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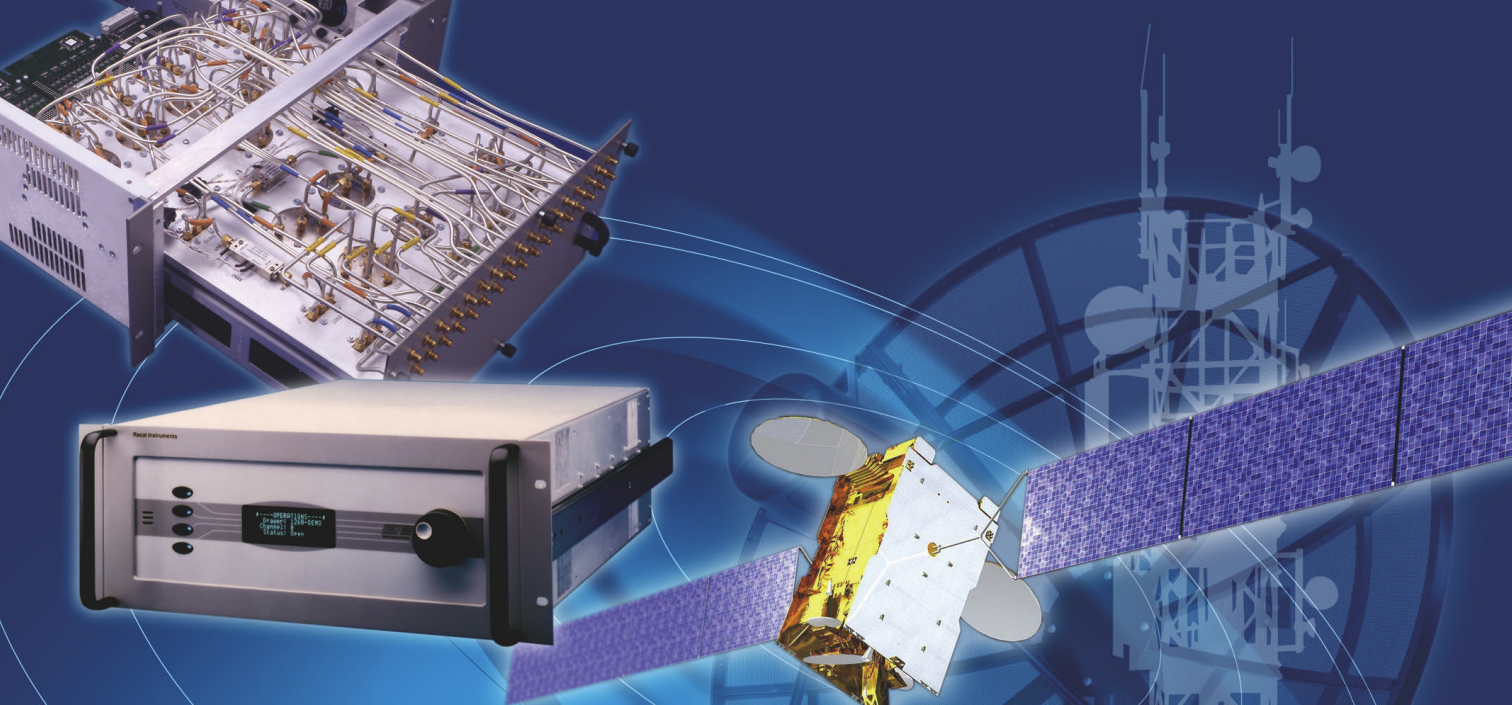
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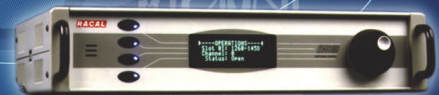
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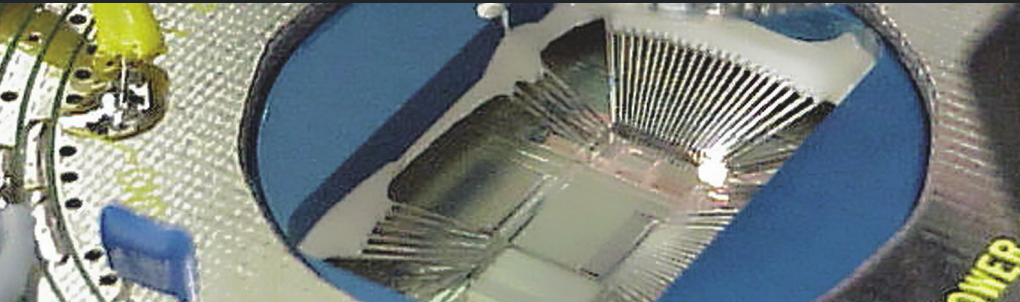
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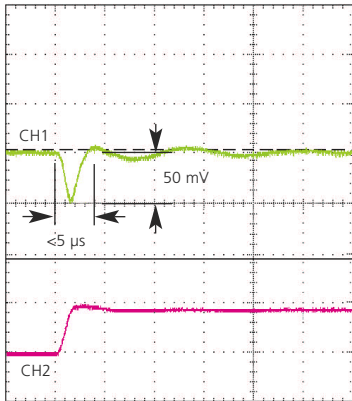


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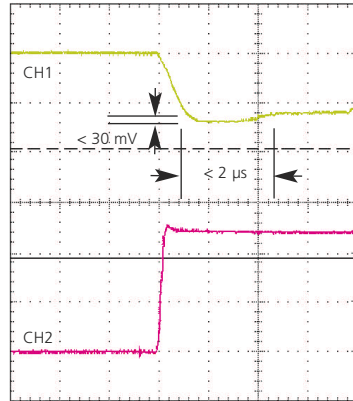


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A severe global recession has challenged the survival skills of many of the test field's premier companies.

By Lawrence D. Maloney,
Contributing Editor



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Check out these exclusive features on the *Test & Measurement World* Web site:

Microwave Week highlights student ingenuity

Students from across the globe gathered at the 2009 International Microwave Symposium to demonstrate their innovative approaches to the microwave industry in the student design competition at the show. This year's symposium offered two new design events: the Packaged Ultra-Wide-Band Filter Design Competition and the Low Noise Amplifier Design Competition.

Overall, 235 papers were submitted, 24 of which were selected as finalists. Read more about the program and the winners:

www.tmworld.com/ims2009_students

Take a T&M Challenge

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Blog commentaries and links

Taking the Measure

Rick Nelson, Editor in Chief

- June's gloom, Apple's Cook, Intel's brands, cybersecurity, and innovation
- Tax man hanging it up?
- Nokia exec touts open innovation at IMS

Rowe's and Columns

Martin Rowe, Senior Technical Editor

- Keep those legacy GPIB cards or upgrade?
- DTV transition complete

Engineering Education and Careers

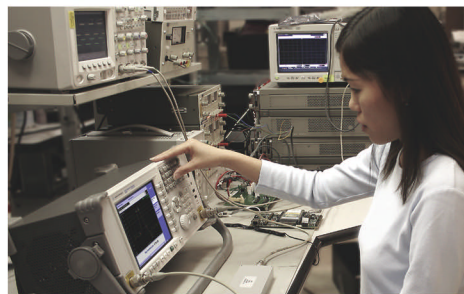
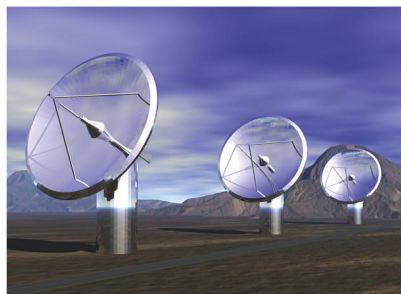
Jennifer Kempe, Contributing Editor

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- IEST welcomes young professionals
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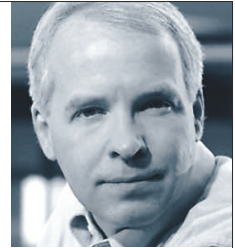
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RICK NELSON
EDITOR IN CHIEF



Students excel at microwaves

At *Test & Measurement World* and sibling publication *EDN*, we have commented frequently about the need for efforts to encourage students to pursue technical careers. Those efforts include the incorporation of STEM (science, technology, engineering, mathematics) programs within schools and such extracurricular activities as FIRST (Ref. 1). In addition, students who have already chosen to study technical fields must be encouraged to continue to do so with extracurricular activities that give them a chance to shine.

One such effort is EcoCAR: The NeXt Challenge, a three-year program in which stu-

Thanks are due to the MTT-S members who make the student programs possible.

dents re-engineer a 2009 Saturn VUE to improve fuel efficiency and reduce emissions (Ref. 2). In recent news from EcoCAR, students from Ohio State earned top honors at the 2009 finals for their EREV (Extended Range Electric Vehicle) design, powered by an E85-ethanol-fueled 1.8-l engine to offer an estimated 300% fuel-economy increase compared with the production four-cylinder vehicle. Over the next two years, teams will convert their designs to real vehicles.

Students also got a chance to demonstrate their engineering prowess at last month's IEEE MTT-S (Microwave Theory and Techniques Society) International Microwave Symposium, which challenged students to participate in three design competitions as well as the symposium's traditional student paper competition.

James Komiak of BAE Systems, who volunteers to help with the student program as a member of the MTT-S technical committee, told contributing editor Jennifer Kempe that he re-

gards the student paper competition as an asset to both the students and professionals, saying that over the years "the quality of the student papers has been just amazing in what they're achieving on a professional level. The program allows them to network and make contact with the judges, so it's an important step in their academic and future professional career" (Ref. 3).

Even within engineering, disciplines have to compete for student interest. As Komiak explained to Kempe, MTT-S members "observed a lot of student interest in computers, while microwave technology was being neglected." To revitalize student interest in microwaves, Komiak and other volunteers launched a student design competition as a means of engaging students with practical applications of design rather than mere theory. As Roger Kaul, a retiree of the Army Research Lab who judged this year's Low Noise Amplifier Design Competition, explained to Kempe, "It's very easy for students to make excuses if something doesn't function properly, saying 'well, in my lab we had different equipment,' but today no one complained at all...this is top-level stuff that they're doing, and the devices they came up with today were very impressive."

Thanks are due to Komiak and Kaul as well as the other MTT-S members for their equally impressive efforts in making the student programs possible. T&MW

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2. Nelson, Rick, and Jessica MacNeil, "Grooming the innovators of the future," *EDN*, November 13, 2008. www.edn.com/article/CA6608527.html.
3. Kempe, Jennifer, "IMS highlights student ingenuity," *Test & Measurement World*, June 24, 2009. www.tmworld.com/article/CA6666612.html.

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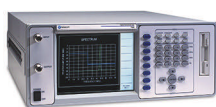


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[An exclusive interview with a test engineer]

Making the calculations

As a senior test automation specialist at Texas Instruments in Dallas, Martin Taylor writes software that tests the embedded software in the company's TI-Nspire line of scientific calculators. The educational calculators require functional testing, including a test of the graphical display. The same software used in the handheld calculators is also available for a PC or Mac. Martin Rowe spoke with Taylor by telephone to learn more about his work.

Q: How does testing a calculator differ from testing PC software?

A: Methods and tools for automated testing of PC and Mac software are generally available, but when testing embedded devices, every device is different. We need custom test-automation software. We create keystroke events in PC software and send them to the calculator under test over a USB link. We can control the calculator remotely through a test engine that's built into the device.

Q: How do you know the state of the calculator during a test?

A: We can upload an image of the screen to the PC. We used to use this to capture and analyze screen images, but now we upload an XML file that records the device's state.

Q: Why did you change the way you test the calculator's response to a keystroke?

A: The design of the user screen changes as we get feedback from teachers and students who use the calculator. To test a screen, we had reference images to which we compared test screen images. When the screen design changed, we needed to update the entire library of screen images. We also had to mask out portions of the screen image from our comparisons. For example, the battery indicator. You never know its state when you run a test. Using an XML representation of the device state, we can get the data we need without using screen images.



Q: Besides the user interface, do you test the calculator's functions?

A: We write special software builds for the embedded software developers to test internal functions. For example, we can run API (application programming interface) tests as well as functional tests. We have fully automated tests that we run on every software build to make sure that new software doesn't break existing functions.

Q: How do you generate test reports?

A: When we used screen images as part of our tests, we sent test results to HP Test Director software (formerly from Mercury Interactive). Now, we use an open-source tool called Robot Framework to control the test execution and generate reports in HTML format. We can drill down to individual tests and test steps with a browser. With open-source software, we can make our own upgrades and modifications whenever we want. We're not tied to releases of a commercial product.

Q: Does your test code run any diagnostics on the calculators?

A: We perform memory-leak analysis. We instrument the memory allocation and deallocation code on the device. The test code looks for suspect lines of code that don't release memory when they should. We produce charts and graphs of free memory over a long sequence of tests. T&MW



The online version of this article contains a link to a conference paper that Taylor wrote on memory-leak testing (www.tmworld.com/2009_07).

Every other month, we publish an interview with an electronics engineer who has test, measurement, or inspection responsibilities. If you'd like to participate in a future column, contact Martin Rowe at mrowe@tmworld.com. To read past "Test Voices" columns, go to www.tmworld.com/testvoices.

Noisecom, Rohde & Schwarz demo 60-GHz noise-figure measurement

At the IEEE MTT-S International Microwave Symposium in June (see p. 13), Noisecom and Rohde & Schwarz demonstrated a system for making Y-factor noise-figure measurements in the 60-GHz frequency range. Noisecom, a division of Wireless Telecom Group, contributed its new noise-figure test set for the 60-GHz wireless communications band. Rohde & Schwarz contributed its R&S FSU67 spectrum analyzer, which provides continuous coverage from 20 Hz to 67 GHz, thereby eliminating the need for hardware such as harmonic mixers to cover the measurement frequency range. Rohde & Schwarz also provided its R&S FS-K30 noise-figure option.



Firmware in the R&S FSU67 controlled the Noisecom test set, and the R&S FS-K30 noise-figure software simplified collection of the measurement results. The DUT (device under test) was a SiGe BiCMOS 60-GHz superheterodyne receiver IC that operates from 57 GHz to 64 GHz and has an onboard image-reject filter, a 9-GHz IF filter, a frequency synthesizer, a low-noise preamplifier, and programmable IF gain blocks. Noisecom's 60-GHz noise figure test sets come in two versions: the NC5115-60G has a waveguide flange, while the NC5115-60GT has a coaxial transition. The sets consist of precision noise sources that cover the 60-GHz band, isolators for optimal VSWR match, and very low noise amplifiers with 30-dB gain to increase the DUT output if it is too low for direct measurement. The noise source delivers 17.5-dB excess noise ratio. www.noisecom.com; www.rohde-schwarz.com.

OSU takes gold in 2009 EcoCAR challenge

Students from The Ohio State University took first place at the 2009 finals of the EcoCAR: The NeXT Challenge competition held in June in

Toronto, ON, Canada. The competition, which just finished the first year of a three-year process, challenges engineering students from 17 universities in North America to re-engineer a 2009 Saturn VUE to improve fuel efficiency and reduce emissions while

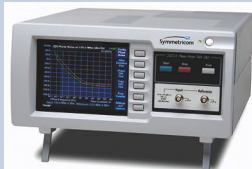
retaining performance and consumer appeal. The competition is being sponsored by General Motors, the U.S. Department of Energy, the Government of Canada, and numerous other organizations and vendors.

For the first year of the competition, students were charged with creating innovative vehicle designs, and they used advanced modeling tools to simulate real-world conditions in order to test and refine their designs. The teams were encouraged to explore various fuel-saving options, such as hybrids, plug-in hybrids, fuel cells, and EREVs (Extended Range Electric Vehicles). In year two, the students will incorporate their powertrains into the Saturn VUE, and in year three, they must refine their vehicles to near-showroom quality.

The OSU team took the gold in the 2009 finals for its design of an EREV that is powered by a 1.8-l engine and fueled by E85 ethanol; the EREV is predicted to provide a 300% increase in fuel economy over the four-cylinder VUE. Second place went to students from the University of Victoria, who also proposed an EREV that runs on E85 ethanol. The Mississippi State University team took third place for its EREV that uses B20 biodiesel. www.green-garage.org; www.ecocarchallenge.org.

Measure phase noise and Allan deviation

The Model 5125A phase noise and Allan deviation test set from Symmetricom lets you characterize signal sources at frequencies from 1 MHz to 400 MHz, and the unit's low noise floor lets you measure signals down to -130 dBc/Hz at 100 MHz. The digital front end digitizes the signal, which makes the frequency downconverters and phase detectors that follow entirely digital. Because of that, internal frequency synthesizers can create a reference signal, which need not have the same frequency as that of the device under test. The instrument can measure phase noise with an accuracy of ± 1 dB. Input signal amplitude can range from 3 dBm to 17 dBm.



The 5125A can measure Allan deviation of less than 3^{-15} in 1 s from 10 MHz to 400 MHz with a 0.5-Hz bandwidth.

Allan deviation is a metric for short-term stability, and the 5125A can measure it for more than 300 days. The instrument can plot frequency and phase vs. time, and its frequency counter displays 13 digits of precision in 1 s. (To learn more about how the 5125A works, you can read an interview with Dr. Sam Stein of Symmetricom in the online version of this article, www.tmworld.com/2009_07).

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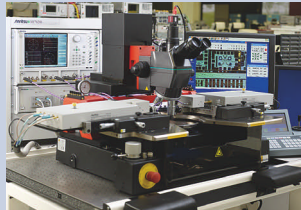
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VNA operates to 110 GHz and beyond

Anritsu's VectorStar Broadband ME7828A vector network analyzer system operates over the frequency range of 70 kHz to 110 GHz. VectorStar now offers dynamic-range improvements of up to 30 dB compared with previous systems. The ME7828A also incorporates the fast switching speed of Anritsu's MG37022A sources to produce a sweep speed of 120 ms for 201 points. It accommodates 100,000 points in a single channel to support time-domain analysis. To facilitate on-wafer environments, the ME7828A delivers calibration and measurement stability that is typically 0.1 dB over a 24-hr period.



Two configurations are available. The standard ME7828A provides basic measurement capabilities for active device testing. The ME7828A-012 delivers additional performance for active device testing, time-domain analysis, and device characterization. Both configurations are compatible with existing Suss and Cascade probe stations and appropriate positioners.

The ME7828A system can be configured with a range of banded millimeter-wave modules that extend the frequency range to 500 GHz. A variable attenuator in the millimeter-band modules for both configurations allows matching power of the two bands for a smooth transition when measuring active devices in the forward and reverse directions.

Base price: \$393,470. Anritsu, www.us.anritsu.com.

Editors' CHOICE

Vendors team up on structural test

Geotest - Marvin Test Systems and JTAG Technologies have announced that Geotest will be offering preconfigured PXI test systems that incorporate JTAG Technologies' JT 37x7/PXI boundary-scan controller. Included with the boundary-scan test option is JTAG Technologies' high-level driver suite for Geotest's ATEasy software, which facilitates integrating boundary-scan applications as part of a functional test strategy. The preconfigured GBATS (Geotest Basic Automated Test System) offers functional and structural test methods in a PXI-based platform and also provides high-throughput, in-system programming for flash memories and programmable logic devices.

Mike Dewey, Geotest's senior marketing product manager, said, "Combining functional and boundary-scan test methods is a test strategy that we see more and more users adopting.

Our partnership with JTAG Technologies is a natural fit for providing customers with solutions that meet these demands and address the need for test coverage and throughput, particularly for boards with limited test access." www.geotest.com; www.jtag.com.

CALENDAR

EMC Symposium, August 17-21, Austin, TX. *IEEE EMC Society*, www.emc2009.org.

Autotestcon, September 14-17, Anaheim, CA. *IEEE*, www.autotestcon.com.

