

# CT'S LEAKAGE AND T&M TECH GUIDE

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## T&M Trends Update

By Timothy Sprinkle, Contributing Editor

It's no secret that these are tough times for the cable industry. No only is the worldwide economy continuing to wallow in a funk, but MSOs face increasing competition from satellite, IPTV and other video providers.

For testing and measurement vendors, however, these challenges have presented new opportunities as developers have set out to find ways to help operators save money and cut down on testing and training time.

In this guide, we'll showcase the tools, outline some of the recent trends and explain share some insights from the experts.

### GOING DIGITAL

The cable industry's transition to digital carriage has reaped plenty of benefits for operators. But the shift has also changed the T&M game dramatically, calling on a range of new technologies to accomplish testing goals that would have been all but impossible with analog.

"In some aspects [the switch to digital] has made testing easier," says Keith Hayes, vice president of network operations and engineering services

with Charter Communications, "in others far more difficult. Analog video is very fault-tolerant to a significant degree, but digital from the customer end gives three states – perfect, intermittent impairment or completely gone."

As a result, Hayes says, troubleshooting digital systems can be challenging. When the customer's signal is spotty, the cause could be the source, the uplink/downlink, the headend, leakage into the network or a range of other issues. This has required techs to develop new skills, including an understanding of both baseband video and MPEG systems in areas where analog and digital overlap.

And there is more to the complexity than just technical headaches. According to Pragash Pillai, Bresnan's vice president of engineering and technology, the real issue is that testing standards have yet to catch up with reality.

"The challenge for us is that we can't change the FCC requirements for leakage without the FCC making that change," he says. "We've updated our systems, but the FCC still needs to update its testing procedures."

Still, says Ray Thomas, principal engineer with Comcast, digital has its advantages, like the ability to directly check customer premise equipment remotely through the network.

"Software tools and CPE reports provide the ability to monitor the network to a greater degree than ever before," he says. "But the massive amount of data needs to be acted upon quickly, so that the tech actually doing the hands-on troubleshooting has access to it. This increased complexity results in a greater focus on maintaining quality performance from end to end."

### EASING THE PROCESS

With these challenges in mind, T&M vendors have focused their development efforts of late on making life easier for operators.

"We're trying to focus on making our customers more productive," says Steve Windle, product manager with Indianapolis-based T&M vendor Trilithic. "And when they're more productive, their costs go down."

To that end, Trilithic has introduced a range of automated testing tools, including a leakage detector that can locate and

pinpoint cable leaks without any user interaction, designed to simplify the training and operations process for operators. "A lot of times the installer isn't the most experienced person on the cable tech team," he says, "so we wanted to shorten the learning curve. With these tests you just push a button and it runs the tests and tells you if it passes or fails."

Automated hardware like this also enables operators to verify that their technicians are actually running every test that they are required to run, helping to cut down on truck rolls and all the costs associated with future service calls to correct inadequate installations.

"The newest test gear I have touched is much more intuitive than just a couple of years ago," says Charter's Hayes. "The displays give you the key info without having to hit several screens, the menus are simpler and they are lighter and appear to be more robust in general. This simplifies initial training but can lead to techs only knowing what measurement is acceptable but not the technology behind it."

The concern is that this

*continued on page 3*

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kind of tunnel vision could prove problematic for operators when techs need to make adjustments to complex systems. Says Hayes: "If 15 dBmV is good then 25 dBmV must be better, right?"

**TECHNOLOGY INTEGRATION**

Aside from automation, another established technology making its way into the T&M space is GPS, which allows users to not only pinpoint problem spots on their networks but also to route their testing staff for future checks.

"Everybody has a GPS in their car and a handheld navigation system now," says Ken Eckenroth with Cable Leakage Technologies (CLT), maker of the Wavetracker line of testing products, "but this technology has never been used in leakage. And it just makes so much sense."

His company has incorporated GPS tracking into its testing products by overlaying users' network information with a digital mapping feature. The map can be then used to plot problem areas as well as keep tabs on where service

technicians are working.

**UP NEXT**

So what does the future hold for the T&M sector?

"We have things in the pipeline in engineering that are going to make things even less complicated," says Trilithic's Windle, adding that his company's newest products are slated to hit the market within the next six months.

And, despite the drawbacks of set-in-and-forget-it testing, anything that helps operators manage their T&M operation more smoothly is likely to do well in this economy.

"Sure, leakage testing is something you have to do as required by the FCC," says CLT's Eckenroth, "but really it's an opportunity for the operator to do some demand and preventative maintenance. That's always huge."

