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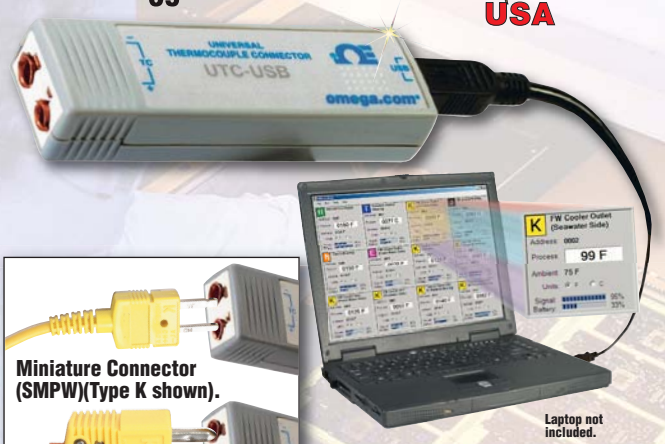

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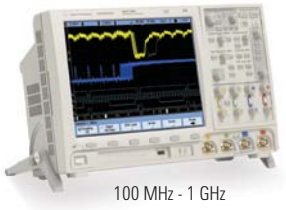

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Complex modulation comes to optical fiber

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RICK NELSON
EDITOR IN CHIEF

Tests temper ATE firms' optimism

A wave of optimism is sweeping the semiconductor equipment industry as evidenced by the positive mood at Semicon West, held July 13 through 15 in San Francisco. ATE manufacturers in particular had positive things to say about the industry on the exhibit floor and in a special Thursday workshop titled "ATE Vision 2020."

But the news out of the workshop for the ATE industry isn't all rosy, and the ATE companies themselves will be tested as they contend with evolving markets and technologies. Consultant Ron Leckie, principal of Infrastructure Advisors, said in his workshop keynote address that he expects the field of five major ATE vendors (Advantest, LTX-Credence, Teradyne, and Verigy, all of which were represented in the workshop, plus Yokogawa) to shrink to three within the next three to 10 years.

The cost of ATE hardware is falling as costs shift to fixtures, probe cards, handlers, and probers.

In good news for the commercial ATE companies, Leckie urged chip makers to avoid in-house solutions. For focused test within captive test operations having few sites and serving a narrow product line, in-house testers can be effective, he said, but in most cases, the pitfalls far outweigh the positives: In-house strategies impose hidden costs and overhead, with respect to documentation, training, customer support, and ongoing maintenance. In addition, firms employing outsourced semiconductor assembly and test services will need to support their proprietary testers within the OSAT (outsource assembly and test) environment.

The bad news for the commercial ATE firms is that they are becoming victims of their own success. Because of the ATE companies' successful implementation of parallel and concurrent test technologies—coupled with the increasing adoption of scan, built-in self-test, and adaptive test techniques—the cost of test hardware is falling as costs shift to fixtures, probe cards, handlers, and probers.

The good news and bad news combined, Leckie suggested, does not add up to support for all five major players. Showing the turmoil that has riled the industry through the years, he presented one slide listing about three dozen companies who have evolved through spinoff, merger, or acquisition into today's major players. You can view the slide at his Website, www.infras-advisors.com, and he invites additions and corrections.

Leckie attributed his prediction that the current field will shrink to three in part to "The Rule of Three," after the book of the same name by Jagdish Sheth and Rajendra Sisodia. According to the rule of three, markets support three generalist competitors plus several specialists, with the generalists including a dominant player with a 40% market share, a strong second-place player with about a 20% share, and a third-place player with about a 10% share. He noted that the dominant competitor in such a situation may be least innovative, with the fragile third-place company leading the field in innovation.

Leckie said that as the field consolidates, we may see mergers and acquisitions involving niche, specialist players such as Aehr Test, ELES, Micro Control Co., Roos Instruments, ProductionLine Testers, and SPEA. The good news for ATE customers is that they can expect to see a wave of innovation as the major and niche players alike struggle to be among the survivors. T&MW

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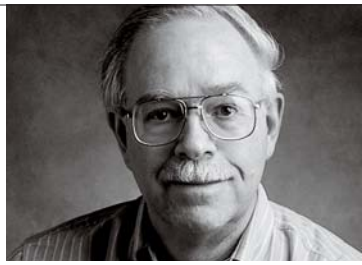


Under the dash, and over my head

Besides the usual perps (stylists, designers, and manufacturing engineers), automobile companies employ sadists and practical jokers who respectively decide where to place the vehicle's radio, er, "entertainment system," and select its connectors.

Our 2004 Nissan Quest minivan's CD changer ate a disc, and a local garage estimated that repairs would cost several hundred dollars. I figured that I could pull the radio and connect a power supply, an antenna, and a couple of loudspeakers to verify the repairs. While it was on the bench, I'd add audio inputs to accommodate a Sirius satellite receiver I'd received as a gift.

I downloaded disassembly instructions for the Quest's uniquely styled "coffee table" central console and began under-dash yoga exercises, searching for screws hidden by sadists and struggling with recalcitrant plastic panels affixed by hidden spring-clip fasteners guaranteed for one insertion/extraction cycle.

I extracted the radio assembly, a featureless metal box that sports no controls—those are embedded in the "coffee table." The CD drive looks nothing like a consumer-audio product, and its broken plastic innards told me that it was beyond repair. As for adding audio inputs, I downloaded the radio's schematic and was stymied. Without knowledge of its internal architecture and data-bus protocols, I couldn't figure out where to attach external audio.

Even armed with my HP 16500B logic analyzer and lots of spare time, attempting to reverse-engineer the various buses' signals would require a test-bench fixture. Short of stripping wiring harnesses and controls from a wrecked Quest, where could I find mates for those unfamiliar-looking connectors selected by Nissan's practical jokers? In short, I was in over my head.

Defeated, I ordered a replacement CD drive ($45) and an aftermarket adapter pod ($90) that plugs into the radio's unused mystery connectors and provides audio inputs for the Sirius receiver. I now have a fully functioning installation and an appreciation for the degree to which a once easily diagnosed and tested box-with-knobs "radio" has mutated into a vehicle-integrated, microprocessor-intensive, bus-oriented "entertainment system."

Now, wasn't that fun? T&MW

To read past "Test Voices" columns, go to www.tmworld.com/testvoices.

READ THIS FIRST!

Always disconnect a vehicle's battery ground strap *before* venturing under the dash. *Never* attempt to remove the positive (hot) terminal connector, as a slip of the wrench can cause a massive short circuit and battery explosion. Disconnecting the ground strap also disables the vehicle's airbag system, preventing accidental actuation.

DIY REPAIR TIPS

Repairing a modern automobile's entertainment system far exceeds the capabilities of most of us. But if you decide to go ahead, here are a few suggestions:

- Begin by reviewing the owner's manual to verify your understanding of how the entertainment system should work.
- Reread the warranty statement. If you're lucky, warranty coverage will pay for repairs. Your attempted repairs will likely void any remaining warranty.
- Check the vehicle's fuse panel for blown fuses. Vaporized metal in a fuse implies a massive overload.
- Ask yourself "What's changed?" Could seemingly unrelated repairs have affected the entertainment system?
- Search the Internet for similar problems reported by other owners.
- Obtain the documentation. Specifically, get removal and replacement instructions and a repair manual (if available).
- Survey your toolkit. You'll need more than a screwdriver and an adjustable wrench to remove most entertainment systems.
- Make a test plan. What instruments are needed to verify your repairs?

RESOURCES

There's a paucity of general information regarding radio removal and repairs. Your best bet is to use a specific vehicle's manufacturer, model, and year as search terms. Some listings may appear under "radio" or "audio system." This Website offers some basic advice:

www.fixitclub.com/Electronics/Car_Radio.shtml?page=1

Rohde & Schwarz enters the time domain

The Rohde & Schwarz test-and-measurement division is entering the time-domain-analysis business with families of oscilloscopes that offer bandwidths to 2 GHz. Roland Steffen, head of the firm's test-and-measurement division, said the new offerings will complement the under-500-MHz offerings from the Hameg subsidiary, which R&S acquired five years ago. He said Hameg will continue to supply instruments costing roughly 4000 euro and less through distributors, while R&S will serve the 500-MHz and up, 4000-euro-and-up market through its direct sales force.

Josef Wolf, head of the spectrum and network analyzers, EMC tests, and oscilloscopes subdivision, said the scope-development effort focused on high-level integration of analog, mixed-signal, and digital subsystems. A key goal, he said, was a low-noise analog front-end achieved through the use of a single-core SiGe 10-GHz ADC with ENOB better than seven. A 90-nm ASIC with 15 million gates provides hardware implementation of digital-signal-processing functions, enabling the analysis of 1 million waveforms per second.

The top-of-the-line R&S RTO models are available in two- and four-channel versions with bandwidths of 1 and 2 GHz. Sampling rate is 10 Gsamples/s. The instruments support a Windows-driven touch-screen user interface. The R&S RTM models offer 500-MHz bandwidth and 5-Gsamples/s sampling. They forgo the touch-screen interface but boot within 7 s to help provide fast measurement results. RTM instruments start at 5000 euro; RTO instruments start at 12,000 euro. www.rohde-schwarz.com.

LabView gets a boost with 2010 release

National Instruments has unveiled LabView 2010, the latest version of its graphical programming software. The company says that with a rewritten complier, the new version offers an overall 20% speed improvement over previous versions, and it also adds features that will help users shorten development time.

For example, the new packed project libraries help developers distribute code to users. Developers can encapsulate portions of compiled LabView code in a packed library, which contains a single file with a .lvlibp extension. The libraries can shorten development time for others looking to incorporate that code into larger projects. Opening a packed library lets users see, but not edit, the LabView code it contains.

Developers and test engineers who use instrument drivers have long had a way to find drivers at www.ni.com, but LabView 2010 lets you search for and install NI-certified drivers from within LabView. The Instrument Driver Finder will connect a computer with Internet access directly to the company's Website to simplify the process.

LabView 2010 also improves development time by reducing the number of clicks needed to gain access to a function. Other new features simplify the process of configuring a system. For example, LabView 2010 lets users configure LabView Realtime PXI systems through a browser rather than through NI's Measurement and Automation Explorer. Prices start at $1249. www.ni.com/labview.

Editors' CHOICE

Waveforms trigger on time

The WaveXciter arbitrary waveform generators from Tabor Electronics let you generate standard, modulated, and arbitrary waveforms with sample rates up to 2.1 Gsamples/s with 12-bit amplitude resolution. The WaveXciter series consists of two models—the single-channel WX2181 and the dual-channel WX2182—both of which feature a trigger that lets you initiate a waveform based on an incoming pulse's width. That is, the instruments can trigger on pulses longer than a programmed width, shorter than a programmed width, or between two widths.

The instruments can store waveforms up to 16 Msamples long (32 Msamples optional). A sequence table with up to 16,000 steps lets you call waveform segments. Each step can initiate a waveform from an external trigger or under software control, and each waveform segment can run up to 1 million times. Standard waveforms include sine; square; triangle with modulation including AM, FM, FSK, PSK, nQAM, and nPSK; and sweep.

Both instruments in the WaveXciter series provide communications through USB, Ethernet (LXI Class C), and GPIB ports. Software support includes ArbConnection software for creating waveforms and drivers for C, C++, LabView, and Matlab.

Base price: $32,000. *Tabor Electronics, www.taborelec.com.*

CALENDAR

Autotestcon, September 13–16, Orlando, FL. *IEEE, www.autotestcon.com.*

EOS/ESD Symposium, October 3–8, Reno, NV. *Electrostatic Discharge Association, www.esda.org.*

International Test Conference, November 2–4, Austin, TX. *IEEE, www.itctestweek.org.*

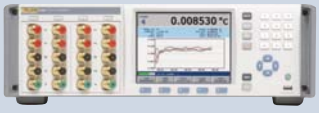
Electronica, November 9–12, Munich, Germany. *Messe München, www.electronica.de.*

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

Calibrate your best temperature probes

Editors' CHOICE

Calibration labs use a hierarchy of temperature probes, starting with SPRTs (standard platinum resistance thermometers) that then become reference probes for other probes. The 1594A and 1595A Super-Thermometers from Fluke can use an SPRT or a reference resistor to calibrate SPRTs, PRTs (also called RTDs), and thermistors. Typical accuracy is 0.2 ppm (0.05 mK) for the 1595A and 0.8 ppm (0.2 mK) for the 1594A.



Both thermometers let you compare an unknown probe against either an external SPRT (and external reference resistor) or an internal reference resistor (1 Ω, 10 Ω, 25 Ω, 100 Ω, or 10 kΩ). You can get a direct comparison or you can get a ratio of the reference resistor to the unknown probe. A ratio self-calibration lets you check the thermometer's measurement circuits.

When calibrating SPRTs or PRTs, you can get test results in ohms or in temperature units. The 1594A and 1595A let you save test results to a USB thumb drive or directly to a PC through the instrument's Ethernet, RS-232, USB, or GPIB ports. You can also use the ports to control the instrument for automated tests.

Prices: 1594A—$20,195; 1595A—$27,195. *Fluke, www.fluke.com.*

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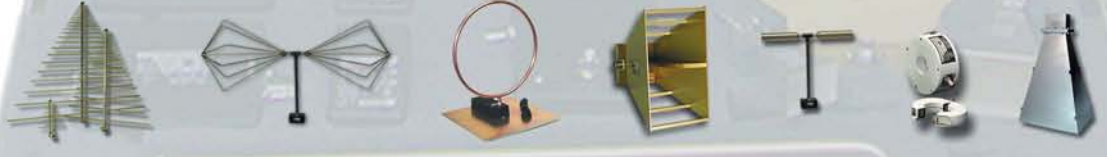

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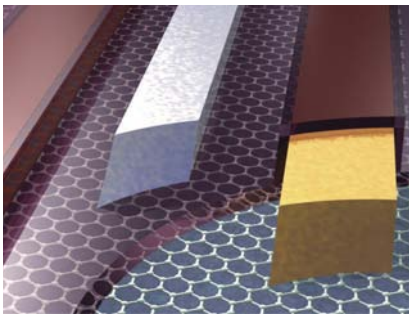
Graphene shows promise

When you think of how far semiconductor devices—particularly CMOS—have come in terms of speed, it can leave you dumbstruck. One day, though, silicon-based ICs will reach their speed limits. Researchers are, therefore, looking for new materials that can take over where silicon will leave off. One such material is graphene. Still in the research stage, graphene is showing promise for applications such as high-speed transistors, sensors, super capacitors, and solar cells.

Graphene is carbon grown on substrates such as silicon, glass, and copper in layers that are just one atom thick. Thus, graphene sheets are two dimensional. The carbon atoms are arranged in hexagonal shape, like a honeycomb. When doped with impurities, graphene takes on some interesting properties.

For example, electrons can pass right through a graphene sheet without knocking into other electrons—a phenomenon called "ballistic transport," which means the material has very low resistance. Lower resistance results in lower voltage losses, which could lead to a new range of low-power electronic devices.

Graphene is being applied in the construction of RF transistors that could set new bandwidth records. IBM has announced the development of graphene transistors with a bandwidth of 100 MHz (Ref. 1). The online version of this article (www.tmworld.com/2010_08) contains links to papers on graphene research.



Graphene sheets form a single-atom layer on silicon or other materials.
Courtesy of IBM.

At first, graphene MOSFET transistors wouldn't work in digital applications because the single-layer sheet has no band gap between a MOSFET's gate and its source-drain channel. Without a band gap, a transistor won't turn off (Ref. 2) and would function as an analog device only. In June, researchers at Lawrence Berkeley National Labs announced that they had created a two-layer graphene device. With two layers, the researchers made a device with a controlled band gap, from 0 meV to 250 meV (Ref. 3). With that band gap, graphene transistors could work as digital devices.

As a sensor, graphene could, with the proper doping, detect the presence of specific chemical compounds. It's also showing properties that make it light sensitive. Thus, graphene could find use in solar cells or as infrared detectors (Ref. 4).

Supercapacitors are yet another possible application for graphene. Experiments have shown that chemically modified graphene ranges in capacitance from 99 F/g to 135 F/g depending on the doping material. These values are high compared to dielectric capacitors but lower than batteries or fuel cells (Ref. 5).

As researchers experiment with graphene-based devices, they must characterize them. That requires measurements. Mary Anne Tupta, senior applications engineer at Keithley Instruments, often assists researchers who, when characterizing graphene transistors, measure a device's I-V curves with source-measure units. Some researchers are measuring the characteristics of the graphene sheets themselves. They may put just 1 pA of current through a sheet and measure its resistance. Many of the papers listed in the online version of this article discuss how researchers make these measurements. T&MW

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USB test switch for PXI

The Model 40-737 test switch from Pickering Interfaces lets you connect up to eight USB devices to a single PXI card. You can use the switch to automatically test USB peripherals. Each port's power is switched through software. www.pickeringtest.com.

Videos on noise figure measurements

Agilent Technologies has released a CD containing five videos called "Hints For Making Noise Figure Measurements." www.agilent.com.

Reference CD on nanoscale measurements

Keithley Instruments' "Nanotechnology Test Tutorials" CD contains technical papers, articles, and data sheets on how to make measurements on nanoscale semiconductor devices and carbon nanotubes. www.ggcomm.com/Keithley/Jun10_PR_NanoCD.html.

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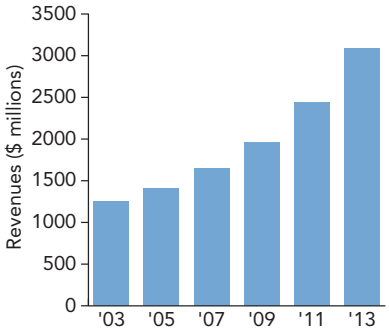
Use of sensors in test instruments increasing

Technological advancements have propelled the growth of sensors in the test and measurement space, and manufacturing environments routinely uses sensor-based test and measurement instruments to ensure quality production. The development of high-value resistor kits allows the unhampered use of high-impedance sensors for accurate measurements without interference from external noise, solder-flux residue, particle tracking, bias currents, and distant charges that can make repeatable measurements difficult.

Many factors are at play in the sensor-based instrument market. For example, the growth of data-acquisition systems has enabled manufacturers to embed microprocessors, custom programming, and displays into proprietary packaged devices, and data-acquisition hybrid devices often can store data for analysis on a computer at a later point in time. Further, product improvements in signal conditioners have improved the interface between real-world analog and digital sensor signals and data-acquisition or measurement and control systems at both the system and the device level. Advances in wide dynamic range encourage the use of vibration and acceleration sensors in test and measurement applications. All of these factors point to a growing market for sensor-based instruments, yet the enhanced ruggedness of many sensors has given them a longer lifespan, and this may have been delaying demands for new products.



