860 DSPi

Multifunction Digital Analyzer

- Optional Embedded CableLabs® Certified DOCSIS 3.0 Modem
- DSP Technology Allows for Quick, Accurate Measurements
- Versatile Capabilities Range from Triple Play Signal Analysis for Installations to a Wide Range of Plant Maintenance Tests
- Adaptable Platform Grows to Meet the Needs of Technicians at Every Tier
- Easy-to-Read Display and Simple Interface
- Integrates with OSS and Workforce Management Systems for Improved Productivity

Change with the times without changing meters.

Fast, accurate measurements with a versatile meter you can update or upgrade anytime, usually with a simple firmware download.

Efficient, versatile, & comprehensive

Now with an optional CableLabs® certified DOCSIS 3.0 modem option, the 860 DSPi™ quickly and efficiently performs all of the critical transmission and signal quality tests needed to install, troubleshoot, and maintain analog, digital, HSD, and VoIP services.

The analyzer can be configured with features that make day-to-day maintenance more efficient and improve troubleshooting speed for plant technicians. Powerful options add high-resolution spectrum analysis, QAM and QPSK constellation displays, and a wide range of return path tests- all without impacting size or weight.

Fast boot-up and quick test mode transition improve technician productivity. And thanks to the efficiency of digital signal processing technology, the battery life of the 860 DSPi can be up to five times longer than that of other instruments. The 860 DSPi works with Guardian System II™ reverse path monitoring equipment, and can be equipped with options to provide an extensive range of reverse path test capabilities. With the SpeedSweep™ FS-1 option, the 860 DSPi receives forward sweep from the 8300 FST™; with the SR-1 option, it also generates a high resolution reverse sweep to be received by the 8310 RSA™ and displayed on the 860's easy-to-read LCD display.

Adaptable for future needs

The 860 DSPi is the first portable instrument platform capable of evolving over time to meet emerging measurement and data communication requirements. It can be upgraded as new services are introduced, usually through Trilithic's free update website.

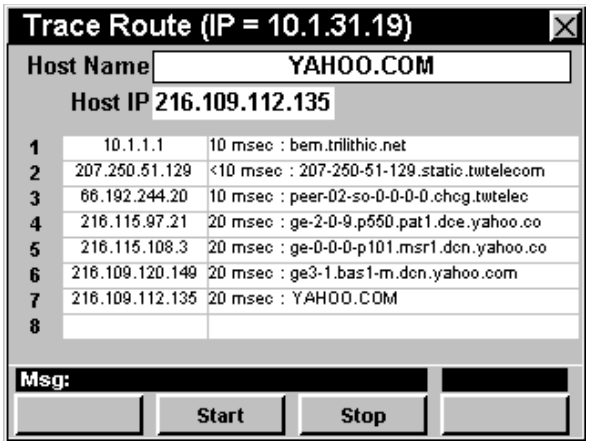
The use of flexible, cutting-edge digital signal processing (DSP) technology means that applications that were not even available when the analyzer was originally purchased can be added later, often by simply downloading firmware. This ability to easily keep the 860 DSPi as up-to-date as currently shipped analyzers gives it a longer life cycle and significantly reduces the lifetime cost of ownership.

Fast boot-up for quick measurements

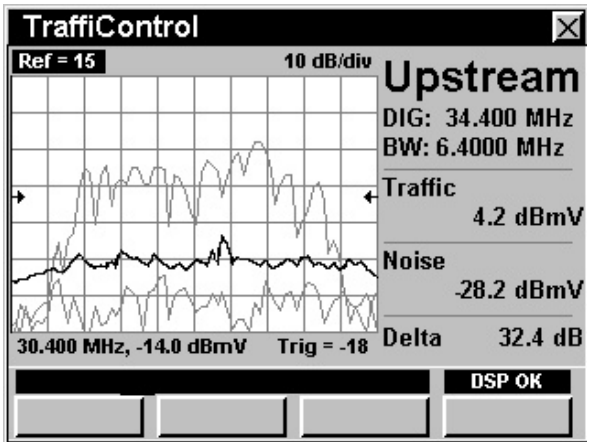
With the 860 DSPi ready to perform measurements within a few seconds after turn-on, technicians can perform tests quickly. The 860 also provides test data to the operator up to 10 times faster than other analyzers, so problem sources can be identified faster, shortening trouble calls.

