VIAVI
VSE-1100

The all-new digital spectrum/video analyzer and noise troubleshooter

The VSE-1100 helps cable service providers maintain optimal network performance in the modern digital cable environment.

Enabling fast and easy maintenance and troubleshooting, the one-of-a-kind VSE meets these challenges:

- **CCAP™** — systems are moving toward a more complete spectrum of carriers on a single output, and channel line-ups change on the fly

- **Crowded upstream spectrum** — no empty spectrum is available for out-of-band spectrum tests; noise under QAM, min-hold, and other traffic-identifying techniques are not feasible because when multiple signals are time-shared and traffic is dense, the signal frequency is rarely unoccupied

- **Video-on-demand and video streaming** — more content needs monitoring, and stronger competition with more contenders increases the need to assure quality

First in the Industry

- An integrated spectrum and video analyzer/noise-troubleshooting platform for converged cable access platform (CCAP) and remote PHY evolution

- The fastest and most powerful upstream verification and troubleshooting capabilities

- The smallest and lightest digital spectrum video analyzer platform available

- One screen shows all spectrum, level, and MER measurements of all channels

- Developed specifically for the digital cable world and the rise in unicast traffic

Key Features

- An easy-to-use, intuitive tablet interface that makes every technician an expert, solving complex problems the first time

- Service-layer to physical-layer testing—from the headend/hubsite to the field

- In-band and in-service detection of faults that standard tools miss

- Demodulation of upstream signals to detect code word errors and linear distortions

- Automatic detection of channel programs and channel plan building

Applications

- Spectrum, QAM, and MPEG video analysis for headend and hub sites

- Upstream analysis and troubleshooting for the HFC plant: noise, ingress, linear impairments, and codeword errors

- Objective upstream carrier and node leg performance assessment for tracking poor service quality throughout the HFC plant

This powerful, truly portable measurement tool includes digital and analog spectrum and video analysis as well as noise and upstream troubleshooting—the headend and the field can use the same instrument to verify problem sources and eliminate finger-pointing. And, better problem isolation means fewer truck rolls and quicker resolution.

Additional VSE-1100 features include:

• Objective and quick segmentation of service-impacting upstream issues

• Clearly-indicated impulse noise and ingress to resolve intermittent issues

• Collaborative MPEG and RF analysis—reducing MTTR by letting techs track issues through the network

• Live MPEG transport-stream analysis and file save

• Fast troubleshooting as technicians work across network segments

• Instant detection of transient interference and noise in real time

Essential, Innovative Test Modes

Downstream Analysis

The VSE-1100 performs all of the downstream RF analysis you would expect from an instrument designed for cable network testing, and more.
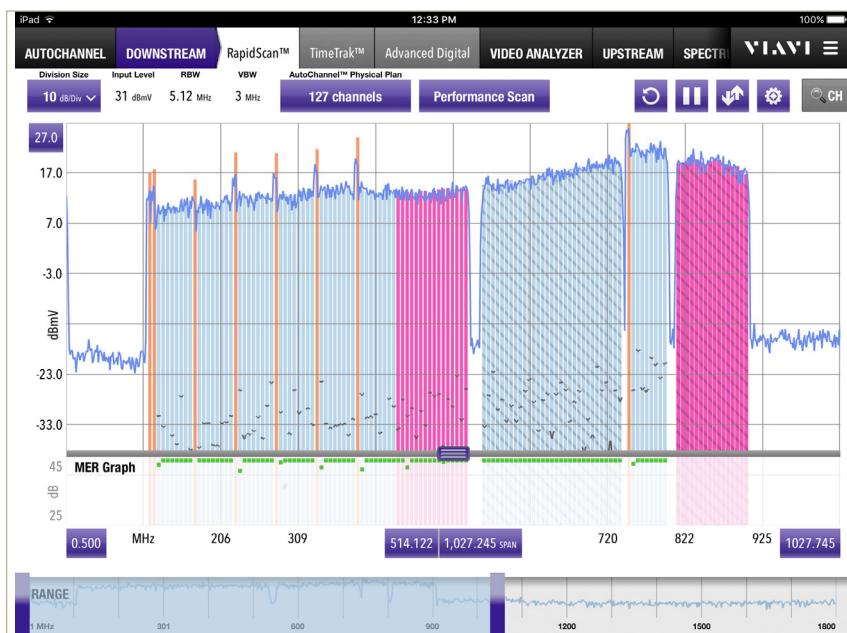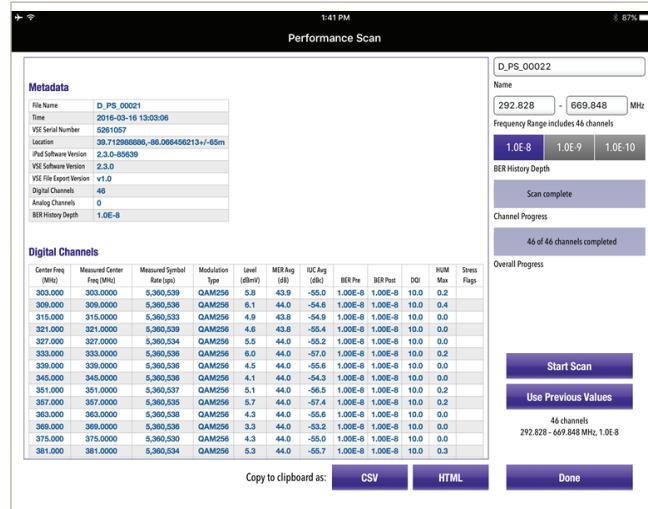

