860 DSPi

Multifunction Digital Analyzer

- ONLY Analyzer with an 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 Get New Users Up and Running Quickly

- 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 reverse sweep to be received by the 9581 SST™ 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.
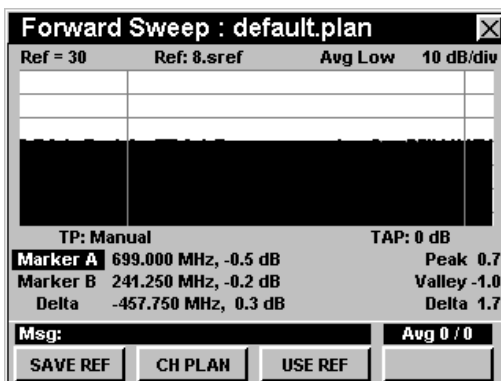
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Complete testing capabilities

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.
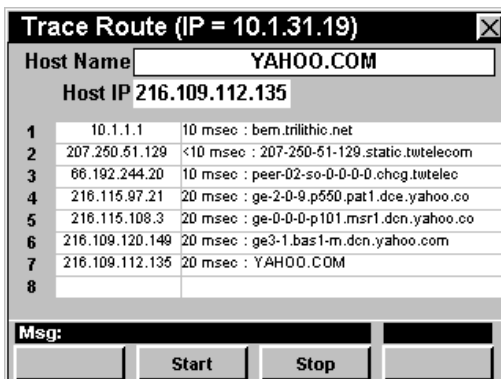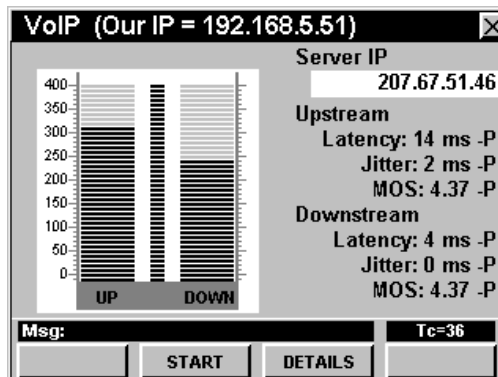

Track IP transmission paths with Trace Route™.

Measure system frequency response with SpeedSweep system compatibility.
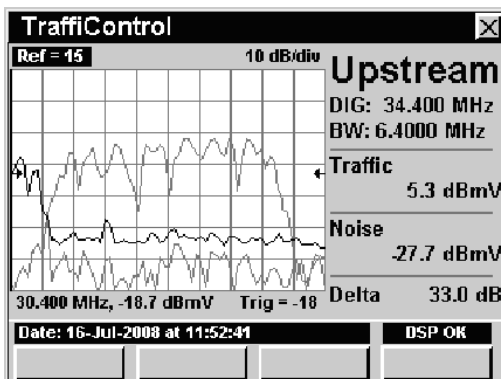
Find in-channel distortion or other interference without interrupting service with Error Vector Spectrum™ or TraffiControl™ modes.

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.
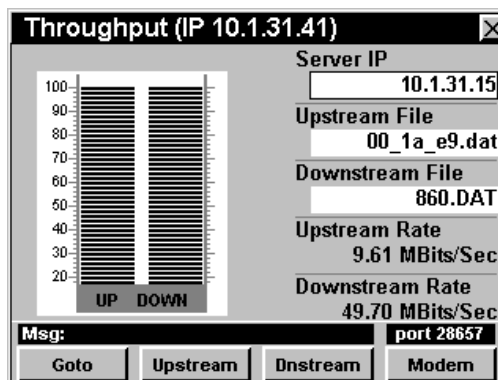
Test throughput, packet loss, reverse transmit levels, MER, BER, and more.
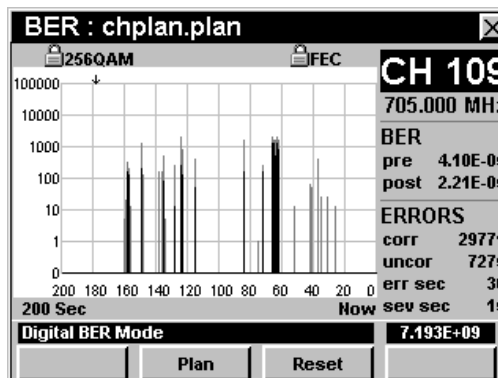
Use the 860 DSPi's Average BER function to estimate BER up to 10 times faster than any alternative. Use the Impulse BER function to detect and count individual lost packets. BER data is displayed with values and a convenient graph that shows how pre and post BER changes over a user-settable interval. 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.

