CT'S T&M TECH GUIDE

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INSIDE THIS ISSUE

T&M Today and Going Forward

By Ron Hendrickson, Managing Editor

Cable test and measurement (T&M) is a huge field to study. Gone are the days when an analog SLM and perhaps a volt-ohmmeter were all a field tech needed. Today, the tests themselves and the equipment they require comprise a vast array. This Tech Guide is an attempt to help you find what your field force needs.

THE LAST 10 YEARS

T&M has become vastly more complex in just the last 10 years, says Keith Hayes, VP Network Operations and Engineering Services for Charter Communications.

"Some years ago all that was likely done was measuring signal levels and amplitude variations within the QAM channel," he says. "Now we're digging deeper into modulation error ratio—we've got more equipment that allows us to look at the constellation diagrams and gives us intelligence on what's causing unwanted variations."

Pragash Pillai, VP Strategic Engineering for Bresnan, is also digging deeper.

"It gets more complex when we start putting video over IP," he says. "You can just look at packet jitter and all that kind of stuff, and it's not sufficient any more when you deliver video."

TRAINING

Ray Thomas, principal engineer for Time Warner Cable, identifies training as a challenge.

"Each system has to have a training plan and ensure that the plan is adhered to," he says. "When techs are promoted, or transfer to another area, or leave the company, their knowledge is lost and takes time to replace."

Hayes also says training is critical, but adds that there's good news. Test gear now often comes with built-in Web browsers and help pages. And today's techs are savvy.

"They've grown up knowing what the Web is ... they're used to touch-screens and graphical user interfaces," Hayes says. "The test equipment manufacturers are getting more savvy in making their gear more intuitive for today's generation of technicians, which usually means we have to teach the fundamental technology of what they're measuring, but 'how to drive it' is almost intuitive for the technicians now."

FUTURE TRENDS

Hayes, Pillai and Thomas all lookk for increasing intelligence in the network itself. Probes in the network, either stand-alone or part of other platforms, can report constantly rather than just raise alarms.

Hayes further sees test gear getting "smarter."

"You can put in just whatever level of code you want to equip that technician with, and it's flexible, so if you want to do some sort of customization because of technology differences in your network, it's pretty easy," he says. "The second trend is essentially the Moore's Law of technology advancement—denser chips, faster processors, lower price points, which allows us to put much more capable test gear in more and more of our technicians' [hands]."

Hayes also likes browser-based test gear. It can be used to upload test results, establish baselines and is largely vendor-agnostic.

"You can have vendor A and vendor B both talking to the same OSS, and you just have to have a simple translational API to allow the two to interface,or the three to interface," he says. "It's not totally [vendor agnostic], but it's kind of a one-time translation effort."

EQUIPMENT

How to equip the field force is a balance between "best and most" and the real world of budgets. Thomas notes, "Budgeting has become a year-round sport that makes cage matches look rather tame."

It's also a matter of getting the right tools into the right hands.

Says Pillai, "There's no point giving test equipment to people that don't know what to do with it."

Hayes likes one box that can be set up differently via either software or firmware.

"You can have the same meter," he says, "but have an installer view, a technician view, a system tech view, a headend tech view that the operator has the discretion of toggling on and off as a technician gets the right skill level, the right training to be able to understand what measurements are being displayed on a deeper level."

WISH LIST

Each man has a different vendor wish list.

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Hayes returns to the idea of the network monitoring itself, specifically for set-tops to provide the same sorts of data that operators currently get from modems and EMTAs.

"We've got probably six or eight times the number of set-tops, if not 10 times the set-tops, installed in customers' homes than we do modems and EMTAs, so the amount of endpoint intelligence is far greater in the set-top box environment," he says.

Pillai cautions against the "trap" of best-of-breed.

"I would love to be picking the best breed, best tool from every single one of them, but I'd end up with five or six vendors," he says. "Then I have to worry about integrations."

Thomas suggests greater input from the field.

"T&M companies might try getting permission from system management to send the T&M's sharpest engineer along on rides with cable techs," he says. "It can be an eye-opening experience to hear a customer's direct feedback in person, and that's where some of the best ideas come from."