And these days there's money at stake as well.

"When budgets get tighter, the bottom line is keeping your customers satisfied and happy," he says. "The way to do that is by having flawless VoIP and very robust Internet service. The benefits of testing are incalculable, and it's an investment that comes back tenfold." ↩

Cable Leakage Technologies (www.wavetracker.com)			
Company	Product Name	Product Type	Features
Cable Leakage Technologies	Wavetracker 4i	Automated Leakage Tool	The original automated signal leakage analysis tool in the industry; now in its fourth generation. Features include in-vehicle moving maps, touch screen interface, digital camera and wireless download.
Cable Leakage Technologies	Wavetracker PNP	Automated Leakage Tool	The plug-n-play (PNP) model of the Wavetracker includes all the full-feature functionality of the 4i product while leveraging the "laptop" in your fleet as a user display interface. The PNP module mounts "out of sight"
Cable Leakage Technologies	ADF Antenna	Auto-Direction Finding Antenna	Another one of a kind product, the "doppler" technology used in the ADF multi element antenna array will "point" the direction to the leak in real time and also include this information on the work order.
Cable Leakage Technologies	APLAS 4i	Leakage Analysis Software	Automated Positional Leakage Analysis Software, version 4 with intelligence. APLAS 4i is the industry original, matured to the "online" world. This analytical program is the result of more than 50 combined years of signal leakage data analysis engineering. Enabling the "SUPER USER STATUS", from the vehicle to the region manager, to the FCC APLAS 4i makes sense of all your leakage patrols.

Comsonics (www.comsonics.com)			
Company	Product Name	Product Type	Features
Comsonics	Shadow	Leakage Detector	Ultra-compact, handheld unit; light-weight, under 7 oz.; single-button operation; patented leakage validation; flip cover, w/built-in antenna
Comsonics	Sentinel	Leakage Detector	Blends size and performance; ruggedized casing, single-button operation; use as handheld or docking station; frequency agile, set by user; external antenna option; measurement accuracy, +/- 2dB
Comsonics	Sleuth II	Leakage Detector	Retractable dipole antenna for accurate/directional readings; adjustable distance, frequency, sensitivity, audio, and squelch settings; use as handheld, vehicle mounted, or combined with our Nexus GPS System; tuning Range: 120 MHZ to 160 MHZ; measurement Accuracy: +/- 2 dB



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### Comsonics ([www.comsonics.com](http://www.comsonics.com)) continued

Company	Product Name	Product Type	Features
Comsonics	Geo Nexus	GPS-based System	GPS-based mobile leakage detection system with WiFi connection; black Box with integrated leak detector or use with external Sleuth II; leakage location and amplitude information plotted on maps; automates work-orders with full reporting capability; tuning Range: 120 MHz to 160 MHz; receiver Sensitivity: -80 dBmV
Comsonics	GENACIS	GPS-enabled System	GPS-enabled Automatic Cable Integrity System (GENACIS); black Box with fully automated leakage detection and tracking; real-time leakage and GPS information; totally hands-off operation for error free results; maps leaks, vehicles, and automates workorders with full reporting capability; web-based interface for anywhere access
Comsonics	Qualifier X-Ray	Ingress and Leakage	Tests for cable ingress and leakage points using a proactive test system; non-intrusive – no home entry needed; powerful troubleshooting tool that finds intermittent problems; reduces return service calls; handheld unit is small and lightweight; single push button operation with pass/fail indicator

### JDSU ([www.jdsu.com](http://www.jdsu.com))

Company	Product Name	Product Type	Features
JDSU	DSAM-1500	Digital Service Activation Meter	Basic signal level meter including: tilt, level, pre/post-FEC BER, QAM MER/BER to 1GHz, DQI (option), AGC stress indicator, dB delta, proof-of-performance with automated tests; automated home and plant certification reports optional.
JDSU	DSAM-2500, -2600	Digital Service Activation Meter	Added features for troubleshooting DOCSIS connections and provisioning, including: errored seconds and severely errored seconds, DOCSIS/EuroDOCSIS based, hum for 60 Hz or 50 Hz power grids, BER for deep interleave (on 2600), QAM ingress (6 MHz and 8 MHz, on 2600), DQI.
JDSU	DSAM-3500	Digital Service Activation Meter	Added features and options to grow with technician's skill level, including: full downstream spectrum mode and constellation view of QAM carriers; return QAM generator (16-QAM upstream), IP tests via Ethernet jack, forward sweepless sweep option.
JDSU	DSAM-6000	Network maintenance sweep meter	All DSAM functions with option of JDSU's patented forward and return path Stealth Sweep technology. Other highlights include: sweepless sweep (standard), can be used with existing Stealth digital analyzer (SDA) rack-mounted sweep gear; can sweep side-by-side with SDA-5000 meters.
JDSU	CLI Series	Leakage and Signal Level Meters	Combination leakage and signal level meters. Leakage and advanced signal level measurements; frequency agile leakage detection; leakage tagging differentiates competing signals in overbuilt networks areas; digital test for DTV and forward cable modem signals with DigiCheck measurement; patrol for RF leakage from vehicle with optional docking station and magnetic mount antenna.