Full downstream channel scan screen

RapidScan™

Unlike traditional analyzers, the VSE-1100's RapidScan™ provides the user with a big-picture view of their cable network. With RapidScan, power level, MER, and ingress under the carrier can be compared across the full range of adjacent channels. The VSE-1100 display highlights QAM level modulation and MER levels to make potential issues standout.

Performance Scan

Headend personnel are required to perform complete tests with recorded results on a regularly scheduled basis. These tests can be time consuming, sometimes require multiple instruments, and the reporting process may be a complicated set of files or even hand written documentation. The VSE-1100 Performance Scan feature provides a simple single test and reporting solution for the entire set of measurements. The quick report on a user selected channel set captures frequency, symbol rate, modulation type, level, MER, and ingress under the carrier. If desired a longer more complete report can be performed adding BER (pre and post), DQI, hum, and any detected AGC or modulation stress flags to the results from the quick report. The results are easily uploaded and accessible in StrataSync, or can be copied to the iPad clipboard as CSV or HTML files for emailing.

Performance Scan

Metadata

File Name	D_PS_00021
Time	2016-03-16 13:03:06
VSE Serial Number	5261057
Location	39.712988888,-86.066456213+/-65m
iPad Software Version	2.3.0-85639
VSE Software Version	2.3.0
VSE File Export Version	v1.0
Digital Channels	46
Analog Channels	0
BER History Depth	1.0E-8

Digital Channels

Center Freq (MHz)	Measured Center Freq (MHz)	Measured Symbol Rate (sps)	Modulation Type	Level (dBmV)	MER Avg (dB)	IUC Avg (dBc)	BER Pre	BER Post	DQI	HUM Max	Stress Flags
303.000	303.0000	5,360,539	QAM256	5.8	43.9	-55.0	1.00E-6	1.00E-8	10.0	0.2	
309.000	309.0000	5,360,536	QAM256	6.1	44.0	-54.6	1.00E-8	1.00E-8	10.0	0.4	
315.000	315.0000	5,360,533	QAM256	4.9	43.8	-54.9	1.00E-8	1.00E-8	10.0	0.0	
321.000	321.0000	5,360,539	QAM256	4.6	43.8	-55.4	1.00E-8	1.00E-8	10.0	0.0	
327.000	327.0000	5,360,534	QAM256	5.5	44.0	-55.2	1.00E-8	1.00E-8	10.0	0.0	
333.000	333.0000	5,360,536	QAM256	6.0	44.0	-57.0	1.00E-8	1.00E-8	10.0	0.2	
339.000	339.0000	5,360,536	QAM256	4.5	44.0	-55.6	1.00E-8	1.00E-8	10.0	0.0	
345.000	345.0000	5,360,536	QAM256	4.1	44.0	-54.3	1.00E-8	1.00E-8	10.0	0.0	
351.000	351.0000	5,360,537	QAM256	5.1	44.0	-56.5	1.00E-8	1.00E-8	10.0	0.2	
357.000	357.0000	5,360,535	QAM256	5.7	44.0	-57.4	1.00E-8	1.00E-8	10.0	0.2	
363.000	363.0000	5,360,538	QAM256	4.3	44.0	-55.6	1.00E-8	1.00E-8	10.0	0.0	
369.000	369.0000	5,360,536	QAM256	3.3	44.0	-53.2	1.00E-8	1.00E-8	10.0	0.0	
375.000	375.0000	5,360,530	QAM256	4.3	44.0	-55.0	1.00E-8	1.00E-8	10.0	0.0	
381.000	381.0000	5,360,534	QAM256	5.3	44.0	-55.7	1.00E-8	1.00E-8	10.0	0.3	

D_PS_00022
Name
292.828 — 669.848 MHz
Frequency Range includes 46 channels
BER History Depth: 1.0E-8 | 1.0E-9 | 1.0E-10
Scan complete
Channel Progress: 46 of 46 channels completed
Overall Progress