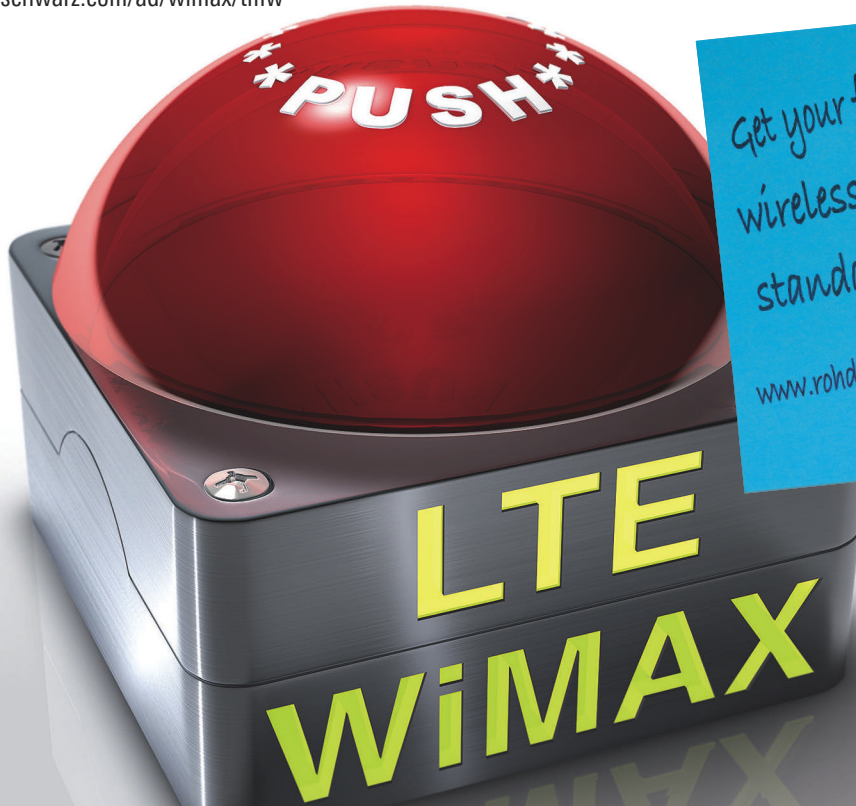
International Test Conference, November 1-6, Austin, TX. *IEEE*, www.itctestweek.org.

To learn about other conferences, courses, and calls for papers, visit www.tmworld.com/events.

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Wireless and energy take the lead

>>> Sensors Conference and Exposition, June 9–10, Rosemont, IL, www.sensorexpo.com.

Last year, “wireless sensor networks” was the hot phrase at Sensors Expo. This year, “energy harvesting” joined the fray. Several technologies for energy storage appeared in 2009. In 2008, energy harvesting wasn’t even listed as a product category in the show directory. This year, the new category consisted of 14 companies.

Companies such as **Cymbet** exhibited ICs that use thin-film batteries to store energy. Batteries and capacitors can be charged by electronic or mechanical means, including RF energy. Using an RF transmitter, receivers from **Powercast** convert RF energy into DC to charge capacitors embedded in products.

Data-acquisition equipment held its own in 2009, and there was one new entry: **VTI Instruments**. The company exhibited its LXI-compliant EX1266 multifunction measurement and switching system, which combines a DMM (digital multimeter) with multiplexer modules for voltage or temperature measurement. **National Instruments** introduced the NI9213, a

16-channel temperature module for its CompactDAQ, CompactRIO, and wireless modular data-acquisition systems.

Pico Technology exhibited its line of USB oscilloscopes, with two or four channels and 8-bit or 12-bit resolution. **Yokogawa** exhibited its MV2000 series paperless data recorder, DML2000 mixed-signal oscilloscope, and WT500 power analyzer.

OriginLab demonstrated Origin 8 data-analysis and graphing software for engineers and scientists. **HBM** exhibited the former LDS/Nicolet GEN5i data-acquisition system that samples at 100 Msamples/s.

The conference consisted of several technical tracks. On the wireless track, Charlie Stiernberg of National Instruments presented “Understanding IT Network Security for Wireless and Wired Measurement Applications.” Stiernberg covered network topology and protocols and explained how measurement equipment can connect to corporate networks. **T&MW**



Yokogawa's DML2000 mixed-signal oscilloscope was on display at the 2009 Sensors Expo.

Courtesy of Yokogawa.

From microwave microscopy to 110-GHz analysis

>>> International Microwave Symposium, June 7–12, Boston, MA, IEEE MTT-S, www.ims2009.org.

Keithley Instruments highlighted its Model 2820A RF vector signal analyzer and debuted its Model 2891-IQ upconverter. **Agilent Technologies** demonstrated nonlinear measurements and scanning microwave microscopy. **AWR** introduced its AWR Connected for Rohde & Schwarz software.

Rohde & Schwarz demonstrated the use of coherent sources to make balanced device measurements, a nonstandard OFDM (orthogonal frequency-division multiplexing) modulation capability, and a group-delay measurement technique that doesn't require local-oscillator access. It also, in conjunction with **Noisecom**, demonstrated noise-figure measurements at 60 GHz (p. 10). **Boonton**, Noisecom's Wireless Telecom Group sibling, introduced the 59318 peak power sensor, which is optimized for its 4540 and 4500B peak power meters.

Giga-tronics touted its 2500B series microwave signal generators, which cover the 100-kHz to 50-GHz frequency range and deliver a fast switching speed, typically less than 500 μ s for a 1-GHz step. **National Instruments** demonstrated its NI Measurement Suite for Fixed WiMAX (IEEE



The Model 2820A RF vector signal analyzer provides a 40-MHz signal-acquisition bandwidth with a frequency range of either 400 MHz to 4 GHz or 400 MHz to 6 GHz. Courtesy of Keithley Instruments.

802.16-2004). **Anritsu** expanded its VectorStar VNA's coverage to 110 GHz, introduced four-port test sets, debuted 18-GHz USB power sensors, and highlighted handheld VNAs that operate to 20 GHz.

Tektronix featured a range of products, addressing radio communications, spectrum management, radar, electronic warfare, amplifier characterization, and ultrawideband applications. It partnered with **Mesuro** to highlight nonlinear measurements. **Aeroflex** expanded its PXI test platform with the 3021C and 3026C RF signal generators, which offer +17-dBm outputs. **Crystek** highlighted its RFPPO (RF Pocket

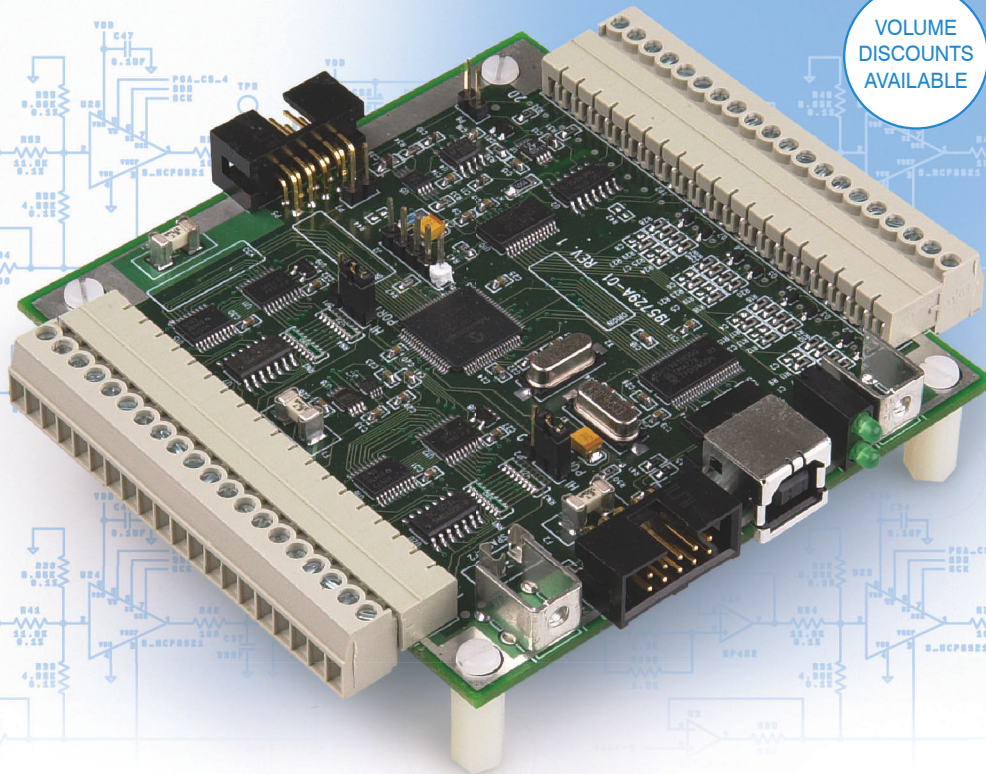
Reference Oscillator) series, which integrates a SAW (surface acoustic wave) oscillator in an SMA housing to deliver 500-MHz and 1-GHz outputs. **Centellax** previewed a 10-MHz to 50-GHz power amplifier. **W.L. Gore** announced that Richardson Electronics will sell Gore's high-performance line of test and measurement microwave/RF cable assemblies. **T&MW**

See the online version of this article for more details about the products exhibited at IMS: www.tmworld.com/2009_07.

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Firms address microwave challenges

Exhibits at last month's IEEE MTT-S International Microwave Symposium (IMS; see p. 13) ran the gamut from design and simulation through high-speed production test.

On the design side, IMS newcomer Synopsys previewed its Galaxy Custom Designer 2009.06

release, which the company introduced a week after the show. Ed Lechner, director of product marketing for custom design at Synopsys, said in an interview at IMS that the

product builds on the Custom Designer version the company released last September to increase productivity for custom designs in an open environment as process geometries shrink below 45 nm.

Custom Designer provides hierarchical mixed text and schematic representations, and it supports cross-probing and schematic annotation with simulation results. It forms the basis of a complete implementation, verification, circuit-simulation, and analysis flow, integrating with other Synopsys tools such as HSpice RF, which supports harmonic-balance and shooting-Newton techniques for analysis of weakly and strongly nonlinear devices, respectively. It also supports envelope analysis for complex modulated RF waveforms and S-parameter analysis for small-signal, linear components.

On the test side, Aeroflex announced it has expanded its PXI test platform with the addition of two 3020 Series RF signal generators that target R&D, design verification, and manufacturing test of RF components and systems. The addition of the 3021C and 3026C extends the output power range of the 3020 Series to +17 dBm for frequencies up to 3 GHz and 6 GHz, respectively.

In addition, Giga-tronics highlighted its new 2500B series 50-GHz micro-

wave signal generators, which deliver a fast switching speed of typically less than 500 μ s for a 1-GHz step and as fast as 100 μ s for small steps—thereby facilitating high-throughput test applications. Sales and marketing VP Malcolm E. Levy said that the instruments



The 3020 Series PXI instruments include integrated dual-channel arbitrary waveform generators and target R&D, design verification, and manufacturing test of RF components and systems.

Courtesy of Aeroflex.

switch more than 10 times faster than their nearest low-noise competitors.

In the microwave world, you won't find the automated test-generation tools that you find in the digital world to assist in production test. Neverthe-

less, design and test companies are working together.

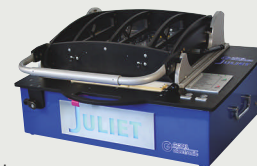
A pioneer in that area is Agilent Technologies, which has established links between its line-up of instruments and its Advanced Design System microwave design and simulation tool. At this year's show, Agilent highlighted nonlinear measurements. Also at the show, EDA firm AWR introduced its AWR Connected for Rohde & Schwarz, which integrates the capabilities of R&S WinIQSIM2 simulation software within AWR's Visual System Simulator (VSS) software to support cross-domain analysis. Earlier this year, AWR and Anritsu announced that AWR's Microwave Office design software ships with Anritsu's 70-GHz VectorStar MS4640A vector network analyzers. At IMS, Anritsu debuted its 110-GHz VectorStar Broadband ME7828A vector network analyzer, which also supports Microwave Office. **T&MW**

Maxim selects Teradyne DC80

Teradyne reports that Maxim Integrated Products chose a microFLEX test system with Teradyne's new DC80 instrumentation to test automotive sensor devices. The DC80, a high-density option for high-voltage and low-current requirements, can test automotive controllers as well as other power devices. It is available on the FLEX and microFLEX systems. www.maxim-ic.com; www.teradyne.com.

Boundary-scan production tester

Goepel electronic's Juliet (JTAG UnLimItEd Tester) integrated stand-alone production tester combines test electronics and mechanics in a compact system that interfaces to an exchangeable adapter and supports fast changeover to accommodate different units under test. The desktop system is available in base and standard versions, with differences in the number of available I/O channels (120 and 240) and TAPs (two and four) as well as in the scan performance (16 MHz and 50 MHz). www.goepel.com.



STS installs Diamond systems

LTX-Credence and Silicon Turnkey Solutions (STS) have announced a business agreement that includes the selection of the Diamond platform as STS's preferred test platform for what STS calls "value-driven" devices. STS chose the Diamond platform to achieve low production test costs. STS has installed multiple Diamond systems, which are available for program development and production test services. www.ltx-credence.com; www.sts-usa.com.

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When robots meet vision

Adding machine vision to a production process presents a big enough challenge to most engineers, but what happens when you combine vision with robotics?

The answer, obviously, is that it's no walk in the park, yet more and more companies are pairing the two technologies. Adept Technology, a Pleasanton, CA, company that has shipped more than 25,000 robots in its 26-year history, reports that about 40% of its applications pair robotics and machine vision. That's up from 30% just two years ago.

Behind this increase, said Adept senior systems engineer Travis Armstrong, is the surge in flexible manufacturing, where robots reduce the need for changes in expensive fixtures as production lines adapt to accommodate a wider mix of products. "Once you've introduced the robot," explained Armstrong, "it's a logical step to include machine vision to inspect a part, often at the point where the robot is loading or unloading a component."

About 20% of Adept's robot/vision applications involve electronics. The company's vision-guided Python electrostatic dissipative robots feature a linear module design that can be configured to fit applications that are sensitive to electrostatic discharge, such as disk-drive alignment.

Adding machine vision to robotics can also provide new insights on ways to improve a manufacturing process. Armstrong said that's especially true for emerging industries like solar energy, where companies are experimenting with a broad variety of processes. Adept's Quattro robot, introduced just last year, is already making a major impact on that market, with some 300 robots already installed.

With its four fixed axes, Quattro typically mounts on a rigid overhead frame above one to four conveyor belts. Its integrated vision system locates the parts on moving belts, and the robot decides when to pick up the part by tracking it through a belt pick-up window. The robot can pick up parts at the rate of up to 180 per minute.

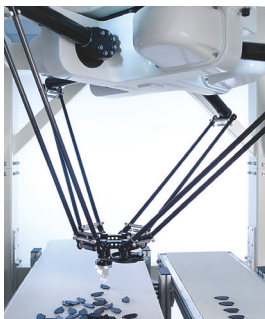
In most cases, said Armstrong, companies tend to think about robotics first, and then begin to consider whether it's beneficial to include vision. As for costs, adding vision to a process involving one robot increases total expenses by 10 to 15%, estimated Armstrong. But that percentage drops as you introduce more robots and cameras, since initial software and setup costs are spread over more components.

But cost, though important, is not the main reason some companies still balk at choosing a robotics/vision solution. "The biggest stumbling block is the perceived complexity of integrating these two technologies," said Armstrong.

To ensure a successful marriage of these tech-

nologies, Armstrong pointed out, companies must make the right choices on cameras, lenses, and lighting—and carefully define such parameters as pass/fail criteria in inspection applications. Even more important, said Armstrong, is the smooth integration of the robot's motion-control system with the software that commands the vision system. Adept believes it has solved that challenge with a closely linked turnkey solution: Its SmartController CX for motion and its PC-based AdeptSight software for vision. **T&MW**

Read past Tech Trends columns at www.tmworld.com/techtrends.



Featuring an integrated vision system, the Adept Quattro robot first locates parts on a conveyor belt and then transfers them to another belt at speeds of up to 180 parts a minute.

Courtesy of Adept Technology.

Smart camera offers dual functions

The Microscan VisionScape smart camera combines machine-vision and auto-ID technologies in a single, cost-effective device for monitoring quality and tracing parts throughout production. Providing optical character recognition and verification, the camera can read bar codes, 2-D symbols, and direct part marks. Built-in communications protocols and I/O make for easy interface to a PLC or PC. www.microscan.com.

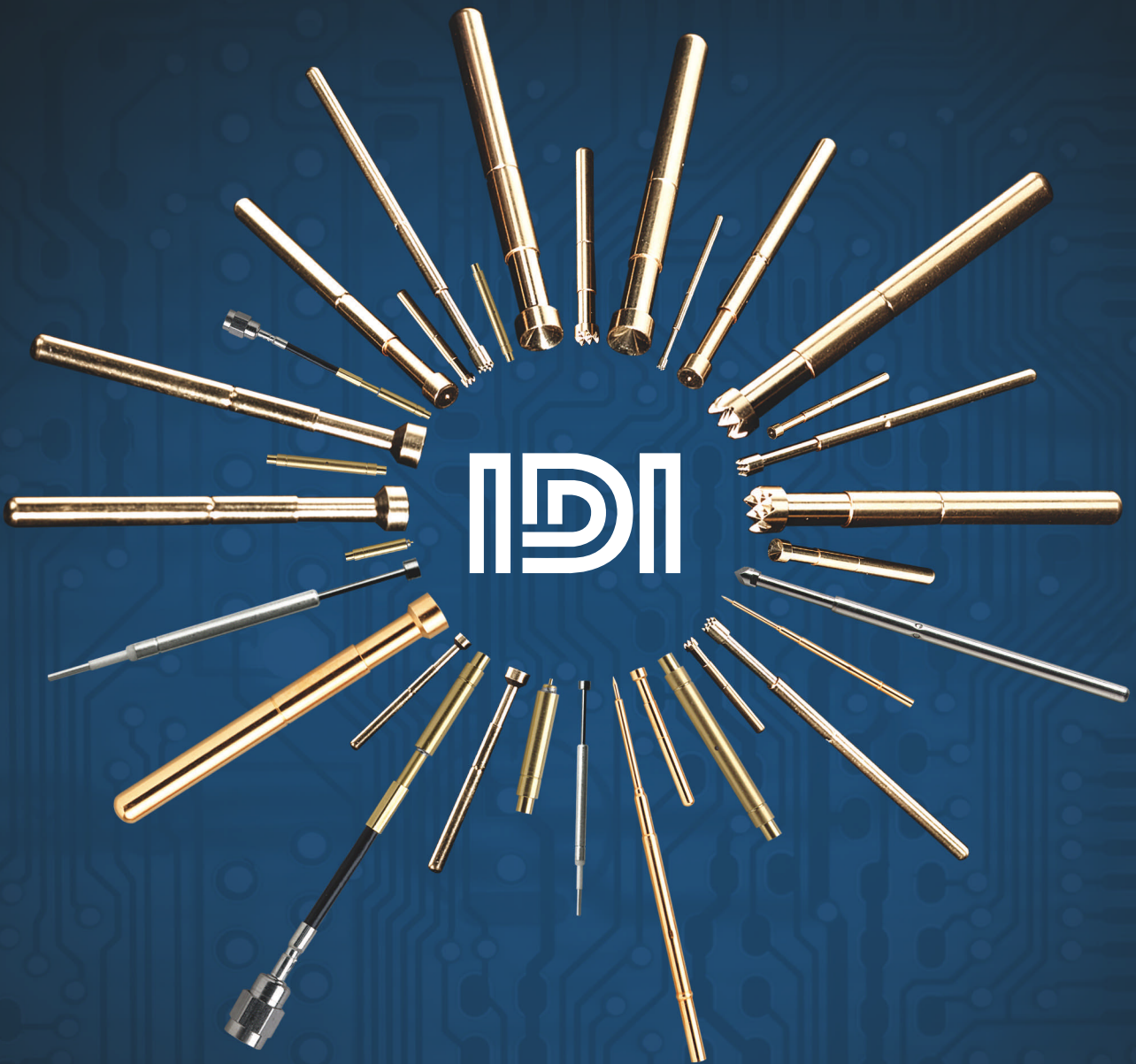


Vision system in a box

V-Series controllers from WSP Technologies can operate with up to four cameras and four sensors. A companion Station Master interface lets the operator define an unlimited number of part configurations, and a series of menus defines control logic, vision locations, and operational sequence. The recently introduced V 4000 model integrates Cognex VisionPro and IPD Sherlock software right in the controller. www.wsptechnologies.com.