### Megger ([www.megger.com](http://www.megger.com))

Company	Product Name	Product Type	Features
Megger	MIT410-TC	Multi-purpose meter	Used to find leakage faults and other hidden faults that cause noisy static; 50, 100, 250, 500, 1000 V insulation resistance settings; includes bed of nails test lead set and soft canvas carry case; Ohm meter for testing shorts, crosses and continuity; 0 to 600 V ad/dc voltage meter; CAT IV 600 V rating; IP54 rated for harsh environments

### Promax ([www.promax.com](http://www.promax.com))

Company	Product Name	Product Type	Features
proMAX	US TV EXPLORER II	Handheld Spectrum Analyzer for all US digital formats	NTSC in analogue and 8VSB / QPSK / 8QPSK/ QAM (Annex A/B) in digital. Satellite formats: DVB-S, DVB-S2 and DSS. Constellation diagrams of digital signals in US formats: 8 VSB, DVB-S/S2/C, CATV QAM Annex A/B. One-key dynamic exploration of channel spectrum with auto identification. Real time video display of MPEG-2 and analog video

### Sadelco ([www.sadelco.com](http://www.sadelco.com))

Company	Product Name	Product Type	Features
Sadelco	DisplayMax-5000	DOCSIS Signal Level Meter	Base unit includes analog and digital signal level meter with a tuning range of 5 to 872 MHz. Measures analog, QAM, QPSK & 8VSB power. Auto-calibrates on every power up. Compatible with all versions of DOCSIS. Features and options include: Ingress detection, leakage detection, MER, BER and C/N, modem return level.
Sadelco	DisplayMAX-800CLI	Signal Level Meter	Full spectrum display verifies that all channels are in tolerance with the auto check function. Ingress detection optimizes return path by testing for on every install. Leakage detection from the drop and home wiring via via rubber duck antenna. Data recording saves all test results in internal memory. Auto-calibrates on every power up. C/N, hum, audio, tilt and fast charge.



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Sunrise Telecom (www.sunrisetelecom.com)			
Company	Product Name	Product Type	Features
Sunrise Telecom	CM1000	Cable modem system analyzer	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	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. A range of automated test suites ensures consistency of tests performed, pass/fail limits and results.
Sunrise Telecom	CE4000	Time domain reflectometer	Designed to provide easy-to-use TDR functions in a modular solution for troubleshooting cable TV and DOCSIS modem installations.
Sunrise Telecom	real/WORX Web	Monitoring system	Comprehensive monitoring system for RF cable and broadband communications services. Performs both ingress and RF performance monitoring, minimizing cable modem and RF signal quality problems. Monitoring above 65 MHz allows operators to better detect laser clipping that erodes data quality of service. RealWORX web-based platform ensures standard web browser control.
Sunrise Telecom	realGATE	Broadband testing management system	Designed to increase workforce productivity by providing comprehensive asset, results and work force management functions in a simple web-based system. Includes the CM1000, CM2000 and the CM2000E. Centralizes essential information while streamlining and improving existing broadband testing solutions.

