kHz
 Selectivity (60 dB / 3 dB Ratio): 5.3:1, 3:1, 2:1, 2:1
 Accuracy: $\pm 5\%$
 Video Bandwidth:
 Range: 1 MHz, 100 kHz & 10 kHz

AMPLITUDE

Response Flatness: ± 0.75 dB (5–1500 MHz)
 Sensitivity: -65 dBmV (300 kHz RBW) to +65 dBmV
 Level accuracy: ± 0.75 dB @ 25°C
 Level resolution: 0.1 dB
 Impedance at RF input: 75 ohm
 Input Return Loss: > 20 dB typical (> 5 dB attenuation)
 Maximum safe input: +68 dBmV
 Spurious free dynamic range: > 70 dB
 Internal calibrator: 48 MHz @ -5 dBmV
 Up to 4 simultaneous traces on screen with Avg, Peak & Min Hold
 Selectable Positive, Negative or Sample detector
 Vertical, Horizontal & Tilt Markers
 Peak Search, Next Peak & Tracking on Vertical Markers
 Vertical scale: 10, 5, 2 dB/Division
 BAND SELECT FILTERS (Auto or Manual) :
 7 high pass filters, 7 low pass filters and 21 bandpass filter combinations.
 High Pass Cutoff Frequencies: 35, 78, 164, 270, 360, 450, 540 MHz
 Low Pass Cutoff Frequencies: 45, 88, 174, 280, 370, 460, 550 MHz

MECHANICAL

Size: 304 x 177 x 355 mm (12"W x 7"H x 14"D)
 Weight: 10 Kg (22 pounds)
 Temperature
 Operating: 0 to 50°C (32 to 122°F)
 Storage: -20 to 55°C (-4 to 131°F)
 Display type: TFT Active Matrix Color LCD
 Display size: 162.5 mm (6.4 inches)

POWER

Battery Type: Rechargeable lead acid, 12 Volt 7 Ah
 Internal Battery Charger: Automatic Fast / Slow / Floating
 Power Supply: PSU2065 100V/250V, 50/60 Hz, 16 VDC, 4.06 A
 Charge Time: < 4 hours
 Operating Time: > 2 hours

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

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 μ sec
 Accuracy: ± 2 kHz, 1–75 kHz, ± 5 kHz to 150 kHz

HUM/LOW FREQ. DISTURBANCES

Modes: CW or Video (In-Service)
 Range: 1–10%
 Accuracy: $\pm 0.5\%$ from 1 to 5%, $\pm 1\%$ from 5 to 10%

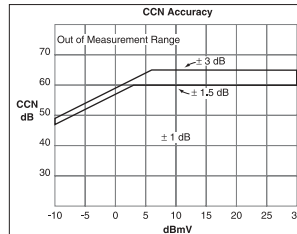
MODULATION DEPTH

AM Range: 40 to 95%
 Resolution: 0.1%
 Accuracy: $\pm 1.5\%$ (CCN > 40 dB)
 Signal type: VITS line with white reference

IN-CHANNEL RESPONSE

Range: ± 10 dB
 Resolution: 0.1 dB
 Accuracy: ± 0.25 dB
 Signal type: VITS line with full amplitude CATV Multiburst signal, Video sweep or Ghost Canceling Reference signal

CARRIER-TO-COMPOSITE NOISE RATIO

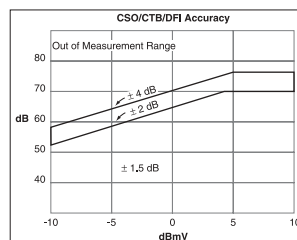


Note: CCN specifications with band select filters on auto and 77 channel loading

Optimum Signal Range: +3 dBmV to +10 dBmV, noise measured with 0 dB Attenuation
 CCN range: 60 dB with ± 1 dB accuracy, 65 dB with ± 3 dB accuracy
 Resolution: 0.1 dB