Start Scan
Use Previous Values
46 channels
292.828 – 669.848 MHz, 1.0E-8

Copy to clipboard as: CSV | HTML | Done

AutoChannel™

One of the challenges that technicians face in the field is to determine which signal is carrying a particular channel. When a customer complains about tiling on a particular program, the tech must then find out which signal is carrying that program in order to do signal quality analysis. The VSE-1100 provides content-intelligent tuning through an innovative method of automatic channel program detection and plan building. This simplifies instrument configuration, speeds problem identification, and shortens repair times. In addition, AutoChannel selectively compares a physical channel plan with the logical (virtual) channel plan. Packet Dashboard™ and Packet Table™ (MACTrak Local™)
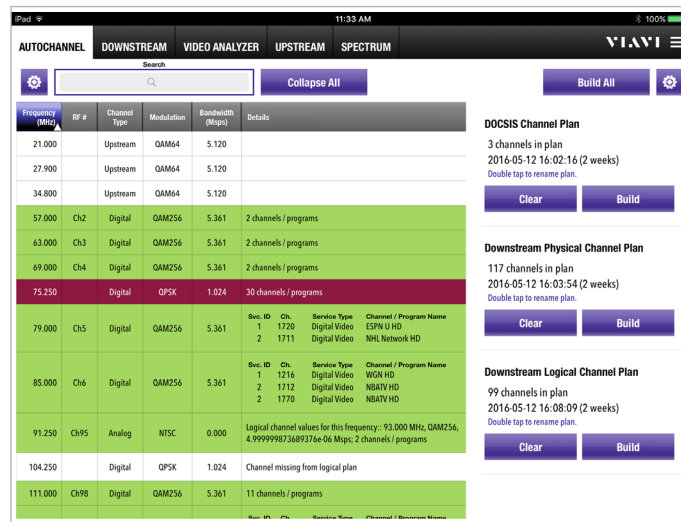
AutoChannel screen

Multiple Channel Plans and adding CW Channels

When an analyzer is used in multiple locations with different channel lineups, it can be time consuming to reconfigure the VSE-1100 with a different channel plan at every location. The VSE-1100 allows the user to build, save, delete, and rename up to 20 plans per channel plan type (physical, DOCSIS, and virtual). When testing at a different network, users can select the plan corresponding with the new location. If there is no plan for the location already, the user can build a new plan and name it so it can be recognized as the plan for this network.

Users can also add up to 40 CW signals to any physical channel plan. Adding CWs to the channel lineup allows these signals to be tested for level in RapidScan and Performance Scan measurements.
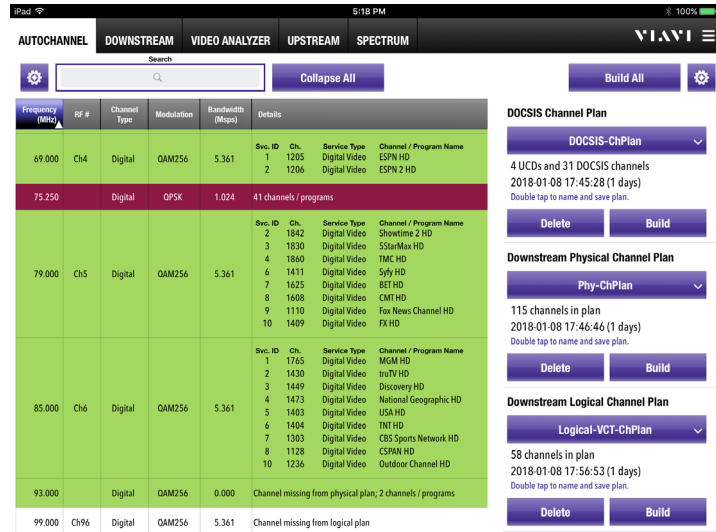
The VSE-1100 allows the user to build, save, delete, and rename
multiple channel plans.