BEST IDEAS

Some of the best ideas in currently available RF field gear appear in this guide. We hope the information helps make your job a little easier. —*CT*

Comsonics (www.comsonics.com)

Company	Product Name	Product Type	Key Features
Comsonics	Companion	Installer signal level meter	Favorite Channel Mode • Visual carrier level (analog) • Multiplex power (digital) • Slope (dB) • Pre-selectable Pass/Fail single channel mode • Analog: V-A auto-calculate, V-A based Pass/Fail • Digital: 64- or 256-QAM, 3-point flatness, Pass/Fail based on power, flatness, MER, BER throughput mode • Downstream gauge • Upstream gauge • Pass/Fail based on power and throughput

JDSU (www.jdsu.com)

Company	Product Name	Product Type	Key Features
JDSU	DSAM-1500	Digital service activation meter	The DSAM-1500 triple-play field meter provides the installation technician with a basic SLM and includes features like: • Carrier-to-noise • Tilt • Level • Pre/post-FEC BER • QAM MER/BER to 1 GHz • DQI (option) • AGC stress indicator • dB delta • Proof-of performance with automated tests • Automated home and plant certification reports optional
JDSU	DSAM-2500 and 2600	Digital service activation meter	The DSAM-2500 and 2600 add features for troubleshooting DOCSIS connections and provisioning. Features include: • Errored seconds and severely errored seconds • DOCSIS/EuroDOCSIS (DOCSIS versions 1.0, 1.1 and 2.0 based) • Hum for 60 Hz or 50 Hz power grids • BER for deep interleave (on the 2600) • QAM ingress (6 MHz and 8 MHz on the 2600) • DQI
JDSU	DSAM-3500 and 3600	Digital service activation meter	With the DSAM-3500 and 3600, features are added to grow with a technician's skill level. More features and options include: • Full downstream spectrum mode and a constellation view of QAM carriers • Return QAM generator (16-QAM upstream) • IP tests via Ethernet jack • Forward Sweepless Sweep option

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JDSU (continued)			
Company	**Product Name**	**Product Type**	**Key Features**
JDSU	DSAM-6000	Network maintenance sweep meter	Gives maintenance technicians all DSAM functions with the option of JDSU's patented forward and return path Stealth Sweep technology. Other highlights include: • Sweepless Sweep: Standard on the DSAM-6000 • Can be used with existing SDA rack-mounted sweep gear, SDA-5500 and SDA-5510 • Can sweep side by side with SDA-5000 meters
JDSU	MS-1200, MS-1300, MS-1400	Signal level meter	The MicroStealth Signal Level Meters (MS-1200, MS-1300, MS-1400): • Offer a complete digital average power test capability • Can be upgraded for leakage measurement capability • Have fast, easy location of forward and reverse ingress and interference with an advanced ingress spectrum scan • digiCheck Digital Signal Measurement: measures DVB, digital TV, cable modem, Internet, and telephony on-cable services
JDSU	SDA 4040 Stealth Digital Analyzer	Digital analyzer	• QAM View digital analysis option adds forward path digital signal testing that includes constellation, pre/post-FEC BER, MER, and an exclusive QAM ingress feature that reveals noise under an active carrier. • RF level, fast-scan, tilt, C/N and hum • 5 to 1000 MHz fast, sensitive spectrum analyzer • Provides zero span measurement of power and carrier-to-noise ratios
JDSU	SDA-5000 Stealth Digital Analyzer	Digital analyzer	• Ensures HFC network integrity with JDSU's patented, non-interfering forward and reverse sweep system • 5 to 1000 MHz, fast, sensitive spectrum analyzer • Delivers comprehensive testing of forward and reverse digital services including optional QAM analysis • Ensures full in-service proof-of performance with automated tests

Megger (www.megger.com)			
Company	**Product Name**	**Product Type**	**Key Features**
Megger	TDR900	Hand-held time domain reflectometer/cable length meter	• Full autoranging for measuring the length of power, telephony, CATV and LAN cables, provides distance to an open or short • Extra large, high resolution backlit LCD • Automatic output impedance control of 25, 50, 75, 100, 125 or 150 ohms • Cable length calibration function • Internal library of 39 standard cable types