By 2013, revenues in the sensor-based instrument market are predicted to be more than double the revenues of 2003.

Market dynamics

Though the process industry is the largest market driving the predictive and preventive maintenance market, revenues from power generation and aerospace have a higher rate of growth. It is estimated that for sensor-based test instruments, the revenues from automotive and aerospace are likely to dominate the market. This growth can be attributed to the higher use of accelerometers, flow transmitters, and data-acquisition devices.

The consumer electronics end user industry is anticipated to provide major growth for the sensor market in the period from 2010 to 2013. The main growth drivers in this space are the increased use of accelerometers and data-acquisition devices. Power generation is the next largest industry expected to grow, due to the increased adoption of test equipment for monitoring various parameters.

Sensors have been making deeper penetration into the test and measurement market with revenues growing since the year 2003, when the sensor industry generated just $1255.3 million. The industry experienced a dip in revenue growth rates in 2008, but recovery started in the second half of 2009, with revenues moving up to $1967.2 million for that year.

It is estimated that in the future, the revenue growth rate is likely to be stronger and will translate into sizable revenues of $3097.3 million by 2013. The use of sensors in test and measurement instruments is likely to accelerate, with the high degree of precision provided by sensor-based test and measurement instruments being key to the end user's demand. T&MW

To read past "Market Trends" columns, go to www.tmworld.com/markettrends.

Foxconn to take more than half of EMS market by 2011

Thanks in large part to growth from its customer Apple, EMS (electronics manufacturing services) provider Foxconn Technology Group is set to take more than half of global EMS industry revenue by 2011, up from 44.2% in 2009, according to a report from iSuppli.

"Foxconn's customers are some of the hottest companies in the electronics business today, most notably Apple Inc.," said Thomas Dinges, iSuppli associate, in a statement. "As Apple and others have gained share, so has Foxconn."

With revenue of $17.1 billion, Taiwan's Foxconn, also known as Hon Hai Precision Industries, was the dominant EMS provider in Q1. Foxconn's revenue was significantly higher than number two player Flextronics International, which posted revenue of $5.9 billion in Q1. Foxconn's revenue in the quarter was up 54.1% from $11.1 billion during Q1 2009.

iSuppli said that part of Foxconn's revenue boom is due to the industry-wide strength of the digital consumer business and a strong recovery in computing-related products. The market research firm further said that Foxconn dramatically outperformed the 27.5% year-over-year revenue increase for the Top 10 EMS providers in Q1 and that the company's revenue increased by 3.4% last year, while the overall EMS industry contracted by 11.9%.

Suzanne Deffree, Managing Editor, News, EDN

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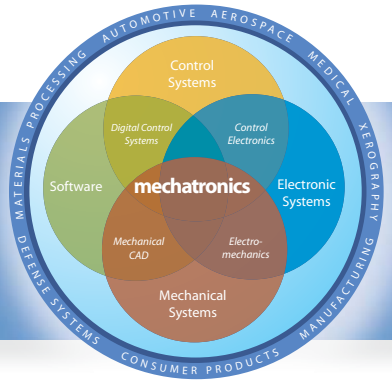


System motion fundamentals

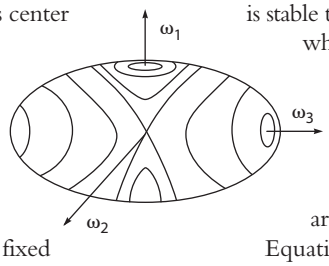
Tossing stuff into the air helps us understand moments of inertia and principal axes that are essential for design.

Kevin C. Craig, PhD, is the Robert C. Greenheck chair in engineering design and a professor of mechanical engineering, College of Engineering, Marquette University.

For more mechatronics news, visit: mechatronicszone.com.

Take any book and wrap a few rubber bands around it. Toss the book in the air three times, each time giving it a pure rotation, as best you can, about one of the three axes perpendicular to its sides. What do you observe? This simple experiment demonstrates fundamentals essential to the design of rotating machines, space satellites, and much more.

The motion of any system depends on the forces acting on it and its constitution—that is, the manner in which its mass is distributed, usually in response to strength, weight, space, and stiffness requirements. To predict dynamic behavior, you need to know the mass, the location of the mass center, and six quantities called the inertia scalars. The concept of mass center is well known, and its location is used to determine the translational motion of a body. But inertia scalars are not well understood. At any point in a body, you can determine six independent quantities called the three mass moments of inertia and the three products of inertia. Together, they quantify how mass is distributed with respect to three perpendicular axes fixed in the body at that point. The mass moments of inertia quantify the resistance of the body to angular acceleration about each axis, and the products of inertia quantify the symmetry of the mass distribution with respect to each plane. In addition, there is always a particular orientation of those axes such that the products of inertia are all zero. The remaining three quantities—the principal mass moments of inertia—play an important role in dynamic analysis.



In the tossed book experiment, the only force acting on the book is gravity, and that force goes through the mass center. The book then is moment-free, spinning freely in space. Since the book is moment-free, the magnitude of its angular momentum vector, H, must be constant (conserved), and if you neglect any translation, the rotational kinetic energy, T, must be constant (conserved). Plotting constancy of T and H using the absolute angular velocities ω_1, ω_2, and ω_3 as ordinates gives two ellipsoids.

$$H = \sqrt{(I_1\omega_1)^2 + (I_2\omega_2)^2 + (I_3\omega_3)^2}$$

$$T = \frac{1}{2}[I_1\omega_1^2 + I_2\omega_2^2 + I_3\omega_3^2]$$

The only allowable spinning states are at the intersections of these two ellipsoids. The lines on the **figure** are the intersections for a fixed value of T and various values of H, where $I_1 > I_2 > I_3$. The three intersections are circles at the greatest and least axes and a saddle at the intermediate axis. This indicates that rotation about the axes with the greatest and least moments of inertia is stable to small oscillations, while rotation with respect to the intermediate axis is unstable to small oscillations.

Another way to arrive at this conclusion is by considering Euler's Equations for this situation, where the 1, 2, 3 axes are body-fixed principal axes through the mass center.

$$I_1\dot{\omega}_1 + (I_3 - I_2)\omega_2\omega_3 = M_1 = 0$$
$$I_2\dot{\omega}_2 + (I_1 - I_3)\omega_1\omega_3 = M_2 = 0$$
$$I_3\dot{\omega}_3 + (I_2 - I_1)\omega_1\omega_2 = M_3 = 0$$

If the body is given a constant spin rate, Ω, exactly about any one of its principal axes, it will continue to spin about that axis. But what happens if that motion is perturbed by an angular velocity ω_p? Assume $\omega_1 = \Omega + \omega_p$. Analysis of Euler's Equations with linearization shows the resulting equation. If the coefficient of ω_2 is negative, the solution for ω_2 grows with time. This happens if the 2-axis is the intermediate principal axis.

$$\ddot{\omega}_2 + \frac{(I_1 - I_3)(I_1 - I_2)\Omega^2}{I_2 I_3}\omega_2 = 0$$

You can apply the topic of principal axes to everyday practice. Modern machines have high-speed rotors fastened to shafts. If the principal axis of the mounted object does not coincide with the axis of the shaft, making the system dynamically balanced, then dynamic bearing reactions result that could lead to premature bearing failure. T&MW

Business is at last turning up for the test industry's largest publicly held firms.

On the rebound

BY LAWRENCE D. MALONEY, CONTRIBUTING EDITOR

After suffering steep declines in revenue from one of the most severe global recessions on record, the worst is over for the test field's giant companies. But robust recovery will take time. Most public companies in the test industry's top 10 in revenue suffered double-digit drops in sales in 2009 (see **table**).

Still, with 2010 has come a noticeable pickup in sales and orders. Behind that upturn: a healthy rebound in key markets that fuel purchases of test equipment. In the first quarter of 2010, for example, Intel's net income nearly quadrupled compared to the same period in 2009.

Analysts note that the industry slump hit bottom in August 2009, with steady sales increases ever since. "The industry is bouncing back faster than it did after the telecom bust in 2001," said Sujan Sami, industry manager for Frost & Sullivan's Measurement & Instrumentation practice. "Then, it took two years before we finally saw recovery in 2004."

ISTOCKPHOTO

R&D marches on

At Agilent Technologies, still the industry kingpin with $2.25 billion in revenues last year from its Electronic Measurement Group (EMG), tough cost controls instituted in 2008 didn't block R&D investment. Ron Nersesian, EMG president, cited more than 200 new products and applications introduced in 2009. The PXA signal analyzer, introduced in the fall of 2009, has already become the flagship of Agilent's X-Series line, said Nersesian, with capabilities for testing a variety of signal standards in cellular communication and digital video. Also important for many applications: Agilent's Infiniium DSO90000A Series oscilloscopes.

Noting solid growth in 2010 business, Nersesian said: "Our general-purpose markets show strong performance. This is driven by the overall improvement in the semiconductor market, which feeds other industries, and by government stimulus packages. Aerospace and defense are also up."

The wireless handset market, however, continues to lag, observed Nersesian, and remains a challenging business with tight margins for test solutions. Looking far more promising is the rollout of LTE, an area where Agilent is targeting test equipment for base stations.

And while Agilent is adjusting its test portfolio, selling its NCX data-network testing line in 2009 to Ixia and buying most of Keithley Instruments' RF test line, the company also is increasing its presence outside electronic measurement. In 2009, Agilent made a huge commitment to its already strong stake in bioanalytical instruments with the acquisition of Varian.

Agilent's major challengers in electronic measurement—Danaher's Tektronix and Fluke companies—also suffered a rocky 2009. But the combined annual revenue of about $1.86 billion for these firms last year was closer than ever to that of Agilent's EMG.

Tektronix, whose business is now divided between general-purpose test instruments and communications

test products, is getting a boost from improvements in key end markets that began in the fourth quarter of 2009, pointed out Amir Aghdaei, Tektronix president.

"Emerging 3G and 4G communications standards are driving investment in our performance products, and mainstream embedded applications are increasing demand for our bench portfolio of products," said Aghdaei. "Our spectrum analyzers are also seeing an increase in demand with the need for greater wideband performance in radar and spectrum management, particularly in intelligence, regulatory monitoring, and defense applications."

Notable 2009 product launches cited by Aghdaei include the MSO70000 Series of mixed-signal oscilloscopes, targeted for high-speed digital applications. Tektronix was also on the prowl for acquisitions in 2009, buying both Sypris Test & Measurement and Davis Calibration.

Meanwhile, sister company Fluke points to stronger business, led by China and the emerging markets of South America, Eastern Europe, and Asia. In particular, the company notes enthusiastic customer response to new tools for boosting energy efficiency and productivity.

"The Fluke 233 remote-display multimeter is jumping off the shelves and winning a number of prestigious awards," said Barbara Hulit, president of Fluke. "The same is true for our Ti32 thermal imager."

Hulit added that sustainability has become a core value for many companies, a trend that she believes benefits both Fluke's handheld measurement products and its higher-end energy recorder and calibration technologies. The company also hopes to get involved in the growing market for smart-grid technology and has received a $1.4 million federal grant from the National Institute of Standards and Technology to develop a comprehensive calibration source to verify the performance of phasor measurement units in smart grids.

Tektronix president Amir Aghdaei sees emerging 3G and 4G communications standards as big sales drivers for the company's high-performance products.
Courtesy of Tektronix.

Softening the blow

For many companies in the top 10, fast action on the cost side helped salvage the bottom line in 2009. "Anritsu started to reduce fixed costs right after the 'Lehman Shock,' and thus made good operating profits in fiscal year 2009 despite the sales decline," said Hirokazu Hashimoto, who became company president in April. "Though it will take some time for sales to get back to where they were, I expect stable operating profits."

Anritsu looks for healthy opportunities from the commercialization of LTE, with such key products as the MD8430A signaling tester, the BTS Master for LTE network testing, and the MP1800 signal-quality analyzer.

Other top-10 firms banking on communications to fuel recovery are JDSU and Spirent Communications, which fared better than most test giants during the recession. "JDSU maintained healthy R&D investment, which has allowed us to take market share and accelerate out of the downturn," said Dave Holly, president of the JDSU Communications Test & Measurement business segment. "We made the right decisions to invest in innovations for the future, such as LTE network deployment."

In today's world of on-demand video from any device, networks are being stressed to a significant degree, noted Holly. For example, the prevalence of smartphones and the mobile Internet are creating "pinch points" in the network and are spurring a need for investment to upgrade the mobile backhaul segment of the network. In that regard, JDSU in 2009 acquired the network tools business of Finisar, a provider of storage-area-network protocol-test tools. And in February of 2010, JDSU agreed to acquire Agilent's Network Solutions Division, strengthening its position in wireless test.

Among the company's important product introductions for such network applications: the handheld T-BERD/MTS-4000 multiple-services test platform. JDSU has also introduced a module for that device that provides enterprise-test capabilities for Ethernet/IP LANs. *(continued)*

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

Company	2009 rank	2008 rank	2009 revenues (millions US$)	2008 revenues (millions US$)	Percent change
Agilent Technologies	1	1	2,257.0[1]	3,228.0	–30
Tektronix	2	2	950.0[2]	1,213.0	–22
Fluke/Fluke Networks	3	3	912.0[2]	1,168.0	–22
Teradyne	4	4	819.4	1,107.0	–26
Anritsu	5	5	790.0	854.5	–8[3]
National Instruments	6	6	677.0	820.5	–17
JDSU	7	8	606.2	710.6	–15
Advantest	8	7	571.8	780.8	–27[3]
Spirent Communications	9	10	427.0	471.1	–9
Verigy	10	9	323.0	691.0	–53

[1]Agilent revenues include only electronic-measurement operations. Instrumentation for bioanalytical measurement totaled $2.1 billion in 2009.

[2]Danaher reported $1.862 billion in revenue from test and measurement in 2009, down 22% from the 2008 total, but it does not break out separate figures for Tektronix and Fluke. Figures for these companies are analyst estimates.

[3]In Japanese yen, the year-over-year revenue decline reported by these Japanese firms is –12% for Anritsu and –30% for Advantest.

Note: Rohde & Schwarz, a privately held company, reported annual sales of 1.2 billion euros in the fiscal year ending June 2009, versus 1.4 billion euros the previous year. If converted to US$, the 2009 sales would place Rohde & Schwarz second on this list.

Spirent also claims to have gained market share in 2009, along with a 14% jump in operating profits. "During the fourth quarter of 2009, we witnessed signs of an economic recovery and are seeing more stability in the marketplace," said Bill Burns, Spirent CEO. "Telecom and IT activities are having a positive impact on test and measurement spending in 2010."

Among the applications driving test business for Spirent: smartphones, cloud computing, high-speed Ethernet, and LTE. To meet growing needs in those areas, Spirent last year released more groundbreaking solutions than ever before, according to Burns. Besides LTE equipment, which accounted for 5% of its 2009 orders, Spirent touts its TestCenter, a unified layer 2–7 architecture to test the performance of 10/40/100-GigE fabrics, virtualized server networking, and cloud-computing applications. The company also expects growing interest in its new No-Code test-automation suite.

Tight cost controls following the "Lehman Shock" helped Anritsu weather the recession, said company president Hirokazu Hashimoto. Courtesy of Anritsu.

For National Instruments, 2009 ended its string of 28 consecutive years of growth, but CEO James Truchard is optimistic about 2010, due in large part to the demand for NI's LabView software and the growing popularity of the PXI test platform.

"PXI has become the new de facto standard for automated test systems," said Truchard, "because it delivers a highly integrated software and hardware solution in a compact, modular platform, which VXI was never able to achieve."

Some of the applications critical to NI's success include: wireless and RF test, semiconductor test, and embedded test. And unlike most test companies, the firm also can count on revenues from simulation and automation applications.

More business for "big iron"

The companies that supply expensive capital equipment to test semiconductors were especially hard hit during the business slump. "Across the board, from automotive to consumer electronics to telecom, demand for semiconductors declined sharply," explained Frost & Sullivan industry analyst Sivakumar Narayanaswamy.

In the case of Verigy, overcapacity of test equipment caused by that contraction in demand led to a 53% plunge in revenues in 2009. But throughout the first half of 2010, integrated device manufacturers and foundries have been making technology purchases, which typically represent the first wave of capacity increases, said Verigy CEO Keith Barnes. He added that utilization rates on the firm's V93000 test platform are now at 90%, a good sign for future sales.

Many of the applications that the V93000 addresses will help lead the recovery for Verigy, according to Barnes. These include: consumer mixed-signal processors, graphics processors, datacom, and wireless/RF. Strong demand in the PC market also is expected.

Verigy expanded its market presence during the recent downturn by entering three additional segments—low-end SOCs, commodity DRAMs, and probe cards. In addition, the firm launched its V101 tester last year, a platform designed to provide the cost economies needed for testing low-cost logic devices. That move, said Barnes, expands Verigy's available market by an estimated $400 million in 2010. Other key 2009 moves included the acquisition of Touchdown Technologies, a developer of probe cards used in wafer-sort testing of memory devices.

Also upbeat about 2010 is Keith Lee, president of Advantest America. "Compared to 2009, I would characterize the increase in Advantest's bookings thus far in 2010 as robust, with continued strong growth forecasted for the remainder of the year," said Lee. "We are seeing spending increases from both memory and SOC customers, with a more aggressive investment stance being taken by customers outside of Japan."

Advantest America's Keith Lee has seen robust bookings in 2010. Courtesy of Advantest.

Markets contributing to the overall upturn, according to Lee, include: consumer electronics, personal computers, smartphones, industrial, and automotive. The T5385 and T5503 memory systems for wafer and final test DRAM applications are expected to dominate business growth for Advantest during 2010. The T2000 SOC test system will also drive significant sales.

In addition, Advantest looks for payoffs from commercialization of advanced technologies developed under its corporate New Product Concept Initiative. For example, the company is introducing the E3620 CD-SEM system, an advanced metrology tool that enables manufacturers to measure the critical dimensions of the miniature-sized patterns in a photomask.

For Teradyne, another semiconductor test power, orders in Q4 2009 were quadruple those of Q1 2009, according to Mark Jagiela, president of Teradyne Semiconductor Test Systems. He added that the SOC market, especially wireless and power-management chips, is leading the recovery. The J750 tester family, which targets advanced microcontrollers and SOC package test, had its best order quarter in nearly four years in Q4 2009.

Jagiela pointed out that the company is benefitting from product introductions made in 2008 and 2009. Prime examples are the UltraFlex-M, targeting the high-speed memory market, and the Neptune, for testing hard-disk drives.

JDSU's Dave Holly observed that innovation helped fuel his company's growth in market share. Courtesy of JDSU.

"Both products take intellectual property from our core test business and aggressively leverage it into adjacent markets," explained Jagiela, "and that can make a meaningful impact on our bottom line since both serve growing markets."