Trilithic (www.trilithic.com)			
Company	Product Name	Product Type	Features
Trilithic	8821Q-R™	Spectrum Analyzer	Comprehensive digital signal quality tests provide alignment, troubleshooting and proof of performance testing to 1 GHz. Software package for remote operation, analysis and reporting; QAM analysis; MER, pre and post-FEC BER; equalizer tap graph; QAM EVS; group delay; automated FCC proof testing; optional tracking generator
Trilithic	8853Q™	Spectrum Analyzer	Expands on features in Trilithic's 8821Q-R, this 3 GHz spectrum analyzer spans CATV, satellite & broadcast markets and general-purpose testing and manufacturing. Additional features: expanded specifications to 8821Q-R; complete software package for remote operation, analysis and reporting; internal calibration; Internal pre-selection; RF IN moves to 75 Ohm N connector; replaceable battery.
Trilithic	860 DSPi™	Multifunction Digital Analyzer	Versatile capabilities range from installation to plant maintenance applications to 1 GHz. Integrates with workforce management systems for improved productivity. New features/options include CableLabs-certified DOCSIS 3.0 modem; DOCSIS 3.0 testing; auto test to limits for simplification, consistency and productivity; QAM in-channel spectrum with EVS and TrafficControl; FDR for drop cable testing.
Trilithic	Model Two™	Signal Level Meter	Provides a full complement of measurement functions: measures analog and digital carrier levels from 5 - 870 MHz; full scan, single channel and spectrum modes; tilt / favorite group level; displays the spectrum of the full reverse and forward paths; direct power measurement of QAM signals; learned channel Plans; data logging; voltmeter function.
Trilithic	Model Three™	Signal Level Meter	Features a range of tests for analog and digital channel measurements: 5 MHz to 1 GHz Frequency range; full scan, single channel and spectrum modes; digital channel measurements power, MER, pre-and post FEC BER including deep interleave; tilt/ favorite group level; data logging; limit tests; hum measurement; auto tests; voltmeter; optional constellation display.
Trilithic	Seeker Lite™	Signal Leakage Detection	Designed to verify that leakage within house is not great enough to contribute to the system's CLI. Measurements on up to ten selectable channels; sensitive, stable measurements; directional for leak location; stable, repeatable readings and built-in directional antenna; "cruise mode" offers continuous surveillance for long periods at reduced battery current.
Trilithic	Seeker™	Signal Leakage Detection	Ideal for efficient distribution leakage management. Displays numerical measurements of leaks on up to 10 selectable channels, emitting a tone proportional to leak strength; high-performance, frequency-settable leakage detector; ideal for drive-outs and leak location and troubleshooting; large numerical measurement display; sensitive, stable measurements; channel-tag compatible; data storage and upload for documentation.
Trilithic	Seeker GPSTM	Leakage Management System	Automatically monitors for leakage outbreaks and records the data with time and date stamp and the leak's GPS location. High performance, GPS-based management system; ideal for drive-outs, leak documentation and troubleshooting; totally automatic operation; leakage record uploadable via Internet or WiFi; compatible with various leakage management applications. Integrated with LAW server.
Trilithic	Seeker BB-2™	Leakage Management System	Automated GPS-based leakage detection system that operates in background while techs drive their routes, without any operator interaction. Ideal for drive-outs, leak documentation and troubleshooting; all vehicle electronics housed in tough aluminum enclosure; leakage record upload via WiFi or Internet to LAW central server analytical and processing application.
Trilithic	LAW™ Server	Leakage Management System	Collects leakage location data from seekers in the field, plots the data, marks the leakage source location as push pins on a map and automatically notifies the techs. Precision of patent-pending quadrangulation technology allows for prioritizing leak repairs and assigning technicians' time, eliminating the need for structured "drive outs" and identifying redundant leak reports.

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### XFTP by Trilithic ([www.trilithic.com](http://www.trilithic.com))

Company	Product Name	Product Type	Features
XFTP by Trilithic	TR-3 TM	Signal Level Meter	46 MHz – 1 GHz frequency range; six favorite channels; automatic tilt calculation; analog or digital power readings; single channel mode; single frequency mode tuned to any frequency (46 - 1000 MHz) in steps of 50 kHz, 100 kHz, 1 MHz, 10 MHz, or 100 MHz; favorites channel mode; standard NCTA channel plan
XFTP by Trilithic	Model Two TM	Signal Level Meter	Full complement of measurement functions: measures analog and digital carrier levels from 5 - 870 MHz; full scan, single channel and spectrum modes; tilt /favorite group level; displays the spectrum of the full reverse and forward paths; direct power measurement of QAM signals; learned channel plans; data logging; voltmeter function
XFTP by Trilithic	Model Three TM	Signal Level meter	Range of tests for analog and digital channel measurements: 5 MHz to 1 GHz Frequency range; full scan, single channel and spectrum modes; digital channel measurements power, MER, pre-and post FEC BER including deep interleave; tilt / favorite group level; data logging; limit tests; hum measurement; auto tests; voltmeter; optional constellation display.
XFTP by Trilithic	Seeker Lite2TM	Signal Leakage Detection	Numerical measurements on up to ten selectable channels; sensitive, stable measurements; directional for leak location; stable, repeatable readings and built-in directional antenna that simplify leak location; "cruise mode" offers continuous surveillance for long periods at reduced battery current.
XFTP by Trilithic	Searcher PLUS GTTM	Signal Leakage Detection	Used to control system leakage, perform proof of performance tests and to identify the small leaks that may warn of reverse ingress problems. Built for systems employing digital terminals that cannot tolerate "tagged" leakage carriers. Tests installations for excessive leakage; walks down the source of a leak; near-field preventative maintenance measurements; optional vehicle mount.
XFTP by Trilithic	Super PLUSTM	Signal Leakage Detection	Designed for the era of digital program services and overbuilt systems. Highly immune to "false alarms" from other signal sources. Responds only to carriers that have been "tagged" by a CT-2 or CT-3. Tests installations for excessive leakage in overbuilt areas; walks down the source of leakage; near-field preventative maintenance measurements.
Trilithic	LAW TM Server	Leakage Management System	Collects leakage location data from seekers in the field, plots the data, marks the leakage source location as push pins on a map and automatically notifies the techs. Precision of patent-pending quadrangulation technology allows for prioritizing leak repairs and assigning technicians' time, eliminating the need for structured "drive outs" and identifying redundant leak reports.