Complete Testing Capabilities

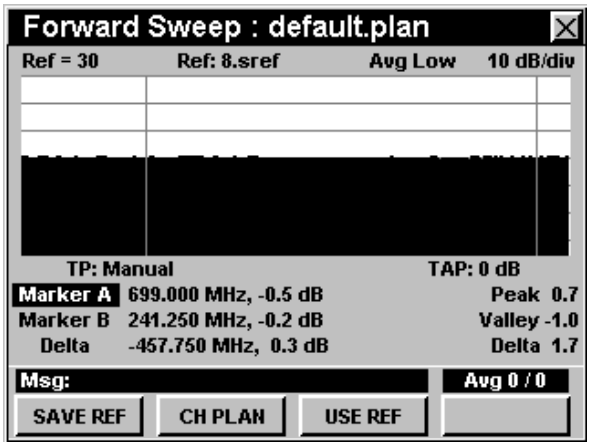
The 860 DSPi provides extremely versatile measurement capabilities, addressing the needs of technicians and engineers for everything from installation signal analysis to a wide range of plant maintenance tests.



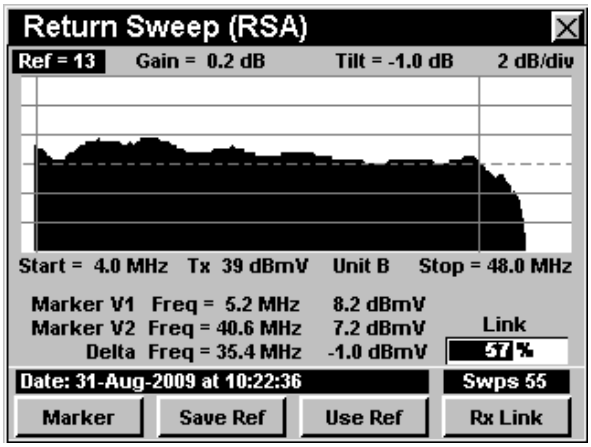
Track IP transmission paths with Trace Route™.



Find in-channel distortion or other interference without interrupting service with Error Vector Spectrum™ or TraffiControl™ modes.



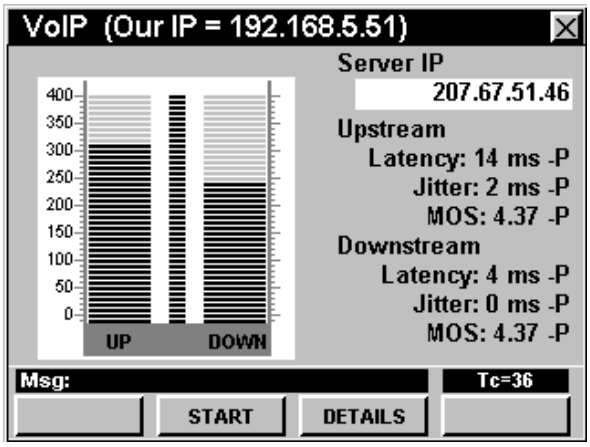
Measure system frequency response with SpeedSweep system compatibility.



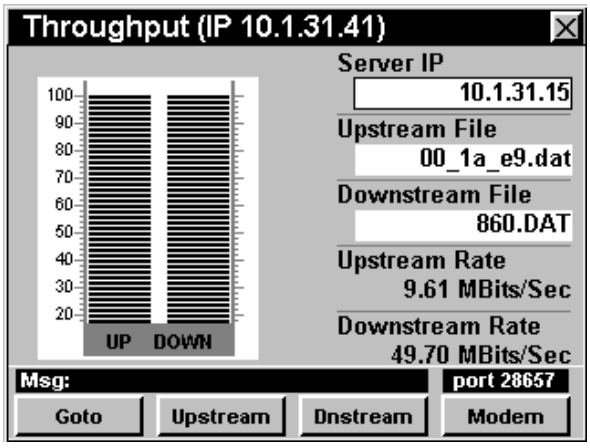
The 860 DSPi, with an SR-1 Option, injects an agile sweep signal configured to “step around” active channels, sweeping in unoccupied spectrum areas to a frequency resolution of 100 kHz. The reverse sweep is received by the 8310 RSA™ and the response information is relayed back to the 860 DSPi on via user configurable frequency agile forward telemetry signal.