Energy-stingy LED boasts long life

Schott North America's new LLS (LED light source) line for machine vision produces nearly twice the light intensity of the previous generation, yet consumes less than 25 W of power and provides up to 50,000 hr of service. An internal feedback function delivers stabilized light output for demanding applications. The LED fits all standard ColdVision light guides. www.us.schott.com.



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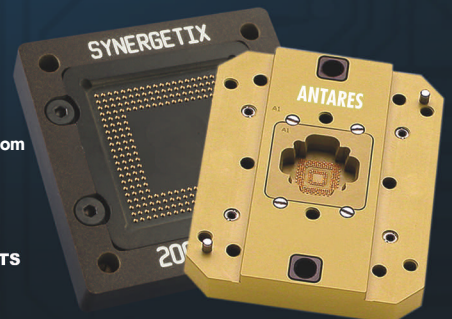
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Weathering the **STORM**



BY LAWRENCE D. MALONEY, CONTRIBUTING EDITOR

Like many sectors of the economy, the electronics test industry started the year 2008 battling very choppy business seas and ended it facing something resembling a perfect storm, as the global economy tanked following the October stock market plunge.

Last year saw sharp cutbacks in semiconductor production—a slide that continues in 2009—causing huge revenue losses at major ATE (automated test equipment) companies serving that industry. In response, most ATE firms early this year announced layoffs, executive salary cuts, and other cost-containment programs aimed at keeping their companies afloat.

In fact, outside of the communications market, it was difficult to find a sector of the test market that showed healthy gains in 2008. “With a virtual halt in global manufacturing in late 2008 and early 2009, the test field has experienced an unprecedented period of decline, even worse than occurred in 2001 and 2002 following the tech bubble,” said John Harmon, an analyst with Needham & Com-

Advantest has aimed its T2000 platform at the next generation of mobile internet devices.



pany. Even so, Harmon noted that electronics test came “roaring back” in 2003 from depressed conditions, and he sees the beginnings of recovery in 2010 and the chance for a solid year in 2011.

Tightening their belts

That hopeful scenario can't come soon enough for Advantest, the world's perennial semiconductor ATE leader. Customer orders in the October to December 2008 quarter fell more than 70% from the same period in 2007. For the fiscal year ending March 31, 2009, the Japan-based firm reported sales of \$780 million, down 57% from the prior year's tally (see **table**). To ensure profitability, the company in recent months has reduced payroll from 4600 employees to 3400, trimmed executive compensation by more than 50% and middle manager pay by up to 20%, and eliminated bonuses. These and other belt-tightening steps are expected to save about

\$255 million in annualized costs.

Looking ahead, Keith Lee, president of Advantest America, said that demand for mobile handsets, especially smart phones, will be a major driver in the next upturn. “The increasing complexity of these products is predicted to

ISTOCKPHOTO IMAGES

stimulate the market later this year,” said Lee. “Our T2000 family is well positioned for testing the next generation of mobile Internet devices.”

Advantest is continuing to diversify beyond its semiconductor memory test equipment to include SOC (system-on-chip) testers, as well as “total solutions” for customers, a strategy that embraces the test system itself, the handler interface, and software. The company also is broadening its market focus, with the acquisition in 2008 of Credence Systems GmbH, a manufacturer of automotive semiconductor test equipment that was a division of Credence Europa, a UK-based subsidiary of Credence Systems Corp.

Frost & Sullivan test industry manager Sujan Sami predicted that Advantest will emerge from the current downturn as the dominant player in semiconductor memory test, but he also sees continuing consolidation in semiconductor ATE. Prime example: the 2008 merger of LTX and Credence Systems Corp. “Five years ago, you had 10 major companies in the field,” said Sami. “Now, there are five.”

In 2008, Teradyne surpassed Advantest in revenues, in part because of the acquisition of two other ATE firms, Eagle Test and Nextest Systems. Teradyne VP Andrew Blanchard noted that



Agilent cites its PXB MIMO receiver tester as one of its most significant new products of 2008.

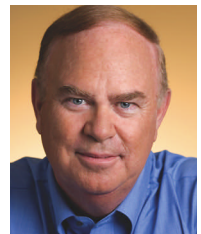
the Nextest Magnum II system, introduced last year, helped Teradyne more than double its market share in the flash memory test market. Among other important new products Blanchard cited is the UltraWave 12G, which he said offers the most economical solution for complex RF SOCs, in terms of cost per test.

“Across the board, our product line-up is stronger than it has ever been,” added Blanchard. Even so, facing sluggish demand, Teradyne in January announced a 14% cut in its work force and a temporary 10% reduction in employee salaries.

Verigy, the firm established in 2006 when Agilent Technologies spun off its semiconductor test business, reported a 9% revenue drop in 2008 and is countering the troubled economy with cost-containment measures amounting to nearly

\$100 million on an annualized basis. But like Advantest, the company expects a healthy boost moving forward from consumer electronics, including low-end cellphones in China, smart phones, and netbooks.

Verigy CEO Keith Barnes pointed to the V93000 platform, equipped with the PortScale RF option, as ideally suited for testing highly integrated digital devices with multiple RF ports. Also expected to capture more business for Verigy: the V6000 memory test platform introduced in late 2008 and aimed at the flash memory and DRAM markets. Said Barnes: “The V6000 is versatile and scalable across the entire semiconductor memory test process, including engineering, wafer sort, and final test.”



Verigy CEO Keith Barnes: A business boost from consumer electronics.

Top 10 test and measurement companies in revenue (publicly traded companies)

COMPANY	2008 RANK	2007 RANK	2008 REVENUES (MILLIONS US\$)	2007 REVENUES (MILLIONS US\$)	PERCENT CHANGE
Agilent Technologies	1	1	3,479.0 ¹	3,415.0	+1.8
Tektronix	2	3	1,173.0 ²	1,105.0	+6.1
Fluke/Fluke Networks	3	5	1,127.0 ²	1,091.8	+3.2
Teradyne	4	4	1,107.0 ³	1,102.2	Flat
Anritsu	5	6	854.5	1,005.0	-14.9
National Instruments	6	8	820.5	740.3	+10.8
Advantest	7	2	780.8	1,824.0	-57.1
JDSU	8	9	710.6	619.2	+14.7
Verigy	9	7	691.0	761.0	-9.2
Spirent Communications	10	NA	477.1	434.1	+9.0

¹Agilent’s revenues include only electronic measurement operations. Instrumentation for bio-analytical measurement totaled \$2.3 billion in 2008.

²In late 2007, Tektronix became part of Danaher, also the parent of the Fluke companies. Danaher reported \$2.3 billion from electronic test in 2008, but does not break out individual figures for Tektronix and Fluke. Figures for 2008 are analyst estimates and also include new acquisitions by Fluke.

³Teradyne’s 2008 figures reflect the acquisitions of Nextest Systems and Eagle Test.

Note: Rohde & Schwarz, a privately held company, reported annual sales of 1.4 billion euros in the fiscal year ending June 2008.

Targets of opportunity

Outside the semiconductor ATE field, Agilent, by far the test industry’s largest company with nearly \$3.5 billion in revenues in 2008, notched a modest 1.8% increase in electronic measurement sales last year. Contrast that with the 17% jump in revenues for its bio-analytical instrument business, which analysts say offers far more growth potential for Agilent.

Following a 16% decline in revenues in its fiscal quarter ending January 31, 2009, Agilent announced restructuring moves, including a reduction of 600 jobs and the closing of its automated optical inspection and automated x-ray inspection businesses.

“Electronic measurement won’t perform very well for Agilent in 2009,” said senior research analyst Sivakumar Narayanaswamy of Frost & Sullivan, “but that field is one of Agilent’s core competen-

cies, and the company will find new business as the economy recovers.”

Ron Nersesian, general manager of Agilent’s Electronic Measurement Group, named several promising application areas, including: aerospace/defense modernization, home security, surveillance, alternative energy, R&D for next-generation wireless devices, and MIMO (multiple input, multiple output) antenna technology. He added that product innovation continues, despite the tough economy, with such significant 2008 introductions as the PNA-X network analyzer and the PXB MIMO receiver tester.

Perhaps the most formidable challenger to Agilent is Danaher, whose electronic test businesses include Tektronix, acquired in late 2007, and the Fluke companies. Tek, known for its high-performance instruments, and Fluke, a dominant player in handheld test devices, combined for \$2.3 billion in sales for 2008.

While some analysts argue that Tek will lose some of its innovation edge as part of a Danaher empire known for hard-nosed business practices, others believe that the Danaher name will give Tektronix a greater global reach. “Tektronix will benefit from Danaher’s purchasing and back-room business, and there are some interesting synergies with Fluke as well,” observed analyst Agit Pai of Thomas Weisel Partners. “That puts Tek in a better position to innovate.”

Discussing promising applications, Martyn Etherington, VP of worldwide marketing for Tektronix, noted that “our customers continue to need support with standards compliance, which is why we believe high-speed

serial applications will experience another wave of growth as the economy recovers.” Embedded system designers also are under pressure to improve energy and power efficiency, he added. Such applications, he said, will fuel demand for real-time spectrum analyzers, signal source products, and oscilloscopes, such as the DPO3000 family of mixed-signal scopes introduced in 2008.

Meanwhile, sister company Fluke hopes to capitalize on customer desires to curb costs, especially in energy. “We



Fluke president Barbara Hulit points to more synergies with Tektronix, now that both companies are under the Danaher umbrella.

have a full suite of solutions to address energy conservation within the context of product design and equipment maintenance, as well as for sustainability and reduction of downtime,” said Fluke president Barbara Hulit. Besides its core products, such as the new 287 digital multimeter, Fluke is focusing more on thermal-imaging products, which electrical contractors use for predictive maintenance and troubleshooting. To expand its thermal line, Fluke acquired Hawk IR in late 2008. Among other strategic moves, Hulit pointed to joint projects with Tektronix in marketing and product development.

Riding the communications wave

Elsewhere in the test market, more firms are depending on the communications market to spur future growth. Although its \$854 million in sales for fiscal year ending March 31, 2009, represented a 15% decline from the prior year’s total, Japan’s Anritsu remains one of the world’s dominant firms in mobile broadband, including 3G, WiMAX, HSPA+ (high-speed packet access), and LTE (long-term evolution). “Expansion is

hard to gauge in this economy,” said company president Hiromichi Toda, “but consistent orders are happening as expected.”

As examples of key products for broadband, Toda cited the new MD8430A signaling tester for LTE development, as well as Anritsu’s line of cable, antenna, and base-station analyzers. The company’s spectrum analyzers target not only the wireless infrastructure market, but also military, homeland security, and public safety applications.

Two other Top 10 test companies—JDSU and Spirent Communications—have parlayed a concentration on communications test into healthy growth, even in a down market. In its fiscal year ending June 30, 2008, JDSU grew revenues by nearly 15% to \$710 million. “Consumer and business communications patterns are creating demand for test solutions that support the cost-effective, reliable deployment of video and other broadband services, Ethernet, wireless backhaul, and 10/40G technologies,” said Dave Holly, president of JDSU’s Test and Measurement business segment. “We delivered a number of innovative instruments and solutions addressing these customer needs in fiscal 2008.”



Bill Burns, Spirent’s CEO, sees plenty of opportunity providing test solutions for broadband networks.

Among notable 2008 product introductions was JDSU’s T-BERD 4000, which provides an all-in-one field solution for testing fiber, copper, and triple-play services. Another new launch, the T-BERD 6000A, is touted as the industry’s most compact 10-GigE field tester. Such products, according to JDSU, help cable and telecom firms maintain the quality of service that consumers demand in a highly competitive market.

Spirent, new to the Top 10 list in 2008 with \$477 million in revenues, grew by 9% last year, largely on the strength of its test platforms for broadband networks. The modular design of the company’s TestCenter lets custom-

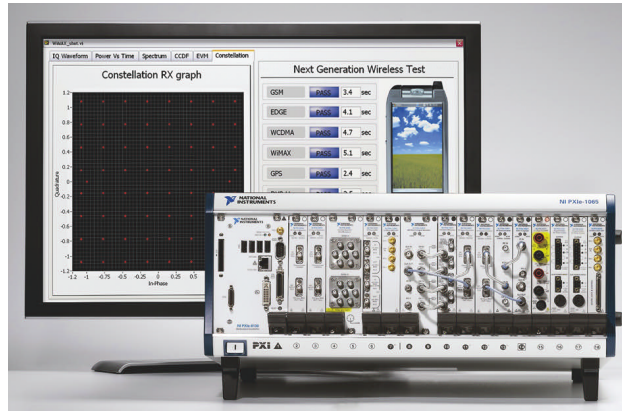


JDSU’s T-BERD 4000 provides an all-in-one field solution for testing fiber, copper, and triple-play services.

ers conduct automated tests as they migrate from existing technologies to new networks. For example, the new TestCenter HyperMetrics modules offer a scalable platform for conducting 2- to 7-layer, multiplay testing through a single 1-Gbit or 10-Gbit port. In addition, the company claims that it has introduced the first FCoE (Fibre Channel over Ethernet) test solution to validate next-generation data centers.

Said CEO Bill Burns: "Enhancements in 2008 to TestCenter have helped our largest customers as they conduct high-performance testing to subject next-generation Ethernet solutions to scalable real-world scenarios."

Solving such emerging test challenges with innovative products will



National Instruments introduced 150 new products in 2008, including its PXI Express 6.6-GHz RF modular instruments.

be the catalyst for putting the electronics test industry back on the growth path again, analysts say. As evidence of the payoffs from relentless R&D, Pai of Thomas Weisel cited the steady growth of National Instruments over three decades.

National Instruments introduced 150 new products in 2008, including its PXI Express 6.6-GHz RF modular instruments. In the process, the company increased its sales by nearly 11% to \$820 million, moving NI from eighth to sixth among the test industry's Top 10 public companies. Also helping to fuel that growth: products that go beyond the test field, including automation control and simulation for product development.

"The wide range of applications we serve gives us a broad customer base and remains a key factor in our long track record of growth and profitability," said James Truchard, NI's CEO. "Last year, no single company accounted for more than 3% of our revenue, and no single industry accounted for more than 10% of our total revenue." T&MW

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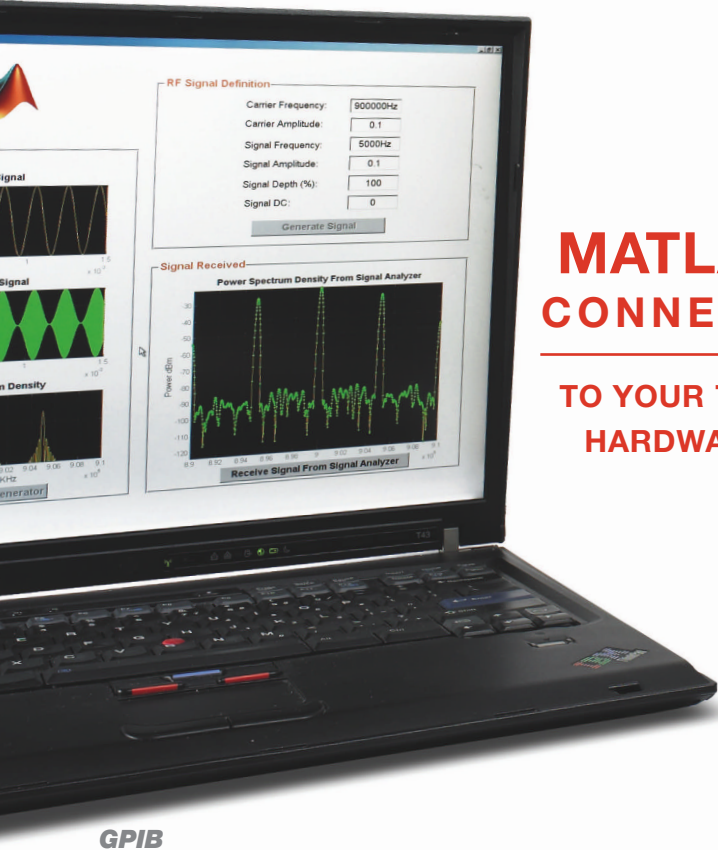
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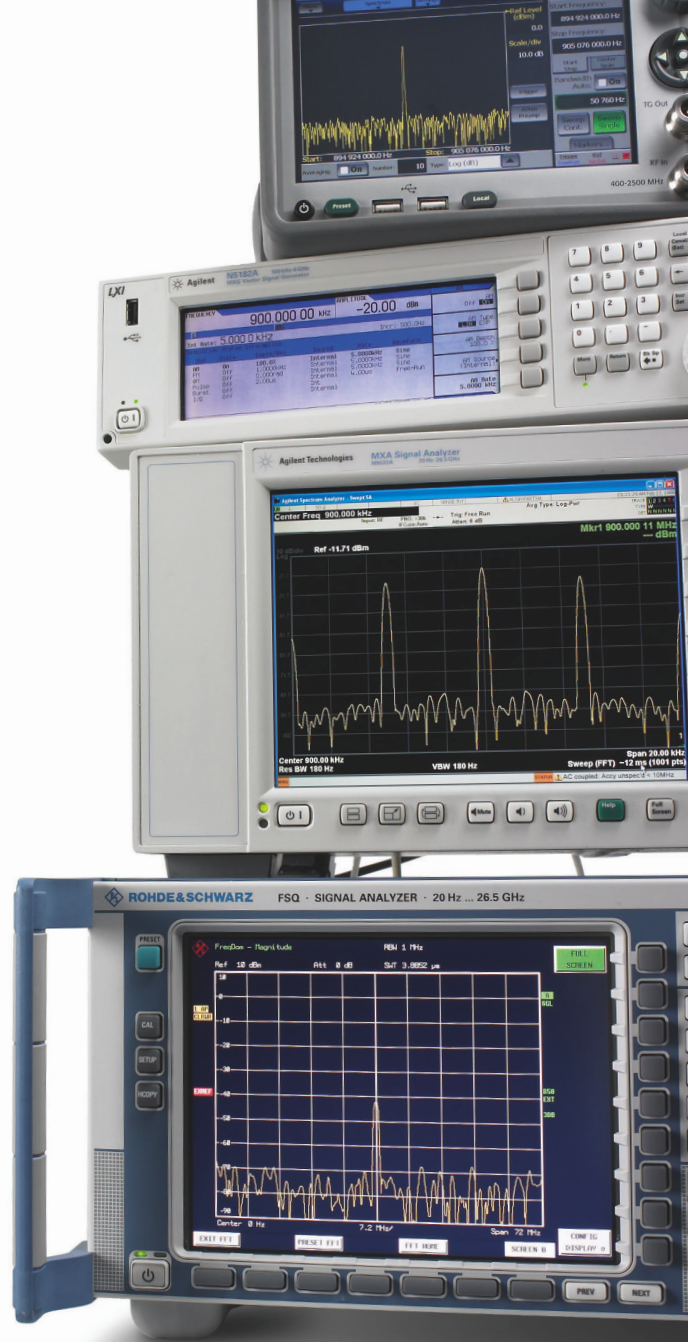
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In this section

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Sampling of products from the past year**Thermometer uses multiple probe types**

The Models 1523 and 1524 reference thermometers from Fluke's Hart Scientific division bring laboratory-quality measurements to the field through RTD (resistance temperature detector), thermocouple, and thermistor probes. The single-channel 1523 and dual-channel 1524 feature an accuracy of $\pm 0.002\%$, and they will hold that accuracy over an ambient temperature range of -10°C to 60°C . The thermometers can log



data that you can download to a computer, and they also plot data and perform statistical analysis on temperature data. *Fluke, www.fluke.com.*

Card injects errors onto the PCI bus

Agilent Technologies' N5323A PCI (PCI Express) Jammer card lets you test a peripheral card or PC motherboard by injecting errors onto the bus. You can inject errors at the physical layer, data-link layer, and transaction layer. Physical-layer errors include disparity error, drop of TLP (transaction-layer packet) start and end characters, and link retraining. Data-link errors include dropping or inserting DLLPs (data-link-layer packets) and sending corrupt CRC (cyclic redundancy code) values. Transaction-layer errors include dropping, delaying, replacing, or modifying TLP packets. *Agilent Technologies, www.agilent.com.*

Spectrum analyzer combines technologies

The Tektronix RSA6000 spectrum analyzers with Option 200 combine Tek's real-time spectrum analysis with the DPX (digital phosphor display) technology that the company developed for oscilloscopes. The real-time spectrum analyzers capture signals in the time domain, then transform the data into the frequency domain.