CSO/CTB/DFI

Optimum Signal Range: 0 dBmV to +4 dBmV, beat measured with 0 dB Attenuation
 CSO/CTB/DFI Range: 64 dB with ± 1.5 dB
 71 dB with ± 4 dB accuracy
 Resolution 0.1 dB



Note: CSO, CTB and DFI specifications with band select filters on auto and 77 channel loading

TDM MEASUREMENT

Frequency Span: Zero Span
 Horizontal Time: 50 μ sec to 500 msec
 (1, 2, 5 settings)

Resolution Bandwidth: 1 MHz, 300 kHz, 30 kHz, 10 kHz
 Video Bandwidth: 1 MHz, 100 kHz, 10 kHz
 Bandwidth Correction Range: 10 kHz to 9.9 MHz
 Pulse Level Accuracy: ± 0.75 dB in 5 μ sec, 1 MHz RBW
 Trigger Modes: Free run, Continuous, Single
 Trigger Level Range: -70 dBmV to +65 dB mV
 Trigger Delay Range: 0 to 100 msec, in 1 μ sec steps
 Trigger Holdoff Range: 50 μ sec to 100 msec, in 1 μ sec steps

DIGITAL MEASUREMENT QAM 16/64/256 SPECIFICATIONS

Modulation Type: 16/64/256 QAM ITU-T J.83 Annex A, B & C (DVS, DVB, DOCSIS, EuroDOCSIS)
 Constellation Display Size: 16, 64 and 256 QAM
 Full constellation with zoom capability
 Adaptive Equalizer Display - Number of Taps: 8 feed-forward; 24 feedback
 Scale: +10 to -80 dBc
 Mask: DOCSIS
 Frequency response, over signal BW: +5 to -5 dB
 Group Delay, over signal BW: -1000 to +1000 nsec
 Digital Carrier Average Power Measurement
 Amplitude Range: -30 to +65 dBmV
 Resolution: 0.1 dB
 Absolute Accuracy: ± 1.5 dB
 Bandwidth Range: 200 kHz to 1.5 GHz
 Modulation Error Ratio (MER)
 Range: 22 to 40 dB
 Accuracy: ± 1 dB typical
 Error Vector Magnitude (EVM)
 Range: 0.65% to 4.1%
 Bit Error Rate (BER), Before and After R-S Decoding, per 1 second period
 Range: 0 to 1.0×10^{-4}
 Average Bit Error Rate (BER), Before and After R-S Decoding
 Range: 0 to 1.0×10^{-4}
 Estimated Noise Margin
 Range: 1 to 12 dB
 Accuracy: ± 1 dB typical
 Statistics Logging
 User-selectable Test Period: 1 to 60 minutes, up to 7 days with WinQAM
 MER, Pre and Post BER, Errored Seconds, Severely Errored Seconds, Frame Loss, System Unavailability time

Symbol Rate
 Range: 1.28 to 7 MS / s
 (Continuous QAM measurements at $< 30^\circ$ C)

VIDEO DEMOD MEASUREMENT (NTSC ONLY)

Differential Phase: $\pm 3^\circ$ maximum
 Differential Gain: $\pm 2\%$ maximum
 Luminance to Chrominance Delay:
 ± 40 nsec maximum
 Luminance to Chrominance Gain: $\pm 3\%$ maximum
 Depth of Modulation: $\pm 2\%$ maximum
 Modulation Linearity: ± 2 IRE maximum
 Signal to Noise (unweighted): ± 4 dB maximum
 Signal to Noise (weighted): ± 4 dB maximum

Note: All specifications apply over the standard 0°C to +50°C operating temperature range, after a minimum of 2 hours of storage within the operating temperature range, if the unit is not fully at ambient temperature. The AT2500RQv meets all its specifications within 1 minute after it is turned on, providing that the AT2500RQv is within the one year calibration cycle. Sunrise Telecom Broadband's unique AutoCal feature assures accuracy by periodically self-testing and triggering a non-obstructive calibration, as required.