860 DSPi

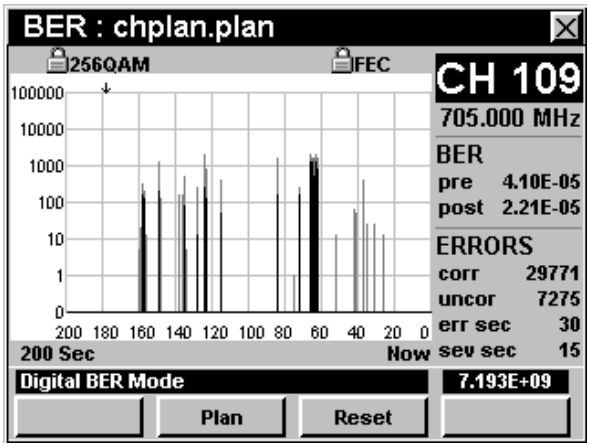
Multifunction Digital Analyzer



Measure latency, jitter, packet loss, and other VoIP parameters in seconds. Analyze VoIP performance from end-to-end and from the subscriber to the CMTS. When testing end-to-end, the 860 DSPi displays separate test results for upstream and downstream paths and even calculates an MOS score for each.



Test throughput, packet loss, reverse transmit levels, MER, BER, and more.



Use the 860 DSPi's Average BER function to estimate BER up to 10 times faster than any alternative. Use the Impulse BER function to detect and count individual lost packets. BER data is displayed with values and a convenient graph that shows how pre and post BER changes over a user-settable interval. Enhanced digital video feature equips the analyzer to perform impulse BER measurements on deep interleave digital video channels and enhances constellation graphs if the 860 DSPi includes Option QA-2.

860 DSPi

Multifunction Digital Analyzer

Designed for Convenience and Durability

- Fast boot up, fast operation
- Simple, direct keyboard functions
- Large, widely spaced buttons are usable with gloves
- Single keystroke measurement functions or soft keys for simple navigation
- Auto-test up to 16 functions, with limit comparison and pass/fail results
- Long battery life (operate your 860 DSPi for 4 to 6 hours on a single charge, even with the display backlight turned on, without intrusive battery-saving methods)
- High resolution 5.7” backlit transflective LCD display
- Strong, shock-resistant construction, with integral rubber boot; padded bag included
- Lightweight, with convenient carrying straps

Standard Measurements

- Signal levels: one channel to full span, analog and digital; total power
- Full channel scan
- “Mini-scans” of up to 10 selected channels (video and digital carriers)
- Forward tilt
- Carrier-to-noise and Hum
- Reverse spectrum scan to -40 dBmV
- Numerical values of forward BER/MER
- Digital power
- Lost packet rate
- DOCSIS modem upstream transmit level
- DOCSIS speed, throughput
- PC substitution
- VoIP jitter, latency upstream, and downstream
- Lost/discarded packets upstream, and downstream
- Calculated MOS score, upstream, and downstream
- Trace route
- Internet browser
- 64 QAM source for upstream testing

OPTIONS

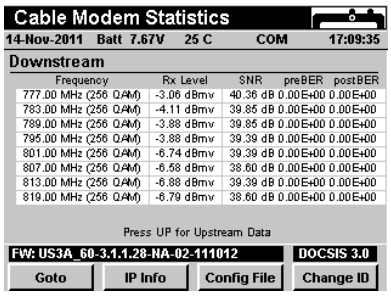
The 860 DSPi options are available on an *a la carte* basis, but the prerequisite option is the Power Pack™, which must be purchased in order for the instrument to be fitted with other DSPi options.