Sencore (www.sencore.com)			
Company	**Product Name**	**Product Type**	**Key Features**
Sencore	SLM 1453I	SLM	The SLM 1453I features testing capabilities for both analog and digital signals. It provides the avg. peak power (level) bBer, MER, and a digital quality measurement. It can be programmed to cover the entire channel line-up or just the channels you are required to test during an installation. It also provides leakage and ingress testing.
Sencore	SA 1454	Portable signal analyzer	The SA 1454 is an RF meter for both analog and digital RF signals. It can measure digital power level, bBER, MER, Digital Quality, and provides a spectral view of either the entire RF spectrum, or zoom-in on a particular channel. It features leakage and ingress testing capabilities and can store readings for documentation or comparison.
Sencore	SLM 1473	Portable signal analyzer	The SLM 1473 features a QAM demodulator for digital readings for level, pre/post BER and MER. It also provides a spectral and constellation display. It features leakage and ingress testing and can store and download measurements for documentation or comparison. With the included SMART software, your channel plan can include all the channels or just certain channels.
Sencore	SLM 1456	Signal level analyzer	The SLM 1456 RF troubleshooting meter is designed to fully test all parameters of both analog and digital signals. It features the same chipset used in set-top receivers. It provides the user with RF levels, Pre/post BER, MER, and a constellation diagram. It also includes leakage and ingress testing capabilities, plus a spectral display.

Evolutionary platform lets techs change with the times, without changing meters

DSP technology enables convenient updates, upgrades.

As broadband services continue to evolve dramatically, cable plant technicians - from installers to headend troubleshooters - need to change with the times.

So do their meters.

Individual techs – and, by extension, system operators – could improve their productivity and reduce overhead dramatically over the long haul by keeping the same, familiar signal level meter as their responsibilities grow or as new services are introduced.

Of course, that requires a convenient way for techs to keep their meters updated with the latest specs. Over the course of several years, it also requires a meter platform that can be easily upgraded with new test capabilities as the operator takes on new tasks.

The 860 DSPi from Trilithic uses digital signal processing technology to simplify meter updates, which can usually be done through a simple firmware download.

Digital Signal Processing (DSP) technology has made both possible.

Easy updates

The 860 DSPi digital field analyzer from Trilithic uses cutting-edge DSP technology to create a portable instrument platform capable of evolving over time to meet emerging measurement and data communication requirements. It can be updated or upgraded as new services are introduced, usually through Trilithic's free update website.

The 860 DSPi achieves this adaptability by employing "virtual instrument" design, including DSP technology. The flexibility of DSP means that applications that were not even available when the analyzer was originally purchased can be added later, often by simply downloading firmware. Through simple online updates, the tech can keep the 860 DSPi ready for new challenges and as up-to-date as currently shipping analyzers.

Gaining capabilities, not weight

The efficiency and versatility of the DSP platform also enable the user to add powerful options – like high-resolution spectrum analysis, QAM and QPSK constellation displays and a wide range of return path tests – all without impacting size or weight.

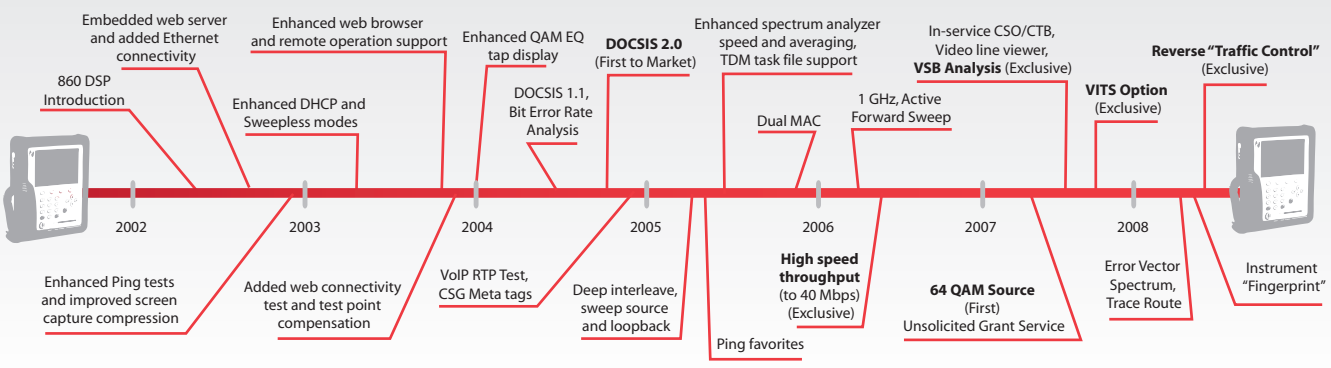
Some significant capability upgrades require a slight hardware modification, but as with meter updates, most simply require a firmware download.

