

### Multifunction HFC Analyzer



## Enhanced Sweep and RSVP Features

DSP Technology Provides Quick, Accurate Measurements

Tests DOCSIS Cable Modem Performance and VoIP Quality Analysis

Internet Browser and Server Functions Integrate with OSS and Workforce Management

**Easy Field Upgrades** 

Large, Easy-to-Read Display and Simple User Interface

The 860 DSPi<sup>™</sup> quickly and efficiently performs all of the critical transmission and signal quality tests needed to install and maintain analog, digital, HSD and VoIP services with none of the pauses and boot-up delays of other field analyzers. The 860 DSPi can be upgraded as new services are introduced, usually through Trilithic's free update website. 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. Thanks to the efficiency of its DSP design, the battery life of the 860 DSPi can be up to five times as long as that of competing instruments.

The 860 DSP is fully compatible with Trilithic 9580 SST<sup>™</sup> and 9581 SST<sup>™</sup> Reverse Path Analyzers and can be equipped for enhanced reverse sweep and an expanded range of RSVP<sup>2</sup> reverse band installation tests.

## Adaptable to Meet Future Measurement and Data Communication Requirements

The 860 DSP is the first portable instrument platform capable of evolving over time to meet emerging measurement and data communication requirements. The 860 DSP achieves this adaptability by employing "virtual instrument" techniques. Much of the analog circuitry of older instruments has been replaced with cutting-edge digital signal processing (DSP) technologies. The flexibility of DSP means that applications that were not even available when the 860 DSP was originally purchased can be added later, usually by simply downloading firmware. By periodically accessing Trilithic's upgrade website, the operator can keep his 860 DSPi ready for new challenges and as up-to-date as currently shipped analyzers.

### **Quickly Performs Measurements**

Ready to perform measurements within two seconds after turn-on, the 860 DSPi has the speed that modern conditions demand. It provides test data to the operator up to 10 times quicker than competing analyzers, so performance problems can be identified faster and trouble calls are shortened.

- 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 and BER and more.
- Use the 860 DSPi's Average BER function to estimate BER up to 10 times faster than any alternative.

### **Overview of Main Functions**



 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.

### **Designed for Convenience and Durability**

- Fast Boot Up, Fast Operation
- Simple, Direct Keyboard Functions

860 DSPi

- Large, Widely Spaced Buttons Useable with Gloves
- Single Keystroke Measurement Functions, or Soft Keys for Simple Navigation
- Autotest Up to 16 Functions, Limit Comparison and Pass/Fail Results
- Long Battery Life (Operate your 860 DSPi for 4-6 hours on a single charge, even with the display backlight turned on, without intrusive battery-saving gimmicks)
- High Resolution 4.6" x 3.5" Backlit 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
- "Mini-scans" of up to 10 selected channels (video and digital carriers)
- Forward Tilt
- 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









### **OPTIONS**

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

**Power Pack** Adds full 5–870 MHz channel scan and monitoring; C/N; Hum; FM Deviation; Depth of Modulation; CSO/CTB; Forward (Sweepless) Sweep Balancing; Internet browser. 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 also includes Option QA-2. (Prerequisite for all other 860 DSPi options).

**QA-2** Constellation and equalizer display capability.

**SA-1 Spectrum Analysis**, full featured DSP alternative to analog analyzers, adds multiple resolution bandwidth settings from 10 kHz to 3 MHz.

**SR-1 Return Sweep Receiver**, compatible with the Trilithic 9581 SST, useful for return path balancing and troubleshooting.

**VP-1** Adds RSVP<sup>2</sup> Installer's Return Tester functions to the 860, expanded to allow testing of eight frequencies at once. Compatible with 9581 SST.





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## Specifications



### **ELECTRICAL SPECIFICATIONS**

Signal Level Measurement Mode	
Frequency Range:	5 to 870 MHz
Tuning Modes:	By channel or by frequency, incremented in steps of 25 KHz - 10 MHz Scans, containing up to 10 Selected Channels
Channel Plans:	9 plans of up to 140 channels/plan
Measurement Range:	-40 to +50 dBmV with 0.1 dB resolution
Measurement Accuracy:	+/- 0.75 dB absolute @ 25 C CW, Video, Audio: +/- 2.0 dB absolute -18 to +50 C
Digital Signals:	+/- >0.5 dB additional
Reverse Spectrum Analyzer	
Frequency Range:	4 to 65 MHz, maximum
Tuning Modes:	Start/Stop or Center Frequency and Span
Input Level Range:	-40 to + 50 dBmV
Spurious Free Dynamic Range:	60 dBc
Span:	Settable,10 KHz to 61 MHz
Resolution BW:	300 KHz
Amplitude Display Scaling:	1,2,5,10 db/div
Marker Functions:	Two frequency-settable variable markers
Downstream QAM Analysis	
Types:	4, 16, 32, 64, 128, 256 QAM
Symbol Rates:	2 MSPS to 7 MSPS, 64 QAM @ 5.05694 MSPS 256 QAM @ 5.360537 MSPS (Compatible with U.S. and International Standards)
Displays:	Power, Pre- and Post- FEC BER, MER