PP-1 Power Pack

- Adds full 5 MHz to 1 GHz spectrum analyzer display (300 KHz RBW), FM deviation, depth of modulation, CSO/CTB, and forward (system carrier-referenced sweep) sweep balancing
- The Power Pack is a prerequisite for all other 860 DSPi options

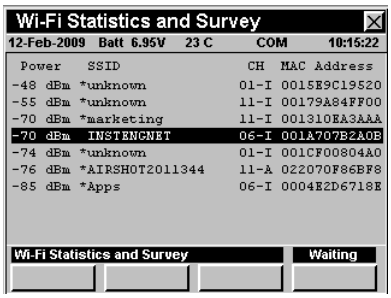
D3 Option - DOCSIS 3.0

- Built-in CableLabs® certified DOCSIS 3.0 modem enabling a full compliment of DOCSIS 3.0 tests that can be performed up to 304 Mbps
- Provides information for all up and downstream signals in bonded sets



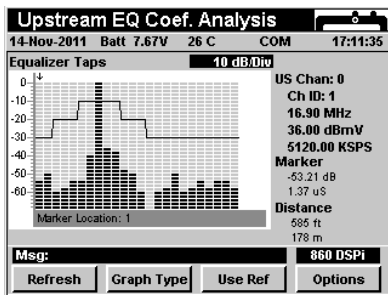
Wi-Fi (802.11 b/g) Option

- Detects in-range wireless IEEE 802.11 b/g access points and lists SSIDs
- Displays up to 10 access points, with signal strength and security status
- Survey mode verifies accessibility throughout a customer’s home



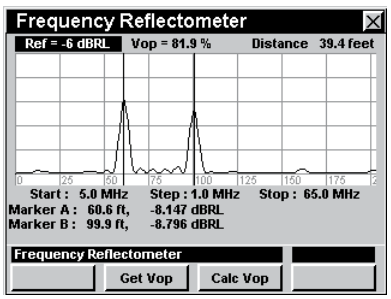
UP-LD (Upstream Linear Distortions) Option

- Determine if equalization is hiding potential problems
- Allows the 860 DSPi to see the pre-equalization of the upstream channel, along with in-channel frequency response and in-channel group delay



FDR Frequency Domain Reflectometer™ Option

- Measurement uses sweep analysis of a cable or drop to determine the distance to multiple opens, shorts, splitters, or faults
- Allows the 860 to identify multiple cable components in a passive home network



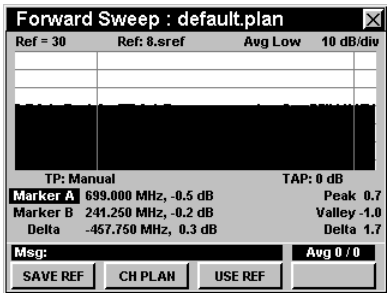
TRILITHIC

860 DSPi

Multifunction Digital Analyzer

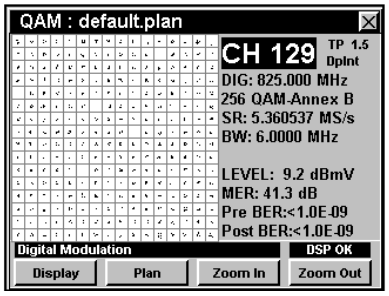
FS-1 Forward Sweep Option

- Enables a forward sweep display
- Compatible with the SpeedSweep System for forward sweep balancing and troubleshooting



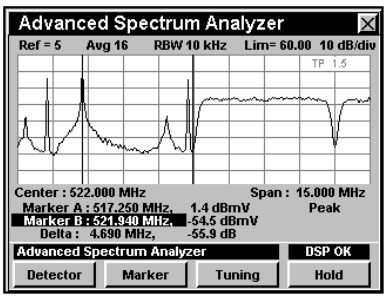
QA-2 QAM Option

- Constellation and equalizer display capability
- Error Vector Spectrum mode – enables viewing in-channel spectrum characteristics



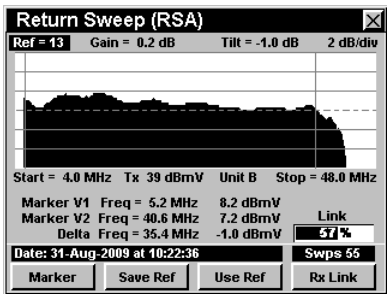
SA-1 Spectrum Analysis

- Full-featured DSP alternative to analog analyzers
- Adds multiple resolution bandwidth settings from 10 kHz to 3 MHz
- Adds Zero Span mode