Long-Term TimeTrak

Intermittent issues can be tough to troubleshoot without knowing exactly when the issue will occur. The TimeTrak feature allows long-term measurements to continuously measure and capture events for up to 25 hours. This enables verification of intermittent signal degradation and identification of a specific time correlating with the impairment, providing valuable insight for troubleshooting. The analyzer tracks and displays level, MER and DQI over the last 25 hours in a rolling window (adjustable axis from 5 minutes to 25 hours). Additionally the tablet connection is not required to maintain the tracking measurement so other daily tasks are not impeded.
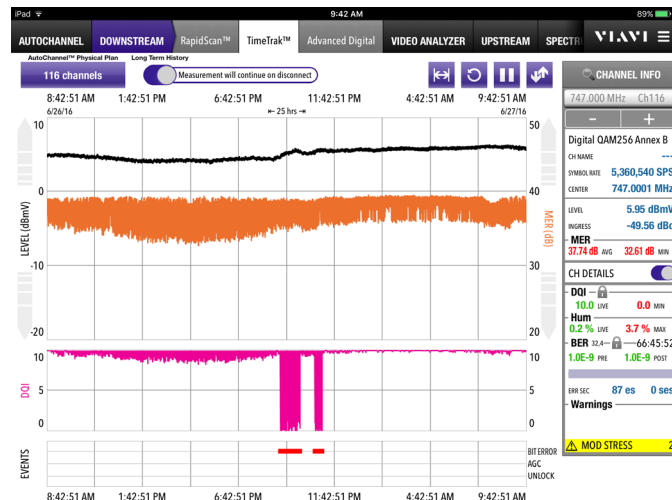
Packet dashboard and packet table screens

Basic OFDM Measurement

DOCSIS® 3.1 OFDM signals must be accurately measured in order to properly set output levels. The VSE-1100 AutoChannel identifies OFDM carriers and adds them to the channel lineup for testing. RapidScan mode measures the OFDM channel levels and highlights them with color in the scan display. The power is measured in 6 MHz blocks, and the user can double-tap at any point on the channel to zoom in and display the measured power of that 6 MHz block of the OFDM channel.

Zoom in to individual 6 MHz "block" within the OFDM signal with
a "double tap."

Spectrum Subtraction

In RF network troubleshooting a common requirement is to compare RF levels at various points in the network. The Spectrum Subtraction feature simplifies this process by allowing the user to save a reference trace, and then displaying a difference trace on subsequent measurements. This is great for identifying frequency response variations such as suck outs, roll-off, or test signal variations. For example, if there is no change, there would be a flat trace with 0dB difference from the reference.
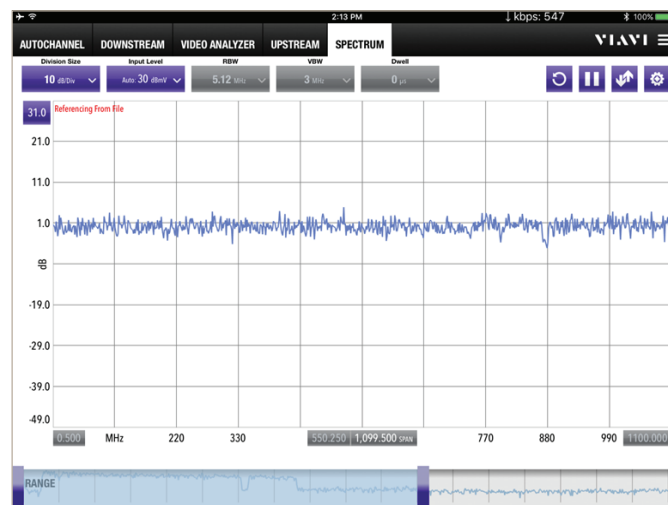
Spectrum subtraction - in this case no change from stored reference.

Packet Dashboard™ and Packet Table™ (MACTrak Local™)

MACTrak Local is a dynamic upstream and return path troubleshooting tool that can be used locally or in the field. The VSE-1100 makes this test capability portable to enable moving the receiver from point-to-point in the return path to test and track codeword errors. The MACTrak display shows multiple measurement results on one screen through its Packet Dashboard and Packet Table display. This enables finding problematic parameters quicker. MACTrak demodulates upstream signals to detect codeword errors and linear distortions. The technician can make a direct comparison of the result at his location with the result at the headend or hub site to identify laser-clipping issues.
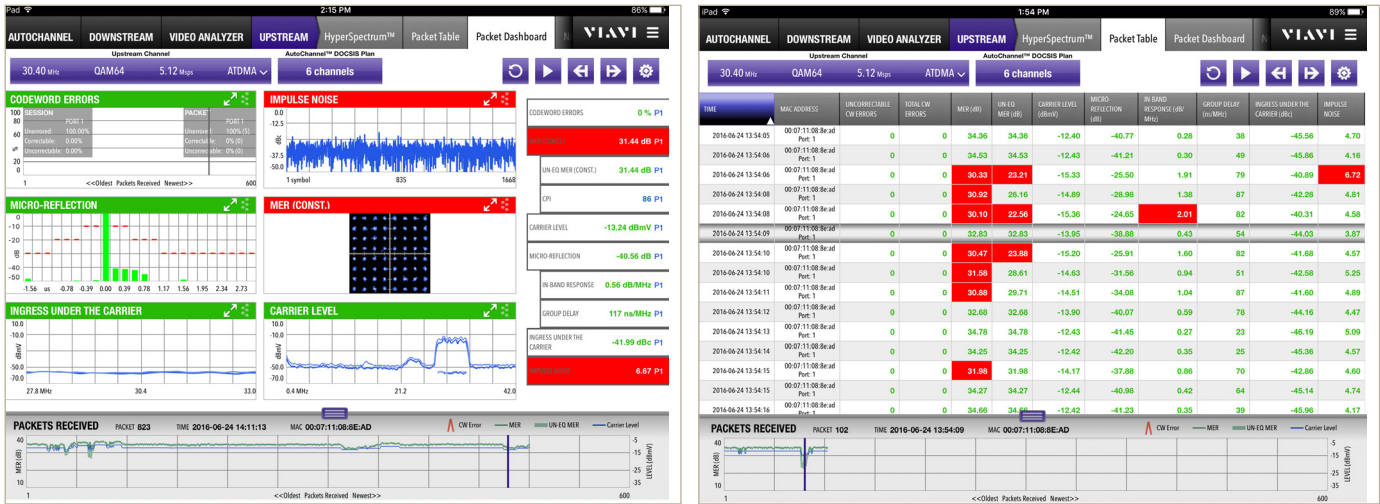
Packet dashboard and packet table screens