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860 DSPi

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
- "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
- Trace route
- 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 channel scan and monitoring; C/N, hum, FM deviation, depth of modulation, CSO/CTB, forward (system carrier-referenced sweep) sweep balancing, and an internet browser

- The Power Pack is a prerequisite for all other 860 DSPi options

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
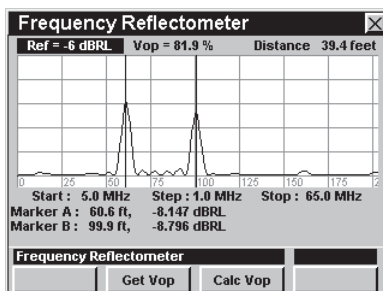
D3 Option - DOCSIS 3.0

The D3 option builds-in a CableLabs® certified DOCSIS 3.0 modem, enabling a full complement of DOCSIS 3.0 tests, including complete statistical information about each of the bonded signals,

including individual downstream receive levels and upstream transmit levels, downstream MER, and pre- and post-FEC BER. Additionally, full range throughput tests can be performed up to 152 Mbps.

The Cable Modem Statistics mode provides comprehensive information for all up and downstream signals in bonded sets. The signal that is configured as "primary" is highlighted.

The 860 DSPi is ready to perform network tests to prepare the plant for these services; perform installation tests as the services are rolled out; troubleshoot throughout the network; and perform sweep/maintenance tests before and after the services are deployed.
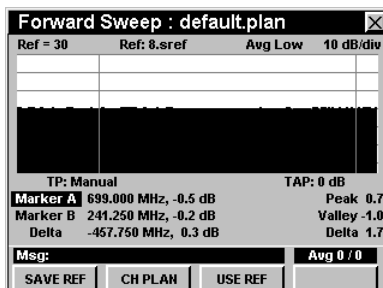
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FS-1 Forward Sweep Option

- 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
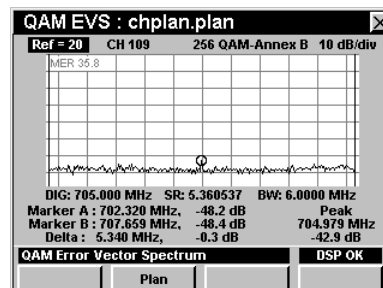
SR-1 Return Sweep Receiver

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

TC-1 TraffiControl Option

- Allows viewing of in-channel spectrum characteristics for upstream data channels
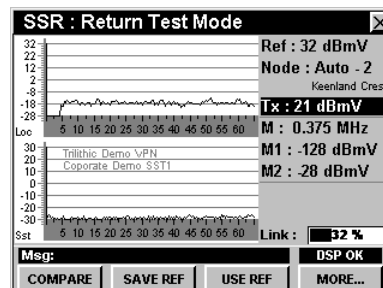
VITS Vertical Interval Test Signal™ Option

- 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
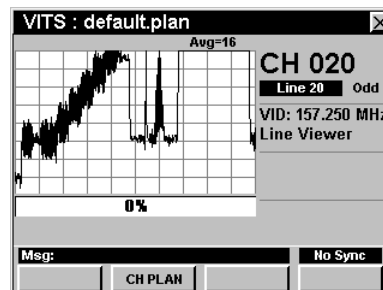
VSB Vestigial Sideband™ Modulation Option

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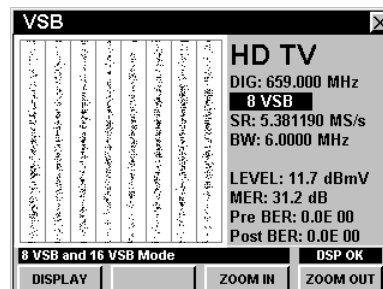
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RELATED PRODUCTS

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.

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-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.

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 con-veniently 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.