This DSP-based, built-in capability for easy upgrading has enabled the 860 DSPi to evolve quickly and significantly since its introduction just over six years ago. The timeline [below] shows the continuous stream of modifications that have become available and can be added to any 860 model.

The 860 series' DSP architecture is an ideal platform for providing a simple upgrade path to accommodate continually emerging technologies and evolving broadband test needs, including such technologies as DOCSIS 3.0.

In the end, the most significant takeaway of the flexible DSP platform for system operators is a financial one. Because the platform enables the 860 DSPi to remain "evergreen" and grow along with the responsibilities of the operator, it can offer significantly lower lifetime costs. Techs can change with the times – or new services – without changing meters. That can change an MSO's bottom line.

For more information on the 860 DSPi analyzer, contact Trilithic at (800)344-2412 or visit www.my860.com.



Sencore (continued)			
Company	**Product Name**	**Product Type**	**Key Features**
Sencore	SLM 1456CM	RF signal and cable modem analyzer	The SLM 1456CM provides capabilities to test and troubleshoot both analog and digital signals including levels, pre/post BER and MER. It also provides testing for DOCSIS 2.0 installations or troubleshooting. It can test the return path all the way to the headend or CMTS of any system. It also provides RF leakage and ingress testing capabilities.
Sencore	SLM 1474	All format RF signal analyzer	The SLM 1474 provides the capability to test RF signals from 47 MHz up to 2.125 GHz. It also provides for confidence monitoring of the video with a 4" inch LCD display. It is also capable of providing dual LNB volt for satellite alignment. The unit provides a spectral display along with both leakage and ingress testing capabilities.
Sencore	SLM 1475	All format RF signal analyzer	The SLM 1475 RF has an MPEG-2/4 decoder and 8-VSB/QAM demodulator built-in. It can test analog and digital signals for terrestrial, satellite or cable and provide a decoded or demodulated video of signals in the clear. It provides digital program information and MER, pre/post BER, and noise margin for satellite, HD terrestrial broadcast, or 64- or 256-QAM signals.

Sunrise Telecom (www.sunrisetelecom.com)			
Company	**Product Name**	**Product Type**	**Key Features**
Sunrise Telecom	CM1000	Cable modem system analyzer	The CM1000 is designed to be a sophisticated troubleshooting tool, geared to resolving tough problems from the CMTS, through the headend, fiber backbone and RF distribution network.
Sunrise Telecom	CM2000	Cable modem network analyzer	The CM2000 is designed for testing high-speed data, VoIP telephone, and digital and analog video services. The unit's set of customizable test functions speeds installations and reduces repair time, while increasing quality of service (QoS). A range of automated test suites ensures consistency of tests performed, pass/fail limits, and results.
Sunrise Telecom	CM750	Analog and digital SLM, network analyzer	Designed to systematically detect and locate impairments in analog and digital video services—in real time. Continuous measurements reveal changing network conditions. • Integrated Web browser and PC emulation option • Upstream spectrum with CPD, C/I & C/N measurements • Comprehensive digital analyzer with constellation and optional equalizer and frequency response displays
Sunrise Telecom	CE4000	Time domain reflectometer	The CE4000 is designed to provide easy to use TDR functions in a modular solution for troubleshooting cable TV and DOCSIS modem installations.
Sunrise Telecom	AT2500RQv Series Analyzer	Spectrum analyzer	The AT2500RQv 1.5 GHz spectrum analyzer is designed as a high performance, lightweight, battery powered analyzer for CATV headend and field portable applications. It combines a full-featured spectrum analyzer with a QAM analyzer, CATV measurement package, video demodulation capabilities and a time domain measurement module.