That ability to quickly target new test technologies to tap expanding markets, analysts say, will make a big difference in determining who will be the test industry's leading companies as the economy prospers. T&MW

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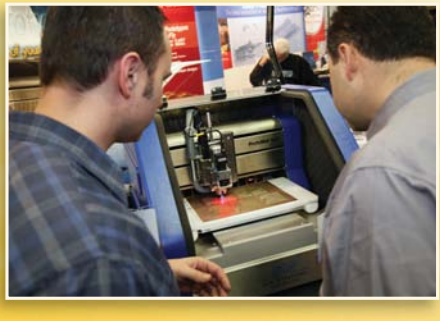

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Vision shines in solar inspection

By Ann R. Thryft, Contributing Technical Editor

Makers of crystalline-silicon PV (photovoltaic) solar wafers and thin-film cells are under continued pressure to improve efficiency and lower prices. Kamalina Srikant, vision product manager for National Instruments, described several vision techniques that manufacturers can employ to inspect and characterize solar cells and wafers, both in-line and offline.

Q: How does the inspection of solar wafers and cells differ from that of regular semiconductors?

A: Semiconductor inspection requires wafer sorting and alignment, which is mostly done in-line. But for crystalline-silicon PV wafers and cells, there's a range of offline and in-line inspection tasks that can be done with small systems.

For example, there are a lot of checks to see if the cell has short circuits and is properly conducting current, and these tests are done both in-line and offline. When developing solar cells, you need to ensure performance and power, and those inspections, such as I-V [current-voltage] characterization, are often done in conjunction with vision tests, all offline.

Q: What types of compact hardware are used to inspect solar wafers and cells?

A: For most crystalline-silicon PV wafer applications, we normally see PC-based systems in use, depending on the types of cameras and sensors needed. For simpler applications, some smart cameras may come into play. The small machine-vision systems, such as our Compact and Embedded Vision System products, can either be placed on the line with the product on a conveyor belt, such as in wafer sorting, or they can be used offline.

Q: How can vision help with solar-cell characterization?

A: In an efficient solar panel, the individual wafers and cells must all share the same electrical characteristics. One technology for characterizing cells is vision.

First, you connect a source-measure unit, like our NI PXI-4130, to each cell and drive current through it to get the cell's current-voltage curve. Based on what that curve shows, you can determine the cell's performance characteristics. You can also tell whether there are any significant shunts in a cell that indicate defects.

But this electrical performance testing only gives you numbers that tell you whether the cell is good or bad. To determine the nature of the defect and see where it's located, you need vision.

Near-infrared vision can reveal whether the wafer wasn't cut properly and can locate spots that lose power. You can also use vision on groups of cells in larger panels to identify the odd cells with different power characteristics, which may be due to shunts.

Sometimes you can cut around the shunts from the center of the cell to isolate them, instead of being required to scrap the entire cell, thus saving some material costs.

Q: What is the future of vision technology in the inspection of PV solar wafers and cells?

A: The PV solar market is still an emerging market, and its test procedures haven't yet been set in stone. So, there's a lot of room to put in additional types of testing, like vision, that can help guarantee better-quality products.

As this industry matures, solar manufacturers that do more testing will see better returns, and that will help them become bigger players. □

Kamalina Srikant
Vision Product Manager
National Instruments

INSIDE THIS REPORT

EDITOR'S NOTE

Vision networks expand

By Ann R. Thryft,
Contributing Technical Editor

The networking capability that GigE Vision has brought to vision and inspection systems is giving integrators and system designers more variety and flexibility in how they design applications, not merely in how they connect components.

When I wrote about GigE Vision trends nearly two years ago, most of the discussion centered on coping with Ethernet's latency and CPU utilization issues while preserving image quality and data rates. This time, concerns were fewer and enthusiasm was high about the standard's networking potential (p. 28). Some of this enthusiasm is caused by the GigE Vision spec's recent 1.2 update that supports nonstreaming devices, thus expanding the number and type of components that can be networked, controlled, and managed—and consequently better integrated—in a single vision application.

But some of the excitement comes from recent efforts to expand bandwidth above 1 Gbps, either using link aggregation or by running 10 GigE over GigE Vision. Link aggregation only boosts speeds to 2 Gbps, which is a big enough jump in data rates for some uses. Although 10 GigE is still a ways off for vision, in some inspection applications, such as flat-panel displays, its use may be well worth the implementation challenges involved. □

Contact Ann R. Thryft at athryft@earthlink.net.

HIGHLIGHTS

Market report shows recovery in North America

A new report from the AIA (Automated Imaging Association) shows that machine-vision sales of components and systems in North America have entered a recovery phase. Overall machine-vision sales increased by 34.4% in Q1 2010 over weak sales occurring in Q1 2009, the report shows. The report, entitled "Quarterly Machine Vision Sales Tracking Report," augments the AIA's annual market studies.

The AIA says the findings are encouraging when compared with the results of its 2009 annual market study, which found that machine-vision sales in 2009 declined by 29.2% on average from 2008. The new report also showed that improvement occurred across all major machine-vision supplier markets, including cameras, lighting, optics, imaging boards, software, application-specific machine-vision systems, and smart cameras. As a whole, major vision component sales increased 57.2%, while machine-vision-system sales rose by 31.3%.

The new report also summarizes industry expectations about sales growth for the next six months. Participating companies were nearly equally split between those that expect sales to increase during the next two quarters and those that expect sales will remain more or less equal in volume to Q1 2010 sales.

"The results of the new report leave little doubt that machine-vision sales have entered a period of recovery; however, it must be recognized that the robust rates of growth for machine-vision product markets also reflect severely depressed sales in 2009," noted Paul Kellett, AIA's director of market analysis. He added, "Based on industry expectations, market growth over 2009 levels will probably continue to occur in 2010 even if growth over first quarter 2010 levels fails to materialize." www.machinevisiononline.org.

MVTec, Cognex weigh in on patent dispute

MVTec Software announced that it has received an initial determination in its favor in the ongoing dispute with Cognex regarding patents related to matching technology. Following an eight-day hearing, an administrative law judge of the US ITC (International Trade Commission) ruled in its initial determination that the Cognex patents in question before the ITC are invalid. Because the ITC found the patents invalid, MVTec's Halcon software will continue to be sold and imported into the US, MVTec reported.

"MVTec certainly respects intellectual property rights—up to the point where they turn out to be based on questionable patents," said Dr. Olaf Munkelt, MVTec managing director. "We will continue to defend ourselves as well as our customers against any complaints that we believe are without any merit," he added.

Cognex responded to the July 16, 2010, ITC determination that the importation and sale of equipment using MVTec's Halcon machine-vision software does not violate two of Cognex's patents. Todd Keebaugh, Cognex's VP of legal services, said, "We are encouraged by the judge's decision confirming that the claims of one of the patents (U.S. Patent No. 7,016,539) are not anticipated or obvious. However, we are disappointed with his initial determination that both Cognex patents in this investigation were not infringed.... Fortunately, the judge's decision at the ITC is only an initial determination, and Cognex will bring these important issues to the full Commission for an independent review."

Based on its initial determination, the ITC will make a final determination on this case in November 2010.

Lens quality is key in machine vision

By Ann R. Thryft, Contributing Technical Editor

Machine-vision camera lenses are usually treated as accessories: Their characteristics may not be specified, or even considered, until the vision system has already been designed. Yet, the lens is responsible for much of an image's quality, said Greg Hollows, director of machine-vision solutions for Edmund Optics. "The optics provided by a camera lens can be thought of as a signal conditioner," he said. "The lens conditions the signal that goes from the object viewed, via the lens, to the camera's image sensor."

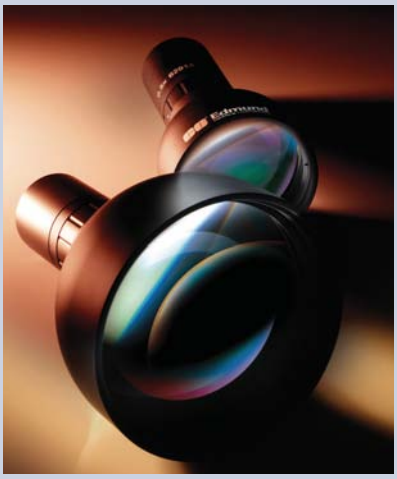
When specifying optics for a machine-vision system, system designers and integrators must consider resolution, field of view, depth of field, and working distance. Two lenses could have nearly identical specifications yet produce very different image quality, said Hollows. That's because the composition of a lens design—the number of elements and their overall tolerancing and quality—determines much of the image quality. For example, two lenses can have the same focal length, but their designs may be targeted at different working distances. If one is designed for surveillance and the other for close-up semiconductor inspection, their individual elements will differ, such as lens curvature or the spacing between internal lenses.

Integrators usually choose a sensor first and then match a lens to that sensor, said Hollows. "But it's best to start considering lenses when you're at most 60% to 70% of the way toward making your sensor choice, because it may be difficult to find the right lens that meets all of your other, non-sensor-related needs."

The inspection of semiconductors and some solar wafers requires high-powered lenses that can help operators evaluate small defects or make fine measurements. For these applications, integrators should look for a lens that provides the smallest detail needed at the highest levels of contrast possible, said Hollows. In semiconductor inspection, high resolution and a small field of view are often needed to examine very small detail in a small area, but integrators often want to combine these qualities with longer working distances, large depth of field, and compact package sizes.

"Unfortunately, integrators may need to trade off some lens qualities, since physics dictates that these qualities often vary in opposite directions," said Hollows. "For example, to achieve higher resolution, a lens must have a low f number, but to achieve a larger depth of field, a lens requires a higher f number. In addition, a lower f number will make lens diameter grow, affecting package size."

Crystalline-silicon photovoltaic solar-wafer inspection requires a lens that provides very small detail at high contrast levels, such as this high-resolution linescan camera equipped with a large-format imaging lens. Courtesy of Edmund Optics.



Telecentric lenses, such as this large-format TechSpec lens, increase measurement accuracy in high-resolution imaging for large fields of view by eliminating the apparent size distortion caused by parallax effects. Courtesy of Edmund Optics.

Integrators might also want to consider using telecentric lenses to ensure measurement accuracy and repeatability in a metrology or inspection system and eliminate variation, said Hollows. Telecentric lenses are especially suited for metrology because they remove parallax, or perspective effects, thus eliminating measurement errors related to the apparent change in size of an object if its position moves closer to or farther away from the lens. Unlike conventional lenses, telecentric lenses yield the same size field of view regardless of the distance an object is from the lens. Since the object does not appear to change in size, the measurements remain consistent. Compared to standard lenses, however, telecentric lenses are limited in the size of their field of view, the lenses are larger, and they cost more. Their use has been increasing in metrology because software that can analyze the images they produce has improved and is easier to use. □

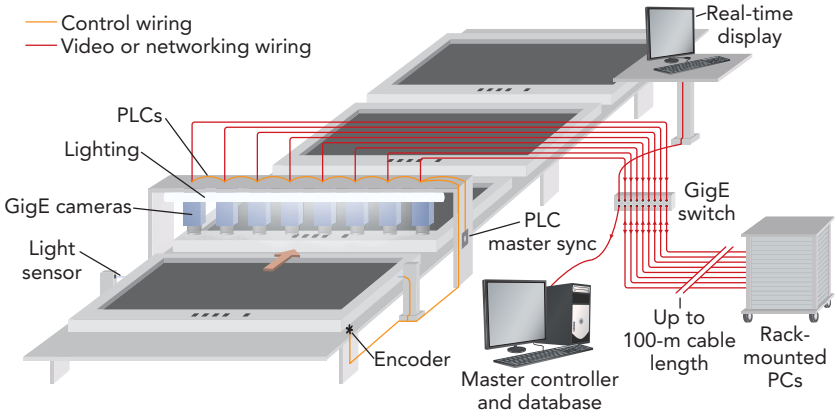
GigE Vision boosts inspection networks

By Ann R. Thryft, Contributing Technical Editor

GigE Vision has brought numerous advantages to machine-vision systems, including a 100-m cable length and higher bandwidth. Other advantages are a variety of lower-cost, readily available, standard hardware components, and the ability to easily manage a network of components, including cameras, switches, and routers. Disadvantages have included Ethernet's inherent latency and the host CPU loading issues that arise with the elimination of frame grabbers, yet some component manufacturers and system integrators are finding they can work around those drawbacks. Today, demands for higher data rates are pushing some to work on methods for increasing bandwidth in GigE Vision above 1 Gbps (see "Next step: 10 GigE?" p. 29).

The demand for networking-based connectivity is rising along with the rise in vision-system complexity, said George Chamberlain, president of Pleora, a co-founder of the GigE Vision standard. "Networking enables a wider range of applications, such as a single point of analysis for multiple cameras and distributing video to multiple end points simultaneously," he said. The GigE Vision 1.2 specification's support for nonstreaming devices brings much more than just traditional camera-computer connectivity, said John Phillips, Pleora's senior product manager. "Now, we have access to multiple device types along an Ethernet backbone, so we can build a more fully featured and robust system that's more tightly integrated."

Until recently, camera interfaces were limited to older analog technology or Camera Link. Although the digital Camera Link is technically an open standard, it is not used outside machine vision. By contrast, the GigE Vision, FireWire (IEEE 1394a/b), and USB digital interfaces are based in the much larger, high-volume consumer and PC industries, said Arndt Bake, GM of Basler Vision Technologies. These interfaces let vision-system designers take advantage of the lower product costs made possible by those high volumes to build larger, faster, more comprehensive vision systems.



In this example of an inspection system for flat-panel displays, imaging data is transferred in real time to a GigE switch, then multicast to rack-mounted PCs, which analyze the images for different types of defects. Courtesy of Pleora.

Although every PC now has a GigE interface, that's no longer true for FireWire, said Bake. In its Scout camera line, the company offers both interfaces, while prices and all other features are identical. In the past year or so, said Bake, most customers buying these cameras have chosen GigE Vision rather than FireWire. He added that FireWire's growth probably peaked in 2008 while GigE Vision is still growing.

In 2010, Basler estimates that, for all vendors, volumes of machine-vision cameras with a GigE Vision interface will be 50% more than in 2009. The company expects GigE Vision to bypass FireWire and analog in a couple of years as the most popular interface in machine-vision cameras and to reach its peak in about six to seven years.

Compared to other camera interfaces, GigE Vision has almost all the advantages, including bandwidth, cable length, the ability to network cameras, and the fact that it's a universal standard, said Ravi Guntupalli, business manager for Princeton Instruments. Camera Link is more mixed: It supports the highest bandwidth for real-time data transmission and has low latency, but cable lengths are limited and the frame grabber is expensive and not easily integrated.

When GigE Vision debuted, everyone thought it would replace Camera Link right away because of its high data rates, said Bake. But it does not reach Camera Link's 6.8-Gbps bandwidth. Only 10% of Basler's GigE Vision cameras are sold as Camera Link replacements, whereas 90% replace either FireWire or analog cameras.

CPU loading and latency

Two key issues that affect all Ethernet networks are CPU loading and latency. Initial concern about the effects of CPU loading on GigE Vision applications was due to the overhead caused by Ethernet's use of packets, especially in high-speed data networks. But the machine-vision industry has proven that neither issue is a problem, said Paul Kozik, product manager for Allied Vision Technologies. Filter and performance drivers have minimized CPU loading, while successful installations and a track record of reliability in GigE Vision systems have eliminated concerns about determinism and latency.

Compared to Camera Link, the CPU load is higher with GigE Vision, but it's not a major concern for Princeton Instruments' industrial machine-vision customers, said Guntupalli. That's because the built-in FPGAs in the company's cameras not only perform onboard image data handling, but also handle some of the post-acquisition image-processing load, such as white balancing, pixel correction, and flat-field removal, before data reaches the CPU.

Some, however, say that Ethernet latency may be a problem at real-time inspection rates. Guntupalli said that many of Princeton's customers acquire images at up to 30 fps, and the company has had no complaints. "If it was hundreds of frames per second, the latency might be a concern to them," he said.

Link aggregation networking technology aggregates Ethernet ports, or links, to boost link speed, such as in the two-port Prosilica-GX GigE camera.
Courtesy of Allied Vision Technologies.

Electronics inspection needs very fast image transfer, especially in automated optical inspection systems, said Bake. "A GigE Vision camera would fit here from the data transfer angle, but other requirements such as latency make Camera Link the better interface choice," he said. "This is especially true when you start to scale things up. At the slower end, you can go with a GigE Vision camera, but the higher the data rate, the more the requirement for real-time behavior increases."

Latency can occur at the camera, network component, and PC driver levels, said Pleora's Phillips. Although vendors have limited control over latency introduced at the network level, the GigE Vision standard lets them differentiate their products in terms of latency introduced at the other two levels. "For example, we can introduce as little as 525 µs of additional latency with a 2-Mpixel camera over a 1-Gbps Ethernet link, with Pleora eBUS drivers on the PC and a Pleora iPORT IP engine in the camera," he said. Pleora's drivers bypass the operating system's network stack and are optimized for GigE Vision, so they not only help reduce latency, but also reduce the burden on the CPU, giving it more head room for image-analysis applications. □

Next step: 10 GigE?

Scaling issues in 10 GigE haven't been solved, said Arndt Bake, GM of Basler Vision Technologies. If 1-Gbps speeds create a CPU load of 3%, then 10-Gbps speeds will create a 30% CPU load, which is definitely a problem. Even if a 10 GigE card existed today to do the job, it's a frame grabber. "The main task of GigE was to replace the frame grabber, so why not just use Camera Link in the first place?" he said. "Now, the question becomes not 'how can I use 10 GigE?,' but 'why should I?'"

But prototypes have already been demonstrated that run 10 GigE over GigE Vision, said John Phillips, Pleora's senior product manager. And although 1 Gbps is enough for most vision applications today, some sensors exceed the 2-Gbps speeds possible with link aggregation.

"One example is flat-panel display inspection with high-speed linescan cameras, each with multiple outputs from the sensor," he said. "Eight or more taps at 40 Mbps gets you over 3 Gbps. Some have said that 10 GigE is too power-hungry or too expensive. But those arguments are falling apart. We've seen a 10-Gbps NIC [network interface card] priced at under $500, and according to the Dell'Oro Group, the total number of 10-GigE ports shipped [in networking equipment] doubled in 2009 Q3 over 2009 Q2. These trends will drive costs down for machine vision, too."

Really fast CMOS sensors from Cypress Semiconductor, Cmosis, and Photon Focus with global, or snapshot, shutters are making the machine-vision industry take CMOS sensors more seriously, said Paul Kozik, product manager for Allied Vision Technologies. "They hold the promise of greater sensitivity than CMOS was capable of in the past," he said. "This need for higher data-transfer speeds is the reason we began offering link aggregation in our cameras." The IEEE's LACP (Link Aggregation Control Protocol) groups two cables into one data pipe. "When you set up a link aggregate group on your computer, the computer perceives that group as a single link at twice the normal speed, and so does the camera," said Kozik. The connection also looks like a single adapter to the application, simplifying application development.