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860 DSPi

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

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Spectrum Mode

Display Spans	User-selectable in 10 kHz steps
Display Scale	1, 2, 5, or 10 dB/division
Display Range	7 vertical lines
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 4ms (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 38 dB 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

Power Source

Charging Time	4 hours
Operating Time, Continuous Use	4 to 6 hours

Physical

Weight	5.85 lbs (2650 g)
Operating Temperature Range	-18° to +50° C (0° to 122° F)

INCLUDES THE FOLLOWING:

5 MHz to 1 GHz analyzer (customer-specified options)
P/N 201097100U

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

VoIP RTP™ server software
P/N 0930110000

WorkBench™ software
P/N 0930083000

ACTS™ software
P/N 0930144000

TDM software
P/N 2011092100

8300 FST Forward Sweep Transmitter
P/N 2011072001

WorkBench

- Simplifies 860 DSP™ Inventory Management

- Stores Measurement Results

- Makes Firmware Updates Easier, Resulting in Improved Accuracy and Productivity

- Enables Configuration of 860 Units, Including Channel Plans and Automated Tests – Ensuring Consistency in Measurement Procedures

- Optional Trilithic Data Manager (TDM™) Component Provides Communication Link with 860 Units in Field
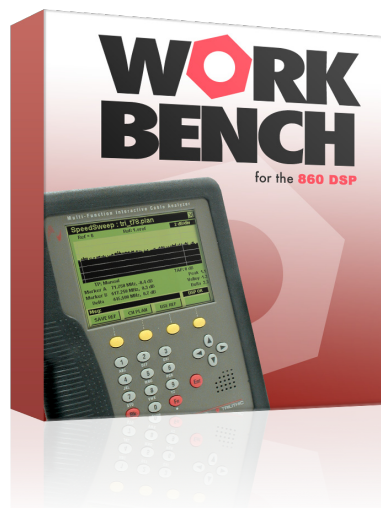
WorkBench™ is a Windows®-based, web-linked software application that supports and augments the many functions and features of Trilithic's 860 DSPi, making it easier to update and upgrade your 860, using an intuitive PC graphic user interface. It is especially helpful for keeping track of a fleet of 860s, to make sure all technicians are working with the same features, channel plans, and test processes. With WorkBench, you can quickly and easily install and configure additional 860 DSP optional performance features by purchasing them, downloading them from the Trilithic website, and installing them at your convenience (with the optional TDM component). Many firmware updates and measurement enhancements are available at no charge.

- Improve accuracy and productivity by ensuring that your 860 DSP analyzers are working with a consistent firmware version, and software configuration.

- Customize your 860 DSPs to meet your specific needs and preferences by configuring the navigation menus, as well as choosing and editing channel plans, locations, auto-test macros, and configuration packages, including a wide variety of measurement options, test mode options, and performance limits for auto-test functions.

- Identify and download 860 DSP firmware updates (to enhance existing features and add new capabilities) or new options. Store downloaded updates in WorkBench until it is convenient for you to load them into your 860 DSPs. Queue updates for download by the technician from any field test point with the optional TDM component.

- Analyze and report on data collected from the 860 DSPs, including performance to user-set limits such as analog signal amplitudes, digital signal power, signal quality, carrier-to-noise ratios,

MER, and other measurements of digital performance, and key return path measurements.

- Receive announcements of new 860 DSP features and functions, firmware revisions and updates, new product options, and other performance enhancements by clicking the banner in the WorkBench online tab.

- Create the most effective menu structure and configure all 860 DSPs with uniform features, settings, and configurations. Your technicians won't have to spend time reconfiguring or relearning how to use individual 860 DSP units; they can instead get right to work with no lost effort.

The WorkBench software is a powerful 860 DSP accessory that makes configuring, maintaining, and customizing any number of 860 DSPs a snap.

Recommended Option: WorkBench TDM Component

A workforce management solution that acts as an interface with the TDM (Trilithic Data Manager) server.

Simplifies updating firmware and managing technician's 860 channel plans and test processes by enabling access at any field test point.

The TDM component option provides a communication link with 860s in the field:

- Manager sends tasks (work orders) to technicians in the field
- Technicians receive tasks, attach test results, close tasks, and upload data to TDM
- Manager reviews/collects task associated data for records

Internet Connection

An internet connection is required to enable use of the WorkBench online feature, which simplifies accessing and downloading the latest firmware updates and new features for your 860 DSP.