The Swept DPX technology lets the RSA6000 combine the transform technology with the more traditional frequency sweep. The instrument captures signals in 110-MHz frequency bands and then assembles the bands together to produce a frequency plot of up to 14 GHz. The RSA6000 also adds a DPX Density Trigger feature that lets you trigger the instrument on the frequency of a spectral occurrence. *Tektronix, www.tektronix.com.*

Oscilloscopes reach 30 GHz

LeCroy's WaveMaster 8 Zi oscilloscopes and SDA 8 Zi serial data analyzers are the first real-time oscilloscopes to offer a bandwidth of 30 GHz. Both lines consist of eight models, with bandwidths starting at 4 GHz. All models are upgradeable to higher bandwidths as your needs change.



You can use the 8 Zi series with high-speed, 50- Ω active probes or with 50- Ω and 1-M Ω passive probes without adapters because the instruments provide connectors for all probes. The high-frequency connectors for the 20-GHz to 30-GHz models are microwave grade. *LeCroy, www.lecroy.com.*

Instrument simulates batteries and chargers

Keithley Instruments' Model 2308, which simulates batteries and chargers for portable devices, lets you test and characterize battery-operated devices for their power consumption. The two-channel instrument can

source voltage and sink current on either channel. The ability to sink current lets the 2308 simulate a discharged battery. The built-in DMM (digital multimeter) measures load current on pulses as short as 50 μs . The instrument has an analog voltage output that is proportional to the load current of the device under test so the current waveform can be characterized with an oscilloscope. *Keithley Instruments, www.keithley.com.*

Digitizer cards work in wide-ranging applications

The Razor series of PCI digitizer cards from GaGe provide two or four channels with 16-bit resolution and sampling speeds of 100 Msamples/s or 200 Msamples/s. The series consists of four models based on number of channels and sample rate. The 200-Msamples/s models feature 125-MHz analog bandwidth, while the 100-Msamples/s models have 65-MHz bandwidth. All models have separate ADCs (analog-to-digital converters) for each channel. They can trigger from an internal or external clock and store 128 Msamples of data (options up to 2 Gsamples). *GaGe, www.gage-applied.com.*

**Software gains wireless and FPGA features**

NI's LabView 8.6 lets you make remote measurements using a WiFi connection to data-acquisition devices. It also works with Bluetooth, GPRS, and GSM. Version 8.6 lets you download drivers for numerous proprietary wireless sensor networks, and it also adds development and integration features for FPGAs (field-programmable gate arrays). You get more than 1200 data-analysis functions optimized for multi-core processors.

You can convert LabView applications into Web services that run on processors that run HTML, Java, or Flash. Users can then gain access to applications through any Web-enabled device. *National Instruments, www.ni.com.*

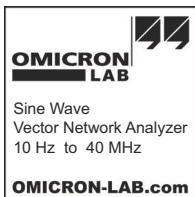
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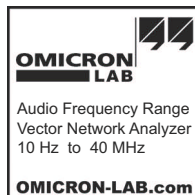


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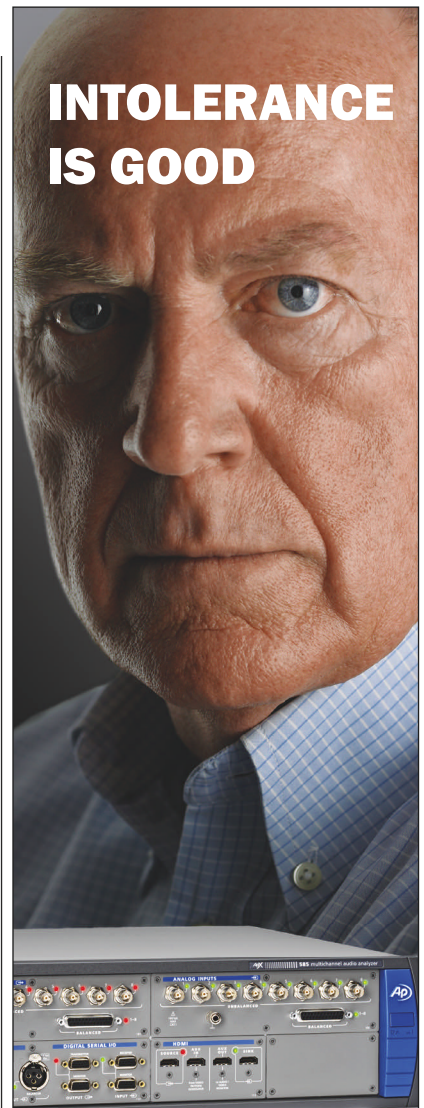
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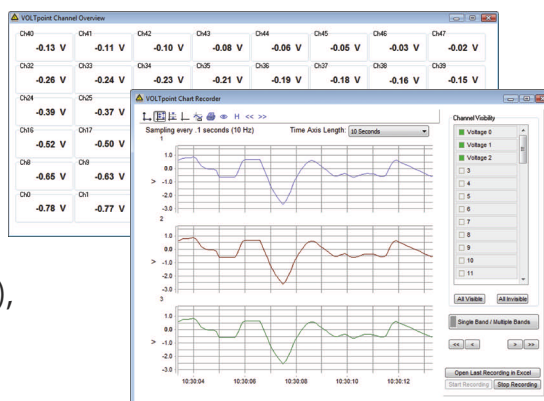
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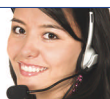
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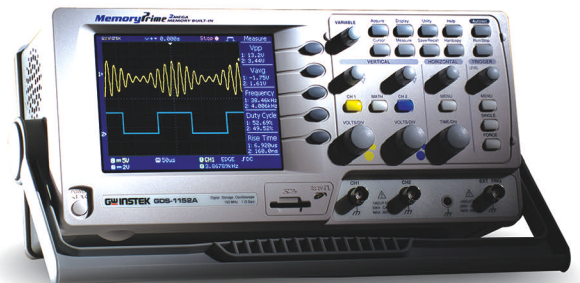
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United Electronic Industries, www.ueidaq.com
Vibration Research, www.vibrationresearch.com
VTI Instruments, www.vtiinstruments.com
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Data Physics, www.dataphysics.com

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Dataq Instruments, www.dataq.com

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Dewetron, www.dewetron.com/us

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EADS North America Test and Services,
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Frequency Devices, www.freqdev.com

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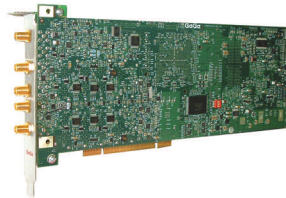
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Keithley Instruments, www.keithley.com
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Pickering Interfaces, www.pickeringtest.com
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Thurlby-Thandar Instruments, www.tti-test.com
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Meters: Digital Multimeters (DMMs)

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Bustec, www.bustec.com
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 Audio Precision, ap.com
 B&K Precision, www.bkprecision.com
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 Bruel & Kjaer, www.bkhome.com
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 Chroma Systems Solutions, www.chromausa.com
 Clarke-Hess Communication Research, clarke-hess.com
 Daytronic, Division of GPT, www.daytronic.com
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 Extech Instruments, www.extech.com
 Flex-Core, www.flex-core.com
 Fluke, www.fluke.com
 HBM, www.hbm.com
 Hioki USA, www.hiokiusa.com
 IET Labs, www.ietlabs.com
 Instek America, www.instek.com
 Keithley Instruments, www.keithley.com

Krohn-Hite, www.krohn-hite.com
 Lake Shore Cryotronics, www.lakeshore.com
 Leader Instruments, www.leaderusa.com
 Linseis, www.linseis.net
 m + p international, www.mpihome.com
 Magnetic Shield, www.magnetic-shield.com
 Murata Power Solutions, www.murata-ps.com
 National Instruments, www.ni.com
 Newport Electronics, www.newportus.com
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 Omega Engineering, www.omega.com



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 PPM, www.pppinc.com
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 Rotronic Instrument, www.rotrotron-usa.com
 Saelig, www.saelig.com

Seaward Group, www.seaward-groupusa.com
 Sefelec, www.sefelec.com
 Sencore, www.sencore.com
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 Data Translation, www.datatranslation.com
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 EADS North America Test and Services, www.eads-nadefense.com
 ELMA Electronic, www.elma.com
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 FuturePlus Systems, www.futureplus.com
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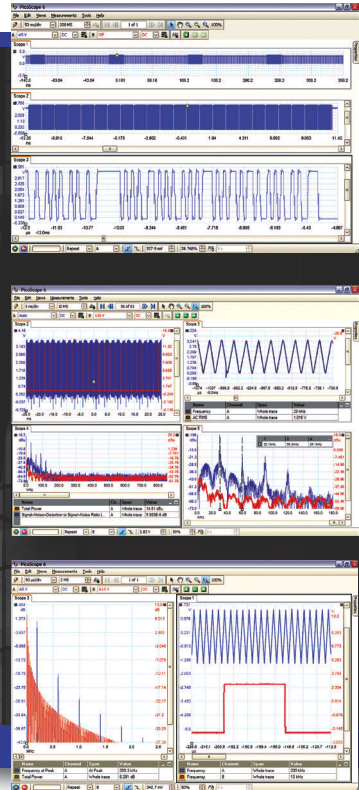
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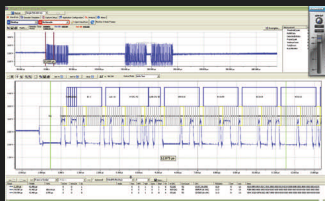
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 Spectrum, www.spec.de
 Tracewell Systems, www.tracewell.com

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Oscilloscopes

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Cirris Systems, www.cirris.com

Clarke-Hess Communication Research,
clarke-hess.com

Connecticut Technology Products, www.c2p.com

Core Technology Group,
www.coretechgroup.com

Curtiss-Wright Controls Embedded Computing,
www.cwcembedded.com

Data Physics, www.dataphysics.com

Data Translation, www.datatranslation.com

Dataforth, www.dataforth.com

Dataq Instruments, www.dataq.com

Dewetron, www.dewetron.com/us

Digalog Systems, www.digalogsystems.com

DIT-MCO International, www.ditmco.com

DL Instruments, www.dlinstruments.com

EADS North America Test and Services,
www.eads-nadefense.com

Elan Digital Systems, www.elandigitalsystems.com

Electronic Systems of Wisconsin,
www.eswtesters.com

Endevco, www.endevco.com

Extech Instruments, www.extech.com

Finisar, Network Tools, www.finisar.com

Flex-Core, www.flex-core.com

Fluke, www.fluke.com

Frequency Devices, www.freqdev.com

Futek Advanced Sensor Technology,
www.futek.com

FuturePlus Systems, www.futureplus.com

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IMC DataWorks, www.imcdataworks.com

Instek America, www.instek.com

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IOtech, www.iotech.com

Ixia, www.ixiacom.com

JFW Industries, www.jfwindustries.com

Keithley Instruments, www.keithley.com

Kemo, www.kemo.com

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Macro Sensors, www.macrosensors.com

Measurement Computing, www.mccdaq.com

Microstar Laboratories, www.mstarlabs.com

Murata Power Solutions, www.murata-ps.com

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Qmax Test Equipments, www.qmaxtest.com

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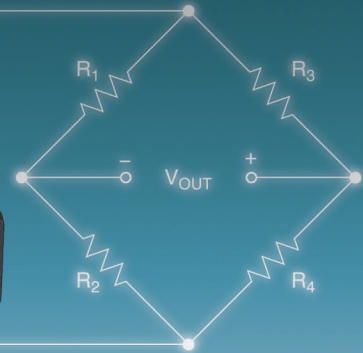
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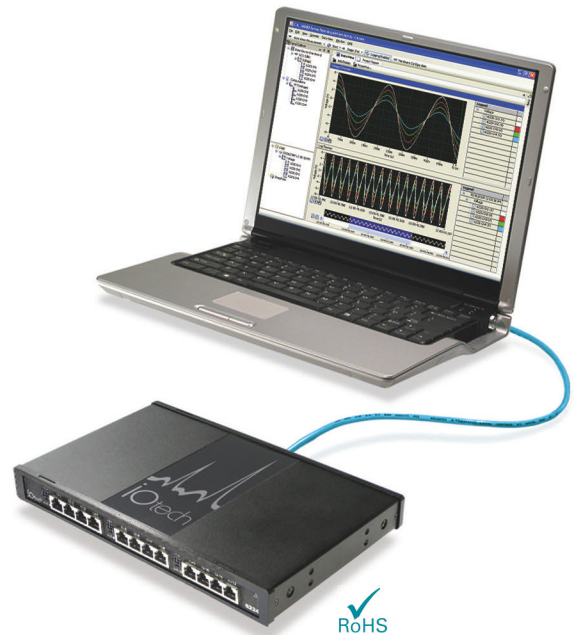
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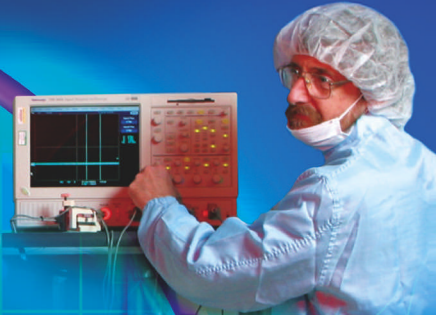
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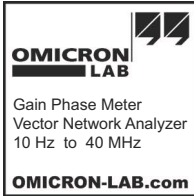
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Improvements to traditional SPICE-type simulation have increased signal integrity channel simulation speeds to thousands of bits per minute. An overnight run can create a million-bit eye diagram and the associated metrics and statistical figures of merit. But signal integrity engineers need to repeat this determination for thousand of points in the design space in order to select the optimum combination of, for example, pre-emphasis, channel characteristics, and equalizer. Therefore, optimization using eye diagram goals requires a channel simulation technique that is orders of magnitude faster than even the fastest SPICE.

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Sampling of products from the past year

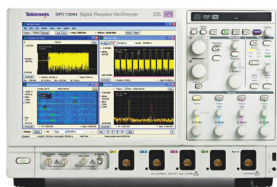
Optical sampling for the next network

As optical network speeds increase to 40 Gbps and then 100 Gbps, the PSO-100 series of optical oscilloscopes can show the signals to you. The USB-based Models PSO-101 (one channel) and PSO-102 (two channels) use a sampling technique that creates a time-stretched copy of the original signal. The scopes convert elongated samples to electrical form before digitizing them, so they can use a sample rate in the tens of megasamples per second while maintaining 500-GHz overall bandwidth.

The oscilloscopes capture samples by using a short pulse that opens an optical gate to capture light. They convert the optical signal to electrical form and digitally process it, measuring jitter, rise time, fall time, eye amplitude, duty-cycle distortion, extinction ratio, and other parameters. *EXFO, www.exfo.com.*

Software analyzes 20-GHz RF signals

Tektronix's SignalVu vector-signal-analysis software for its DPO7000 and DPO/DSA70000 digital oscilloscopes combines the signal-analysis engine of Tek's RSA6100A real-time spectrum analyzer with the triggering capabilities of the oscilloscopes to enable designers to evaluate complex signals up to 20 GHz without using an external downconverter. SignalVu controls all scope-acquisition parameters such as record length, vertical scaling, and sample rate. When a trigger event



occurs, SignalVu processes the acquisition for analysis in multiple domains. In addition to providing spectrum analysis, the software can generate spectrograms that display frequency and amplitude changes over time. Time-correlated measurements can be made across the frequency, phase, amplitude, and modulation domains. *Tektronix, www.tektronix.com.*

With the WaveBlade Ethernet 1104 module, VeriWave added four Ethernet ports to its WaveTest network test system. Each port can generate or analyze traffic on 10/100/1000-Gbps Ethernet layer 2 through layer 7, and each supports up to 500 clients. You can use the WaveBlade to connect the WaveTest to wired Ethernet devices, and then use wireless-interface cards to connect the system to IEEE 802.11a/b/g/n networks. New WaveQoE software lets the WaveTest system measure end-user QoE (Quality of Experience). The software enables users to create profiles and test conditions that generate mixtures of traffic that simulate actual network conditions. WaveQoE controls traffic-carrying applications such as HTTP, FTP, and TCP protocols for data; VoIP for voice; and MPEG-2 for video. *VeriWave, www.veriwave.com.*



LitePoint has launched three systems for testing to four wireless standards. The IQnXplus offers multistream signal capabilities for WiFi and WiMAX MIMO development. Its modules support frequency ranges of 2.15 to 2.7 GHz, 3.3 to 3.8 GHz, and 4.9 to 6.0 GHz, and its GUIs provide analysis and display capabilities for single, multistream, and beam-forming adaptive-antenna functionality testing. The IQultra, an error-vector magnitude test system for UWB (ultrawideband) devices, combines a vector signal analyzer with an attenuator for UWB receive testing. The system can

System tests converged networks

capture and analyze all WiMedia band groups (1 to 6) and time frequency codes (1 to 10).

The IQnav for manufacturing test of GPS-equipped devices enables both CNR (carrier-to-noise ratio) measurements and location-fix tests to be performed in a single connection to the device under test. In addition, the IQnav offers synthetic power sweep capabilities where up to six CNR measurements are made simultaneously. *LitePoint, www.litepoint.com.*

VNA operates to 70 GHz

Able to handle S-parameter measurements on RF, microwave, and millimeter-wave devices, Anritsu's VectorStar VNA (vector network analyzer) family delivers frequency coverage of 70 kHz to 70 GHz, a dynamic range of 103 dB at 67 GHz, and a measurement speed of 20 μ s/point. The VectorStar MS4640A family offers three standard frequency ranges that go to 20 GHz, 40 GHz, and 70 GHz. For true broadband applications such as device modeling, the 70-kHz low-end provides seven octaves of additional information below the traditional 10-MHz low-end cutoff of conventional microwave VNAs.



VectorStar offers a 100-dB dynamic range at 70 GHz. Supplementing the wide dynamic range is the +10-dBm, 0.1-dB receiver compression level at 70 GHz. *Anritsu, www.us.anritsu.com.*

Test system handles 8x8 MIMO configurations

Keithley Instruments targets research of RF MIMO technologies such as 4G LTE (long term evolution) and UMB (Ultra Mobile Broadband). The MIMO test systems are built on Keithley's RF instruments, including the Model 2820 RF vector signal analyzers, which have a frequency range of 400 MHz to 6 GHz; Model 2920 RF vector signal generators, which can generate frequencies from 10 MHz to 6 GHz; Model 280111 WLAN 802.11n signal-analysis software; and Model

2895 MIMO synchronization units. The 8x8 system holds signal sampler synchronization to within ± 1 ns; sample jitter is less than 1 ns peak-to-peak, and RF-carrier phase jitter is less than 1° peak-to-peak. *Keithley Instruments*, www.Keithley.com.

Enhanced VNAs reduce test costs

Agilent Technologies has introduced 13.5-, 43.5-, and 50-GHz models of both its PNA-X network analyzer and its PNA-X NVNA (nonlinear-vector-network analyzer). Low-noise-amplifier tests typically require separate test stations for small-signal gain/match, distortion, and noise figure. By integrating these tests into one station, the PNA-X reduces the number of stations by as much as 75% and costs by 30%.