One major challenge in shifting to 10 GigE speeds over GigE Vision is increased power consumption on the interface hardware, said Kozik. "The other main factor is the cost of off-the-shelf network components: The networking industry is still ramping up to 10 GigE, and those component prices are still higher than for 1 GigE." Kozik therefore believes that link aggregation makes GigE Vision an even more serious contender to Camera Link.

But some think link aggregation is only a stopgap: As soon as vendors provide 2 Gbps, the market will demand yet higher bandwidth. And the LACP does not specify exactly how image reconstruction and control will be performed, said Phillips. The protocol separates data into two streams to go over two Ethernet links, but there's no standard way for cameras to split an image and reassemble it on the other end, or for software to understand how it was done so it can be correctly reassembled.—*Ann R. Thryft*

IN THIS SECTION

Sampling of products from the past year

ScopeCorder gets a major upgrade

Yokogawa's DL850 ScopeCorder succeeds the company's DL750. The DL850 features a 10X measurement speed increase to 100 Msamples/s (12 bit), an 8X increase in channel count to 128, a 4X increase in hard-disk capacity to 160 Gbytes, and a 2X increase in acquisition memory to 2 Gbytes. The DL850 also adds a 100-Msamples/s analog input card, a 12-channel scanner module, and a digital-input card.

The DL850 adds an optional SATA interface for external hard drives and an IRIG interface for a time-synchronization module. An SD card slot supports up to 16 Gbytes. GPIB (optional), Ethernet, and USB ports are also supported. *Yokogawa, tmi.yokogawa.com.*

Data-acquisition logger stands alone

Multifunction data-acquisition systems often require a PC. The LGR-5320 series from Measurement Computing doesn't. You can program it from your PC, then download the configuration data into the module for stand-alone operation.

The three models in the series have eight differential/16 single-ended 16-bit analog inputs, 16 digital inputs, four counter inputs, and a relay output. For analog inputs, the two higher-end models sample at 200 ksamples/s; the third module samples at 100 ksamples/s. All models come with a 4-Gbyte SD memory card. The instruments can trigger an acquisition based on analog levels or on a combination of digital inputs. *Measurement Computing, www.mccdaq.com.*

Waveform generators sample to 1 Gsample/s

The ArbStudio waveform generators from LeCroy have a bandwidth of 125 MHz with a maximum sampling rate of 1 Gsample/s. Four models are available: two- and four-channel versions with analog waveform capabilities plus two- and four-channel versions that can generate both analog waveforms and digital patterns.

Any analog channel can operate as an arbitrary function generator or as a DDS (direct digital synthesis) generator. The arbitrary function lets you build waveforms, import them from software, or import them from LeCroy oscilloscopes.

As a DDS signal generator, the ArbStudio produces sine, cosine, ramp, sawtooth, triangle, rectangle, pulse, exponential, sweep, DC, and noise signals. *LeCroy, www.lecroy.com.*

Oscilloscope offers 32-GHz bandwidth

Agilent Technologies has unveiled a 32-GHz oscilloscope as part of its 90000-X series of instruments. The 32-GHz instrument and its accompanying probes form a 30-GHz measuring system. Using a probe head with SMA connectors provides a 28-GHz bandwidth. The instrument's 13.5-ps rise time, amplitude noise floor of 2 mVrms at 50 mV/div, and jitter-measurement floor of 180 fs maximize signal fidelity.

The 90000-X series consists of five digital oscilloscopes and five signal analyzers. Bandwidths cover 16 GHz, 20 GHz, 25 GHz, 28 GHz, and 32 GHz on two channels. All models operate at 16 GHz on four channels. In addition, all models sample at 80 Gsamples/s (two channels) and 40 Gsamples/s (four channels). *Agilent Technologies, www.agilent.com.*

Calibrator handles nearly any electrical instrument

Fluke's Model 5080A multifunction calibrator can calibrate multimeters, panel meters, and wattmeters; with options, the 5080A can calibrate oscilloscopes, clamp meters, and megohmmeters.

The 5080A can source DC voltage to 1020 V at 600 mA, DC current to 20.5 A at 50 V, AC voltage to 1020 V at 800 mA, and AC current to 20.5 A

at 44 V. It also sources resistance to 190 MΩ, AC and DC power to 20.5 kW, phase to 179.99°, and frequency from 45 Hz to 1 kHz. The voltage and current specifications are the highest among Fluke's multifunction calibrators. *Fluke, www.fluke.com.*

Audio analyzer aims at production

The APx515 from Audio Precision uses technology from the company's eight-channel audio analyzers in a unit that has two analog inputs and two analog outputs. It also has 192-kbps digital audio I/O.

The APx515 can test an audio device in 3 s, providing measurements such as power and noise. Test operators can control the APx515 through a keyboard, foot pedal, or bar-code scanner. One software option adds high-speed multitone and continuous-sweep measurements; a second adds intermodulation distortion, maximum output level, dynamic range, and FFTs; and a third adds acoustic-response measurements. *Audio Precision, www.ap.com.*

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Analyzers, Waveform and Signal

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Audio Precision; *ap.com*
Berkeley Nucleonics; *www.berkeleynucleonics.com*
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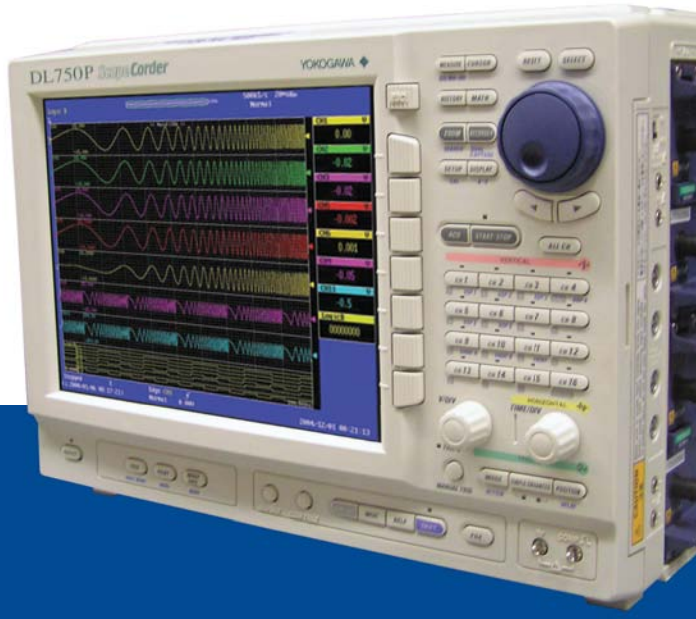

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Innovative Integration; *www.innovative-dsp.com*
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Zodiac Data Systems SAS; *www.zds-us.com*

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continued >

Production Test Solutions for Today's Systems That Integrate RF, Video and Audio

From smartphones to set-top boxes, more and more devices share the need to test for Bluetooth, Wi-Fi, USB and other RF, audio/video capabilities.

Welcome to the age of testing convergence. As more and more consumer devices are laden with multimedia capabilities, products which used to have divergent testing needs increasingly share many of the same multimedia requirements.

For instance, Ford has continued to innovate SYNC®, a factory-installed, in-car communications and entertainment system developed jointly with Microsoft and originally introduced in 2008. More recently, new features have been added including traffic, directions and information capabilities. To ensure that all these capabilities work as designed, Ford has to be able to perform tests for Bluetooth, Wi-Fi, USB, and the audio and video features found in SYNC. Likewise, EchoStar, which focuses on creating hardware and service solutions for cable, telco, IPTV and satellite, must test for shadows, jitter, macroblocking, ghosting, or other video stream anomalies in their global production of set-top boxes.

It is complex challenges like these that have led both EchoStar and Ford to adopt a new, integrated testing system, MMTS™ (Multimedia Test System) from VI Technology (an Aeroflex Company) which, for the second year, has been awarded the prestigious Best in Test Award by readers of *Test & Measurement World* magazine. (Best in Test in the "Audio/Video and Multimedia" category). The integrated testing provided by MMTS aims to reduce dependence on expensive and fallible human testers. In a recent *Test & Measurement World* article, EchoStar senior test engineer, Lisa Moder, explained why MMTS proved so valuable to her team, describing it as "probably the best commercially available device for measuring motion video."

MMTS™ Moving Video Test System leverages state-of-the-art automated analysis techniques to spot errors that are largely undetectable with manual testing. For example, rather than capture a still image frame for manual analysis, MMTS Moving Video Test System reviews a complete video sequence and compares it to a reference signal. Because of its ability to include video tests along with other functional testing, leading smartphone makers have also adopted MMTS.

Smartphones and Hand Sets – The Need for Speed

In fact, the requirements for hand set audio-visual testing increasingly demand an automated and integrated approach. Manual testing is unreliable, slow, subjective, and non-repeatable. Data analysis is time consuming and, again due to subjectivity, is of less value to design and repair functions. Full functional testing has traditionally required multiple pieces of equipment not optimized for production test environments, and tasks such as audio/video synchronization and integration of new AV and RF standards has been particularly difficult. Even if "home made" solutions can be engineered successfully, maintaining and upgrading them can be challenging and costly.

MMTS, which provides a fully-integrated test and measurement capability, offers an attractive alternative – automating test for multiple devices simultaneously with accurate, reliable, repeatable results and integrated capabilities ideal for tests such as "lip-synch" between audio and video signals. MMTS can reduce labor costs, space requirements, and time to market while positioning adopters for further advances in technology and test requirements.

Richard House, Vice President of Operations at Aeroflex, the parent company of VI Technology, says

Test Technology Ideal for Hand Sets and Other Multimedia Products

MMTS™ is a suite of product and service offerings (including MMTS™ Moving Video Test, MMTS™ Lip Sync Test, MMTS™ A/V Test, and MMTS™ Framework). MMTS offers fully-integrated, modular measurement solutions for:

- Parametric measurements for design, validation and production
- Audio/video measurements that target a variety of industries such as:
  - Consumer electronics
  - Military/aerospace
  - Mobile communications

Capabilities include:

- Latency/synchronization measurements calculated on a frame-by-frame
- Generates predefined audio and video signals
- Multi-channel inputs

- Ideal for teleconference systems
- Supports standard and high definition video

Supported Interfaces include:

- Composite/component/S-video/RGB
- HDMI/DVI/SDI

- NTSC and PAL
- Analog and digital audio

Resolutions

- 480, 576, 720i/p, 1080i/p
- Progressive and interlaced

Video Encoding Formats

- RGB and YCbCr

Standard A/V Measurements

- Tonal Audio (frequency, amplitude) - multitone
- Video (H-timing, color bars, chrominance, multiburst, and more

RF Technologies

- Wi-Fi
- Bluetooth
- LTE
- 3G
- WiMax
- GSM

"Whereas other test equipment is designed to test only wireless, video, or audio capabilities, MMTS is the only test system optimized to test wireless, video, and audio at high production test speeds."

In fact, MMTS test system is well suited for automated testing of all kinds of modern consumer electronics, such as Blu-ray players, set-top boxes, smartphones, mobile devices, telematic devices, computers, and video game consoles. Adaptability to various input protocols also makes MMTS ideal for many military and aerospace applications, such as night vision systems and avionics.

MMTS is based on the PXI platform and takes advantage of the latest measurement technology. It is often deployed at the Functional Circuit Test (FCT) and End of Line (EOL) locations in manufacturing, providing the fastest path to analog and digital measurements for audio/video devices. User experience has shown MMTS can significantly reduce testing time for DVD players, set-top boxes, smartphones, portable media players, telematics units, and video game consoles while yielding much higher quality data.

In the case of SYNC, VI Technology worked closely with Ford's design team to customize MMTS tests specifically for Bluetooth, Wi-Fi, USB, and audio/video features found in SYNC. A key feature of MMT is its scalable architecture, which enables users to easily create or add existing tests. These customized tests and the ability of MMTS to test up to eight devices simultaneously were essential to Ford's aggressive 2010 roll-out plans. "The Ford SYNC project is a perfect example of how to leverage MMTS," notes Alex Backus, vice president of Strategic Development at Aeroflex. "Ford required fast and accurate automated measurements for a variety of multimedia technologies in a high volume production environment. MMTS consistently addresses these types of challenges."

As a complete suite, MMTS includes hardware, software, algorithms, and extensions for testing all the components in devices, including: analog and digital video and audio, power sources, USB, modem, and Ethernet connectivity and wireless.

For more information, please email vi.info@vi-tech.com *or visit* www.vi-tech.com.

AWARD WINNING

In 2009, MMTS was awarded *Test & Measurement World's* prestigious "Best in Test" award in the audio/video and multimedia category. In 2010, MMTS Moving Video Test also won the same award in the same category. Both awards recognize the ability of MMTS to deliver full-featured test solutions for complex products – from set-top boxes to cell phones – that many consumers use on a daily basis.

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EADS North America Test and Services; *www.ts.eads-na.com*
Elan Digital Systems; *www.elandigitalsystems.com*
Endevco; *www.endevco.com*
Frequency Devices; *www.freqdev.com*
GaGe; *www.gage-applied.com*
Geotest - Marvin Test Systems; *www.geotestinc.com*
Giga-tronics; *www.gigatronics.com*
GOEPEL Electronics; *www.goepelusa.com*
GuideTech; *www.guidetech.com*
Highland Technology; *www.highlandtechnology.com*
ICS Electronics; *www.icselect.com*
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Kemo; *www.kemo.com*
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Spectrum; *www.spec.de*
Strategic Test; *www.strategic-test.com*
Symmetricom, Timing, Test & Measurement Division; *www.symmetricom.com*
Teradyne; *www.teradyne.com*
Viewpoint Systems; *www.viewpointusa.com*
VTI Instruments; *www.vtiinstruments.com*
Yokogawa, Test & Measurement Instruments; *tmi.yokogawa.com*
ZTEC Instruments; *www.ztecinstruments.com*

LXI Instruments

Agilent Technologies; *www.agilent.com*
AMETEK Programmable Power; *www.programmablepower.com*
Bustec; *www.bustec.com*
C&H Technologies; *www.chtech.com*
Data Translation; *www.datatranslation.com*

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GOEPEL Electronics; *www.goepelusa.com*
ICS Electronics; *www.icselect.com*
Keithley Instruments; *www.keithley.com*
Kepco; *www.kepcopower.com*
Pickering Interfaces; *www.pickeringtest.com*
Rigol Technologies; *www.rigolna.com*
Thurlby-Thandar Instruments; *www.tti-test.com*
VTI Instruments; *www.vtiinstruments.com*
Yokogawa, Test & Measurement Instruments; *tmi.yokogawa.com*
ZTEC Instruments; *www.ztecinstruments.com*

Meters: Digital multimeters (DMMs)

AEMC Instruments; *www.aemc.com*
Agilent Technologies; *www.agilent.com*
Amprobe Test Tools; *www.amprobe.com*
B&K Precision; *www.bkprecision.com*
Berkeley Nucleonics; *www.berkeleynucleonics.com*
Chroma Systems Solutions; *www.chromausa.com*
EADS North America Test and Services; *www.ts.eads-na.com*
Elan Digital Systems; *www.elandigitalsystems.com*
Extech Instruments; *www.extech.com*
Fluke; *www.fluke.com*
GW Instek; *www.gwinstek.com*
Hioki USA; *www.hiokiusa.com*
Keithley Instruments; *www.keithley.com*
Linseis; *www.linseis.net*
Newport Electronics; *www.newportus.com*
Omega Engineering; *www.omega.com*
Pickering Interfaces; *www.pickeringtest.com*
Protek Test and Measurement; *www.protektest.com*
Rigol Technologies; *www.rigolna.com*
Sencore; *www.sencore.com*
Siborg Systems; *www.siborg.com*
Signal Recovery; *www.signalrecovery.com*
Sperry Instruments; *www.sperryinstruments.com*
Tecpel; *www.tecpel.com*
Thurlby-Thandar Instruments; *www.tti-test.com*
Yokogawa, Test & Measurement Instruments; *tmi.yokogawa.com*

Meters: Other than DMMs

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Agilent Technologies; *www.agilent.com*
Amprobe Test Tools; *www.amprobe.com*
Applied Physics Systems; *www.appliedphysics.com*
Audio Precision; *ap.com*
B&K Precision; *www.bkprecision.com*
Bird Technologies Group; *www.bird-technologies.com*
Bruel & Kjaer; *www.bkhome.com*
Chroma Systems Solutions; *www.chromausa.com*
Clarke-Hess Communication Research; *clarke-hess.com*
Daytronic; *www.daytronic.com*
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Extech Instruments; *www.extech.com*
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HBM; *www.hbm.com*
Hioki USA; *www.hiokiusa.com*
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Keithley Instruments; *www.keithley.com*
Krohn-Hite; *www.krohn-hite.com*
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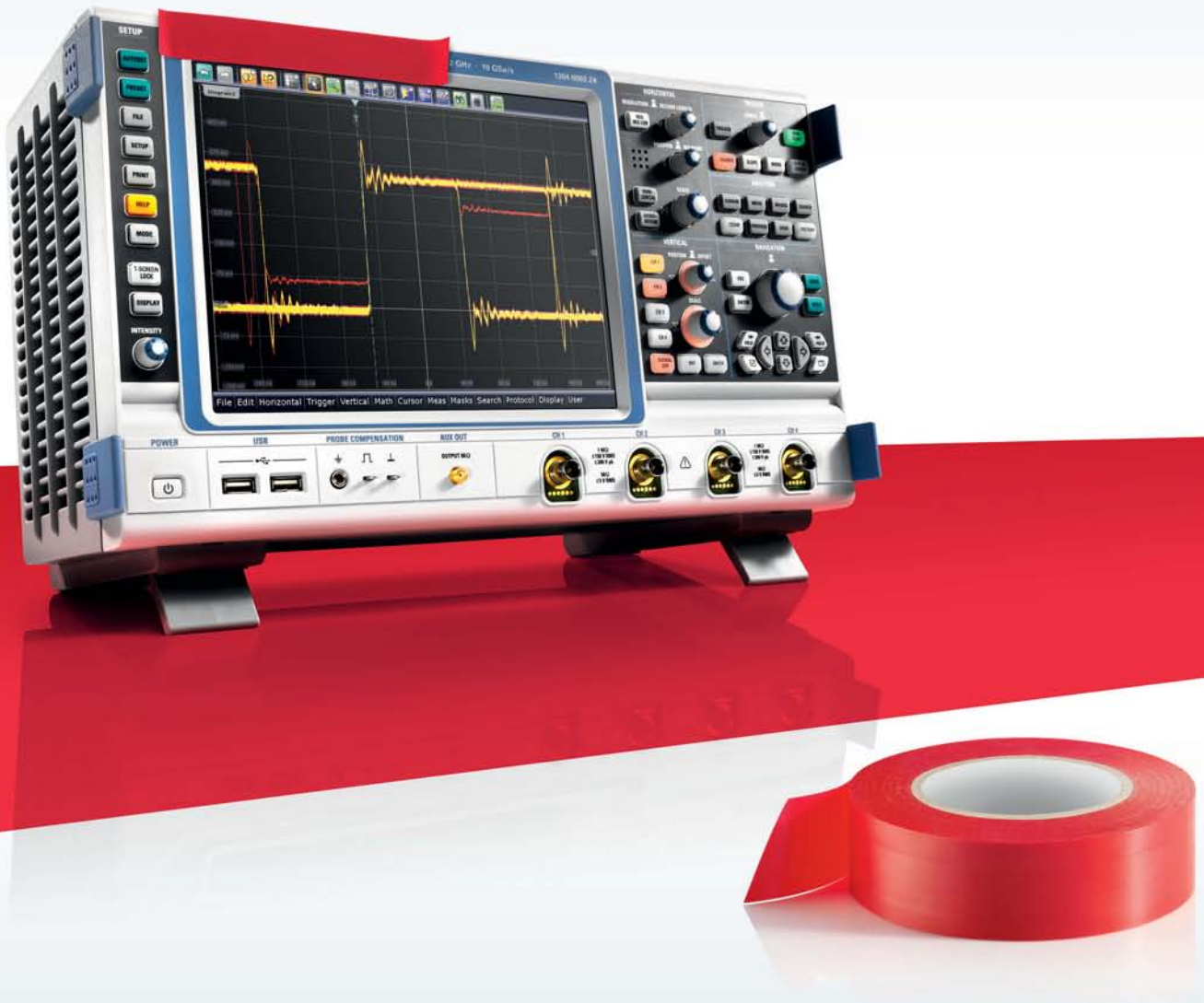