Hyper-Spectrum™

It is challenging to sort noise and interference from system signals in an upstream spectrum that is loaded with service signals. VSE-1100 real-time, no-gap FFT analysis and hyper-speed discerns noise/interference vs. service signals. The real-time analyzer has persistence in an 85 MHz band making interfering signals stand out. The innovative overlapping FFT analysis means that no transient interfering signals will go undetected.
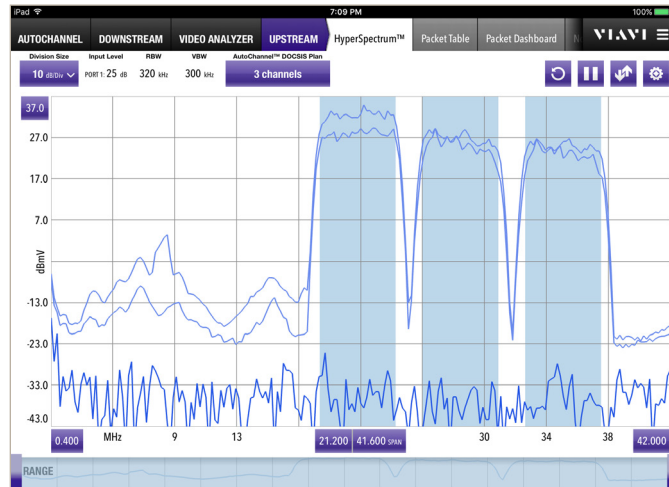
Hyper-Spectrum with upstreams screen

## HyperSpectrum Persistence Heat Map

Ingress has long been a performance impediment for HFC high speed data services, and cable companies have intensified their efforts to combat this problem. As most of the return band becomes filled with service carriers, it becomes challenging to see noise and ingress, without the ability to look for noise in empty spectrum. The VSE-1100 HyperSpectrum features a selectable persistence heatmap view which easily shows ingress and noise under the active upstream channel bands.
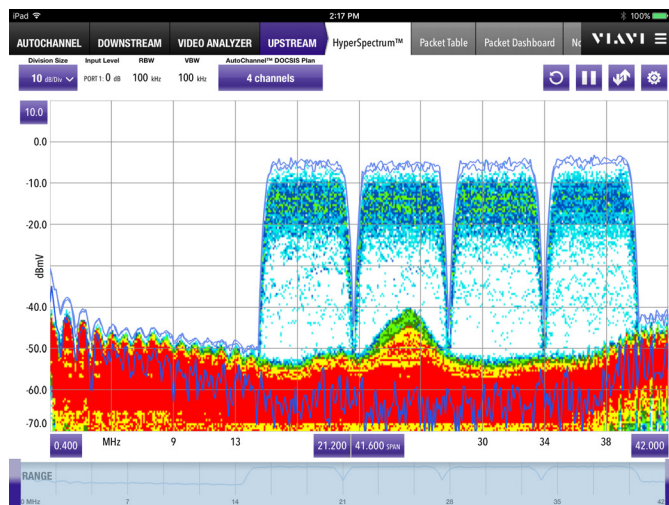
HyperSpectrum persistence heat map reveals ingress in active channel bands