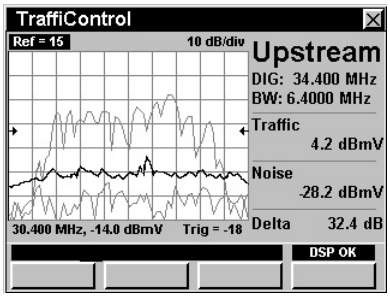
SR-1 Return Sweep Receiver

- Compatible with the 9581 SST and 8310 RSA
- Useful for return path balancing and troubleshooting



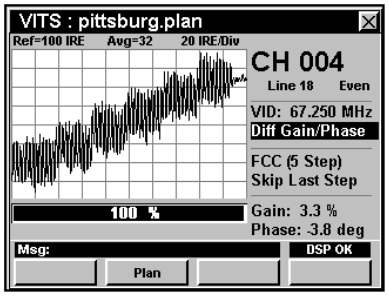
TC-1 TraffiControl Option

- Allows viewing of in-channel spectrum characteristics for upstream data channels



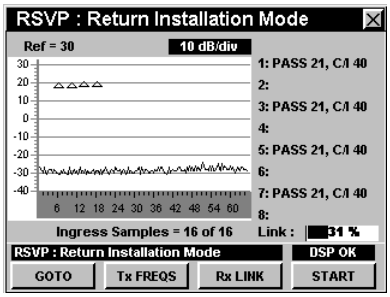
VITS Vertical Interval Test Signal™ Option

- Enables testing of baseband video parameters on active analog channels with active VITS



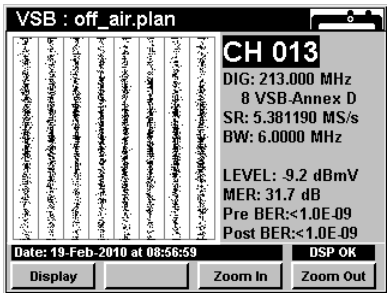
VP-1

- Adds RSVP²™ Installer's Return Tester functions to the 860
- Expands the 860 to allow testing of eight frequencies at once
- Compatible with 9581 SST



VSB Vestigial Sideband™ Modulation Option

- Feature enables analysis of off-air digital video transmissions, including levels, constellation, equalizer taps, and BER



860 DSPi

Multifunction Digital Analyzer

RELATED PRODUCTS

Improved productivity with workforce management

The 860 DSPi integrates with Trilithic's TDM™ test data management server package to enable managers and others to configure and manage analyzer inventory, store measurement data, generate reports and create custom database queries.

The integrated system lets cable operators track tech performance, control the quality of installations and – via a connection to the company billing system – even develop and monitor productivity improvement metrics.

I-Stop™ Ingress Test Probe (P/N 2010838001)

The I-Stop probe contains a patented circuit that, when used with a reverse path monitoring system, confirms the location of an ingress source down to the nearest tap. Eliminates the need to remove reverse pads, tap bodies, or diplexers for troubleshooting. Pressing the button on the side of the probe causes a 4 to 6 dB reduction in the ingress seen by the return monitoring system, confirming this leg of the distribution system contains the ingress source. The I-Stop probe has little or no visible effect on forward video signals.

TLB-60 Return Measurements Filter (P/N 2011066000)

The TLB-60 60 MHz low-pass filter is useful when searching for common path distortions or other low-level disturbances, eliminating overload from forward channels present at the test port. The TLB-60 can extend the measurement range of a spectrum analyzer or field signal analyzer by as much as 20 dB.

8310 RSA (P/N 2011375000)

The 8310 RSA Return Sweep Analyzer receives a sweep initiated from a field test point by an 860 DSPi field analyzer and transmits the received sweep level information back to the analyzer on a downstream telemetry signal.

860 DSP Analyzer: A Cost-Effective Alternative.

Part of the 860 family, the 860 DSP is for applications that do not require a modem-equipped meter. It performs physical measurements only. For technicians not required to maintain DOCSIS services, the 860 DSP is a cost-effective alternative.