Specifications subject to change without notice.

FIELD-PROVEN SOLUTIONS

For detailed information on the AT2500R, visit our website at www.sunrisetelecom.com for the name of your local Sunrise representative. Or telephone us at 1-800-297-9726 (Int'l calls: 1-514-725-6652).

Sunrise Telecom Broadband is a leader in digital broadband and DOCSIS test instruments for the cable industry. As part of the Sunrise Telecom family, we leverage the strength of one of the world's largest communications test and measurement companies.

Sunrise Telecom Broadband's field-proven solutions include installation and maintenance instruments; portable headend analyzers; and network test systems and software. Our goal is to enable service providers to rapidly deploy television, high-speed Internet, and digital video applications.

Based on our core strength in RF testing, we have established a successful track record as a provider of leading edge solutions that incorporate innovative test methods, intuitive user interfaces, and thorough product training. At Sunrise Telecom Broadband, we uncomplicate the cable broadband engineer's and field technician's day.

JUST ANOTHER WAY WE'RE UNCOMPLICATING CABLE



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Fax: 1-408-363-8313

ORDERING INFORMATION

AT2500R 1.5 GHZ PORTABLE CATV SPECTRUM ANALYZER

Includes:

PSU2065 Power Supply, Rechargeable lead acid battery,
User Manual, 2-Year Warranty, Padded Protective Soft Case
AT2VIDOUT Baseband NTSC video output
AT2VGAOUT VGA Output (15 Pin D Connector)
10Base-T Network connection (RJ45)
High/Low preselection filters
AT2CATVPAK CATV Measurement package
Carrier measurement, Precision frequency counter,
In-service Hum, CCN, CSO and CTB, Digital Channel Power
AT2TDM Time Domain Measurement package
A99026010 WinCom II Data Management Software (license for 1 PC)

AT2500Rv 1.5 GHZ PORTABLE CATV/VIDEO SPECTRUM ANALYZER

Includes all AT2500R features plus:

NTSC Video Demodulator Measurement Option

AT2500RQ 1.5 GHZ PORTABLE CATV/QAM SPECTRUM ANALYZER

Includes all AT2500R features plus:

16/64/256 QAM Digital Measurement Analyzer
(Constellation, BER, MER Adaptive EQ, Data Logging)
AT2Q+QIA QAM+ Impairment Analysis Mode

AT2500RQv 1.5 GHZ PORTABLE CATV/QAM/VIDEO SPECTRUM ANALYZER

Includes all AT2500R features plus:

QAM and Video Demodulator Options

OPTIONS AND ACCESSORIES

HARDWARE OPTIONS

These options are factory installed and must be ordered with product—requires AT2500RQ or AT2500RQv

AT2Q6-8 64/256 QAM RQ+ Euro/Annex A/B/C, Dual 6 - 8 MHz band width (Required for Annex A)
AT2Q-ASI MPEG ASI Output through BNC Connector

WINDOWS PC SOFTWARE FOR SUNRISE AT2500RQV (1 LICENSE PER PC)

Includes: CD, User Manual, A65000909 Serial Cable and A65000945 RJ-45 Ethernet Crossover Cable

A99026010 WinCom II - Data Management Software (licenses for additional PCs)
A99026020 WinRemote - Remote Control Spectrum Analyzer Software
A99026050 WinQAM - Remote Control QAM Digital Measurements Software (Requires AT2500RQ or AT2500RQv)

ACCESSORIES

A99025600 Padded Protective Soft Case for Sunrise AT2500RQv
A90093030 Model BTA Bucket Truck Adapter

CALIBRATION OPTIONS

AT-W32 3-Year Calibration Program
AT-W52 5-Year Calibration Program
AT2-CC Certificate of Calibration/compliance (N/C when requested at time of purchase)
AT2-CCM Certificate of Calibration/compliance with measurement data (requested at the time of purchase only)



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