MPEG Analysis

In addition to content-intelligent tuning, the VSE-1100 gives technicians insight into the actual customer experience with MPEG transport stream analysis—an unprecedented test capability for a field instrument. Technicians can now run TR101-290 verification tests and see real-time status and bandwidth use—all with an easy-to-use and intuitive interface. And, transport streams are recordable for further analysis.
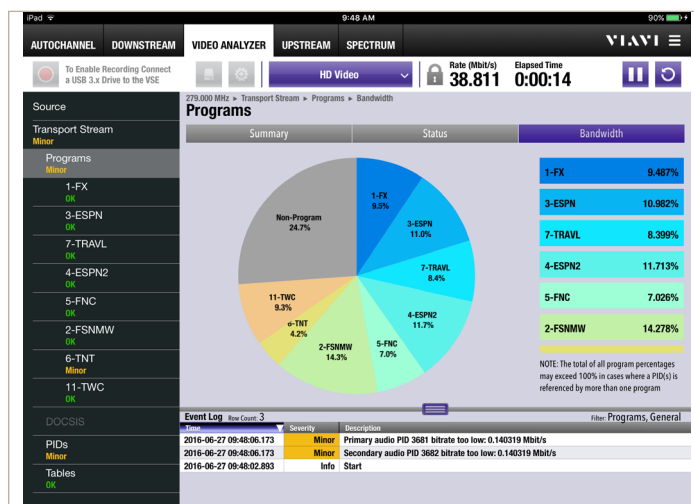
MPEG analysis screen

NoiseTrak™

Impulse noise and ingress can be very difficult and time consuming to troubleshoot, as a technician uses subjective discernment to determine which leg of the return path contains the noise source. The innovative VSE-1100 dual-input NoiseTrak mode enables simultaneous viewing of spectrum and demodulated signals from both legs with an objective analysis to expose the problem leg. Another innovation is overlapping FFT analysis that ensures that no transient interference will go undetected. This unique test capability dramatically shortens repair times.
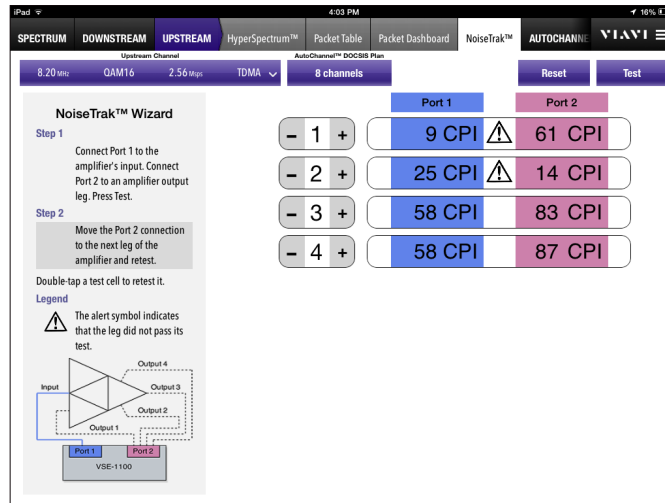
NoiseTrak screen

Teamwork and Remote Access

Sometimes a problem shows itself only over an extended period of testing. It is impractical to expect a technician to sit and monitor the analyzer screen for an extended period, so it makes sense to enable remote testing. The VSE-1100 is perfectly suited for this application: a technician can run tests from any network-accessible location, even when the measurement engine is positioned in a remote network location. This enables a completely new method of troubleshooting.

Future-Proof Frequency Range

With an optional high-end test frequency of 1.8 GHz in RapidScan and Spectrum modes, the VSE-1100 can be used to pretest your network to assure OFDM signals will perform when added to extended frequency networks. Identify frequency roll off, standing waves, and excess attenuation.
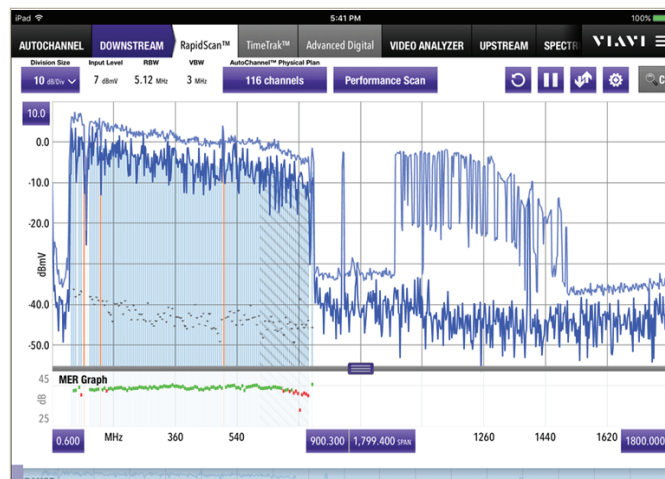
Specifications

Physical

Weight	11.2 lb (5.08 kg)
Size (H x W x D)	2.75 x 11.75 x 14 in (7 x 29.85 x 35.56 cm)