The configurable two- or four-port network analyzer uses a single connection for measurements of continuous-wave and pulsed S-parameters, compression, intermodulation distortion, and noise figure. Two built-in high-performance sources offer output power of 16 dBm, harmonics of -60 dBc, and a power-sweep range of 40 dB. *Agilent Technologies*, www.agilent.com.

Compact spectrum analyzers reach 26.5 GHz

Aeroflex 3250 Series spectrum analyzers serve engineers working in military, communications, satellite, radar, and PMR (portable mobile radio) applications. The series includes four models, each measuring a frequency range beginning at 1 kHz, with the 3251 ranging up to 3 GHz, the 3252 to 8 GHz, the 3253 to 13.2 GHz, and the 3254 to 26.5 GHz. Three traces can be displayed per window and as many as nine markers can be selected with a marker table viewable in an alternate window. The compact instruments support remote control via LAN, GPIB, and RS-232C interfaces.

The 3250 Series includes digital demodulation capabilities for the analysis of 802.11a/b/g wireless networks. Optional measurement personalities include GSM/EDGE, WCDMA, and WiMAX. *Aeroflex*, www.aeroflex.com.

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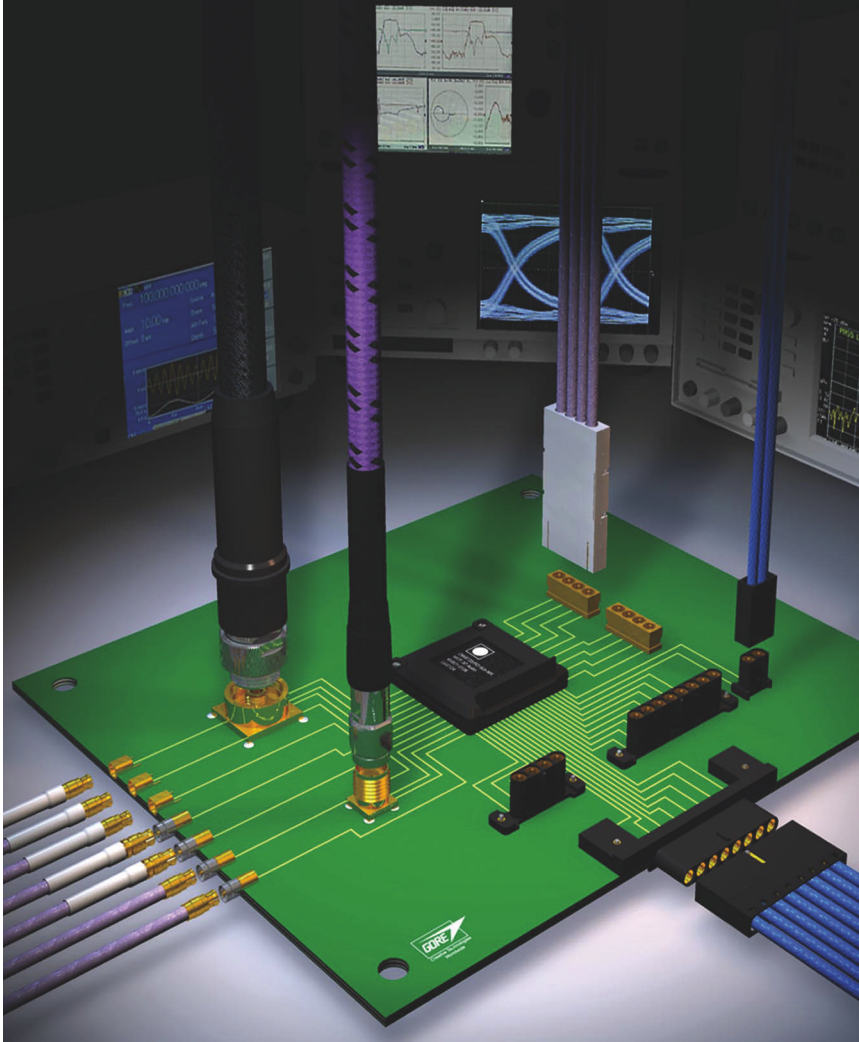
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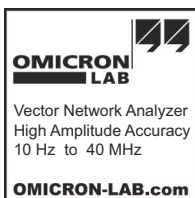
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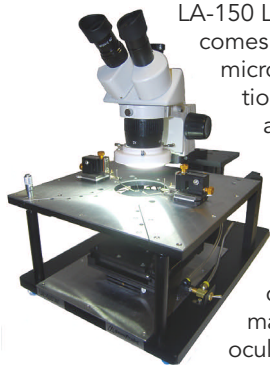
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- Accessories & Software: ATE/Production Test/QA, p. 60
- Third-Party Services: Production Test, p. 66

Sampling of products from the past year**System tests 256 DDR3 devices in parallel**

An expanded configuration of the Advantest T5503 high-speed memory test system offers parallel test capability of up to 256 DDR3 devices—double that of the previous T5503 model. The expanded configuration, known as the T5503 8448 Channel Test Head, works with Advantest's M6242 handler to form a complete DDR3 test cell. An optional pin card is available that preserves the 256-DUT (device under test) parallel test capacity for high-speed, high-pin-count stacked DRAM. The system can test DDR3-SDRAM, GDDR3, GDDR4, and other memory devices, with test speeds to 3.2 Gbps. *Advantest, www.advantest.com.*

Probe system has DC and RF configurations

SemiProbe has created a low-cost multifunctional probe system suitable for R&D applications that involve simple probing operations yet require system flexibility and reliability. The



LA-150 Lab Assistant comes in DC and RF/microwave configurations, both of which allow individual manipulator or probe-card contact to the DUT.

The standard configuration comes with two DC manipulators; a trinocular, stereo-zoom microscope; a 150-mm vacuum chuck; and a platen that provides 360° of manipulator placement and that has a built-in 4.5-in. probe-card holder. The system may be upgraded

to add x-y linear stages (chuck and microscope), a CCTV system, vibration isolation, a thermal chuck, and additional manipulators with a variety of probe arm and base choices. *SemiProbe, www.semiprobe.com.*

Tester handles both flash memory and DRAM

Verigy's V6000 testers enable engineers to test both flash and DRAM memory on the same automated test platform by simply changing to a new test program and probe card. The V6000 family includes the V6000e, which supports memory test-program development and device characterization; the V6000 WS, which enables 300-mm one-touchdown wafer-sort probing; and the V6000 FT, which performs single-insertion final test of flash, DRAM, or MCPs (multichip packages) that include both flash and DRAM memory. All V6000 systems include Verigy's Active Matrix technology, which provides massive parallelism, supporting more than 18,000 I/O pins and more than 4000 programmable power supplies. The V6000 offers scalable AC performance at 140, 280, 560, and up to 880 Mbps. *Verigy, www.verigy.com.*

**Boundary-scan I/O module offers external stimulus**

The JT 2149/MPV DIOS (digital I/O scan) module from JTAG Technologies provides test access to printed-circuit boards requiring external I/O stimulus and response monitoring. The MPV (multi-programmable/multi-voltage) DIOS plugs directly into the company's QuadPOD, the standard front-end of its Data-Blaster series of boundary-scan controllers. When connected to a circuit board via the edge connector or fixture test pins, the module exercises the board's connections in synchronization with the boundary-scan infrastructure. The DIOS module supports the vendor's SCIL (Scan Configurable Interface Logic) technology to allow custom

functions such as pattern generators, counters, and bus simulators to be factory formatted for advanced functional and pattern-oriented testing. *JTAG Technologies, www.jtag.com.*

Test platform gains digital subsystems

LTX-Credence extended the capabilities of its X-Series test platform with the introduction of two digital subsystem options. The FX2 offers double the digital pin count per instrument of the FX1 subsystem, enabling higher levels of multisite test. It offers improved scan chaining for multisite testing, high-voltage pin-electronic capability for embedded flash testing, full-featured synchronization, and independent timing domains to support multiple periods running simultaneously. The FX-HS targets the test requirements of high-speed I/O, including DDR parallel and MIPI SerDes interfaces. A real-time protocol-detect feature simplifies test development and can be used to reduce the test time of high-speed I/O by up to 30%. The FX-HS provides high-speed digital pattern rates up to 800 Mbps. *LTX-Credence, www.ltx-credence.com.*

Avionics platform enables mixed-signal test

Based on the 14-slot GX7102A PXI platform and providing multichannel ARINC429 and MIL-STD-1553 interfaces, the GBATS (Geotest Basic Automated Test System) offers a variety of options for analog, digital, and mixed-signal test applications. The modular system addresses both military and commercial avionics test applications for depot and maintenance repair overhaul facilities.

The GBATS is equipped with a 960-pin UUT interface that provides access to all system resources. In addition to the ARINC429 and MIL-STD-1553 interfaces, the system can be configured with a synchro/resolver, an arbitrary waveform generator, a dual-channel digitizer, a counter/timer, a multichannel voltage source, digital cards supporting vector rates of up to 200 MHz, and a high-density static I/O card. *Geotest – Marvin Test Systems, www.geotestinc.com.*

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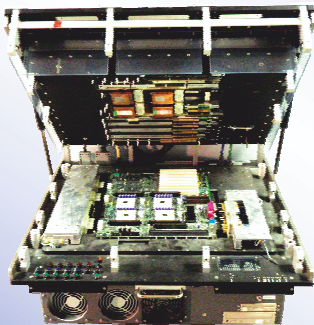
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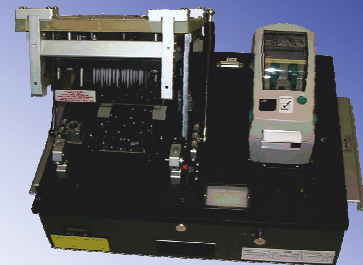


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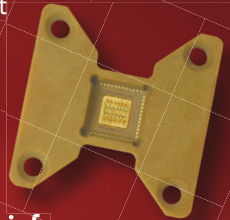


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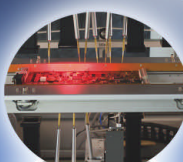
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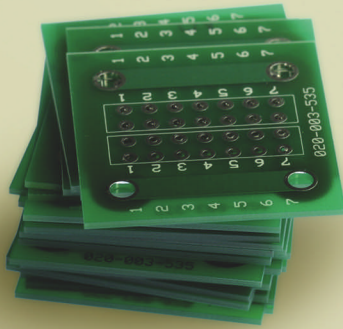
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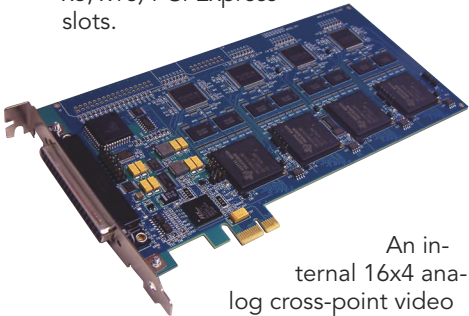
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Sampling of products from the past year

PCI Express frame grabber captures 16 channels

Sensoray's Model 817 PCI Express JPEG frame grabber card captures 16 channels of compressed JPEG or uncompressed bit maps at 480 total fps. To provide flexibility, the board permits all capture parameters to be set independently for each channel. The Model 817 supports x1 or wider (x4, x8, x16) PCI Express slots.



An internal 16x4 analog cross-point video switch can route any combination of four input channels to external monitors. The Model 817 contains four identical VCPUs (video capture and processing units), each of which employs a four-channel video decoder to convert analog video into digital. A DSP (digital signal processor) captures digitized video and performs frame decimation, caption overlay, JPEG compression, and status reporting. *Sensoray, www.sensoray.com.*

IR thermometer uses visible light camera

The Extech/FLIR i40, i50, and i60 infrared thermometers feature a visible-light camera that lets you see the target and point the instrument. The i40 has a 0.6-Mpixel camera, while the i50 and i60 have 2.3-Mpixel cameras. All models feature a picture-in-picture display with fixed (i40), three-step

(i50), or scalable (i60) images on a 3.5-in. LCD. With the i40, you can view the target image; the i50 and i60 include a semiconductor laser target, and the i60 is able to display the laser on the screen. The instruments can also find the hottest or coldest spot within a designated area. Temperature range is -20°C to 350°C (-4°F to 662°F) with 2% accuracy and 0.1°C thermal resolution. *Extech Instruments, www.extech.com/iseries.*



Ultracompact vision board has 5-Mpixel resolution

With dimensions of just 40x65 mm, the VCSBC4012 nano is one of the smallest vision systems on the market, according to Vision Components. The VCSBC4012 nano is part of the company's BoardCam family and features a CMOS sensor that provides a resolution of 5 Mpixels. It is a complete machine-vision system on a single board and is suitable for stand-alone operation. An external PC is not required.

The camera board offers computational power of 3200 MIPS and acquires images at 11.6 fps with a resolution of 2592x1944 pixels. In addition, it has 64 Mbytes of DRAM, 4 Mbytes of flash EPROM for program and data storage, and a 100-Mbps Ethernet interface. *Vision Components, www.vision-components.com.*

X-ray inspection system offers one-click operation

The Y.Cheetah 160-kV, 64-W microfocus x-ray system from Yxlon, which combines Feinfocus x-ray technology with high-speed flat-panel detectors, performs 2-D inspection and 3-D microfocus computed tomography for applications such as failure analysis, R&D, and production inspection. The Y.Cheetah provides magnification control through a twin magnification axis, offering Zoom+ and PowerDrive modes. The system offers an inspec-

tion area of 460x410 mm, which can be viewed at $\pm 70^{\circ}$, even at the highest geometric magnification, and it can be customized through retrofit modules and components.

Y.Cheetah performs 2-D inspection and 3-D microfocus computed tomography for failure analysis, R&D, process and quality control, and batch, series, and production inspection. Options include a multifocus tube and high-power target, a module for 3-D inspection, and additional trays and manipulation devices. *Yxlon, www.yxlon.com.*

AOI system employs multiple cameras

OptiCon TurboLine, an automated optical inspection system from Goepel electronic for the production-line inspection of printed-circuit boards, employs a modular camera system that can be configured with multiple cameras for orthogonal and angled-view inspection. A 20-Mpixel camera module provides microscopic resolution with telecentric image recording in an inspection area of approximately 17 cm^2 .

The telecentric lens allows imaging of components and solder joints, regardless of their position in the field of view or their height extension, without distortion or parallax error. The system's Extended Colour Technology produces realistic color images of detected faults that can be viewed at repair stations at different resolution levels. *Goepel electronic, www.goepel.com.*



MACHINE-VISION & INSPECTION EQUIPMENT MANUFACTURERS

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Adimec, www.adimec.com
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Basler Vision Technologies, www.baslerweb.com
Cognex, www.cognex.com
Creative Devices, www.creativedevices.com
Dalsa, www.dalsa.com
Dewetron, www.dewetron.com/us
EPIX, www.epixinc.com
Fast-Vision, www.fast-vision.com
Hamamatsu, sales.hamamatsu.com
Illunis, www.illunis.com
Image Labs International, www.imagelabs.com
The Imaging Source, www.theimagingsource.com
Imperx, www.imperx.com
Integrated Design Tools, www.idtvision.com
Intercon 1, Division of Nortech Systems, www.nortechsys.com/intercon
JAI, www.jai.com
KAPPA opto-electronics, www.kappa-vision.com
Leutron Vision, www.leutron.com
LMI Technologies, www.lmistechnologies.com
Lord Ingenierie, www.lord-imaging.com
Lumenera, www.lumenera.com
Matrox Imaging, www.matrox.com/imaging
MicroImage Video Systems, www.mivs.com
NAC Image Technology, www.nacinc.com
National Instruments, www.ni.com
NET USA, www.net-usa-inc.com
Nikon Instruments, Industrial Measuring, www.nikoninstruments.com
Omron Electronics, www.omron.com/oei
Panasonic System Solutions, www.panasonic.com/medical
PCO, www.pco.de
PerkinElmer, optoelectronics.perkinelmer.com
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Point Grey Research, www.ptgrey.com
PPT VISION, www.pptvision.com
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Sentech America, www.sentechamerica.com
Silicon Imaging, www.siliconimaging.com
Sony Electronics, www.sony.com/videocameras
StingRay Optics, www.stingrayoptics.com
SVS-Vistek, www.svs-vistek.com
Teledyne Scientific & Imaging, www.teledyne-si.com
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Videology Imaging Solutions, www.videologyinc.com
Vision Components, www.vision-components.com
Vision Research, www.visionresearch.com
WESCO, Western Scientific, www.wescomicroscopes.com
Wintriss Engineering, www.weco.com
Zmation, www.zmation.com

Coordinate and Dimensional Measuring Equipment

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Dalsa, www.dalsa.com
Data Translation, www.datatranslation.com

EPIX, www.epixinc.com
Euresys, www.euresys.com
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Foresight Imaging, www.fi-llc.com
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The Imaging Source, www.theimagingsource.com
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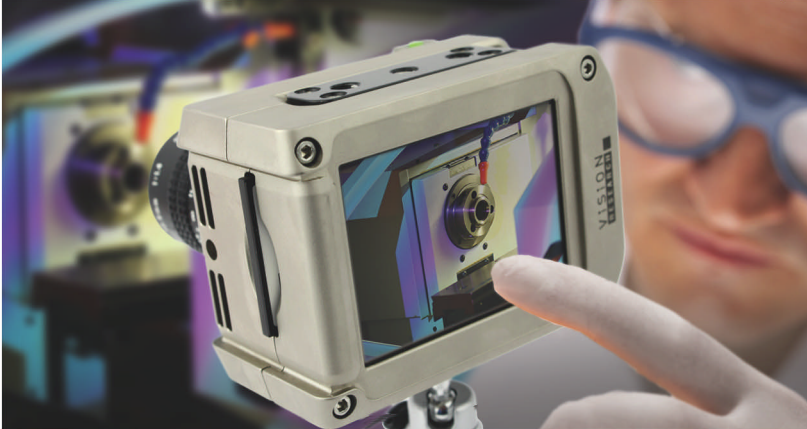
Leutron Vision, www.leutron.com
Matrox Imaging, www.matrox.com/imaging
National Instruments, www.ni.com
PerkinElmer, optoelectronics.perkinelmer.com
Pleora Technologies, www.pleora.com
SVS-Vistek, www.svs-vistek.com

Inspection Systems, Optical

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MACHINE VISION & INSPECTION

> MACHINE-VISION & INSPECTION EQUIPMENT MANUFACTURERS *Continued*

Multiprobe, www.multiprobe.com
 NAC Image Technology, www.nacinc.com
 Navitar, navitar.com
 Nikon Instruments, Industrial Measuring, www.nikoninstruments.com
 Olympus, Industrial Micro-Imaging, www.olympusmicroimaging.com
 Optical Gaging Products, www.ogpnet.com
 OptoMetrix, www.optomet.com
 Panasonic System Solutions, www.panasonic.com/medical
 Photron, www.photron.com
 Prior Scientific, www.prior.com
 Qioptiq Linos, www.qioptiqlinos.com
 Rolyn Optics, www.rolyn.com

Rudolph Technologies, www.rudolphtech.com
 Scienscope International, www.scienscope.com
 Sentech America, www.sentechamerica.com
 Silicon Imaging, www.siliconimaging.com
 StingRay Optics, www.stingrayoptics.com
 StockerYale, www.stockeryale.com
 Tamar Technology, www.tamartechnology.com
 Unitron, www.unitronusa.com
 Vision Engineering, www.visioneng.us
 Volpi USA, www.volpiusa.com
 WESCO, Western Scientific, www.wescocomicroscopes.com
 WITec Instruments, www.witec-instruments.com
 Zygo, www.zygo.com