### VeEX Inc ([www.veexinc.com](http://www.veexinc.com))

Company	Product Name	Product Type	Features
VeEX	VePAL CX100, CX110	Installer Meter	SLM up to 1GHz; support deep interleave and constellation; ingress (forward/reverse); system scan and installation check for fast troubleshooting; 12 hours battery; color touch screen; electronic signature capture; 15sec power up time; (CX110 with DOCSIS 2.0 upranging)
VeEX	VePAL CX150	Installer Meter with DOCSIS 2.0	SLM up to 1GHz; supports deep interleave and constellation; DOCSIS 2.0 emulation/testing; ingress (forward/reverse); VoIP and CAT 3/5 testing; scan and install check for fast troubleshooting; 12-hour battery; color touch screen; electronic signature capture; 15 sec power up time.
VeEX	VePAL CX120	Meter/Upstream Generator	SLM up to 1 GHz; supports deep interleave and constellation; upstream generation of CW, QPSK, QAM16, QAM64, QAM 128 w/FEC; ingress (forward/reverse); other features, as above
VeEX	VePAL CX180	All-in-one Tool	Advanced spectrum analysis; optional DOCSIS and TDR testing. All other VePAL features.
VeEX	VePAL CX350	DOCSIS 3.0 Tool	Optional DOCSIS2.0 and/or 3.0 Testing; optional TDR testing; 8 hr battery; 7" color touch screen; 21sec power up time .Includes all other VePAL CX features.
VeEX	VePAL CX380	Spectrum, QAM/ MPEG tool	Advanced spectrum analyzer; QAM characterization; upstream generation and analysis of CW, QPSK, QAM16, QAM64 and QAM128 with FEC; MPEG evaluation; ASI Interface; optional DOCSIS testing; 8-hr. battery; 7" color touch screen; 21sec power up time
VeEX	CX180R	Return Path Monitoring	Spectrum analysis from 5 to 65 MHz, -40 to +55 dBmV; ingress scan detecting fast transient noise; return path QAM 16/64/128 with constellation; on demand tests without stopping monitoring function; 100-T Ethernet interface to CX180R server/controllers; secured access
VeEX	CX180F	Forward Path Monitoring	Monitors analog, digital TV channels and FM carriers; fast continuous scan of all active channels; on-demand channel camp-on; digital channel QAM 64/256 with constellation; on-demand ingress noise scan from 1 MHz to 1GHz; 100-T Ethernet interface to CX180F server/controllers.

### VGI Solutions ([www.vgisolutions.com](http://www.vgisolutions.com))

Company	Product Name	Product Type	Features
VGI Solutions	CPAT	Leakage Monitoring System	Automatically detects, records and dispatches signal leakage events without intervention from your field technicians. Automatic and fully agile frequency shifting for systems using multiple leakage frequencies. Wireless communication interface: WiFi 802.11 G - GPRS (option) - 1X (option). Dead-reckoning for urban canyon environment (option). Real-time vehicle position
VGI Solutions	DRV-02	Leakage Detection Meter	Digital receiver/demodulator. Agile from 120-155 MHz in 1kHz increments (Hi-band version) Agile from 109-110 MHz in 1kHz increments (Lo-band version). Supports channel tagging detection AM /FM (3 to 20Hz tones). 8 hours of continuous operation