30-Day Evaluation Period

WorkBench software is distributed at no charge including meter configuration utilities. A full set of data management features (data log upload and analysis) are active for evaluation for 30 days after installation. When the evaluation period expires, WorkBench's meter configuration utilities remain active, but data management features will automatically deactivate (stored data remains accessible but new data can not be stored). To continue to use data management features contact Trilithic to purchase a key code.

INCLUDES THE FOLLOWING:

One user license for one PC
P/N 0930083000

I/O-14 9-pin data cable
P/N 2071401000

OPTIONAL ACCESSORIES:

WorkBench Software with TDM component for uploading/downloading information to TDM server
P/N 0930083002

TDM component for existing WorkBench software installation
P/N 0930083001

REQUIREMENTS

200 MHz Pentium® II PC Minimum	64 MB RAM
	100 MB free disk space
	Windows 2000®, or later color monitor running at 256 colors or higher, 800 x 600 minimum screen resolution
	Standard 9-pin serial port and/or Ethernet adapter (860 DSP Ethernet interface is optional)

- Enables In-Field 860 DSPi™ Configuration Updates

- Upload or Download Measurement Data for Records; "One-Click" to Send and Receive Data

- Interfaces with Records, Work Order Management, and Third Party Diagnostic Information; Facilitates Inventory and Tracking of Work Order Completion, etc.

- Messaging Interface for Broadcast or Individual Technician Communication

- All Server Software is Pre-Installed on a High-Performance Server, Ensuring Reliability and Minimizing System Activation Time

The TDM™ (Trilithic Data Manager) Integrated Server Package is a pre-configured server, integrating powerful software applications and hardware to provide a tailored, comprehensive solution for managing test data for installation technician performance and quality assurance, and managing field analyzer inventory. In addition to Microsoft® 2003 Server® and SQL Server®, the server hardware comes pre-configured with TDM server software, and one on-board WorkBench™ application with TDM component. Six additional WorkBench with TDM component packages are provided, standard.

TDM is a server application that enables remote configuration of the 860 DSP™ or the 860 DSPi™; allows for the collection of measurement records; and enables instrument updates and

feature addition via the Internet. An optional TDM component resides within WorkBench, Trilithic's 860 family configuration and management application, and enables the user to communicate information globally, by groups, or individually to 860s in the field. 860s can upload measurement information to the TDM server to be viewed in WorkBench and saved for historical purposes.

APPLICATIONS

TDM makes keeping field meter firmware up to date simple by notifying the technician that an update is available whenever he/she enters the browser mode. The transmission (upload and download) of data can be performed with the push of a button. This means that all field analyzers will be running on the most current firmware version.

Management reports are another important function of TDM. The vast amount of data collected by installers throughout the day would be overwhelming to analyze without simple, well-designed reports. All TDM reports have certain characteristics, including a summary and expandable/collapsible depth of data detail (some reports are only obtainable with data acquired from a billing system, which includes information related to work orders).

TDM

FEATURES AND BENEFITS:

- Allows 860s to send and receive e-mails, as well as to share data with other technicians using 860s in the field.
- Enables management to view team reports through an IE web browser.
- Consistent, efficient, and accountable quality assurance improves installation service quality, resulting in retaining satisfied customers.
- Decreases the number of service calls, which leads to cutting operational expenses.
- Improves installation technician performance with measurable results while eliminating costly rework.
- Proactive and automated test processes save maintenance technicians' troubleshooting time, also cutting operational expenses.
- Test automation speeds installation technicians' measurement and data collection time, thereby improving productivity.

TDM Server
- Data communication
- Measurement database

860 DSPi
- Work order retrieval
- Test macros, temp storage
- File transmission

WorkBench / TDM Component
- TDM user interface
- Data display and analysis
- Queries, reports

Microsoft® Internet Explorer®
- Manager/supervisor access to reports

860 DSP Meter Inventory

The TDM system enables supervisors to make sure every technician's meter has the proper configuration to ensure that the right tests are done on the right channels. Firmware upgrades can be forwarded to technicians' inboxes and supervisors can track which meters have been updated. Complete meter inventory reports provide a quick reference indicating which meters have specific measurement capabilities, and when the last calibration was performed. A calibration check report provides a quick method for ensuring that technicians are checking meter calibration on-schedule, and that all meters are making accurate measurements. The supervisor can access specific uploaded data logs for detailed analysis using WorkBench.