ACCESSORIES & SOFTWARE: MACHINE VISION & INSPECTION

Accessories: Machine-Vision and Inspection

AccuSentry, www.accusentry.com
 Aerotech, www.aerotech.com
 Allied Vision Technologies, North America, www.goavt.com
 CIMTEK, www.cimtek.com
 Data Translation, www.datatranslation.com
 Geller Microanalytical Lab, www.gellermicro.com
 Image Labs International, www.imagelabs.com
 Integrated Design Tools, www.idtvision.com
 Intercon 1, Division of Nortech Systems, www.nortechsys.com/intercon
 MicroImage Video Systems, www.mivs.com
 Micromanipulator, www.micromanipulator.com
 Optical Gaging Products, www.ogpnet.com
 Piezosystem Jena, www.piezोजना.com
 Prior Scientific, www.prior.com
 Silicon Imaging, www.siliconimaging.com
 SUSS MicroTec, Test Systems, www.suss.com
 Tamar Technology, www.tamartechnology.com
 WESCO, Western Scientific, www.wescocomicroscopes.com
 Zmation, www.zmation.com

Machine-Vision and Image-Analysis Software

AccuSentry, www.accusentry.com
 Adlink Technology, www.adlinktech.com
 Alacron, www.alacron.com
 Avera, www.avera.com
 BitFlow, www.bitflow.com
 Bloomy Controls, www.bloomy.com
 CIMTEK, www.cimtek.com
 Cognex, www.cognex.com
 Creative Devices, www.creativedevices.com
 Dalsa, www.dalsa.com
 Data Translation, www.datatranslation.com
 EPIX, www.epixinc.com
 Euresys, www.euresys.com
 GOEPEL Electronics, www.goepelusa.com
 Golden Software, www.goldensoftware.com
 Image Labs International, www.imagelabs.com

The Imaging Source, www.theimagingsource.com
 KAPPA opto-electronics, www.kappa-vision.com
 Landrex Technologies, www.landrex-us.com
 Leutron Vision, www.leutron.com
 LMI Technologies, www.lmitechnologies.com
 The MathWorks, www.mathworks.com
 MatriX Technologies, www.m-xt.com
 Matrox Imaging, www.matrox.com/imaging
 MVTec Software, www.mvtec.com
 National Instruments, www.ni.com
 NorPix, www.norpix.com
 Photron, www.photron.com
 Pixelink, www.pixelink.com
 Pleora Technologies, www.pleora.com
 Rad-Icon Imaging, www.rad-icon.com
 ScanCAD International, www.sancad.com
 Silicon Imaging, www.siliconimaging.com
 Stemmer Imaging, www.stemmer-imaging.co.uk
 SUSS MicroTec, Test Systems, www.suss.com
 Unisoft, www.unisoft-cim.com
 Viscom, www.viscom.com
 Vision Components, www.vision-components.com
 WESCO, Western Scientific, www.wescocomicroscopes.com
 YXLON International, www.yxlon.com

THIRD-PARTY SERVICES: MACHINE VISION & INSPECTION

Distributors, Rentals, Used Equipment: Machine Vision and Inspection

Advanced Test Equipment Rentals, www.atecorp.com
 Aegis Electronic Group, www.aegis-elec.com
 Continental Resources, Test & Measurement, www.conres.com/test-equipment
 Creative Devices, www.creativedevices.com
 FLIR Systems, www.flirthermography.com
 Image Labs International, www.imagelabs.com
 Industrial Resources, www.industrialresources.com
 Instrumart, www.instrumart.com
 K & Us Equipment, www.kandus.com
 Madell Technology, www.madelltech.com
 NET USA, www.net-usa-inc.com
 Silicon Imaging, www.siliconimaging.com
 Stemmer Imaging, www.stemmer-imaging.co.uk
 SVS-Vistek, www.svs-vistek.com
 TEAM A.T.E., www.team-ate.com
 Teradyne, www.teradyne.com
 TRS-RenTelco, www.trs-rentelco.com
 Vision Research, www.visionresearch.com

Labs, Services: Machine Vision and Inspection

Amkor Technology, www.amkor.com
 Bloomy Controls, www.bloomy.com
 Digalog Systems, www.digalogsystems.com
 GE Sensing & Inspection Technologies, www.geinspectiontechnologies.com
 Geller Microanalytical Lab, www.gellermicro.com
 Glenbrook Technologies, www.glenbrooktech.com
 Hermon Labs TI, www.hermonlabs.com
 Image Labs International, www.imagelabs.com
 Integra Technologies, www.integra-tech.com
 Nevada Automotive Test Center, www.natc-ht.com
 Oneida Research Services, www.ors-labs.com
 Panasonic Factory Solutions Company of America, www.panasonicfa.com
 Premier Semiconductor Services, www.premiers2.com
 Product Safety Consulting, www.productsafetyinc.com
 SUSS MicroTec, Test Systems, www.suss.com
 Sypris Test & Measurement, www.sypris.com/stm
 TUV SUD America, www.tuvamerica.com
 Vision Systems International, www.vision1.com/vsi
 VJ Electronix, www.vjelectronix.com
 Zygo, www.zygo.com

Training: Machine Vision and Inspection

A.T.E. Solutions, www.beststest.com
 Advint, www.advint.com
 GOEPEL Electronics, www.goepelusa.com
 Image Labs International, www.imagelabs.com
 Matrox Imaging, www.matrox.com/imaging
 SUSS MicroTec, Test Systems, www.suss.com
 Sypris Test & Measurement, www.sypris.com/stm

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In this section

- EMC Test, below
- Environmental Test, p. 76
- ESD Control and Protection, p. 78

Sampling of products from the past year

System tests automotive transient emissions

The AES 5500 EMC transient-emissions test system from Teseq lets you test automotive systems for conducted electrical transients. Designed for tests compliant with ISO 7637-2,



the system consists of a mechanical switch, a line-stabilization network, an electronic switch, and a controller. The system lets you capture EUT (equipment under test) disturbances when you apply power. The EUT connects to the electronic switch, which lets the disturbance pass through to the EUT. You can capture the EUT's response with an oscilloscope. The system handles battery current up to 100 A with a 1000-A inrush current for 10 ms or with a 300-A inrush current for 1 s. *Teseq*, www.teseq.com.

Vibration controller teams with dynamic signal analyzer

Configured with 4, 8, or 16 channels, the VibPilot from M+P International offers a portable solution for vibration testing and dynamic signal analysis. The system, which employs 24-bit sigma-delta ADCs (analog-to-digital converters) with simultaneous sampling rates of up to 102.4 kHz, enables alias-protected measurements in a frequency range of up to 40 kHz and a spurious-free dynamic range of more than 120 dB.

You can use the VibPilot, along with the VibControl and SO Analyzer

software, to perform shaker testing that complies with ISO, DIN, MIL-STD 810, and other vibration-testing standards. It is suitable for general data acquisition and spectrum analysis, time-history recording, modal analysis, rotational dynamics, acoustic analysis, and vehicle pass-by-noise testing. *M+P International*, www.mpihome.com.

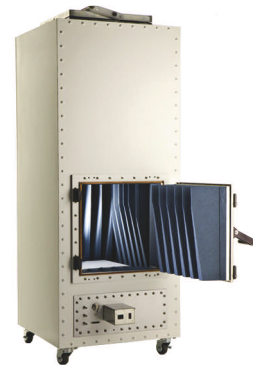
Test socket gets adjustable pressure pad

Aries Electronics now offers its 27-mm CSP/MicroBGA (chip-scale package/micro-ball-grid array) test and burn-in sockets with an optional adjustable pressure pad. With only a 0.010-in. (0.254-mm) displacement per revolution of the screw, this mechanism makes the sockets suitable for testing devices with large height tolerances as well as for testing devices that are small and fragile. Each adjustable pressure pad comes with a user-adjustable washer stack that serves as a hard stop to eliminate device over-compression. The CSP/MicroBGA family accommodates a variety of CSP, MicroBGA, DSP, LGA, SRAM, DRAM, and flash devices from 6.5 mm² to 55 mm². Operating temperature is -55°C to

+150°C, and estimated contact life is a minimum of 500,000 cycles. *Aries Electronics*, www.arieselec.com.

RF shielded enclosure aids test of wireless devices

ETS-Lindgren's Model 5247 RF shielded enclosure lets you measure transmitter power and receiver sensitivity on wireless devices at frequencies from 700 MHz to 6 GHz. You can use the chamber for precertification and production testing of cellphones, WiMAX devices, WiFi devices, Bluetooth devices, and other portable devices. Because the enclosure's anechoic absorbers prevent reflected signals from interfering with wanted signals, you can use the enclosure to test your mobile device indoors.



The low end of the Model 5247's frequency range will let you test devices in the 700-MHz band once reserved for UHF TV. The chamber provides more than 80 dB of RF isolation from outside interference. *ETS-Lindgren*, www.ets-lindgren.com.

EMC TEST

EMC Test Equipment Manufacturers

A.H. Systems, www.ahsystems.com

Agilent Technologies, www.agilent.com

AMETEK Programmable Power, www.programmablepower.com

Anritsu, www.us.anritsu.com

AR, RF/Microwave Instrumentation, www.ar-worldwide.com

Bird Technologies Group, www.bird-technologies.com

Boonton Electronics, www.boonton.com

California Instruments, www.california-instruments.com

Com-Power, www.com-power.com

Cuming Lehman Chambers, www.cuminglehman.com

Electro-Metrics, www.electro-metrics.com

Electronic Systems of Wisconsin, www.eswtesters.com

EMCC DR. RAŠEK, www.emcc.de

Emcor Enclosures-Crenlo, www.emcorenclosures.com

ESD Systems.com, www.esdsystems.com

ETS-Lindgren, www.ets-lindgren.com

Fluke, www.fluke.com

Hameg Instruments, www.hameg.com

Hipotronics, www.hipotronics.com

HV Technologies, EMC, www.hvtechnologies.com

Kikusui America, www.kikusuiamerica.com

Krohn-Hite, www.krohn-hite.com

Lake Shore Cryotronics, www.lakeshore.com

Magnetic Shield, www.magnetic-shield.com

Noise Laboratory, www.noiseken.com

Ophir RF, www.ophirrf.com

Precision Test Systems, www.ptsys.com

QualiTau, www.qualitau.com

Rohde & Schwarz, www.rohde-schwarz.com

Ross Engineering, www.rossengineeringcorp.com

Saelig, www.saelig.com

Sefelec, www.sefelec.com

SUSS MicroTec, Test Systems, www.suss.com

Swift Textile Metalizing, www.swift-textile.com

TDK RF Solutions, www.tdkrfsolutions.com

Teseq, www.teseq.com

Thurlby-Thandar Instruments, www.tti-test.com

Toellner Electronic Instruments, www.tellner-usa.com

Continued >



ELECTRICAL & PHYSICAL ENVIRONMENTAL TEST

> EMC TEST *Continued*

W.L. Gore & Associates, Electronic Products Division, www.gore.com
XiTRON Technologies, www.xitrontech.com
Yokogawa Corp. of America, www.yokogawa.com/us

Distributors, Rentals, Used Equipment: EMC Test

A.H. Systems, www.ahsystems.com
Advanced Test Equipment Rentals, www.atecorp.com
AR, RF/Microwave Instrumentation, www.ar-worldwide.com
Avalon Equipment, www.avalontest.com
Bell Electronics NW, www.bellnw.com
Continental Resources, Test & Measurement, www.conres.com/test-equipment
Electro Rent, www.electrorent.com
Industrial Resources, www.industrialresources.com
MetricTest, www.metrictest.com
Microlease, www.microlease.com
PTL Test Equipment, www.ptltest.com
Rohde & Schwarz, www.rohde-schwarz.com
Saelig, www.saelig.com
Test Equipment Connection, www.testequipmentconnection.com
Testforce, www.testforce.com
Transcat, www.transcat.com
Trek Equipment, www.trekequip.com
TRS-RenTelco, www.trs-rentelco.com
Tucker Electronics, www.tucker.com

Test Houses, Labs, Services: Compliance Test

Accolade Engineering Solutions, www.accoladeeng.com
Alion Science & Technology, rb.alionscience.com
Amkor Technology, www.amkor.com
AST Technology Labs, www.asttechlabs.com
CIMTEK, www.cimtek.com
CKC Laboratories, www.ckc.com
Communication Certification Laboratory, www.cclab.com
CSA International, www.csa-international.org
D.L.S. Electronic Systems, www.dlsemc.com



Degree Controls, www.degrec.com
Elite Electronic Engineering, www.elitetest.com
EMCC DR. RAŠEK, www.emcc.de
Environment Associates, www.eatest.com
ETS-Lindgren, www.ets-lindgren.com
Hermon Labs TI, www.hermonlabs.com
Integra Technologies, www.integra-tech.com
Intertek, www.intertek.com
Invisar, www.invisar.com
MET Laboratories, www.metlabs.com
Motorola Product Testing Services, www.motorola.com/producttesting

National Technical Systems, www.ntscorp.com
Nevada Automotive Test Center, www.natc-ht.com
Noise Laboratory, www.noiseken.com
Northwest EMC, www.nwemc.com
Omega Engineering, www.omega.com
Product Safety Consulting, www.productsafetyinc.com
Stephen Halperin & Associates, www.halperinassoc.com
Stork Garwood Laboratories, www.garwoodtestlabs.com
Sypris Test & Measurement, www.sypris.com/stm
TDK RF Solutions, www.tdkrfsolutions.com
Teseq, www.teseq.com
Test Site Services, www.testsiteservices.com
Tracewell Systems, www.tracewell.com
TUV Rheinland of North America, www.tuv.com

ENVIRONMENTAL TEST

Environmental Test Equipment Manufacturers

ACG Dynamics and Ling Electronics, www.acgdynamics.com
Advint, www.advint.com
Aehr Test Systems, www.aehr.com
AEMC Instruments, www.aemc.com
Agilent Technologies, www.agilent.com
Aries Electronics, www.arieselec.com
Armel Electronics, www.armel.us
Associated Environmental Systems, associatedenvironmental-bma.com
B&W Engineering, www.b-w-engineering.com
Berkeley Nucleonics, www.berkeley-nucleonics.com
Brüel & Kjær, www.bkhome.com
Burnsco Technologies, www.burnsco.ca
Bustec, www.bustec.com
C&H Technologies, www.chtech.com
CableTest Systems, www.cabletest.com
Campbell Scientific, www.campbellsci.com
Cascade Microtech, www.cascademicrotech.com
Chart Industries, www.chartchambers.com
CIMTEK, www.cimtek.com
Cincinnati Sub-Zero, www.cszindustrial.com
Data Physics, www.dataphysics.com
Data Translation, www.datatranslation.com
Despatch Industries, www.despatch.com
Dewetron, www.dewetron.com/us
Dynamic Solutions, www.dynsolusa.com
EADS North America Test and Services, www.eads-nadefense.com
Electronic Systems of Wisconsin, www.eswtesters.com
Emulation Technology, www.emulation.com
Environment Associates, www.eatest.com
Environmental Specialties, A Bahnson Group Co., www.eschambers.com
Envirotronics, www.envirotronics.com

TUV SUD America, www.tuvamerica.com
Underwriters Laboratories, www.ul.com

Training: EMC Test

A.T.E. Solutions, www.besttest.com
D.L.S. Electronic Systems, www.dlsemc.com
EMCC DR. RAŠEK, www.emcc.de
Equipment Reliability Institute, www.equipment-reliability.com
Intertek, www.intertek.com
OptEM Engineering, www.optem.com
Rohde & Schwarz, www.rohde-schwarz.com
SUSS MicroTec, Test Systems, www.suss.com
TDK RF Solutions, www.tdkrfsolutions.com
TUV SUD America, www.tuvamerica.com

ESPEC, www.espec.com



GHI Systems, www.ghisys.com
GOEPEL Electronics, www.goepelusa.com
HALT&HASS Systems, www.haltandhass.com
HBM, www.hbm.com
IMV, www.imv.co.jp/e
Instron, www.instron.com
Instrumented Sensor Technology, www.isthq.com
Integrated Technology, www.inttechcorp.com
inTEST, www.intest.com
IOtech, www.iotech.com
Ironwood Electronics, www.ironwoodelectronics.com
LMS North America, www.lmsintl.com
LR Environmental Equipment, www.lre.com
m + p international, www.mpihome.com
M/RAD, www.mradcorp.com
Materials Development, www.mdc4cv.com
Micro Control, www.microcontrol.com
Micromanipulator, www.micromanipulator.com
3M, Electronic Solutions Div., www.3mstatic.com
MTI Instruments, www.mtiinstruments.com
National Instruments, www.ni.com
Nevada Automotive Test Center, www.natc-ht.com
Omega Engineering, www.omega.com
OROS, www.orosinc.com
Photron, www.photron.com
Plastronics, www.plastronicsusa.com
Q-Lab, www.q-lab.com
QualiTau, www.qualitau.com
Robson Technologies, www.testfixtures.com

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Rotronic Instrument, www.rotrotronic-usa.com
 RS Tech, www.rstechinc.com
 Sharetree, www.sharetree.com
 Sigma Systems, www.sigmasystems.com
 Signalysis, www.signalysis.com
 Sun Electronic Systems, www.sunelectronics.com
 SUSS MicroTec, Test Systems, www.suss.com
 TEAM, www.teamcorporation.com
 Telops, www.telops.com
 Temptronic, www.temptronic.com
 Test Tooling Solutions Group, www.tts-grp.com
 Thermal Product Solutions, www.thermalproductsolutions.com
 Thermonics, www.thermonics.com
 Thermotron Industries, www.thermotron.com
 Trio-Tech International, www.triotech.com
 TUV SUD America, www.tuvamerica.com
 Unholtz-Dickie, www.udco.com
 Vektrex Electronic Systems, www.vektrex.com
 Vibration Research, www.vibrationresearch.com
 VTI Instruments, www.vtiinstruments.com
 Wells-CTI, www.wellsci.com
 XiTRON Technologies, www.xitrontech.com
 Yamaichi Electronics USA, www.yeu.com

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Burnsco Technologies, www.burnsco.ca
 Cincinnati Sub-Zero, www.cszindustrial.com
 Continental Resources, Test & Measurement, www.conres.com/test-equipment
 Data Physics, www.dataphysics.com
 Direct Industry, www.directindustry.com
 Dynamic Solutions, www.dynsolusa.com
 Environment Associates, www.eatest.com
 Envirotronics, www.envirotronics.com
 HALT&HASS Systems, www.haltandhass.com
 Industrial Resources, www.industrialresources.com
 K & Us Equipment, www.kandus.com
 LabX, www.labx.com
 LR Environmental Equipment, www.lre.com
 m + p international, www.mpihome.com
 Microlease, www.microlease.com
 NEA, www.neainc.com
 PTL Test Equipment, www.ptltest.com
 Sharetree, www.sharetree.com
 Thermal Product Solutions, www.thermalproductsolutions.com
 Thermotron Industries, www.thermotron.com
 Transcat, www.transcat.com
 Trek Equipment, www.trekequip.com
 TRS-RenTelco, www.trs-rentelco.com
 Tucker Electronics, www.tucker.com
 TUV SUD America, www.tuvamerica.com
 Vibration Research, www.vibrationresearch.com

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Accolade Engineering Solutions, www.accoladeeng.com
 Alion Science & Technology, rb.alionscience.com
 Amkor Technology, www.amkor.com
 AST Technology Labs, www.asttechlabs.com
 Avera, www.avera.com
 Bloomy Controls, www.bloomy.com
 Cobham Sensor Systems, Sensor and Antenna Systems, Lansdale, www.cobhamdes.com
 CSZ Testing Services, www.csztesting.com
 D.L.S. Electronic Systems, www.dlsemc.com
 Dynamic Solutions, www.dynsolusa.com
 Elite Electronic Engineering, www.elitetest.com
 EMCC DR. RAŠEK, www.emcc.de
 Environment Associates, www.eatest.com
 GOEPEL Electronics, www.goepelusa.com
 HALT&HASS Systems, www.haltandhass.com
 Hermon Labs TI, www.hermonlabs.com
 Integra Technologies, www.integra-tech.com
 Intertek, www.intertek.com
 m + p international, www.mpihome.com
 M/RAD, www.mradcorp.com
 Materials Development, www.mdc4cv.com
 MET Laboratories, www.metlabs.com
 Micro Control, www.microcontrol.com
 Motorola Product Testing Services, www.motorola.com/producttesting
 National Technical Systems, www.ntscorp.com
 Nevada Automotive Test Center, www.natc-ht.com
 Pikes Peak Test Labs, www.pptli.com
 Premier Semiconductor Services, www.premiers2.com
 Reliability Analysis Laboratory, Raytheon, www.reliabilityanalysislab.com
 Sharetree, www.sharetree.com
 Sypris Test & Measurement, www.sypris.com/stm
 Telops, www.telops.com
 Thermotron Industries, www.thermotron.com
 Tracewell Systems, www.tracewell.com
 Trio-Tech International, www.triotech.com
 TUV SUD America, www.tuvamerica.com