Frequency

Range	0.5 to 1,800 MHz
Accuracy	1 ppm
RBW	1.4 kHz to 5.12 MHz variable steps
Spectrum update rate	10 frames/sec on full scan

Level

Max input level	65 dBmV
Min detectable level	−58 dBmV (320 kHz RBW)
Amplitude accuracy	±0.75 dB @ 25°C (typical CW)
	±1.5 dB on carriers over levels, temperatures, and frequency
Return loss	14 dB typical
	12 dB worst case

Upstream Analysis

Dual inputs for comparisons	Demod and spectrum	
Maximum and minimum hold for zero dead time	RBW	320 kHz
	Dual overlapping FFTs	
	No time gaps	99.99% coverage
Amplitude accuracy	±1.5 dB on HyperSpectrum and upstream carriers over levels, temperatures, signal type (QAM/ QPSK), mod rate (1.28,2.56,5.12), and frequency	

Packet Dashboard and Packet Table (MACTrak Local)	Upstream channel details (frequency, modulation, symbol rate)
	Codeword errors (correctable, un-correctable)
	Equalized and unequalized MER
	Constellation diagrams (equalized and unequalized MER)
	Carrier performance index (CPI)
	Carrier level (with upstream spectrum trace)
	Synchronized spectrum with demodulation
	Micro-reflection
	In-channel response
	Group delay
	Ingress under the carrier
	Impulse noise
	Packets received, level, and MER (equalized and unequalized) trace
	Source MAC address

One second persistence in 0.4 to 85 MHz

Minimum detectable level upstream	−58 dBmV

Downstream Analysis

Simultaneous display of carriers (with min and max), noise, and MER for any number of channels

Fast level measurement — SA scan	10 updates per second
AutoChannel plan builder	Auto detection of channel parameters (analog/digital, symbols, QAM, DOCSIS 3.1 OFDM)

Spectral estimation of channel parameters

Analog Channel Measurement

Video and audio levels (dual)

Standards	NTSC and PAL
Accuracy	±0.75 dB @ 25°C (Typical)
	±1.5 dB over temp

Downstream Digital Channel Analysis

QAM modulation(s)	QAM-64, QAM-128, QAM-256 annex A, B, and C
Regional demods	DVB-C
Full span MER	

MER scan	10 channels/sec
MER	Range to 50 dB
	Resolution 0.1 dB
	Accuracy ±2 dB (for signals less than 42 MER) over temperature
BER	Single Channel BER down to 1E-9 (Pre/Post FEC)
	Performance Scan selectable Pre/Post BER 1E-8, 1E-9, 1E-10
Ingress under carrier	Full span ingress noise trace
Group delay and in-channel response (ICR)	
Digital Quality Index (DQI) (including strip charts)	
Errored/severely errored seconds	
Digital hum	
Constellation diagrams	
Level, measured symbol rate, carrier frequency, modulation, interleaver depth, AGC stress, EQ stress	

Display/Interface

Color touch screen	
Detachable remote use via Wi-Fi	
Tablet requirements	Apple iPad (iPad Air or iPad with Lighting connector)/iOS 8.1 or greater
Will charge tablet from VSE-1100	2.0 A available when plugged into wall

Usability

Typical battery life	>6 hr
Battery charge time (AC charger)	5 hr
Boot time	15 sec

Environmental Ruggedness

Hard rain	4 in/hr (10 cm/hr)
Drop	4 ft (1.22 m)
Temp range	−4° to 122°F (−20° to 50°C)
Storage temp	−20° to 149°F (−20° to 65°C)

MPEG Analysis Option

Comprehensive real-time MPEG analysis	
RF and GigE transport stream source input options	
Event Log Tracking	Time, Severity, Description
Recording Transport Streams	Manual or Timed with adjustable recording length
TR101-290 Limit Testing	
Configurable limits for Pass/Fail analysis	

Transport Stream	Sync Loss Count
	Transport Stream ID
	Bitrate
	NULL PID Bitrate
	Packet Count
	Sync Byte, Transport, and Continuity Count Errors
	Errors catagorized by Priority 1, 2, 3, or Other
	Summarize bandwidth (Pie Chart breakdown)
	Stream type analysis
	DOCSIS Transport Stream analysis with DOCSIS Tunnel Selection
Programs	Identified list of programs in stream
	ID, Type, Logical Channel number, Name, Encrypted status, Bit Rates
	Status (Priority 1, 2, 3, Other)
	Summarized bandwidth (Pie Chart breakdown)
	PMT/PCR PIDs
	Conditional Access information
	Continuity Counter errors
Packet IDs (PIDs)	PID
	Stream type analysis
	Packet Count
	Encryption Status
	Bitrate Information
	Continuity Counter errors
Tables	MPEG-PSI
	SCTE
	DigiCipher II