Trilithic (www.trilithic.com)			
Company	**Product Name**	**Product Type**	**Key Features**
Trilithic	8821Q-R	Spectrum analyzer	The lightweight 8821Q-R can be used anywhere in the network to analyze digital, analog and base-band video signals. An intuitive user interface, remote operation via LAN, automated proof testing and a range of built-in applications help simplify alignment, troubleshooting and FCC compliance for headend techs. Primary tests include: QAM, MER, BER, in-channel frequency response, equalizer tap graph and group delay.
Trilithic	860 DSP	HFC field analyzer	For applications that do not require a modem-equipped meter, the 860 DSP is designed to offer a cost-effective solution for balancing the distribution system, maintaining analog and digital signal quality, and controlling return path ingress. Optional capabilities include high-resolution spectrum analysis, QAM and QPSK analysis, and return path installation and distribution tests.
Trilithic	860 DPSi	Portable network analyzer	The 860 DSPi is designed to quickly and efficiently perform all the critical tests needed to install and maintain analog, digital, HSD and VoIP services. Technicians can easily upgrade it in the field for new applications or add powerful options for high-resolution spectrum analysis, QAM and QPSK constellation displays and return path testing.

XFTP (www.fieldtechproducts.com)			
Company	**Product Name**	**Product Type**	**Key Features**
XFTP by Trilithic	TR-2	Installer meter	The TR-2 is designed to be a simple to use, lightweight meter that provides fast and efficient measurements featuring signal level measurement, tilt measurement to balance your system, carrier-to-noise measurements, a voltmeter function and an extended battery life. The TR-2 comes ready to use with the standard NCTA channel plan.
XFTP by Trilithic	Model Two	Signal level meter	This signal level meter includes all-channel scan displays, single channel and spectrum modes, "favorites" displays, tilt measurements, direct power measurements of QAM signals, and data logging. Featuring expanded proof-of-performance testing and the ability to define test sequences that perform to user specified limits.
XFTP by Trilithic	Model Two Lite	Small system SLM	The Model Two Lite has been fine-tuned to the needs of the installer and small system operator, performing the basic signal level, return ingress and system flatness tests needed for insuring signal integrity. The Model Two Lite is the ideal basic service instrument for maintaining small community distribution systems and systems serving resorts, hotels and other large facilities.

VeEx (www.veexinc.com)			
Company	**Product Name**	**Product Type**	**Key Features**
VeEx	VePAL CX100	Installer meter	• SLM up to 1GHz • Support deep interleave and constellation • Ingress (forward/reverse) • System scan and installation check for fast troubleshooting • Long operation battery (12 hours) • Color touch screen
VeEx	VePAL CX150	Installer meter plus DOCSIS 2.0 modem	• SLM up to 1GHz • Support deep interleave and constellation • DOCSIS 2.0 testing/emulation • Ingress (forward/reverse) • System scan and installation check for fast troubleshooting • Advanced IP functions and true Web browser • VoIP and CAT-3/5 testing • Long operation battery (12 hours) • Color touch screen
VeEx	VePAL CX120	Installer meter plus upstream signal generator	• SLM up to 1GHz • Support deep interleave and constellation • Upstream generation of CW, QPSK, 16-, 64- and 128-QAM with FEC • Ingress (forward/reverse) • System scan and installation check for fast troubleshooting • Long operation battery (12 hours) • Color touch screen
VeEx	VePAL CX180	All-in-one installation and maintenance tool	• SLM up to 1GHz • Support deep interleave and constellation • Upstream analysis of 16-, 64- and 128-QAM with MER and constellation • Advanced spectrum analysis • System scan and installation check for fast troubleshooting • Optional DOCSIS testing • Optional TDR testing • Long operation battery (12 hours) • Color touch screen

ViewTEQ (www.viewteq.com)			
Company	**Product Name**	**Product Type**	**Key Features**
ViewTEQ	MR-3	Installer signal level meter	Designed for measurement of TV signals, either CATV or over-the-air. It provides signal strength, tilt, carrier-to-noise, and a voltmeter. In single channel mode, it displays channel number, video RF level in dBmV, video frequency in MHz, and the dB difference between the video and audio carrier. It also lets you hear the audio from the built-in speaker.

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