I/O-15 Coaxial Precision Test Cable (P/N 2071527048)

The I/O-15 is a precision test cable suitable for field and head end test equipment. The small-diameter (0.16") allows the cable to be conveniently stored in a pocket or in the instrument's bag. The I/O-15 exhibits a loss of only 0.7 dB at 1 GHz, and lab quality materials and machined female F-type connectors insure long service life. A lab-quality push-on adaptor is included with each cable.

CC-23 Utility Bag (P/N 2131221000)

The CC-23 is a protective carrying case large enough to conveniently hold a technician's instrument kit, including the 860 DSPi, a Searcher Plus-series leakage detector, test cables, probes, and more. Includes one I/0-15 precision test cable.

8300 FST (P/N 2011072001)

The 8300 FST Forward Sweep Transmitter generates a sweep that steps around system carriers to avoid interference, filling in vacant spectrum areas for a complete view of the network frequency response.

860 DSPi

Multifunction Digital Analyzer

SPECIFICATIONS

Frequency Range	5 MHz to 1 GHz
Level Measurement	
Range	-40 to +50 dBmV
Resolution	0.1 dB
Accuracy	@ 25˚ C (77˚ F): ±0.75 dB Over temp -18˚ to +50˚ C (0˚ to 122˚ F): ±2.0 dB (analog), ±2.5 dB (digital)
Carrier-to-Noise (In-service, non-scrambled standard channels only)	
Minimum Input Level for Full Range	+10 dBmV
Dynamic Range	50 dB
Resolution	<0.5 dB
Hum (In-service, non-scrambled standard channels only)	
Minimum Input Level	0 dBmV
Range	0 to 5%
Resolution	0.1%
Accuracy	±0.5%
Depth of Modulation (In-service, non-scrambled standard channels only)	
Range	50 to 100%
Resolution	0.5%
Audio Dimension	FM carriers
Tilt	
Max Number of Carriers	10
High/Low Delta Resolution	0.1 dB
Scan	Video, audio, pilot, and digital carriers; includes total power measurement
Spectrum Mode	
Display Spans	User-selectable in 10 kHz steps
Display Scale	1, 2, 5, or 10 dB/division
Display Range	8 vertical divisions
Sweep Rate (78 Channels)	~500 ms
Detection and Dwell	Selectable detector modes (Narrow or Wide) and dwell time
Spurious Free Dynamic Range	60 dB @ 25˚ C (77˚ F) (+50 dBmV)
Sensitivity	-40 dBmV (4 MHz to 1 GHz)

Zero Span Mode

Video Bandwidth	Digital averaging
Resolution Bandwidth	10, 30, 100, and 300 KHz; 1, 3 MHz
Pulse Measurement Accuracy	Nominal level in <7ms, ±2 dB from nominal in 4 ms (300 kHz RBW)
Sweep Times	50 µs to 20 sec in 1, 2, 5 settings

Intermodulation Distortion (CSO/CTB)

Range	≥60 dB
Resolution	0.1 dB

QAM Measurements

Modulation Types	ITU J.83 annex A, B, C; QPSK, 16, 32, 64, 128, and 256 QAM (at symbol rates from 2 MSPS to 6.9 MSPS)
Measurable Input (Lock) Range	**64 QAM:** -20 to +50 dBmV (typical) **256 QAM:** -15 to +50 dBmV (typical)
Frequency Tuning	5 MHz to 1 GHz
BER; 64 and 256 on all Modulations	10^{-4} to 10^{-10}
MER	**64 and 256 QAM, 6 MHz channel bandwidth:** Range: 21 to 40 dB ±1dB Accuracy (typical): ±1.5 dB **64 and 256 QAM, 8 MHz channel bandwidth:** Range: 21 to 35 dB Accuracy (typical): ±2.0 dB
EVM	**64 QAM, 6 or 8 MHz channel** Range: 1.1 to 8.1% Accuracy: ±0.5% (1.1 to 2.0%) ±1.0% (2.1 to 4.2%) ±1.6% (4.3 to 8.1%) **256 QAM, 6 or 8 MHz channel** Range: 1.1 to 5.3% Accuracy: ±0.5% (1.1 to 2.0%) ±0.8% (2.1 to 4.2%)