#### **VoIP PERFORMANCE TESTS**

Parameters Tested:	Up- and Downstream Jitter, Latency, Lost and Discarded Packets. Calculates Up- and Downstream MOS (Mean Opinion Score).
Supported Codec's:	G.711
Packet Rates:	20 msec to 250 msec in 10 msec Increments
Packet Sizes:	20 Bytes to 1000 Bytes in 10 Byte Increments
Call Length:	10 Seconds to 40 Seconds in 1 Second Increments
Tests to Limits:	Max Latency, Max Jitter, and Min MOS
MODEM PERFORMANCE TESTS	
Lost Packet Rate	
Ping Address:	Any IP address or Domain Name.
Packet Transmission Rate:	User-settable for 10 msec / packet to 1000 msec / packet in 20 msec increments.
Packet Payload:	User settable from zero to 1024 bytes (0, 32, 64, 256, 512, 768, 1024).
Test Results Displayed:	Max, Min, Avg Transit Time, Packets Sent, Received, Lost and Lost Packet Rate (LPR).
Throughout	
Upstream Test:	Transmits a file to any TFTP server on the Network that allows write access.
Downstream Test:	Receives a file from any TFTP server on the Network or from any HTTP (WEB) server on the Network.
Test Results Displayed:	Throughput rate in kilobits per second or Megabits per second.



UPSTREAM POWER DISPLAY RANGE	
QPSK:	8 dBmV to 58 dBmV
16 QAM:	8 dBmV to 55 dBmV
GENERAL	
Automatic Test and Evaluation	
AutoTest Content:	Each AutoTest routine can execute up to 16 sequenced steps. Each step can be a complete parameter test with evaluation to limits.
Number of AutoTests Storable in 860 DSPi:	Up to 9 AutoTest sequences, individually assembled and named. One AutoTest is always FCC Proof Test.
Displays:	AutoTest Menu Measurement Data PASS or FAIL.
Data Storage	
Memory:	Approx. 1520 kb total user storage organized in up to 192 variable size records.
Storable Data:	Channel level data, QAM measurements, Reverse spectrum, FCC tests and analyses, AutoTest results, display screen captures, text reference files.
User Interface	
Function Keys:	On/Off, Enter, Back, Fn (2nd function) - 4 Soft Keys - 4 Arrow Keys
Display:	240 x 320 pixel backlit LCD panel, Quarter VGA
Audio:	Waterproof Speaker
Data Connections:	Ethernet, RS232C and USB host
Power:	90-240 VAC, 50-60 Hz
Internal Batteries:	6 cell NiMh pack, field replaceable >7 hours operation with backlight in SLM mode, less with some options active

### **Specifications**



INCLUDES THE FOLLOWING:

5-870 MHz Analyzer (customer specified

### **POWER PACK UPGRADE KIT**

#### **Additional Analog Measurements**

Hum:	0 to 5% +/- 0.5% 50/60 Hz, 100/120 Hz,	options)
	1 KHz lowpass	Protective Carrying Case
C/N:	Measures C/N on active signals, > 50 dB	Shoulder Strap
	Requires +10 dBmV carrier level	Universal Charger 90-220 VAC U.S. Plug
Depth of Modulation:	50 to 100% with 0.5% resolution	Users Manual
FM Deviation Measurement:	0 to 35 KHz with 1 KHz accuracy	OPTIONAL ACCESSORIES:
CSO/CTB:	Range >/= 60 dB, Accuracy +/- 2 dB	External Battery Charger P/N 2010986000
FULL-SPECTRUM ANALYZER (EXPANDED SPECS)		Vehicle Power Adaptor (CL-5) P/N 2070704002
Frequency Range:	4 to 870 MHz	Protective Display Shields P/N 2230521001
Span:	10 KHz to 866 MHz	WorkBench Software P/N 0930083000
Sweep Times:	Auto optimized by DSP	
Typically Scan Rate:	750 MHz/600 msec	
Internet Browser		
Functionality:	HTML 4.01 Compliant Supports Cookies, Caching for offline applications, SSL for network security, fixed and animated GIFs, JPEG's, and PNG Image Formats.	
Function Bar Displays:	URL Bar, Status Bar, and Toolbar. Bars can be hidden for maximum screen viewing area.	
Access and Control:	Menu of permitted sites, downloaded to 860 DSPi from Trilithic WorkBench Software.	
External Network Interface:	Ethernet. Can function as substitute for customer PC, operate through external subscriber modem.	

860 DSPi

Notes



**TRILITHIC** (800) 344-2412 (317) 895-3600 www.trilithic.com