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Reports and Summaries

The TDM system helps installation technicians become more professional, thorough, and efficient. They quickly check and certify the installations with simple macros, verifying the quality of services delivered to customers. The tests are done quickly with the fastest installation analyzer on the market, so the installer can get more done in less time.

History Reports / Work Orders

To further simplify the process for the technician, the 860 DSPi can be set up with a very friendly user-customized interface to enable quick access to specific macros that comprehensively evaluate the services in one combination of measurements. The test data is stored in a task (work order) file, and all of the data from the day's work is uploaded to TDM at the end of the day.

Increased Efficiency and Productivity

Implementation of the TDM system leads to satisfied customers with improved reliability and service that meets expectations. The system improves productivity by eliminating rework, and provides management with metrics to control and improve productivity. The ability to collect, sort, and analyze data gives new productivity enhancing insight to users, and the integration provides a cost cutting quality improvement which – by increasing subscriber satisfaction – mitigates churn and improves the potential for new customer business.

INTEGRATED SOFTWARE SPECIFICATIONS

Microsoft Windows 2003 Server®	A comprehensive, integrated, and dependable server platform designed to reduce costs and increase the efficiency and effectiveness of computing operations.
Microsoft SQL Server®	More than a relational database management system; it is a complete database and analysis product that meets the scalability and reliability requirements of the most demanding enterprises.
WorkBench Client License	One WorkBench client license included.
TDM Server Software	Integrates powerful software and hardware to provide remote access to channel plans, auto test and firmware updates, and supports data uploads via the internet.

HARDWARE SPECIFICATIONS

Specially configured Dell PowerEdge® 2U rack-mount server

|	
Storage	TDM Server can store more than 10 million data logs (average data log is 34 KB).
Warranty	Next business day, parts and labor, on-site response – 3 years (provided by Dell).

A second power supply is available from Dell to provide redundancy and extra reliability.
A backup storage system is recommended for prevention of data loss.

INCLUDES THE FOLLOWING:

Pre-configured server with six WorkBench/TDM software packs

RELATED PRODUCTS:

TDM integrated server package
P/N 2011092100

TDM Component software
P/N 0930083001

WorkBench software
P/N 0930083000

WorkBench/TDM software package
P/N 0930083002

ACTS

- Server Application Enables a Proprietary Connection with the 860 DSP or 860 DSPi

- Includes Separate Pass/Fail Results for Forward and Return Path Troubleshooting

- Enables High Speed Throughput Tests Using the 860 DSPi

- DOCSIS 3.0 Compatible

- Can Also be Used as a Ping Test
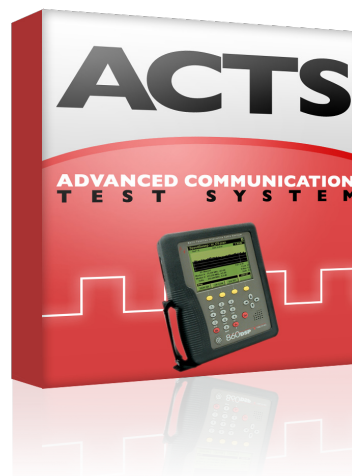
As the name suggests, this new server performs a variety of tests related to cable system advanced communication services, including VoIP and high speed data.

The server enables a VoIP RTP test from any field test point with or without unsolicited grant service (UGS), as well as high speed throughput.

The VoIP test enables efficient service pre-installation verification with a simple, yet comprehensive set of measurement data including upstream and downstream latency, jitter, packet loss, and MOS.

The throughput test adds an increased level of security, by enabling customizable communication ports, and it doesn't write files to the hard drive.

SYSTEM REQUIREMENTS

Processor	1 GHz Pentium-IV® or upward compatible CPU
Memory	1 GB RAM
Hard-Drive	100 MB free disk space
Operating System	Windows 2003 Professional® or Server® or Windows XP®
Network Card	10/100/1000 Base-T network interface card

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