QAM Level Measurement

Signal Types	QPSK; QAM (16, 32, 64, 128, and 256)
Range	-40 to +50 dBmV
Accuracy @ 25˚ C	±1.25 dB

QAM Source

Frequecy Range	5 MHz to 42 MHz (65 MHz Euro/Dual mode models)
Output Level Range	22 dBmV to 53 dBmV (User calibrated in 1 dB steps, Cal Adjustable by +/- 4dB steps, and dependent upon symbol rate)
Modulation Types	QPSK; 16 QAM, and 64 QAM Upstream BER format

Power Source

Battery	Twin 7.2V 2700 mAHr NiMh packs
Charging Time	4 hours

860 DSPi

Multifunction Digital Analyzer

Operating Time, Continuous Use	6 hours in level mode 4 hours in modem mode
Symbol Rates	160 kS/sec, 320 kS/sec, 640 kS/sec, 1.280 MS/sec, 2.560 MS/sec, 5.120 MS/sec

Physical

Weight	5.85 lbs (2650 g)
Dimensions	10” in. x 8” in. x 3” in.
Operating Temperature Range	-18˚ to +50˚ C (0˚ to 122˚ F)

DOCSIS 3.0 Modem

Protocol Support	(Euro)DOCSIS 1.1 / 2.0 / 3.0 compliant (DOCSIS 4x4) SNMP V1, V2c, V3 IEEE 802.3, 802.3u
Compliance Certificates	CE mark RoHS compliant CableLabs wave 61, 63, 66 (DOCSIS 4x4) CableLabs wave 80 (DOCSIS 8x4)
Receiver Demodulation	**Demodulation:** 64 QAM, 256 QAM **Data rate:** Up to 304 Mbps with 8 downstream channel bonding (DOCSIS 8x4) Up to 200 Mbps with 4 downstream channel bonding (EuroDOCSIS 4x4) **Channel bandwidth:** 6 Mhz (DOCSIS, DOCSIS-J) 8 Mhz (EuroDOCSIS 4x4) 6/8 MHz (Dual mode 4x4) **Maximum modem input signal level:** 17 dBmV
Transmitter Modulation	**Modulation:** QPSK, 8 QAM, 16 QAM, 32 QAM, 64 QAM, and 128 QAM (SCDMA only) **Data rate:** Up to 108 Mbps with 4 upstream channels bonding **Frequency (edge to edge):** 5 to 42 MHz (DOCSIS) 5 to 65 MHz (EuroDOCSIS) 5 to 65 MHz (DOCSIS-J) Output level of CM can be controlled by CMTS though power ranging function **Step:** 1 dB
85 MHz Source Board (optional)	**Frequency range:** 5 to 85 MHz **Modulation types:** CW, pulse, tag, sweep 42, sweep 65, sweep 85, single, repeat, loopback **Frequency tuning:** 10 kHz, 100 kHz, 1 MHz, 3 MHz, 5 MHz, 6 MHz **Min output:** 20 dBmV **Max output:** 55 dBmV Built-in pre-amp Built-in 85 MHz low-pass filter

INCLUDES THE FOLLOWING:

5 MHz to 1 GHz analyzer (customer-specified options)

Protective carrying case

Shoulder strap

Universal charger, 90 to 220 VAC, U.S. plug

User’s manual

OPTIONAL ACCESSORIES:

Protective display shields
P/N 2230521001

Utility bag (CC-23)
P/N 2131221000

RELATED PRODUCTS:

External battery charger
P/N 2010986000

Vehicle power adaptor (CL-5)
P/N 2070704002

Precision test cable (I/O-15)
P/N 2071527048

I-Stop probe
P/N 2010838001

TLB-60 filter
P/N 20110666000

WorkBench™ software
P/N 0930083000

ACTS™ software
P/N 0930144000

TDM software
P/N 2011092100

8300 FST Forward Sweep Transmitter
P/N 2011072001

8310 RSA Return Sweep Analyzer
P/N 2011375000