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Signal Recovery; *www.signalrecovery.com*
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Spirig; *www.spirig.com*
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Tegam; *www.tegam.com*
Thurlby-Thandar Instruments; *www.tti-test.com*
XiTRON Technologies; *www.xitrontech.com*
Yokogawa, Test & Measurement Instruments; *tmi.yokogawa.com*

Modular Instrument Chassis and Accessories

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Agilent Technologies; *www.agilent.com*
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Spectrum; *www.spec.de*
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Oscilloscopes

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GaGe; *www.gage-applied.com*
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Tektronix; *www.tektronix.com*
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Other General-Purpose Instrumentation

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AEMC Instruments; *www.aemc.com*
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Agilent Technologies; *www.agilent.com*
Alligator Technologies; *www.alligatortech.com*
AMREL; *www.amrel.com*
Anritsu; *www.us.anritsu.com*
AR, RF/Microwave Instrumentation; *www.ar-worldwide.com*
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AudioControl Industrial; *www.audiocontrolindustrial.com*
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B&K Precision; *www.bkprecision.com*
Berkeley Nucleonics; *www.berkeleynucleonics.com*
Bloomy Controls; *www.bloomy.com*
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Dewetron; *www.dewetron.com/us*
Digalog Systems; *www.digalogsystems.com*
DIT-MCO International; *www.ditmco.com*
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Finisar, Network Tools; *www.finisar.com*
Flex-Core; *www.flex-core.com*
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JFW Industries; *www.jfwindustries.com*
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Kikusui America; *www.kikusuiamerica.com*
Kistler Instrument; *www.kistler.com*
Klein Instruments; *www.kleininstruments.com*
Krohn-Hite; *www.krohn-hite.com*
Leader Instruments; *www.leaderusa.com*
LeCroy; *www.lecroy.com*
Macro Sensors; *www.macrosensors.com*
Measurement Computing; *www.mccdaq.com*
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Murata Power Solutions; *www.murata-ps.com*
National Instruments; *www.ni.com*
Navatek Engineering; *www.navatek.com*
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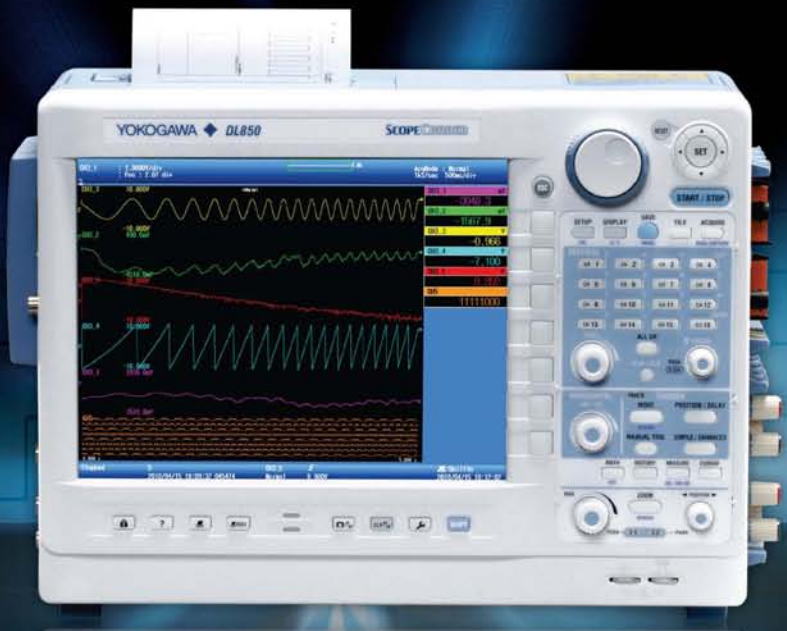

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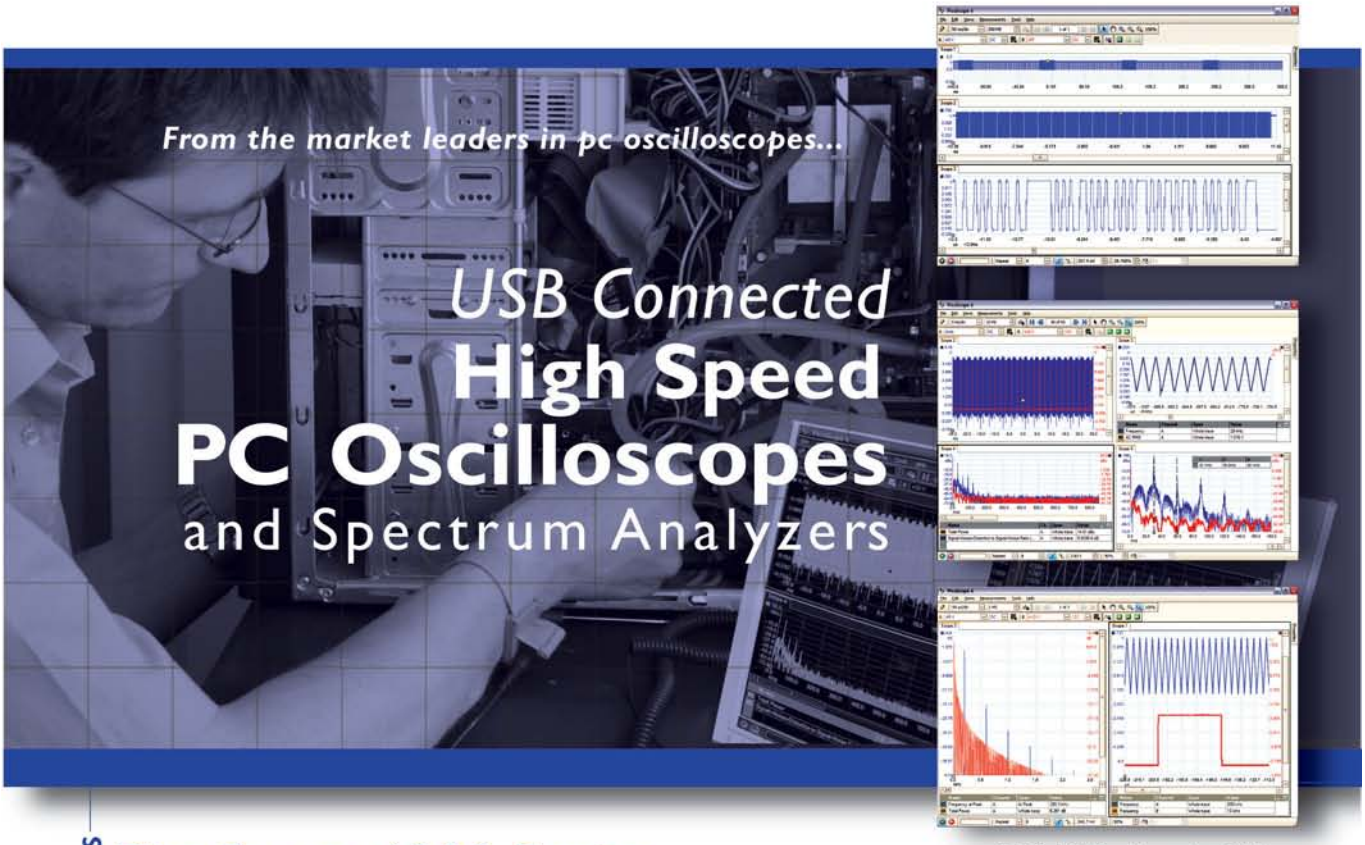

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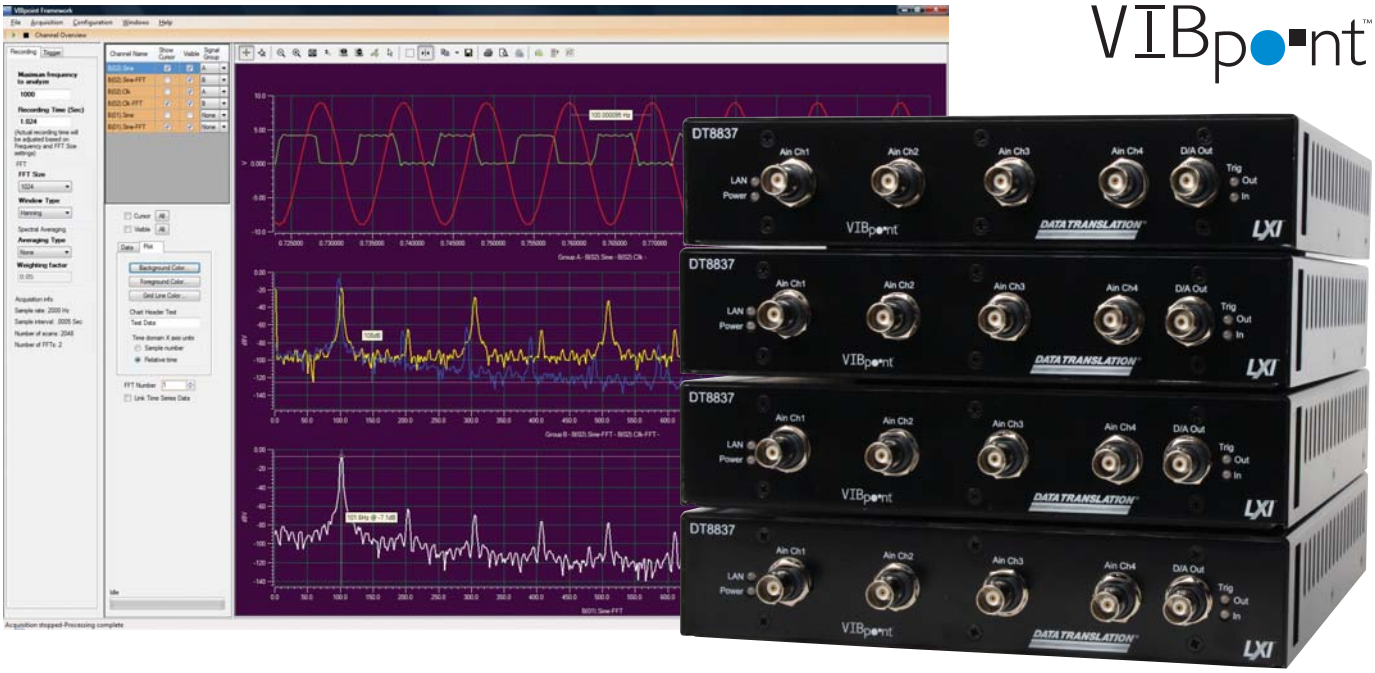

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IN THIS SECTION

Sampling of products from the past year

BER tester reaches 25-Gbps data stream

The 25-Gbps BERTScope instruments from SyntheSys Research (which is now part of Tektronix) let you make physical-layer measurements on 100-Gbps Ethernet applications. The BERTScope 25000A and BERTScope Si 25000C can both measure BER and perform jitter analysis. The Si model also lets you stress receivers with sinusoidal jitter, random jitter, bounded uncorrelated jitter, and phase modulation. SyntheSys has also increased the speed of its BERTScope CR clock-recovery unit to 26 Gbps.

The testers include a linear equalization feature that removes distortion from an incoming data stream. With that feature, each instrument's clock-recovery unit can restore the clock embedded in the data. *SyntheSys Research, www.bertscope.com.*

Signal-generator family reaches 70 GHz

Anritsu's MG3690C RF/microwave signal generators allow engineers to conduct tests on microwave subsystems, components, and systems in the lab, and the fast 5-ms switching time also maximizes throughput in manufacturing applications.

Models in the MG3690C family generate signals from 0.1 Hz to 70 GHz. Individual instruments can produce baseband, IF, RF, and microwave signals. Options enable low phase-noise performance of –115 dB/Hz at 20 GHz at a 10-kHz offset. All models have a 0.1-Hz start frequency option, and they offer top frequencies of 10, 20, 31.8, 40, 50, or 70 GHz. *Anritsu, www.us.anritsu.com.*

Modules simplify 10-Gbps optical tests

Yokogawa has introduced a transceiver interface module and a signal generator module for its AQ2200 optical-test-system mainframe. The modules streamline testing of 10-Gbps XFP, SFP+, and XENPAK optical transceivers.

The AQ2200-642 transceiver I/F module combines an optical multimeter, a power supply, and a signal controller for an optical-module evaluation board. The power supply has one adjustable range and four fixed ranges that cover popular voltages used in optical modules. The AQ2200-651 signal generator module provides five channels of RF clock outputs at frequencies from 155 MHz to 180 MHz and 620 MHz to 720 MHz. *Yokogawa, tmi.yokogawa.com.*

LTE platform targets 4G system-level designers

Agilent Technologies now provides predictive products and algorithmic references for its SystemVue platform that are consistent with the LTE v.8.9.0 standard. The new products include the W1715 MIMO Channel Builder (a simulation block set for LTE architecture and receiver designers), the W1716 Digital Pre-Distortion (DPD) software (which assists in the transition from 3G to 4G by creating baseband signal-processing networks), the W1910/2 LTE Baseband Verification Library reference block set (which supports LTE v.8.9.0), and the W1912 LTE Baseband Exploration Library (an updated C++ source-code version of the W1910). *Agilent Technologies, www.agilent.com.*

Spectrum analyzers operate to 30 GHz

Based on the R&S FSV, the R&S FSVR from Rohde & Schwarz provides the functionality of both a signal analyzer and a spectrum analyzer. In real-time mode, the instrument detects everything from sporadic events to ultrashort signals. By capturing RF signals with a bandwidth of up to 40 MHz and computing up to 250,000 spectra/s, it enables engineers to analyze the behavior of signal sources when the frequency changes.

By providing measurements without blind times, the R&S FSVR offers an advantage to developers of RF components used in LTE, WiMAX, WLAN, Bluetooth, and RFID systems, and in general RF applications such as radar and frequency-hopping transmissions. *Rohde & Schwarz, www.rohde-schwarz.com.*

Platform monitors 10-Gbps IP networks

With the introduction of the Iris family, Tektronix Communications has enhanced the IP-network-monitoring capabilities of its GeoProbe platform. The product line includes the GeoProbe G10, the Iris Analyzer toolset, and the IrisView software.

The GeoProbe G10 is a 10-Gbps probe that handles high-bandwidth IP traffic. The Iris Analyzer toolset includes a protocol analyzer, a session analyzer, and a traffic analyzer; it provides layer 2–7 troubleshooting by characterizing IP traffic by links, applications, and servers. And the configurable IrisView software provides an integrated platform for all applications, including feeds to customer-experience management systems. *Tektronix Communications, www.tektronixcommunications.com.*

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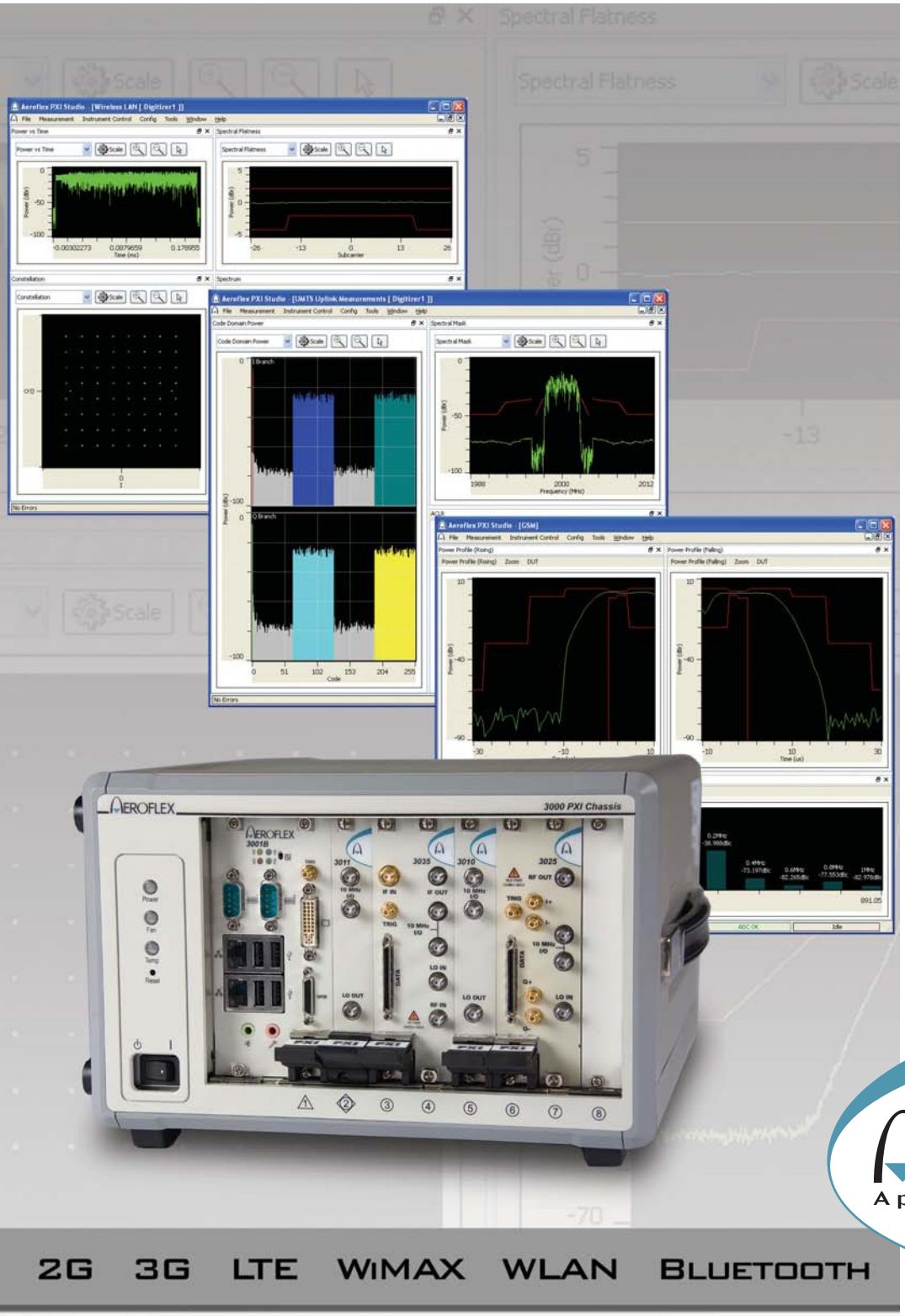

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T&MW

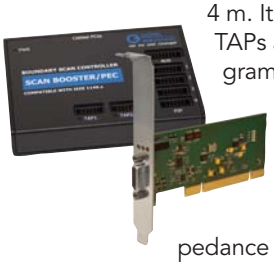
IN THIS SECTION

Sampling of products from the past year.