Training: Environmental Test

A.T.E. Solutions, www.besttest.com
 Advint, www.advint.com
 Cobham Sensor Systems, Sensor and Antenna Systems, Lansdale, www.cobhamdes.com
 Data Physics, www.dataphysics.com
 Dynamic Solutions, www.dynsolusa.com
 Environment Associates, www.eatest.com
 Equipment Reliability Institute, www.equipment-reliability.com
 HALT&HASS Systems, www.haltandhass.com
 Hobbs Engineering, www.hobbsengr.com
 Intertek, www.intertek.com
 Nevada Automotive Test Center, www.natc-ht.com
 SUSS MicroTec, Test Systems, www.suss.com
 Technology Training, www.tti.edu.com
 Thermotron Industries, www.thermotron.com

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ACL Staticide, www.aclstaticide.com
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 DESCO, www.desco.com
 Electro-Tech Systems, www.electrotechsystems.com
 ESD Systems.com, www.esdsystems.com
 Lista International, www.listaintl.com
 MKS Instruments, www.mksinst.com
 3M, Electronic Solutions Div., www.3mstatic.com
 Monroe Electronics, www.monroe-electronics.com
 Noise Laboratory, www.noiseken.com
 Prostat, www.prostatcorp.com
 QRP Gloves, www.qrpgloves.com
 Simco, www.simcoion.biz
 Static Solutions, www.staticsolutions.com
 SUSS MicroTec, Test Systems, www.suss.com
 Terra Universal, www.terrauniversal.com
 TREK, www.trekinc.com

Distributors: ESD Control and Protection Products

Allied Electronics, www.alliedelec.com
 S.R.S. Market Solutions, www.metersuperstore.com
 Terra Universal, www.terrauniversal.com
 Test & Measurement Global Exchange (Tamge), www.tamge.com
 TREK, www.trekinc.com

Test Houses, Labs, Services: ESD Control and Protection

Alion Science & Technology, rb.alionscience.com
 Amkor Technology, www.amkor.com
 AST Technology Labs, www.asttechlabs.com
 D.L.S. Electronic Systems, www.dlsemc.com
 Electro-Tech Systems, www.electrotechsystems.com



SUSS MicroTec, Test Systems, www.suss.com

Training: ESD Control and Protection

D.L.S. Electronic Systems, www.dlsemc.com
 Equipment Reliability Institute, www.equipment-reliability.com
 Prostat, www.prostatcorp.com
 Stephen Halperin & Associates, www.halperinassoc.com
 SUSS MicroTec, Test Systems, www.suss.com

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PROFESSIONAL SOCIETIES & TRADE ASSOCIATIONS

3rd Generation Partnership Project (3GPP), www.3gpp.org. The 3GPP brings together a number of telecommunications standards bodies.

Accellera, www.accellera.org. Accellera's mission is to drive development of standards that enhance a language-based design automation process.

AeA, www.aeanet.org. AeA is a trade association representing all segments of the technology industry.

Alliance for Telecommunications Industry Solutions (ATIS), www.atis.org. ATIS is a US-based body that is committed to developing technical and operations standards for the communications and information technologies industry worldwide.

American Association for Laboratory Accreditation (A2LA), www.a2la.org. The A2LA is dedicated to accreditation of competent testing and calibration laboratories, proficiency testing providers, and reference materials producers.

American Council of Independent Laboratories (ACIL), www.acil.org. ACIL is a trade association representing independent, commercial scientific, and engineering firms.

American National Standards Institute (ANSI), www.ansi.org. ANSI is a private, non-profit administrator and coordinator of the US voluntary standardization system.

American Society for Nondestructive Testing (ASNT), www.asnt.org. ASNT promotes NDT (nondestructive testing) as a profession and facilitates NDT research.

American Society for Quality (ASQ), www.asq.org. The ASQ advances learning, quality improvement, and knowledge exchange to improve business results.

American Society of Test Engineers (ASTE), www.astetest.org. The ASTE, a nonprofit corporation, is dedicated to promoting test engineering as a profession.

ASTM International, www.astm.org. ASTM develops and distributes voluntary technical standards for materials, products, systems, and services.

Audio Engineering Society (AES), www.aes.org. The AES is a professional society devoted exclusively to audio technology.

Automated Imaging Association (AIA), www.machinevisiononline.org. The AIA is a trade association for machine-vision imaging suppliers and users. The AIA also maintains the Camera Link and GigE Vision standards.

British Standards Institution (BSI), www.bsi-global.com. BSI is the National Standards Body of the UK, responsible for publishing and marketing British Standards.

Broadband Forum, www.broadband-forum.org. Formerly the DSL Forum, the Broadband Forum is a consortium of telecom, equipment, networking, and service-provider companies that promotes the use of multi-service broadband packet networking specifications.

Canadian Standards Association (CSA), www.csa.ca. CSA works in Canada and around the world to develop standards that enhance public safety and facilitate trade.

Collaborative Alliance for Semiconductor Test (CAST), www.semi.org/cast. A special interest group within SEMI, CAST works to lower the costs of semiconductor test and resolve issues surrounding the standardization of test equipment.

Electronic Industries Alliance (EIA), www.eia.org. EIA represents companies involved in the manufacture of electronic components, parts, systems, and equipment.

ESD Association, www.esda.org. The ESD Association is dedicated to advancing the theory and practice of electrostatic discharge avoidance.

European Committee for Electrotechnical Standardization (CENELEC), www.cenelec.org. CENELEC creates electrotechnical standards, many of them following the mandates of the European Commission.

European Committee for Standardization (CEN), www.cen.eu. CEN works to implement voluntary technical harmonization in Europe.

European Machine Vision Association (EMVA), www.emva.org. The EMVA works to strengthen the position of its members in worldwide markets, and it hosts the GenICam standard group.

European Telecommunications Standards Institute (ETSI), www.etsi.org. ETSI's mission is to produce the telecom standards that will be used throughout Europe.

Federal Communications Commission (FCC), www.fcc.gov. The FCC is an independent US government agency charged with regulating interstate and international communications by radio, television, wire, satellite, and cable.

Fibre Channel Industry Association (FCIA), www.fibrechannel.org. The FCIA aims to develop the market for Fibre Channel products.

IEEE, www.ieee.org. The IEEE is a professional association dedicated to the advancement of technology.

Institute of Environmental Sciences and Technology (IEST), www.iest.org. The IEST is concerned with the effects that natural, indoor, and extreme environments have on equipment and machinery.

Institution of Engineering and Technology (IET), www.theiet.org. The IET, a UK-based professional organization, aims to lead in the advancement of engineering and technology by facilitating the exchange of knowledge and ideas.

Institute for National Measurement Standards (INMS), inms-ienm.nrc-cnrc.gc.ca. The INMS (Canada's national metrology institute) carries out a range of research and service activities.

International Committee for Information Technology Standards (INCITS), www.incits.org. The INCITS works to produce voluntary consensus standards for storage media, databases, programming languages, multimedia, and communication among computing devices and information systems.

International Electrotechnical Commission (IEC), www.iec.ch. The IEC creates international consensus standards and conformity assessment schemes in the fields of electricity, electronics, and associated technologies.

International Microelectronics and Packaging Society (IMAPS), www.imaps.org. IMAPS is a professional society dedicated to educating engineers in all phases of electronics packaging.

International Organization for Standardization (ISO), www.iso.org. The ISO promotes the development of international standards.

International Society of Automation (ISA), www.isa.org. ISA is a society of professionals involved in automation, instrumentation, and control.

International Telecommunication Union (ITU), www.itu.int. Through the ITU, governments and industries establish and coordinate policies, standards, regulations, and treaties covering global telecommunication networks.

IP/MPLS Forum, www.ipmplsforum.org. The IP/MPLS Forum's mission is to drive the success of IP/MPLS-based technology, networks, and services.

IPC-Association Connecting Electronics Industries, www.ipc.org. IPC is a global trade association that represents all facets of the electronic interconnection industry.

Japan Electric Measuring Instruments Manufacturer's Association (JEMIMA), www.jemima.or.jp/english. JEMIMA promotes research and standards to help develop Japan's electric measuring instrument industry.

LXI Consortium, www.lxistandard.org. The LXI Consortium is working to develop the LXI (LAN eXtensions for Instrumentation) standard.

Microelectronics Packaging and Test Engineering Council (MEPTEC), www.meptec.org. MEPTEC is a trade association committed to enhancing the competitiveness of the back-end portion (assembly and testing) of the semiconductor business.

National Cooperation for Laboratory Accreditation (NACLA), www.nacla.net. NACLA's primary mission is to evaluate US laboratory ABs (accreditation bodies).

National Institute of Standards and Technology (NIST), www.nist.gov. NIST promotes US economic growth by working with industry to develop and apply technology, measurements, and standards.

National Society of Professional Engineers (NSPE), www.nspe.org. The NSPE is an interdisciplinary professional engineering society.

National Voluntary Laboratory Accreditation Program (NVLAP), www.nist.gov/nvlap. NVLAP provides third-party laboratory accreditation services.

NCSL International, www.ncsl.org. The National Conference of Standards Laboratories, NCSL International, is an association of metrology organizations with a focus on education.

Optical Society of America (OSA), www.osa.org. The OSA is a nonprofit professional society of engineers and scientists in the optics and photonics community.

PC/104 Embedded Consortium, www.pc104.org. The PC/104 Embedded Consortium disseminates information about PC/104 and serves a liaison function between PC/104 and standards organizations.

PCI-SIG, www.pcisig.com. The PCI SIG is committed to the development and enhancement of the PCI standard.

PCMCIA, www.pcmcia.org. PCMCIA is an international standards body and trade association that promotes the interoperability of PC Cards in a variety of products.

PXI Systems Alliance, www.pxisa.org. The PXI Systems Alliance maintains the PXI specification, promotes PXI technology, and ensures multivendor interoperability.

SAE International, www.sae.org. SAE International works to advance the engineering of mobility systems, whether for use on land or sea or in air or space.

Semiconductor Equipment and Materials International (SEMI), www.semi.org. SEMI is an international trade association for equipment and materials suppliers to the semiconductor, MEMS, and flat-panel display industries.

Semiconductor Industry Association (SIA), www.sia-online.org. The SIA is a trade organization that represents US-based semiconductor manufacturers.

Semiconductor Test Consortium (STC), www.semittest.org. The STC oversees the Openstar (Open Semiconductor Test Architecture) platform.

Society for Information Display (SID), www.sid.org. The SID is devoted to the advancement of electronic display technology, manufacturing, and applications.

Society of Flight Test Engineers (SfTE), www.sfte.org. The SfTE is a fraternity of engineers involved in the flight testing of aircraft and missiles.

SPIE (formerly International Society for Optical Engineering), www.spie.org. The SPIE is a technical society dedicated to advancing engineering and commercial applications of optical, photonic, imaging, electronic, and optoelectronic technologies.

Standards Council of Canada, www.scc.ca. The Standards Council of Canada oversees Canada's National Standards System.

Surface Mount Technology Association (SMTA), www.smta.org. The SMTA seeks to advance the industry through education, training, and networking in regards to electronics assembly technologies and related business operations.

Telecommunications Industry Association (TIA), www.tiaonline.org. The TIA is a trade association serving the communications and information technology industries.

Test and Diagnostics Consortium (TDC), www.test-diagnostics.org. The TDC brings together users and suppliers from industries such as medical, automotive, satellite, railroad, trucking, and defense to optimize the test and diagnostic environment.

Underwriters Laboratories (UL), www.ul.com. The UL is an independent, nonprofit certification organization that evaluates products in the interest of public safety.

VMEbus International Trade Association (VITA), www.vita.com. VITA is a nonprofit trade association that promotes the use of open system architectures.

VXibus Consortium, www.vxibus.org. The VXibus Consortium develops and promotes the VXibus instrumentation standard.

WiMAX Forum, www.wimaxforum.org. The WiMAX Forum certifies and promotes the compatibility and interoperability of broadband wireless products based upon the harmonized IEEE 802.16/ETSI HiperMAN standard.

ZigBee Alliance, www.zigbee.org. The ZigBee Alliance works to enable low-power, wirelessly networked, monitoring and control products based on a global standard.

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PRODUCT FOCUS

The following write-ups were supplied by advertisers in this issue

Solid-state switching system

The new VDM chassis are 19-in. rack-mount systems with RS-232, IEEE 488, and Ethernet controls. These solid-state systems are nonblocking, full fan-out matrices in



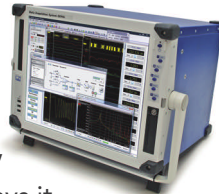
configurations up to 32x32 with multiple connector options; they can switch both 50-Ω and 75-Ω impedance signals. Small signal band pass is DC to over 400 MHz, with crosstalk less than -60 dB at 50 MHz.

Cytec, cytec-ate.com.

Data-acquisition system

The GEN5i integrates a high-end PC and a state-of-the-art data-acquisition and transient recording system in a single, portable instrument.

GEN5i is ready to run "out of the box," and HBM says it combines unmatched performance with ease of use. It offers up to 40 input channels, sample rates from 200 ksamples/s to 100 Msamples/s, and transient recording to RAM or high-speed streaming to disk.



HBM, www.hbm.com/highspeed.

500-W RF amplifier

AR RF/Microwave Instrumentation is introducing the first model in its new "A" series RF amplifier line. The Model 500A250 is a 500-W, 10-kHz to 250-MHz RF amplifier that packs more power into a smaller size and boasts

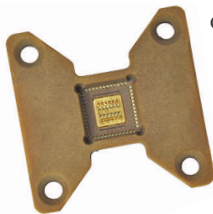


roughly a 35% reduction in size and weight compared to existing products.

AR RF/Microwave Instrumentation, www.ar-worldwide.com.

Best-in-class electrical performance

Johnstech says its Pad ROL 100A Series offers the best-in-class electrical performance for testing demanding RF/microwave communications



devices up to >40 GHz. Whether you're performing engineering tests

on high-gain RF amplifiers, RF transceivers, or the latest WiMAX or 3G devices, the Pad ROL 100A delivers.

Johnstech International, www.johnstech.com.

PoP test sockets

IDI'S Antares test sockets provide innovative PoP (package over package) test solutions. Field-proven coaxial fan-out returns offer unsurpassed signal integrity, and the interchangeable top-side technology permits the use of common interposers in lids and change kits. Known-good memory systems offer the ability to test primary packages as a stand-alone system.

Interconnect Devices, www.idinet.com/synergetix.

Thermocouple dataloggers

The OM-CP-PRTC210 series of pressure and thermocouple temperature dataloggers accepts thermocouple types J,



K, T, E, R, S, B, and N.

Models are available with pressure ranges from 2 to

345 bar (30 to 50,000 psi).

The series features real-time operation and programmable start time. The miniature sized OM-CP-PRTC210 is CE compliant and has a battery life of up to 2 yr.

Omega Engineering, www.omega.com/pptst/OM-CP-PRTC210.html.

PRODUCT FOCUS

The following write-ups were supplied by advertisers in this issue

PXI downconverter modules

Phase Matrix's PXI downconverter modules are programmable and configurable to operate between 100 kHz

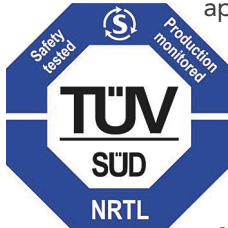


and 26.5 GHz. The following modules are available: preselector (PXI-1410), microwave downconverter (PXI-1420), RF downconverter (PXI-1430), IF downconverter (PXI-1440), and local oscillator (PXI-1450).

Phase Matrix,
www.phasematrix.com.

NRTL spotlight

TÜV SÜD America is offering free NRTL certificates to customers transferring NRTL certification from another NRTL agency (some conditions may



apply). Anyone interested in transferring an NRTL service should view

the company's complimentary on-demand Webinar, "Changing Safety Agencies: Your Guide for a Smooth Transfer."

TÜV SÜD America,
www.tuvamerica.com/rollover.

Digital oscilloscope series

Instek has introduced the GDS-1000A series digital oscilloscopes, which feature 1-Gsample/s sampling and a 2-Mpoint record length. The



three models in the family offer 60-MHz, 100-MHz, and 150-MHz bandwidths. With Instek's MemoryPrime Technology, the 2-Mpoint memory is fully utilized so waveform update speed is not sacrificed.

Instek America,
www.instek.com.

Telecentric lens with low F/#

Edmund Optics' TechSpec High Resolution 5 Megapixel Telecentric Lens, designed to maximize 5-Mpixel sensors,



produces levels of contrast that yield maximum image quality with a high degree

of measurement accuracy. Lenses are configured with an F/# of F6, and a locking iris and focus make the lenses perfect for factory assembly lines and high-vibration environments.

Edmund Optics,
www.edmundoptics.com.

Li-Ion cell measurement

VOLTpoint is a series of precision high-voltage USB- or Ethernet-compatible measurement instruments ideal for lithium-ion cell-by-cell battery testing where sources range from millivolts to ± 400 V.



VOLTpoint's ISO-Channel technology provides galvanic isolation methods to guarantee 1000-V isolation

between any two input channels and ± 500 V to earth ground.

Data Translation,
www.datatranslation.com.

Protocol analysis and test platform

Xgig is a unified, integrated platform that employs a unique chassis and blade



architecture to provide users the utmost in scalability and flexibility. Various blades support a wide range of protocols and can easily be configured to act as a protocol analyzer, jammer, BER tester, traffic generator, and load tester without changing hardware.

Finisar, www.finisar.com/protocol_test_solutions.

LXI Class A DMM/switch

The scalable EX1200 series is the highest-density switch/measure and control subsystem available, according to VTI Instruments. Modular and flexible, the EX1200 features LXI Class A technology and

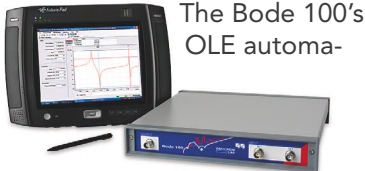


can measure up to 576 channels of temperature/voltage in a single-rack U mainframe. Additional options include analog and digital I/O modules and a 6.5-digit DMM.

VTI Instruments,
www.vtiinstruments.com/ad/ex1200/TMW.

Automated vector network analysis

Repeating the same measurement over and over again is time consuming and boring.

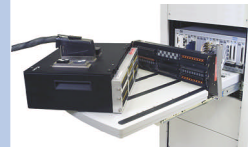


The Bode 100's OLE automation interface allows for easy setup of automated vector network analyzer measurement systems. The common languages and programs used in R&D, quality assurance, and production automation are supported; code examples are available.

OMICRON Lab,
www.omicron-lab.com.

High I/O interconnect

The G12x interconnect system offers all the benefits of the G12 (slide kits, optional accessories, and a multipositional handle) in an 18-module interface. The G12x accepts both G12 and G12x



ITAs (interchangeable test adapters)

and supports up to 180 lbs (350 lbs with the optional leg kit). The G12x offers reliability beyond 20,000 cycles and operates in temperatures from -55°C to 85°C .

Virginia Panel Corp.,
www.vpc.com.

RF power calibrators

TEGAM's PM series of RF power calibrators delivers more calibration capability with less equipment by add-



ing the ability to calibrate reference outputs and estimate port parameters of signal generator outputs. The core is the 1830A RF power meter with new modular power standards for extended frequency range in a compact 2U half-rack configuration.

TEGAM, www.tegam.com.