Input/Outputs

RF (2)	F connectors (replaceable)
Port 1	Upstream and downstream
Port 2	Upstream only 85 MHz
USB host (thick and thin client)	
Ethernet	RJ45
Power	Polarized

Asset and Data Management

StrataSync™ asset and data management

Reporting Capability

Measurement screen capture save and recall
.csv file save via StrataSync and USB export
StrataSync data management
StrataSync asset management

Remote Access/Connectivity

Measurement unit can be left behind for longer-term measurements/recording

Addressable via IP address or name (same subnet), Bonjour/Avahi

WiFi, Ethernet connections

WiFi — 802.11n

WAP and client

Logical Channel Plan Acquisition

DVB NIT/SDT

DOCSIS DSG tunnel (Cisco, Motorola, and Broadcast)

Ordering Information

Feature Matrix	SA	US	DS	Base
Spectrum analyzer	✓	✓	✓	✓
Spectrum Referencing	✓	✓	✓	✓
HyperSpectrum Upstream	✓	✓	✓	✓
Remote access (via WiFi)	✓	✓	✓	✓
RapidScan	1 channel		✓	✓
TimeTrak	✓		✓	✓
AutoChannel			✓	✓
DS advanced (EQ, GD, ICFR)	✓		✓	✓
MACTrak Local		✓		✓
NoiseTrak		✓		✓
Performance Scan			✓	✓
Long Term TimeTrak	✓		✓	✓
OFDM	1 channel		✓	✓
MPEG analysis (RF or GigE)			Optional	Optional

DS = Downstream

US = Upstream

SA = Spectrum Analyzer Model

Description	Part Number
Base model with 1.8GHz highest frequency, includes complete set of standard features and is option capable (choose return pass band)	VSE-BASE-42MHZ-18GHZ-PKG
	VSE-BASE-65MHZ-18GHZ-PKG
	VSE-BASE-85MHZ-18GHZ-PKG
Downstream model with 1.8GHz highest frequency, includes complete set of standard features and is option capable (choose return pass band)	VSE-DS-42MHZ-18GHZ-PKG
	VSE-DS-65MHZ-18GHZ-PKG
	VSE-DS-85MHZ-18GHZ-PKG
Upstream model with 1.8GHz highest frequency, includes complete set of standard features and is option capable (choose return pass band)	VSE-US-42MHZ-18GHZ-PKG
	VSE-US-65MHZ-18GHZ-PKG
	VSE-US-85MHZ-18GHZ-PKG
Spectrum analyzer model with 1.8GHz highest frequency, includes complete set of standard features and is option capable (choose return pass band)	VSE-SA-42MHZ-18GHZ-PKG
	VSE-SA-65MHZ-18GHZ-PKG
	VSE-SA-85MHZ-18GHZ-PKG

Options	
MPEG video analysis, factory installed	VSE-VIDEO-ANLYZ
MPEG video analysis, field upgrade	VSE-VIDEO-ANLZ-FLD
MPEG video analysis, timed option license	VSE-VIDEO-ANLYZ-TIMED
MPEG video analysis, floating license	VSE-VIDEO-ANLYZ-FLOATING

Upgrades	
Upgrade SA model to DS model	VSE-1100-SA-TO-DS
Upgrade SA model to BASE model	VSE-1100-SA-TO-BASE
Upgrade US model to BASE model	VSE-1100-US-TO-BASE
Upgrade DS model to BASE model	VSE-1100-DS-TO-BASE

Included Accessories	
Case with detachable tablet holder and shoulder strap	
AC power supply with choice of country-specific adapter plug	
12 V DC automobile power supply	
Quick-start guide	
Supported by StrataSync Core	
3-year standard warranty	
Optional Accessory	
VSE-1100 interface (Air)	VSE-INTERFACE

Note: Port 2 cutoff frequency is 85 MHz.

VIAVI Care Support Plans

Increase your productivity for up to 5 years with optional VIAVI Care Support Plans:

- Maximize your time with on-demand training, priority technical application support and rapid service.

- Maintain your equipment for peak performance at a low, predictable cost.

For more Information: go to viavisolutions.com/viavicareplan

Features

*5-year plans only

Plan	Objective	Technical Assistance	Factory Repair	Priority Service	Self-paced Training	5 Year Battery and Bag Coverage	Factory Calibration	Accessory Coverage	Express Loaner
BronzeCare	Technician Efficiency	Premium	✓	✓	✓				
SilverCare	Maintenance & Measurement Accuracy	Premium	✓	✓	✓	✓*	✓		
MaxCare	High Availability	Premium	✓	✓	✓	✓*	✓	✓	✓