PCI bus gains boundary-scan controller

The ScanBooster/PCI-DT boundary-scan controller from Goepel Electronic complies with the PCI bus specification and supports JTAG/ boundary-scan tests, VarioTAP emulation tests, ISP (in-system programming) for PLDs and FPGAs, and ISP for flash serial EEPROM devices of moderate size.

ScanBooster/PCI-DT consists of a PCI plug-in card coupled with an external TAP (Test Access Port) transceiver unit, supporting distances to 4 m. It features two separate TAPs and supports a programmable TCK frequency to 16 MHz. Test bus parameters such as output and input voltage as well as output and input impedance can be programmed independently for both TAPs. As additional resources, the controller provides 32 voltage-level-programmable, dynamic parallel I/O ports; two ADC/DAC channels; external trigger signals; and three static I/O lines. *Goepel Electronic, www.goepel.com.*



PXI instruments target semiconductor test

National Instruments has introduced a suite of 10 products that adapt PXI for mixed-signal semiconductor characterization, addressing ADCs, DACs, power-management ICs, wireless ICs, and MEMS devices. The NI PXI Semiconductor Suite includes four HSDIO (high-speed digital I/O) instruments, two digital switches, two RF instruments, an SMU (source-measure unit), and digital-vector file-importing software. The HSDIO instruments offer single-ended clock rates up to 200 MHz and data rates to 400 Mbps. The SMU delivers current sensitivity down to 10 pA, and the two digital switches help users multiplex DC instrumentation onto HSDIO lines.

Finally, the vector signal analyzer and vector signal generator offer increased measurement speed through deterministic changes in RF configurations. The new suite also permits the importing of WGL and STIL digital-vector formats to streamline design-to-test integration when using NI PXI high-speed digital products. *National Instruments, www.ni.com.*

Tester gains mixed-signal capability

Verigy's V101 platform, designed for high-volume testing of cost-sensitive ICs at both wafer sort and final test, now has a mixed-signal capability for testing devices with audio and video signals. The new capability comes in the form of a plug-and-play module that can be quickly installed into the V101 for testing mixed-signal ICs used in applications such as automotive, communications, data processing, and audio and video consumer electronics. The zero-footprint V101 platform can test microcontrollers and other low-pin-count, low-cost ICs in the high-mix manufacturing environments where these devices are typically produced. *Verigy, www.verigy.com.*

Air-cooled mainframe targets semiconductor test

The new T2000 LSMF (Light Star Mainframe) from Advantest is an air-cooled test platform that offers cost-effective test of semiconductor devices. The T2000 LSMF supports modules developed for the existing T2000 mainframes while cutting investment costs 30%, according to the company. By replacing conventional liquid-cooling technology with an air-cooled configuration, the T2000 LSMF eliminates the need for a separate cooling unit.

The LSMF platform can test up to 64 devices in parallel and operates on single-line 200-VAC power. It is compatible with several T2000 modules: the 250-Mbps digital module, the multipurpose PMU32 (parametric measurement unit, 32-channel) module, the 16-channel AAWGD (audio waveform generator/digitizer) mixed-signal module, the 16-channel BBWGD (baseband waveform generator/digitizer) mixed-signal module, and the 12GWSGA (12-GHz wideband signal generator/analyzer) RF module. *Advantest, www.advantest.com.*

JTAG tools support board debug

Instead of addressing the high-volume production-test applications that boundary-scan tools have traditionally served, the JTAG Live family from JTAG Technologies addresses debug, small-volume production, and field-service applications, according to Peter van den Eijnden, JTAG managing director, who added that the tools don't burden users with netlist requirements. The JTAG Live family consists of three products: Buzz replaces the audible continuity test of traditional DMMs or allows oscilloscope-like probing, checking direct and indirect connections between devices that support boundary scan; Clip acts as a logic analyzer, applying vector-based cluster tests; and Script enables users to employ the Python language to adopt a functional, device-oriented approach to take control of a design through onboard boundary-scan-compliant devices.

The JTAG Live family members are compatible with the JTAG programming cables from Altera and Xilinx as well as with the two-port USB Explorer from JTAG Technologies. *JTAG Technologies, www.jtaglive.com.*

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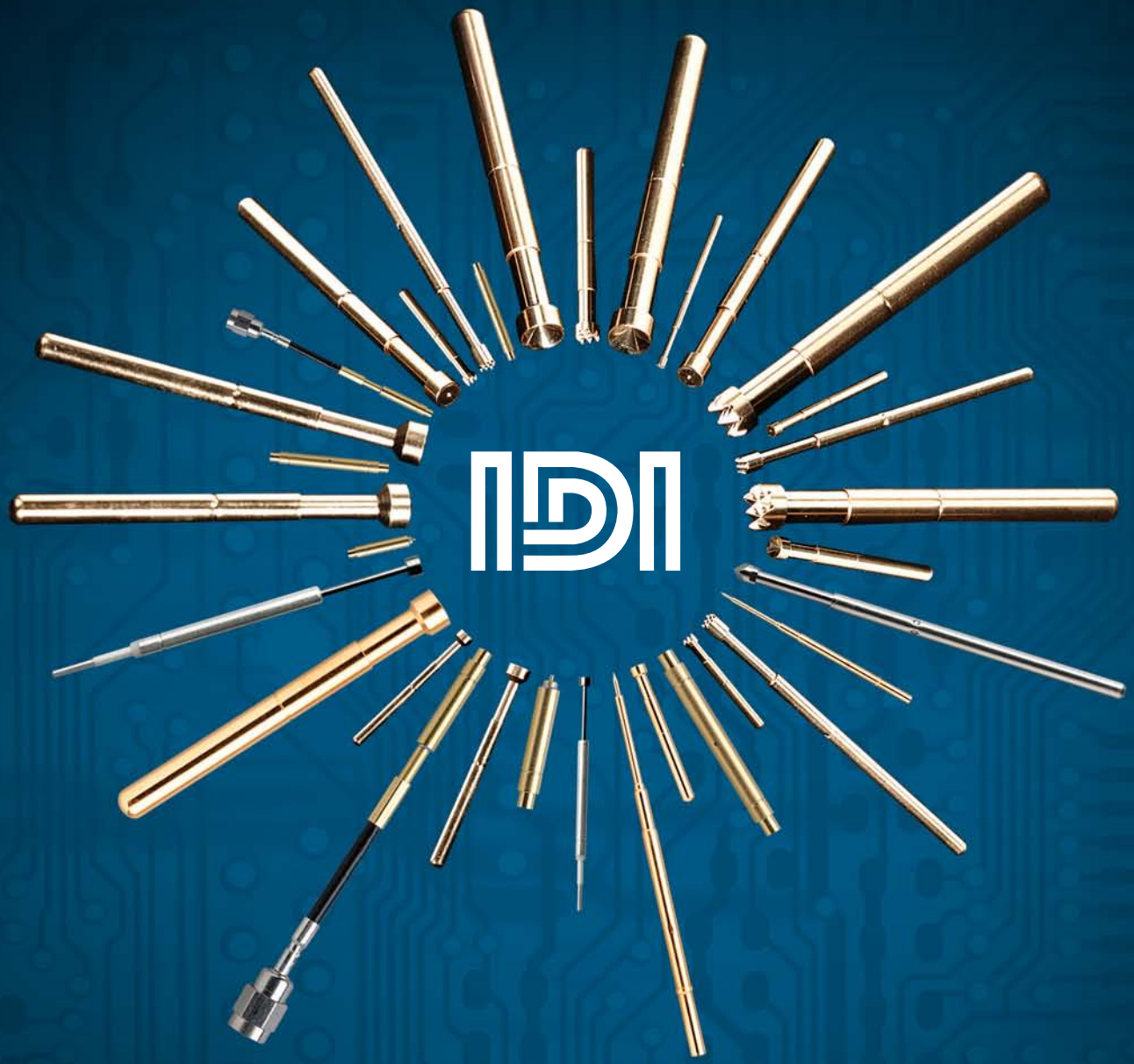

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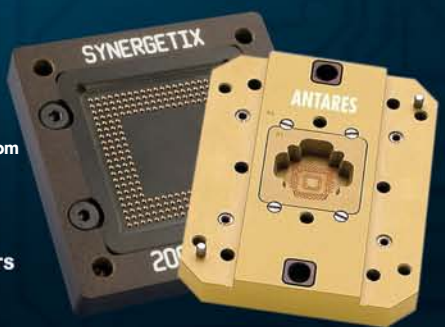

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IN THIS SECTION

Sampling of products from the past year

Smart cameras employ 700-MHz processors

The Nano smart cameras from Vision Components are based on a board that is populated on both sides, providing each camera with 8 Mbytes of flash and 128 Mbytes of DRAM as well as a 700-MHz processor that delivers 5600 MIPS to execute image-processing tasks without an external PC. The single-board VCSBC6210 Nano camera measures 40x65 mm. An enclosed version, the VC6210, measures 80x45x20 mm.

The cameras feature an Ethernet interface and can optionally be equipped with an RS-232 interface. They record images by means of a global-shutter CMOS sensor with performance equaling that of a CCD sensor. *Vision Components, www.vision-components.com.*

Compact vision system provides PoE ports

ADLink Technology has released the EOS-1000 compact vision system, which is based on the Intel Core2 Duo P8400 processor. The EOS-1000 provides four independent PoE (Power over Ethernet) ports with data transfer rates up to 4.0 Gbps, and it combines high computing power and multicamera imaging. The EOS-1000 has undergone harsh vibration and shock testing during its design to ensure durability; while in operation, the EOS-1000 can tolerate vibrations of up to 5 g. System-monitoring components monitor CPU temperature, fan speed, and system responsiveness.

The PoE ports allow power to be supplied through an Ethernet cable, and the system supports cable distances to 100 m. The EOS-1000 also features multiple I/O options, including two RS-232/485 interfaces, four USB ports, 32 isolated digital lines, and dual storage options (HDD and CompactFlash). *ADLink Technology, www.adlinktech.com.*

Self-contained vision system has 5-Mpixel resolution

Cognex has introduced the In-Sight 5605, a self-contained vision system for applications that require visualization of very small defects, even in a large field of view. The In-Sight 5605 offers 5-Mpixel resolution, support for Gigabit Ethernet communication, an IP67 rating to withstand dust and wash down, and a library of Cognex vision tools for application setup.

The company says the In-Sight 5605 offers more than twice the resolution previously available with an In-Sight system. It supports applications such as high-accuracy gauging, and it can find very small edge defects and read ID codes from many palletized products simultaneously.

Cognex has also released a new version of its In-Sight Explorer software. In addition to supporting the In-Sight 5605, In-Sight Explorer 4.4.1 adds a 1-D bar-code reading tool optimized for omnidirectional bar-code reading, support for multiple simultaneous connections to an In-Sight ModBus TCP server, and the ability to generate output pulse trains and clocked data pulses for controlling devices such as stepper motors. *Cognex, www.cognex.com.*

GigE camera keeps costs low

Basler Vision Technologies has introduced the Ace GigE camera, a low-cost unit that targets applications served by analog and FireWire models. The company says the Ace camera keeps costs low, because it requires no frame grabber and can work with low-cost cables and accessories. In addition, the Ace features PoE, which allows a single cable to handle both data and power, and it also works with Basler's Pylon software, which comes with more than 50 application programming examples.

The Ace series will initially consist of four models in monochrome and color, with resolutions from VGA to 2 Mpixels and featuring a C-mount adapter. All cameras are equipped with a CCD sensor. *Basler Vision Technologies, www.baslerweb.com.*

Wafer-inspection system detects macro defects

Microelectronic device manufacturers can use the Iris wafer-inspection system from SemiProbe to detect flaws in the wafer circuit pattern as well as contamination or process damage. Depending on the choice of optics, the Iris inspection system is able to identify defects as small as 3 µm.

The system is suitable for examining optical components, double-sided devices, photovoltaics, MEMS, and other microelectronic devices. Iris can find visual defects such as probe marks, thru-silicon vias, bumps, incomplete etch, scratches, large-scale contamination, and passivation. Configurations are available for performing manual or automated inspection.

Once a defect is identified, its failure code is noted on the wafer map. Wafer maps are exportable in a variety of formats for offline analysis or downstream processing. *SemiProbe, www.semiprobe.com.*

MACHINE-VISION & INSPECTION EQUIPMENT MANUFACTURERS

Cameras, Vision Sensors, and Accessories

AccuSentry; *www.accusentry.com*
Active Silicon; *www.activesilicon.com*
Adimec; *www.adimec.com*
Allied Vision Technologies, North America; *www.goavt.com*
Banner Engineering; *www.bannerengineering.com/ivu*
Basler Vision Technologies; *www.baslerweb.com*
Cmosis; *www.cmosis.com*
Cognex; *www.cognex.com*
Creative Devices; *www.creativedevices.com*
Dalsa; *www.dalsa.com*
Dewetron; *www.dewetron.com/us*
Edmund Optics; *www.edmundoptics.com*
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*
Keyence Corp. of America; *www.keyence.com/usa*
Leutron Vision; *www.leutron.com*
LMI Technologies; *www.lmitechnologies.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*
PCO; *www.pco.de*
Photon Focus; *www.photonfocus.com*
Photron; *www.photron.com*
PixeLink; *www.pixelink.com*
Point Grey Research; *www.ptgrey.com*
PPT Vision; *www.pptvision.com*
Princeton Instruments; *www.princetoninstruments.com*
Qioptiq Linos; *www.qioptiqlinos.com*
Rad-icon Imaging; *www.rad-icon.com*
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*
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

Aerotech; *www.aerotech.com*
cyberTechnologies USA; *www.cybertechnologies.com*
Image Labs International; *www.imagelabs.com*
Kappa Opto-electronics; *www.kappa-vision.com*
MicroImage Video Systems; *www.mivs.com*
Micro-Vu; *www.microvu.com*
Nikon Instruments, Industrial Measuring; *www.nikoninstruments.com*
Optical Gaging Products; *www.ogpnet.com*
Panasonic Factory Solutions Company of America; *www.panasonicfa.com*
RAM Optical Instrumentation; *www.ramoptical.com*
Rudolph Technologies; *www.rudolphtech.com*
Sony Manufacturing Systems America; *www.sonysms.com*
Starrett; *www.starrett.com*
Tamar Technology; *www.tamartechnology.com*
VIEW Micro-Metrology; *www.viewmm.com*
Vision Engineering; *www.visioneng.us*
WESCO, Western Scientific; *www.wescomicroscopes.com*

Failure-Analysis Equipment

Bloomy Controls; *www.bloomy.com*
Carl Zeiss MicroImaging; *www.zeiss.com/micro*
Creative Devices; *www.creativedevices.com*
cyberTechnologies USA; *www.cybertechnologies.com*
Data Translation; *www.datatranslation.com*
FEI Co.; *www.fei.com*
Geller Microanalytical Lab; *www.gellermicro.com*
Hamamatsu; *sales.hamamatsu.com*
Image Labs International; *www.imagelabs.com*
JEOL USA; *www.jeolusa.com*
KLA-Tencor; *www.kla-tencor.com*
LTX-Credence; *www.ltx-credence.com*
MatriX Technologies; *www.m-xt.com*
Micromanipulator; *www.micromanipulator.com*
MTI Instruments; *www.mtiinstruments.com*
OptoMetrix; *www.optomet.com*
Robson Technologies; *www.testfixtures.com*

continued >

> MACHINE-VISION & INSPECTION EQUIPMENT MANUFACTURERS *continued*

Tamar Technology; *www.tamartechnology.com*
TDK RF Solutions; *www.tdkrfsolutions.com*
Vision Research; *www.visionresearch.com*
Zygo; *www.zygo.com*

Frame Grabbers

Active Silicon; *www.activesilicon.com*
ADLink Technology; *www.adlinktech.com*
Alacron; *www.alacron.com*
BitFlow; *www.bitflow.com*
Cognex; *www.cognex.com*
Creative Devices; *www.creativedevices.com*
CyberOptics; *www.cyberoptics.com*
Dalsa; *www.dalsa.com*
Data Translation; *www.datatranslation.com*
EPIX; *www.epixinc.com*
Euresys; *www.euresys.com*
Fast-Vision; *www.fast-vision.com*
Foresight Imaging; *www.fi-llc.com*
Image Labs International; *www.imagelabs.com*
The Imaging Source; *www.theimagingsource.com*
Imperx; *www.imperx.com*
Kappa Opto-electronics; *www.kappa-vision.com*
Leutron Vision; *www.leutron.com*
Matrox Imaging; *www.matrox.com/imaging*
National Instruments; *www.ni.com*
Pleora Technologies; *www.pleora.com*
SVS-Vistek; *www.svs-vistek.com*