Prototyping PCB designs

Sunstone Circuits and National Instruments have joined forces to provide an easy approach to PCB (printed-circuit board) prototyping. The collaboration lets engineers benefit from a streamlined design flow with NI Multisim circuit design, flexible NI Ultiboard layout, and PCB prototype order integration with Sunstone Circuits. A free 30-day evaluation copy of Multisim and Ultiboard is available.

Sunstone Circuits,
www.sunstone.com.

PXI automated test system

A customizable and ready-to-test PXI platform without the custom price, GBATS



(Geotest Basic Automated Test System) includes standard configurations for mixed-signal test, digital test, boundary scan, and commercial- and military-avionics applications. The ATEasy software option offers an integrated test executive and development environment.

Geotest - Marvin Test Systems, www.geotestinc.com.

PRODUCT FOCUS

The following write-ups were supplied by advertisers in this issue

Universal input DAQ

The USB-2404-UI, Measurement Computing's new universal input device, features four simultaneous sampling, 24-bit universal analog inputs at 100 samples/s per channel, with 250 Vrms channel-to-channel and channel-to-ground isolation. Each channel is capable of measuring voltage, current, thermocouples, RTDs, resistance, or bridge-based sensors. The device includes a built-in thermistor for CJC (cold-junction compensation).
Measurement Computing, www.mccdaq.com.



LXI modular switching system chassis

Pickering's chassis allow PXI modules from the company's range of more than 500 products to be controlled in an LXI environment. This includes a huge range of switching modules together with programmable power supplies, battery simulators, amplifiers, attenuators, digital I/O, breadboards, and programmable resistor cards.
Pickering Interfaces, www.pickeringtest.com.



2009 electronic load catalog

AMREL has released its 2009 eLoad catalog. With AMREL's wide selection of programmable electronic loads, the catalog showcases eLoads ranging from 60 W to 250 kW+. The New eLoad Selection Guide on p. 1 makes it easy to find the eLoad that meets your requirements. You can obtain a catalog by sending an e-mail to pdinfo@amrel.com or by calling 800-654-9838.
AMREL/American Reliance, www.amrel.com.



Antenna kits

A.H. Systems offers nine models of portable antenna kits from 2 GHz to 40 GHz. Each kit provides all the antennas, current probes, and accessories needed to satisfy a wide array of customer requirements. Additional pre-amplifiers and cables can be added. The company offers what you need for compliance testing with next-day delivery.
A.H. Systems, www.ahsystems.com.



Best practices for data centers

Often, the bulk of an IT department's time and money is spent ensuring that systems are operational. Network outages or application degradations often result in financial loss, delays in treatments, or customer dissatisfaction. A white paper from MRV highlights a number of "best practices" that allow IT management staff to improve security and availability while reducing costs for equipment and staffing.
MRV, www.mrv.com.

24-bit USB data acquisition

The DEWE-43-V connects to a PC via USB, and includes Dewetron's DEWESoft acquisition software. The system features simultaneous sampling, anti-alias filters, synchronous counter/encoder inputs, and two CAN bus interfaces. A 5-min video demonstration is available on the company's Website and on youtube.com. System price is \$4500 total, including software.
Dewetron, www.dewamerica.com.



CATALOGS & PRODUCTS

The following write-ups were supplied by advertisers in this issue.

Affordable high-speed camera

Vision Research has introduced the Phantom v210, which the company says sets a new price/performance for digital high-speed cameras. The Phantom v210 is capable of taking over 2000 pictures/s at 1280x800 resolution. *Vision Research, www.visionresearch.com.*



Telephony test lab

AST Technology Labs provides standards-based (TIA, ITU, ETSI, IEEE) performance testing and development consulting for telephony products including analog (PSTN) and digital (VoIP) telephones, gateways, STBs (DSL, cable), and PBXs. *AST Technology Labs, www.asttechlabs.com.*

Protocol testing

Xgig's unified, integrated platform supports a wide range of protocols and can be easily configured to act as an analyzer, jammer, bit-error-rate tester, traffic generator, and load tester without changing hardware. *Finisar, www.finisar.com/protocol_test_solutions.*

Audio analyzer

The APx Series is a high-performance multichannel audio analyzer with a next-generation user interface. Interface options include two to 16 channels of analog, AES3 and S/PDIF, HDMI, and eight-channel I2S. *Audio Precision, ap.com.*

Thermal-testing interface

The SL4 combines a unique slide-lock engaging mechanism with a front-mounted handle, making it ideal for thermal-testing applications. It has a four-module capability for a range of I/O needs and is PCB-mountable. *Virginia Panel Corp., www.vpc.com.*

DAQ in mini format

QuantumX by HBM is a universal data-acquisition system for highly reliable test and measurement tasks. Its compact modules can be used as stand-alone instruments or extended to a distributed synchronized system. The system also supports TEDS. *HBM, www.hbm.com/quantumX.*

LXI-compliant supply

Using high-frequency switch-mode topology, the KLP provides 1200 W of well-regulated, controllable DC power over an expanded operating region, not just a single point. Standard features include GPIB and RS-232 interfaces and isolated analog I/O. *Kepeco, www.kepeco.com.*

Solid-state RF matrix

The VDM 32x32 RF matrix with RS-232, IEEE 488, and Ethernet controls can switch 50 Ω or 75 Ω with connector options. Small signal band pass is DC to over 400 MHz, and crosstalk is better than -60 dB at 50 MHz. *Cytec, cytec-ate.com.*

Bargain corner

If your budget is tight, the AR Bargain Corner on the company's Website is a place to find some great values. Discontinued and demonstration equipment is available at a fraction of its original price. *AR RF/Microwave Instrumentation, www.ar-worldwide.com.*

Switch/measure brochure

VTI's switch/measure and control brochure provides an overview of the latest technology available on the LXI, VXI, and VME platforms, covering a range of applications from DC to light. *VTI Instruments, www.vtiinstruments.com/Contactus.aspx?sales=SMB.*



Testing RF communications

Johnstech's ROL technology combines >20 GHz electrical performance for engineering and characterization testing of RF communications, analog, and mixed-signal devices with proven mechanical reliability and repeatability for production testing. *Johnstech International, www.johnstech.com.*

Printed-circuit-board solutions

Do you have a simple PCB job that you need completed in a hurry? Sunstone's Quickturn Prototype Service offers a fast turnaround on high-quality, two- to six-layer boards with limited features. Expedited service is also available. *Sunstone Circuits, www.sunstone.com.*

PXI downconverter modules

Phase Matrix's PXI downconverter modules are programmable and configurable to operate up to 26.5 GHz. The following modules are available: preselector (PXI-1410), microwave downconverter (PXI-1420), RF downconverter (PXI-1430), IF downconverter (PXI-1440), and local oscillator (PXI-1450). *Phase Matrix, www.phasematrix.com.*

Antennas and accessories

A.H. Systems provides EMC antennas, accessories, and calibration services for global testing. The company offers a line of antenna kits from 20 Hz to 40 GHz. *A.H. Systems, www.ahsystems.com.*



Complimentary white papers

TÜV SÜD America offers complimentary white papers written by industry professionals who are experts in their fields. The company recently added white papers about functional safety. *TÜV SÜD America, www.tuvamerica.com/tuvnews/whitepapers.cfm.*

Plug-and-play measurement

Data Translation offers a wide range of USB data-acquisition hardware and software products for any application and budget. From low cost to high speed and high performance, a variety of multifunction USB data-acquisition solutions are available. *Data Translation, www.datatranslation.com.*

Cable test system

DIT-MCO's Model 2115 quickly tests cables and wire harness assemblies with up to 1500 V and 2 A stimulus. Options allow for AC hipot and functional component testing. *DIT-MCO International, www.ditmco.com.*

Three-output programmable power

Instek's GPD-3303S programmable power supply features three isolated outputs (195 W), 1-mV/1-mA high resolution with fine-tuning, four sets of setup memory, USB remote control, a smart cooling fan control, a compact size, and high reliability. *Instek America, www.instek.com.* (continued)

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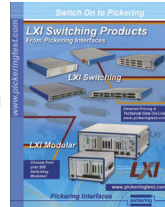
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The Dyno test socket employs an innovative wiping contact design that ensures low and consistent contact resistance. IDI says this design will revolutionize the testing of QFNs, MLFs, and other leadless devices. *Interconnect Devices*, www.idinet.com/synergetix.

LXI short form

A short-form catalog highlights Pickering Interfaces' broad range of LXI switching systems that address DC, RF, microwave, and optical applications. The company also offers its PXI switching in an LXI environment. *Pickering Interfaces*, www.pickeringtest.com.



Wideband injection transformer

The B-WIT100 wideband injection transformer is used for the signal insertion into electronic circuits. Together with the VNA Bode 100, the transformer is used to assess the stability of control loops. *OMICRON Lab*, www.omicron-lab.com.

2009 instrumentation catalog

TEGAM helps customers be more productive by making instrumentation easier to use, more accurate, and faster. The company says its areas of expertise include precision amplifiers, RF power calibration, and low-level measurements. *TEGAM*, www.tegam.com.

24-bit USB DAQ

The DEWE-43-V connects to a PC via USB, and includes DEWESoft acquisition software. The unit offers simultaneous sampling, anti-aliasing, eight counters, and two CAN interfaces. A video demo is available on the company's Website. Price: \$4500. *Dewetron*, www.dewamerica.com.

High-voltage power products

AMREL has released several new 800-VDC and 1000-VDC eLoad and ePower models. Power levels range from hundreds of watts to hundreds of kilowatts and can be customized to meet specific application demands. *AMREL/American Reliance*, www.amrel.com.

Free technical papers

On Geotest's Website, you can access a database of free test- and measurement-related technical papers. Topics include PXI platforms for factory and depot test applications, instrument obsolescence, and digital instrumentation for video test. *Geotest - Marvin Test Systems*, www.geotestinc.com/WhitePaper.

USB DAQ for OEMs

The USB-2500 series provide true multifunction performance: up to 64 single-ended/32 differential, high-speed (1-MHz throughput) analog inputs; waveform-capable analog outputs; 24 digital I/O bits; four counter inputs; and two timer outputs. *Measurement Computing*, www.mccdaq.com.

Benchtop flash station

The CCI-689 from Circuit Check programs the chips on up to four printed-wiring-board assemblies simultaneously, in a PC-based benchtop package. The built-in fixture uses replaceable drop-in probe plates, allowing one CCI-689 to program multiple products. *Circuit Check*, www.circuitcheck.com.

Telephone signal analyzer

The TSA6000 telephone signal analyzer is used for capturing, measuring (time domain and FFT), auto-



matically analyzing, and troubleshooting telephone signals including analog PSTN lines (FXO) and analog FXS ports (DSL, cable, VoIP, caller-ID). *AST Technology Labs*, www.tsa6000.com.

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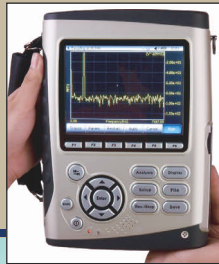
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[An exclusive interview with a technical leader]

**RON NERSESIAN**

Senior VP and
General Manager
Electronic Measurement Group
Agilent Technologies
Santa Clara, CA

In March, Ron Nersesian was named senior VP and general manager of Agilent Technologies' Electronic Measurement Group. He began his career with Computer Sciences Corp. as a systems engineer in satellite communications. In 1984, he joined Hewlett-Packard, serving in various management roles before moving to LeCroy in 1996 as VP of worldwide marketing and later as general manager of the digital storage oscilloscope business. Nersesian joined Agilent in 2002 as VP and general manager of the Design Validation Division. He holds a BSEE from Lehigh University and an MBA from New York University. Contributing editor Larry Maloney conducted an e-mail interview with Nersesian on the outlook for the test industry and new technology development at Agilent.

Charting test's road to recovery

Q: How will the recession change the electronics test and measurement business?

A: Electronics test will remain a critical part of all electronic product delivery, whether in wireless communications, vehicle electronics, or general electronics. In some sense, every economic environment requires some level of purchasing for test products—hardware and software. Having said that, customers have become very conservative about new product purchases. Lately, we see them using existing equipment for the tests and measurements required to successfully take products to market. What's required—and Agilent is taking a leadership role—is delivering versatile instruments and applications that can serve a broad spectrum of test needs.

Q: When will the test industry begin growing again?

A: We expect limited growth in 2009, followed by a slow rebound beginning in 2010. For Agilent, the best opportunities for growth are likely to be found in such areas as modernization in aerospace and defense, homeland security and surveillance, wireless R&D, MIMO antenna technology, smart phones, alternative and green energy, handheld RF instrumentation for base-station deployment, and 3G ecosystems, such as LTE, HSPA, and EDGE Evolution. We're also pursuing the resurgent investment in university-based research.

Q: How will Agilent's 2009 exit from the AOI and AXI business affect existing operations?

A: In the wake of our exit from the AOI (automated optical inspection) and AXI (automated x-ray inspection) businesses, Agilent is focusing new investment and expanding our product offerings for ICT (in-circuit test) and functional test. Examples include the i3070 and i1000 in-circuit testers, and the TS54xx family of automotive functional-test systems. Agilent has also introduced innovative limited-access solutions, such as Bead Probe and Cover

Extend, which will enable our customers to enjoy new levels of value from ICT.

Q: What synergies exist between Agilent's electronic measurement arm and its fast-growing bio-analytical instruments business?

A: A great example is our new measurement platform in scanning microwave microscopy. It combines two existing products: the vector network analyzer from our electronic measurement business and the AFM (atomic force microscope) from our bio-analytical measurement business. This platform is the first commercial scanning multifrequency, absolute-capacitance AFM.

The combination of world-class microwave electronics and world-class AFM provides exceptional performance and enables applications never before possible. One key application is the probing of dopant concentrations in semiconductors. Existing techniques are destructive to the wafer and cannot sense deep below the surface. With our scanning microwave microscopy, it is possible to nondestructively see the electronic structure beneath the surface, providing new insights into semiconductor materials.

Q: What other methods does Agilent use to drive innovation?

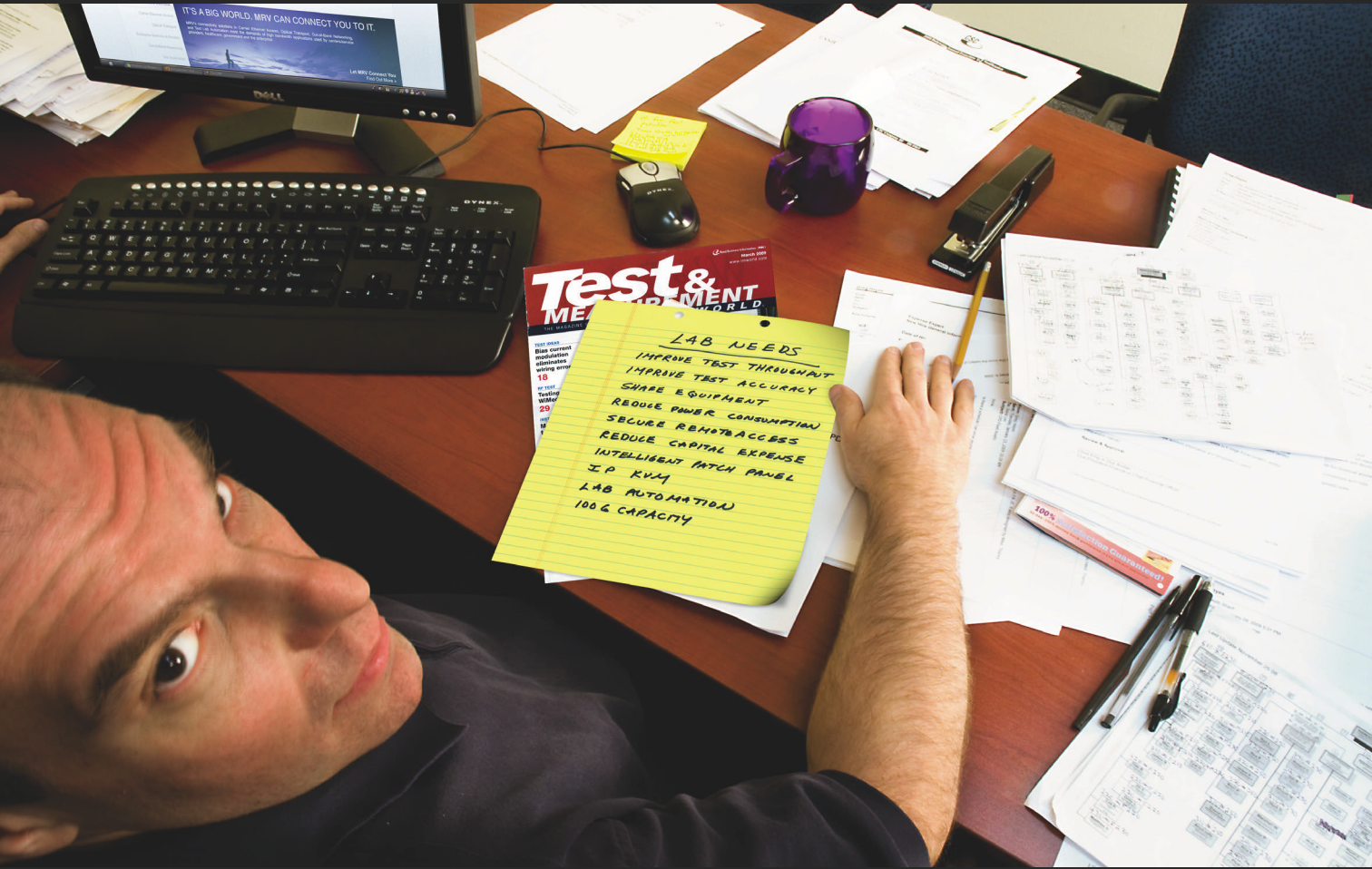
A: Our individual business units are constantly looking, listening, and probing for test and measurement solutions that will address today's needs and anticipate those likely to emerge far into the future. To keep our finger on the pulse of the market, Agilent is active in all the major standards groups and we chair several of them. **T&MW**



Ron Nersesian addresses more questions on new instrumentation and emerging applications in the online version of this interview: www.tmworld.com/2009_07.

To read past Viewpoint columns, go to www.tmworld.com/viewpoint.

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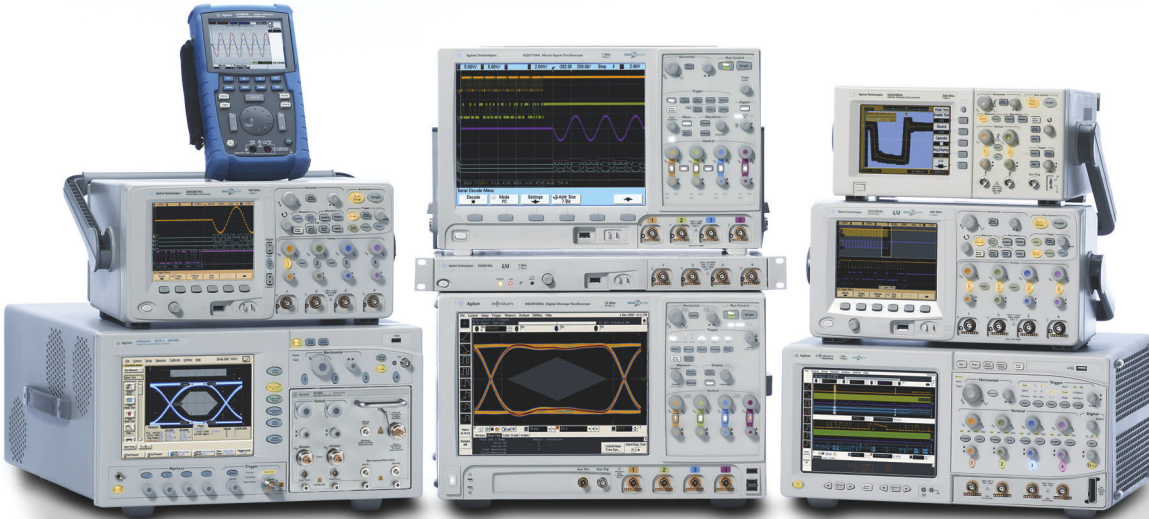


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