Inspection Systems, Optical

AccuSentry; *www.accusentry.com*
Advint; *www.advint.com*
Aerotech; *www.aerotech.com*
Bloomy Controls; *www.bloomy.com*
Camtek Intelligent Imaging; *www.camtek.co.il*
Creative Devices; *www.creativedevices.com*
CyberOptics; *www.cyberoptics.com*
cyberTechnologies USA; *www.cybertechnologies.com*
Dalsa; *www.dalsa.com*
Edmund Optics; *www.edmundoptics.com*
EPIX; *www.epixinc.com*
GE Sensing & Inspection Technologies; *www.geinspectiontechnologies.com*
GOEPEL Electronics; *www.goepelusa.com*
Hamamatsu; *sales.hamamatsu.com*
Huntron; *www.huntron.com*
Image Labs International; *www.imagelabs.com*
Integral Vision; *www.iv-usa.com*
Integrated Design Tools; *www.idtvision.com*
JEOL USA; *www.jeolusa.com*
Kappa Opto-electronics; *www.kappa-vision.com*
Keyence Corp. of America; *www.keyence.com/usa*
KLA-Tencor; *www.kla-tencor.com*
Klein Instruments; *www.kleininstruments.com*
Landrex Technologies; *www.landrex-us.com*
Machine Vision Products; *www.machinevisionproducts.com*
MatriX Technologies; *www.m-xt.com*
Matrox Imaging; *www.matrox.com/imaging*
Meiji Techno America; *www.meijitechno.com*
Metron Optics; *www.metronusa.com*
MicroImage Video Systems; *www.mivs.com*
Micro-Vu; *www.microvu.com*
Mirtec; *www.mirtecusa.com*
MTI Instruments; *www.mtiinstruments.com*
NAC Image Technology; *www.nacinc.com*
Navitar; *navitar.com*
Nikon Instruments, Industrial Measuring; *www.nikoninstruments.com*
Nordson YesTech; *www.yestechinc.com*
Olympus, Industrial Micro-Imaging; *www.olympusmicroimaging.com*
Optical Gaging Products; *www.ogpnet.com*
OptoMetrix; *www.optomet.com*
Panasonic Factory Solutions Company of America; *www.panasonicfa.com*
Photron; *www.photron.com*
Rudolph Technologies; *www.rudolphtech.com*
ScanCAD International; *www.scancad.com*
Seica; *www.seica.com*
SemiProbe; *www.semiprobe.com*
Silicon Imaging; *www.siliconimaging.com*
Sony Manufacturing Systems America; *www.sonysms.com*
Tamar Technology; *www.tamartechnology.com*
Teradyne; *www.teradyne.com*
Test Research; *www.tri.com.tw*
Unitron; *www.unitronusa.com*
Vi Technology; *www.vitechnology.com*
Viscom; *www.viscom.com*
Vision Engineering; *www.visioneng.us*
Volpi USA; *www.volpiusa.com*
WESCO, Western Scientific; *www.wescomicroscopes.com*
YXLON International; *www.yxlon.com*
Zmation; *www.zmation.com*
Zygo; *www.zygo.com*

Inspection Systems, Thermal/Infrared

Compix; *www.compix.com*
Creative Devices; *www.creativedevices.com*
FLIR Systems; *www.flirthermography.com*
Hamamatsu; *sales.hamamatsu.com*
Image Labs International; *www.imagelabs.com*
Ircon; *www.ircon.com*

Inspection Systems, X-Ray

Aerotech; *www.aerotech.com*
Faxitron X-Ray; *www.faxitron.com*
GE Sensing & Inspection Technologies; *www.geinspectiontechnologies.com*
Glenbrook Technologies; *www.glenbrooktech.com*
GOEPEL Electronics; *www.goepelusa.com*
Hamamatsu; *sales.hamamatsu.com*
JEOL USA; *www.jeolusa.com*
MatriX Technologies; *www.m-xt.com*
Nordson Dage; *www.dage-group.com*
Nordson YesTech; *www.yestechinc.com*
Rad-icon Imaging; *www.rad-icon.com*
Sens-Tech; *www.sens-tech.com*
Teradyne; *www.teradyne.com*
Test Research; *www.tri.com.tw*
Viscom; *www.viscom.com*
VJ Electronix; *www.vjelectronix.com*
YXLON International; *www.yxlon.com*

Lighting and Optics

AccuSentry; *www.accusentry.com*
Active Silicon; *www.activesilicon.com*
Advanced Illumination; *www.advancedillumination.com*
Banner Engineering; *www.bannerengineering.com/ivu*
Cognex; *www.cognex.com*
CVI Melles Griot; *www.cvimellesgriot.com*
Fiberoptic Systems; *www.fiberopticsystems.com*
Image Labs International; *www.imagelabs.com*
The Imaging Source; *www.theimagingsource.com*
Integrated Design Tools; *www.idtvision.com*
Leutron Vision; *www.leutron.com*
Moritex USA; *www.moritexusa.com*
Navitar; *navitar.com*
NET USA; *www.net-usa-inc.com*
PCO; *www.pco.de*
PerkinElmer; *www.perkinelmer.com*
Phlox; *www.phlox-gc.com*
Princeton Instruments; *www.princetoninstruments.com*
ProPhotonix; *www.prophotonix.com*
Qioptiq Linos; *www.qioptiqlinos.com*
Rolyn Optics; *www.rolyn.com*
Schott North America; *www.us.schott.com/fiberoptics*
Sentech America; *www.sentechamerica.com*
StingRay Optics; *www.stingrayoptics.com*
Sunnex; *www.sunnexonline.com*
Tamron USA; *www.tamron.com*
Volpi USA; *www.volpiusa.com*
WESCO, Western Scientific; *www.wescomicroscopes.com*

Microscopes and Accessories

AFL Telecommunications, Noyes Test & Inspection; *www.afltele.com*
Anchor Optics, Division of Edmund Optics; *www.anchoroptics.com*
Basler Vision Technologies; *www.baslerweb.com*
Berkeley Nucleonics; *www.berkeleynucleonics.com*
Carl Zeiss MicroImaging; *www.zeiss.com/micro*
Creative Devices; *www.creativedevices.com*
CVI Melles Griot; *www.cvimellesgriot.com*

Edmund Optics; *www.edmundoptics.com*
FEI Co.; *www.fei.com*
Geller Microanalytical Lab; *www.gellermicro.com*
Image Labs International; *www.imagelabs.com*
The Imaging Source; *www.theimagingsource.com*
Infinity Photo-Optical; *www.infinity-usa.com*
Integrated Design Tools; *www.idtvision.com*
JEOL USA; *www.jeolusa.com*
Kappa Opto-electronics; *www.kappa-vision.com*
Keyence Corp. of America; *www.keyence.com/usa*
KLA-Tencor; *www.kla-tencor.com*
Lumenera; *www.lumenera.com*
Meiji Techno America; *www.meijitechno.com*
Metron Optics; *www.metronusa.com*
Micromanipulator; *www.micromanipulator.com*
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*
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*
Tamar Technology; *www.tamartechnology.com*
Unitron; *www.unitronusa.com*
Vision Engineering; *www.visioneng.us*
Volpi USA; *www.volpiusa.com*
WESCO, Western Scientific; *www.wescomicroscopes.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.piezojena.com*
Prior Scientific; *www.prior.com*
Silicon Imaging; *www.siliconimaging.com*
Tamar Technology; *www.tamartechnology.com*
WESCO, Western Scientific; *www.wescomicroscopes.com*
Zmation; *www.zmation.com*

continued >

> ACCESSORIES & SOFTWARE: MACHINE VISION & INSPECTION *continued*

Machine-Vision and Image-Analysis Software

AccuSentry; *www.accusentry.com*
ADLink Technology; *www.adlinktech.com*
Alacron; *www.alacron.com*
Averna; *www.averna.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.scancad.com*
Silicon Imaging; *www.siliconimaging.com*
Stemmer Imaging; *www.stemmer-imaging.co.uk*
Viscom; *www.viscom.com*
Vision Components; *www.vision-components.com*
WESCO, Western Scientific; *www.wescomicroscopes.com*
YXLON International; *www.yxlon.com*

THIRD-PARTY SERVICES: MACHINE VISION & INSPECTION

Distributors, Rentals, Used Equipment: Machine Vision and Inspection

Advanced Test Equipment; *www.atecorp.com*
Aegis Electronic Group; *www.aegis-elec.com*
Continental Resources; *www.conres.com*
Creative Devices; *www.creativedevices.com*
Cyth Systems; *www.cyth.com*
FLIR Systems; *www.flirthermography.com*
Image Labs International; *www.imagelabs.com*
Instrumart; *www.instrumart.com*
K & Us Equipment; *www.kandus.com*
Madell Technology; *www.madelltech.com*
NET USA; *www.net-usa-inc.com*
Seika; *www.seikausa.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*
Cyth Systems; *www.cyth.com*
Digalog Systems; *www.digalogsystems.com*
GE Sensing & Inspection Technologies; *www.geinspectiontechnologies.com*
Geller Microanalytical Lab; *www.gellermicro.com*
Glenbrook Technologies; *www.glenbrooktech.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*
Pikes Peak Test Labs; *www.pptli.com*
Premier Semiconductor Services; *www.premiers2.com*
STI Electronics; *www.stielectronicsinc.com*
Sypris Test & Measurement; *www.sypris.com/stm*
TUV SUD America; *www.tuvamerica.com*
Vision Systems International; *www.vision1.com*
VJ Electronix; *www.vjelectronix.com*
Zygo; *www.zygo.com*

Training: Machine Vision and Inspection

A.T.E. Solutions; *www.besttest.com*
GOEPEL Electronics; *www.goepelusa.com*
Image Labs International; *www.imagelabs.com*
Matrox Imaging; *www.matrox.com/imaging*

T&MW

IEEE AUTOTESTCON 2010
ORLANDO
September 13-16, 2010

IEEE AUTOTESTCON 2010
45 years of Support Innovation - Moving Forward at the Speed of Light

Autotestcon is the largest conference focused on support systems for military and aerospace systems, and is sponsored annually by the Institute of Electrical and Electronics Engineers (IEEE). Our conference theme, "45 Years of Support Innovation – Moving Forward at the Speed of Light", reflects that 2010 marks the 45th year of AUTOTESTCON and how our technical program is focused on the future of automatic test, diagnostics, and prognostics. Attendees & exhibitors represent a supplier base of prime contractors and subcontractors as well as a customer base from virtually all of the DOD and allied countries. The Technical Program will feature 100 carefully selected papers and panel presentations addressing the latest innovations in software and diagnostics, instruments, management, systems and logistics.

IEEE AUTOTESTCON 2010 conference will be held September 13-16, 2010 at the Orlando World Center Resort, the largest Marriott facility in the world on over 200 acres. **Discover** an extraordinary Orlando resort at the spectacular Orlando World Center Resort & Convention Center. Enjoy a luxurious golf and spa resort in Orlando, Florida that includes 18 challenging holes of championship golf, six swimming pools with 106'-foot waterslide and pool side activities, award winning restaurants, and full-service spa. Escape to this Orlando resort near Disney World (just 1.5 miles) and only minutes from Sea World Orlando, Universal Studios, and Discovery Cove.

The AUTOTESTCON 2010 golf tournament will be held at the top rated **Shingle Creek Golf Club**, featuring an 18 hole, 7,228 yard championship golf course designed by the legendary David Harman. The tournament will be a 4-man scramble with many awards and door prizes. Make your plans for a great day of golf including breakfast and a BBQ lunch.

Universal Studios Gala. Come join us at the New York Street Party at Universal Studios for a very special evening. You will be entertained by rides and attractions including the Hollywood Rip Ride Rockit℠ with audio and special-effects engineering, sophisticated, on- and off-board video and one-of-a-kind guest personalization to create a roller-coaster experience unlike any other, The Revenge of the Mummy® to experience the Mummy's curse on this indoor roller coaster, and TWISTER...Ride It Out® to feel the full force of nature as this attraction rips a scene right out of the movies! Relax and see the Blues Brothers Show and have fun playing video games in the Arcade.

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www.autotestcon.com

IN THIS SECTION

Sampling of products from the past year

Broadband amplifier powers EMI tests

The BBA100 broadband amplifier lets you perform immunity tests when combined with an antenna. Its modular design lets you add amplifier

modules when you need to increase power or widen bandwidth. Modules can be removed or replaced by removing the amplifier's front panel.

The BBA100 covers 9 kHz to 250 MHz and 80 MHz to 400 MHz at power levels of 125 W, 250 W, and 500 W. For 250 MHz to 1 GHz, the available power is 70 W, 125 W, and 250 W. Power ratings are based on the 1-dB compression point. *Rohde & Schwarz, www.rohde-schwarz.com.*

Coupling/decoupling network travels

Electronic products need surge immunity tests on their AC mains to prove that they can operate in hostile electrical environments. The CDN 3083-S100M coupling/decoupling network, which supports the EN 61000-4-5 required current of 100 A per phase on three-phase products, lets you inject surges up to 8 kV for 1.2 µs or 4 kV for 50 µs on power supplies that operate at voltages up to 620 V.

The CDN 3083-S100M disassembles for travel. It mounts on floors, tabletops, and test lab walls, or you can mount wheels on the 80-kg network for portability. *Teseq, www.teseq.com.*

Instrument measures vibration on four channels

With the DT8837 sound and vibration instrument, you can measure four accelerometer inputs with 1000-V channel-to-channel isolation. Each channel has a dedicated 24-bit ADC that can sample at 52.734 kHz. The DT8837 is LXI Class C compliant and can trigger a measurement based on LAN packets as well as on input levels, software, and an external trigger input.

The instrument has a 24-bit DAC with a sample size ranging from 2 ksamples to 128 ksamples. A 16-bit feedback ADC lets you monitor the DAC's output. Two 32-bit counters let you measure tachometer, gate, and ADC conversion relationships. The DT8837 has four digital outputs for driving relays or motors. *Data Translation, www.datatranslation.com.*

Antenna covers wide range

The Model 3183 omnidirectional biconical antenna has a frequency range from 1 GHz to 18 GHz, which covers common frequencies of EMC immunity and emissions. Because of its small size and wide bandwidth, the antenna is suited for characterizing fields in EMI chambers as required for CISPR 16 immunity measurements. You can also use the

antenna to make harmonic measurements on amplifiers in accordance with IEC 61000-4-3.

The Model 3183 operates in both the horizontal and vertical planes with omnidirectional radiating patterns in the horizontal plane, and it can accommodate continuous power of 50 W at 1 GHz and 25 W at 18 GHz. Its average VSWR (voltage standing wave ratio) is 2:1. *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*
Associated Research; *www.asresearch.com*
Bird Technologies Group; *www.bird-technologies.com*
Boonton Electronics; *www.boonton.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*
Finero; *www.qacontrol.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.ptsyst.com*
QualiTau; *www.qualitau.com*
Rohde & Schwarz; *www2.rohde-schwarz.com*
Ross Engineering; *www.rossengineeringcorp.com*
Saelig; *www.saelig.com*
Sefelec; *www.sefelec.com*
TDK RF Solutions; *www.tdkrfsolutions.com*
Teseq; *www.teseq.com*
Thurlby-Thandar Instruments; *www.tti-test.com*
Toellner Electronic Instruments; *www.toellner-usa.com*
W.L. Gore & Associates; *www.gore.com*
XiTRON Technologies; *www.xitrontech.com*

Distributors, Rentals, Used Equipment: EMC Test

A.H. Systems; *www.ahsystems.com*
Advanced Test Equipment; *www.atecorp.com*
AR, RF/Microwave Instrumentation; *www.ar-worldwide.com*
Avalon Equipment; *www.avalontest.com*
Bell Electronics NW; *www.bellnw.com*
Continental Resources; *www.conres.com*
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; *www2.rohde-schwarz.com*
Saelig; *www.saelig.com*
Test Equipment Connection; *www.testequipmentconnection.com*
Testforce; *www.testforce.com*
Transcat; *www.transcat.com*
Trek Equipment; *www.trekequipment.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*
CSA International; *www.csa-international.org*
D.L.S. Electronic Systems; *www.dlsemc.com*

Datest; *www.datest.com*
Degree Controls; *www.degreec.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*
MET Laboratories; *www.metlabs.com*
Motorola Product Testing Services; *www.motorola.com/producttesting*
National Technical Systems; *www.ntscorp.com*
Nemko-CCL; *www.cclab.com*
Nevada Automotive Test Center; *www.natc-ht.com*
Noise Laboratory; *www.noiseken.com*
Northwest EMC; *www.nwemc.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 SUD America; *www.tuvamerica.com*
Underwriters Laboratories; *www.ul.com*

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EMCC DR. RAŠEK; *www.emcc.de*
Equipment Reliability Institute; *www.equipment-reliability.com*
Intertek; *www.intertek.com*
OptEM Engineering; *www.optem.com*
Rohde & Schwarz; *www2.rohde-schwarz.com*
TUV SUD America; *www.tuvamerica.com*

ENVIRONMENTAL TEST

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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*
Berkeley Nucleonics; *www.berkeleynucleonics.com*
Bruel & Kjaer; *www.bkhome.com*
C&H Technologies; *www.chtech.com*
CableTest Systems; *www.cabletest.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*

continued >

> ENVIRONMENTAL TEST *continued*

EADS North America Test and Services; *www.ts.eads-na.com*
Emulation Technology; *www.emulation.com*
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Environmental Specialties; *www.eschambers.com*
Envirotronics; *www.envirotronics.com*
ESPEC; *www.espec.com*

GHI Systems; *www.ghisys.com*
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IMV; *www.imv.co.jp/e*
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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.wellscti.com*
XiTRON Technologies; *www.xitrontech.com*

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Envirotronics; *www.envirotronics.com*
HALT&HASS Systems; *www.haltandhass.com*
Industrial Resources; *www.industrialresources.com*
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LR Environmental Equipment; *www.lre.com*
m + p international; *www.mpihome.com*
PTL Test Equipment; *www.ptltest.com*
Sharetree; *www.sharetree.com*
Thermotron Industries; *www.thermotron.com*
Trek Equipment; *www.trekequipment.com*
TRS-RenTelco; *www.trs-rentelco.com*
Tucker Electronics; *www.tucker.com*
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Cobham Sensor Systems; *www.cobham.com*
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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*
Premier Semiconductor Services; *www.premiers2.com*
Reliability Analysis Laboratory, Raytheon; *www.reliabilityanalysislab.com*
Sharetree; *www.sharetree.com*
Sypris Test & Measurement; *www.sypris.com/stm*
Thermotron Industries; *www.thermotron.com*
Tracewell Systems; *www.tracewell.com*
Trio-Tech International; *www.triotech.com*
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Nevada Automotive Test Center; *www.natc-ht.com*
Technology Training; *www.ttiedu.com*
Thermotron Industries; *www.thermotron.com*

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ESD Systems.com; *www.esdsystems.com*
Lista International; *www.listaintl.com*
MKS Instruments; *www.mksinst.com*
3M; *www.3mstatic.com*
Noise Laboratory; *www.noiseken.com*
Prostat; *www.prostatcorp.com*
Static Solutions; *www.staticsolutions.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*

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*

T&MW

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.

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, nonprofit 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. 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 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.

Global Semiconductor Alliance (GSA), www.gsaglobal.org. The GSA works to increase the return on investment of the global semiconductor industry by fostering a more effective fabless ecosystem.

IEEE, www.ieee.org. The IEEE's core purpose is to foster technological innovation and excellence.

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.

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.

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.

InterNational Committee for Information Technology Standards (INCITS), www.incits.org. The INCITS works to promote the effective use of information and communication technology through standardization.

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.

IPC-Association Connecting Electronics Industries, www.ipc.org. IPC is a global trade association that represents all facets of the electronic interconnection industry, including design, printed wiring board manufacturing, and electronics assembly.

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 works to ensure instrument interoperability by developing and supporting 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. Administered by NIST, NVLAP provides third-party laboratory accreditation services.

NCSL International, www.ncsli.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 the PC/104 community and standards organizations.

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

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.

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 whose principal professional interest is the flight testing of aircraft and missiles.

SPIE, 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, charged with promoting efficient and effective standardization, 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.

T&MW

PRODUCT FOCUS

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

Programmable pulse generators

The 4033 and 4034 are high-performance programmable pulse generators that generate pulses with a repetition rate up to 50 MHz and feature variable pulse widths, delays, and output

levels. The pulses can be output in continuous, triggered, gated, or burst mode with an internal or external trigger signal.

B&K Precision, www.bkprecision.com.

PXIe quad-core controller

The NI PXIe-8133 high-performance embedded controller features the quad-core Intel Core i7-820QM processor and

can be used to significantly reduce test times for applications that require intensive data processing, such as RF protocol testing and hardware-in-the-loop simulations.

National Instruments, sine.ni.com/nips/cds/view/p/lang/en/nid/208834.

EMC test equipment

Advanced Test Equipment Rentals offers a range of EMC test systems up to 40 GHz. The systems support product-testing, power-quality, automotive, communications, and aerospace applications. Standards include MIL-STD-461, DO160, IEC 61000, and ISO7637. Next-day delivery and tech support are available for most equipment.

Advanced Test Equipment Rentals, www.atecorp.com.

Advanced Test Equipment Rentals
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Test and measurement catalog

The Rohde & Schwarz "Test & Measurement Catalog 2010/11" is now available, presenting solutions for wireless communications, EMC, and broadcasting.

The catalog also lists general-purpose and RF test equipment. Customers can order a copy of the catalog by contacting customersupport@rohde-schwarz.com.

Rohde & Schwarz, www.rohde-schwarz.com.

Safety-compliance tester

The 19032 series safety analyzer performs a variety of safety tests including AC/DC hipot, insulation-resistance, ground-bond, opens-and-shorts, and leakage-current tests. The analyzer can be used for testing compliance to IEC, UL, TUV,

CSA, EN and other standards, including the stringent IEC 60601-1 for medical applications. Chroma says its patented TwinPort feature cuts test time in half.

Chroma Systems Solutions, www.chromausa.com, www.hipotsafetytest.com.

Battery-powered datalogger

Omega's OM-CP-PHTEMP2000 series is a battery-powered, stand-alone pH and tempera-

ture datalogger with a large LCD. The product logs data in real time and features programmable engineering units, a programmable start time, and automatic temperature compensation. The datalogger sports the CE Mark and offers NIST-traceable calibration.

Omega, www.omega.com.

PoE vision system

ADLink's EOS-1000 is a rugged and compact vision system that features an Intel multicore processor and four independent Power over Ethernet ports—

a combination that is ideal for high computing power and multicamera imaging.

ADLink Technology, www.adlinktech.com/vision.

PXI FPGA card

Offering 160 digital I/O signals for specific application needs, the user-configurable GX3500 FPGA card from Geotest employs the Altera Cyclone III FPGA, which supports clock rates up to 150 MHz and can be used with Altera's Quartus II design software. The GX3500 can also accept application-specific expansion boards for addressing custom applications and interfaces.

Geotest—Marvin Test Systems, www.geotestinc.com/Product.aspx?model=GX3500.

Swept RLC-Q measurements

The Bode Analyzer Suite V2.30 significantly extends the application range of Omicron Lab's Bode 100 vector network analyzer. Swept RLC-Q measurements from 1 Hz to 40 MHz allow users to gain detailed insight on impedances of circuits and components. The new B-SMC and B-WIC adapters provide a safe grip on SMD and wired components.

Omicron Lab, www.omicron-lab.com.

Preamplifiers and low-loss cables

A.H. Systems has preamplifiers and high-frequency low-loss cables to match all antennas to 2, 4, 7, 18, 26.5, and 40 GHz. Each preamplifier is supplied with a DC-regulated power source. A low-voltage indicator lets users power the preamplifier with an external battery. The high-frequency low-loss cables can be made to a customer's specified length.

A.H. Systems, www.ahsystems.com.

Programmable DC electronic load

The PEL-2000 series instruments from GW Instek are multiple-channel programmable DC electronic loads with a modularized structure. Each unit has a flexible configuration with multiple independent load inputs

(up to eight channels in a mainframe). The multi-mainframe can link up to five mainframes in a system.

GW Instek, www.instekamerica.com.

Excite your world!

Tabor's WaveXciter arbitrary waveform generators are 2.1-Gsamples/s, 12-bit, single- or dual-channel instruments

that can generate any waveform at frequencies up to 1 GHz with eight digits of resolution and 1-point granularity, resulting in high-precision signal creation and regeneration. The WaveXciter can also be used as a full-featured standard, modulation, or pulse generator in various applications.

Tabor, www.taborelec.com/us.

PRODUCT FOCUS

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

Production test audio analyzer

The APx515 is a high-performance audio analyzer optimized for production test. Audio Precision says the APx515 is a best-in-class instrument for its speed, performance, automation, and

ease of use. Typical THD+N is –106 dB, and projects can be shared with any APx analyzer. Prices start at $6200 in the US and include a three-year warranty.

Audio Precision, ap.com.

Spectrum analyzers

The Advantest U3700 Series is a portable (14 lb) two-channel battery-operated spectrum ana-

lyzer that operates up to the Ka band. It allows you to monitor RF (C/X/Ku/Ka band) and IF (L band) frequencies independently with simultaneous sweeps through Virtual Network Computing. The U3700 was selected as a finalist in *Design News*' 2010 Golden Mousetrap Best New Products Awards.

MetricTest, www.metrictest.com.

Multipurpose I/O control module

The EX1200-7500 multipurpose I/O control module—the latest addition to VTI's precision switch, measure, and I/O platform—combines relay control and dynamic pattern generation for applications such as driving and controlling external relays,

monitoring input state conditions, and dynamic digital-pattern generation with acquisition rates up to 2.5 MHz.

VTI Instruments, www.vtiinstruments.com.

Switches for ATE applications

Dow-Key's new product catalog offers a wide range of RF switches. For smaller testing applications, the company

offers 5-million cycle, miniature-sized, and pin-mount PCB switches; for larger setups, PXI modules and GPIB/Ethernet/RS-232-controlled matrices are available.

Dow-Key, www.dowkey.com.

USB digital I/O modules

USB digital I/O modules from Sealevel Systems connect to any USB port and provide optically isolated inputs, reed and

Form C relays, and TTL interfaces to industry-standard solid-state relay racks. Installation and operation is easy using the Windows 2000/XP/Vista operating system.

Sealevel Systems, www.sealevel.com.

Handler for test-cell efficiency

The MT2168 handler from Multitest optimizes test-cell efficiency. Speed and high parallelism leverage improving tester capabilities in terms of shorter test times and multisite testing. The MT2168 is scalable for test situations from engineering to high-volume applications. It is package-style convertible and offers a flexible contact site, which is adaptable to existing load boards.

Multitest, www.multitest.com/MT2168.

CATALOGS & PRODUCTS

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

Test 6-kV applications

Teseq's NSG 3060 6-kV conducted immunity generator fulfills requirements for multiple IEC standards, CE Mark, and ANSI C62.41 testing. Test options include combination wave, ring wave, EFT pulses, and PQT. *Advanced Test Equipment Rentals, www.atecorp.com.*

Automate your switching

Cytec's general-purpose LX Series switching systems allow the configuration of up to 128 one- or two-pole relays for automated test, data acquisition, or communications. Custom and specialty systems are readily available from the company. *Cytec, cytec-ate.com.*

Three-output programmable power

GW 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, and a compact size. *GW Instek, www.instekamerica.com.*

Digital I/O with PMU

Geotest's GX5295 100-MHz PXI digital instrument with a parametric measurement unit capability features a per-pin architecture, programmable levels from –2 to +7 V, and 32 dynamically configurable, input/output channels. *Geotest—Marvin Test Systems, www.geotestinc.com/product.aspx?model=GX5295.*

32-GHz oscilloscopes

Agilent's 90000 X-Series real-time oscilloscopes are engineered for 32-GHz true-analog bandwidth and deliver what the company says is the highest real-time scope measurement accuracy, the only 30-GHz probing system, and the first application-specific measurement software. *Agilent Technologies, www.agilent.com/find/90000X-Series.*

PXI downconverter modules

Phase Matrix offers a family of five PXI downconverter modules that are available in six primary configurations covering 100 kHz to 2.9 GHz, 2.7 GHz to 26.5 GHz, and 100 kHz to 26.5 GHz for test and measurement applications. *Phase Matrix, www.phasematrix.com.*

Single-load mainframe

Chroma's 63600-1 mainframe provides a portable, low-cost electronic load for benchtop testing. Three load modules are available (100 W, 300 W, and 400 W), each including a constant-impedance mode for realistic loading behavior. *Chroma Systems Solutions, www.chromausa.com.*

Free digital I/O handbook

Jon Titus and Tom O'Hanlan explain real-world digital input/output implementation from both a hardware and software perspective in a free handbook. Use code TMW01 to get your free copy at www.sealevel.com/store/ref101. *Sealevel Systems, www.sealevel.com.*

Antenna kit

A.H. Systems AK-40G antenna kit with a frequency range of 20 Hz to 40 GHz provides all the antennas, current probes, and cables needed to satisfy an array of customer requirements. All are available with next-day delivery. *A.H. Systems, www.ahsystems.com.*

Heavy-duty enclosures

The Emcor 10 Series enclosures from Crenlo offer both heavy-duty electronics protection and contemporary style. Features include a 3500-lb load capacity, a fully welded frame, and a seamless design. *Crenlo, www.emcorenclosures.com.*

16-bit, 250-ksamples/s DAQ

ADLink's PXI-2022 is a 16-channel simultaneous-sampling multifunction data-acquisition card offering 16-bit resolution and 250-ksamples/s sampling rates. All 16 analog input channels can be sampled simultaneously with differential input configurations for maximum noise elimination. *ADLink Technology, www.adlinktech.com/DAQ.*

High-performance microwave switching

The modular EX72SF simplifies the development of custom RF and microwave requirements with an open architecture platform that provides the foundation for a common, corporate-wide solution with an operating range up to 40 GHz. *VTI Instruments, www.vtiinstruments.com.*

Battery-operated spectrum analyzers

The Advantest U3700 series spectrum analyzers are portable (14 lb), two-channel, battery-operated instruments that operate up to the Ka band. The analyzers monitor RF (C/X/Ku/Ka band) and IF (L band) frequencies independently with simultaneous sweeps with VNC. *MetricTest, www.metrictest.com.*

Low-cost USB thermocouple

The NI USB-TC01 measures and records temperature data from a thermocouple and helps customers instantly take temperature measurements with no setup time or driver software installation. *National Instruments, sine.ni.com/nips/cds/view/p/lang/en/nid/208177.*

Audio analyzer

The APx515 audio analyzer is optimized for production test. Audio Precision says that the APx515 is a "best-in-class" instrument because of its speed, performance, automation, and ease-of-use. Prices start at $6200. *Audio Precision, ap.com.*

(continued)

CATALOGS & PRODUCTS

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

Downloadable application notes

B&K Precision offers free comprehensive guides for DC electronic loads, function generators, arbitrary waveform generators, and power supplies. Topics include applications, how-to examples, and product tips for test and measurement. *B&K Precision, www.bkprecision.com.*

Arbitrary and function generators

Tabor's Wave Standard series of single- and dual-channel arbitrary/function generators are designed to provide superior performance at a low price. The series has both memory-based, true arbitrary-waveform-generator architecture for jitter-free waveforms and a DDS-based generator for creating standard modulation formats. *Tabor, www.taborelec.com/us.*

Universal recorder

Omega's Superecorder, a microprocessor-based portable universal circular chart recorder, comes in five different models. The instrument offers a large dual backlit display, has a front-panel keypad for programming, and includes an RS-232 PC interface for downloading recorded data. *Omega Engineering, www.omega.com/pptst/CTXL.html.*

Low-frequency VNA

The Bode 100 vector network analyzer measures complex gain, reflection, and S-parameters from 1 Hz to 40 MHz. In addition, it provides frequency dependent RLC-Q curves of components and electronic circuits. *Omicron Lab, www.omicron-lab.com.*

Interconnect catalog on CD

VPC, a manufacturer of mass-interconnect systems, has a free 2010 Media CD that contains electronic versions of the company's entire set of catalogs and brochures plus informational videos on new products and applications. *Virginia Panel Corp., www.vpc.com/mediacd.*

Homogeneous probe

The HG homogeneous probe pin series features a custom-developed precious metal alloy, eliminating tip plating. IDI says the construction offers superior longevity, cleaning cycles, and stable contact resistance for SAC105BGA and NiPdAuQFN packages. *Interconnect Devices, www.idinet.com.*

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VIEWPOINT

[An exclusive interview with a technical leader]

ATUL BHATNAGAR
President and CEO
Ixia
Calabasas, CA

With more than 20 years in the computing and communications industries, Atul Bhatnagar runs Ixia's day-to-day operations and is also intimately involved with strategy and long-term business planning. Prior to joining Ixia, he led product development at a mobile-to-mobile convergence start-up, DiVitas Networks, focusing on WiFi and cellular convergence. Prior to that, he served as VP and GM of the Enterprise Data Networks Division of Nortel. Bhatnagar also held management positions at Alteon Web Systems and Hewlett-Packard. He holds an MSEE from the University of New Mexico and a BSEE from India's Birla Institute of Technology and Science.

Contributing editor Larry Maloney conducted a phone interview with Atul Bhatnagar about test challenges and solutions in wired and wireless networks.

Testing meets a "multimedia digital tsunami"

Q: How would you describe the growth of IP (Internet Protocol) networks?
A: IP networks are growing significantly as a result of the convergence of wired and wireless, the rapid expansion of applications like smartphones, the rising popularity of social media, and the trend toward "always on" connectivity. In addition, data centers have increasingly adopted Ethernet and IP for virtualization and storage needs.

Q: What are the biggest test challenges arising from network expansion?
A: It is very difficult to predict what kind of traffic these rich multimedia applications will generate. I call it a "multimedia digital tsunami." First, you must scientifically simulate and characterize this traffic to design a network that delivers a quality experience for users. In addition, you must ensure that your network architecture and testing strategy are building incrementally. That means that you must test the base network (layers 2 and 3) and data center appliances (layers 4 through 7) and address security issues through proper testing. You must also address issues that affect performance, such as jitter and latency. Finally, the industry needs to design test solutions for the coming massive upgrade in networks, as they move to 10-, 40-, and even 100-Gbps standards.

Q: What is Ixia's approach to providing test solutions for these advanced networks?
A: We've moved from being a niche company focused on IP and Ethernet, particularly testing routers and switches, to a broad-based test provider. Now, we can provide testing and simulation for layers 4 through 7, as well as security testing. And through last year's acquisition of Catapult, we are involved in wireless edge testing and simulation. Increasingly we are concerned with testing and simulation of converged wired and wireless networks, as well as converged data center solutions where we can test deep packet inspection devices, security devices, and load balancers.

Q: What distinguishes Ixia's product line from that of other test firms?
A: We have architected our solutions on three key pillars: IP, Ethernet, and 3G and 4G technology, especially LTE. On top of these are multiple applications to address the scalability, protocol, and conformance needs of our customers. Our products are based on the industry standards that are being adopted by customers, and we put great emphasis on time to market in the test solutions we provide. Many times, we are early adopters of industry standards. For example, we were the first in the world to do 100-Gigabit Ethernet implementation. Our test architecture is also highly unified so that customers can expand their testing and simulation as their business grows. We can provide a 1-Gigabit tester, a 10-Gigabit tester, a 40-Gigabit tester, or a 100-Gigabit tester in the same chassis. We have hundreds of test protocols for IP, Ethernet, and 3G and 4G.

Q: Can you cite examples of significant new product introductions?
A: Even during the recession, we spent 25% of revenue on product development. The first in a series of breakthrough products was IxYukon, a high-density, 10-Gigabit Ethernet tester that packs 96 ports in a 10U rack chassis. This product supports full layer 2 through 7 functionality for testing routers and switches with network emulation and Internet applications. We also introduced our "K2" 100-Gigabit Ethernet solution. A third significant product is our Acceleron-NP load module, which gives network equipment manufacturers a simulation solution for testing their equipment for the functional requirements of next-generation data centers. T&MW

Atul Bhatnagar discusses other network test technologies, including new energy efficiency solutions, in the online version of this interview: www.tmworld.com/2010_08.

Centellax 40Gb/s Bit Error Rate Testing at a price you can afford

The SB40B-40G BERT System is a complete cost effective solution for 40, 28, and 25Gb/s device characterization and production testing.

SYSTEM FEATURES:

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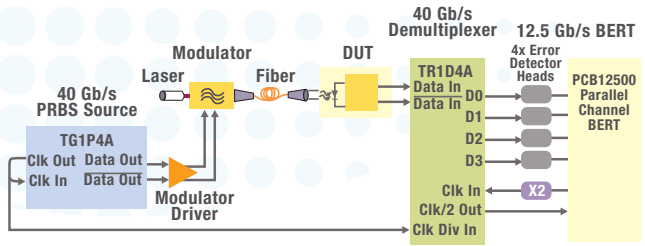
- True PRBS pattern generation at full data rate
- Supports differential or single ended inputs and outputs
- High voltage drivers available for laser modulator testing
- Remote control through USB or GPIB
- Automatic receiver clock phase alignment
- High speed clock option for continuous operation from 22-44Gb/s
- Centellax model number: SB40B

APPLICATIONS:

- 2 x 22G QPSK Testing
- 40G DPSK Demodulator Testing
- 4 x 28G DP-QPSK Testing

Typical BER Test System for 40 Gb/s Optical Receiver



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For additional details, application notes and assembly diagrams, please visit our website: www.centellax.com

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