

Timing and Synchronization

From the Editor's Bench

Shlomo Engelberg

That the Tabernacle May Be One Whole

The tabernacle, the Jewish nation's central point of worship while in the desert and for many years after, was designed in a modular fashion and was meant to be assembled and disassembled on a regular basis. Its component parts were works of beauty and were built by the best craftsmen of their day. In the description of the assembly of the tabernacle, we are told, "And thou shalt make fifty clasps of gold, and couple the curtains one to another with the clasps, that the tabernacle may be one whole" (Exodus, 26:6, The Tanach, Jewish Publication Society translation, 1917). The tabernacle was modular in design but was designed so that when fully assembled, it formed a coherent whole.

Most of what we do is done in modules. We write computer programs one subroutine at a time; we design amplifiers by putting together subcircuits; and we make CMOS logic gates by designing a pull-up network and a pull-down network and combining them. When done correctly, as in the tabernacle and the best of programs and circuits, the result is a coherent whole that is a work of surpassing beauty. When done poorly, the results range from the esthetically unpleasing to the absolutely ghastly.

Modular design is popular because it allows us to take a task and break it into manageable pieces. It also allows us to separate a single task that requires expertise in many areas into many smaller tasks each of which requires expertise in a single area. This has obvious advantages, but there are also disadvantages. A major disadvantage of modular designs is that the different pieces often do not fit together as well as they might.

This problem is sometimes painfully obvious. Textbooks are often designed to be self-contained – to be individual modules. Such textbooks can be adopted without being overly concerned about the background of the students who will be using the book; the book is self-contained. On the other hand, to make the book self-contained, the author has had to studiously avoid making references to material that the students may not have covered yet. When reading a book that teaches how to program a microcontroller, you may not hear much about how its input-output ports are designed. To keep the book self-contained, the author may have decided that there would be no transistor-level, hardware-oriented discussions. When describing how to output a sine-wave to a digital to analog converter, the author may have decided not to consider different techniques for approximating a sine-wave because that would require more mathematical sophistication than can be safely assumed.

My students are currently registering for the courses they will be taking in the next semester. When looking over the courses they are taking, it is clear that we have been attempting to take

engineering and break it into modules. This attempt sometimes leads to having courses with an extremely narrow focus. Having too many such courses can lead students to see engineering as a subject made up of almost independent sub-disciplines. With reasonable luck, a student will have enough professors who have a broad view of engineering that the student will understand that the sub-disciplines are coupled, often quite tightly, and that electrical engineering is in many ways “one whole.” A properly modularized course of study for a student of engineering breaks the field into many subfields and is careful not to leave out the “fifty clasps of gold” that hold the subject together and make its beauty apparent.

At the magazine, we try to see to it that our different modules, be they tutorials or articles, columns or editorials, all help the reader to understand the instrumentation and measurement field and experience the field’s beauty. To that end, in this month’s issue we have tutorials about the science, tricks, and techniques that make ultra-high speed waveform measurements interesting and articles about equalizers, the Kalman filter, MEMS sensors, and high voltage systems, along with our usual assortment of columns.

Enjoy!

Shlomo

President’s Perspectives

Jorge Fernández Daher

President’s Perspective

In February, as every year, we held our strategic planning meeting. This is one of our most important opportunities to discuss the vision and future of our society. It is a complete day of discussions and brainstorming where we can suggest ideas without any previous filtering. At the end, we develop a set of action items so that we can start working on the new ideas. Here are my comments on ideas we discussed.

We need to attract engineers and students working in industry. Most of our members come from universities, and their activity is very well matched to what our society offers. However we know that we are not meeting the needs of people in industry. It is clear that in engineering there are hundreds or thousands of applications related to measurements and instruments, and many engineers in other fields are using instruments for their everyday work. The results of such measurement depend on thoroughly understanding the principle on which it is based and the use of the correct instruments. Sometimes it is not easy to make those decisions, and it would be helpful if instrumentation and measurement professionals could be available to advise, teach and assist. Our society has thousands of professionals all over the world whose expertise can be valuable for others. The society needs to develop educational material useful for people in industry, but we need to understand the real needs of industry. We have appointed one of our AdCom members to develop a plan of action. Please let us know what you need to develop as a professional in your job.

We need to continue to develop our Technical Committees. The Instrumentation and Measurement Society has 35 Technical Committees working on a broad selection of activities defined by the scope of our society. The committees provide a forum for close cooperation and exchange of technical information among members who share common interests. They are fundamental elements of our society since they develop documents and standards which are references for industry and engineering work. If you have knowledge in a specific area, I invite you to join the society and become a member of one of our Technical Committees. It may also

happen that in your work you have detected a lack of standards in certain areas, so please let us know about such situations and get in contact with the relevant committee. In both cases, please contact Mihaela Albu, our Vice President of Technical Committees and Standards. You can see a list of all the committees and contact information on p. 21 or on our web page.

Development of local Chapters is a great benefit. The local Chapters are the organizational units located in a certain geographical area which promote the technical activities of a society. There are 39 Instrumentation and Measurement Chapters all over the world. They belong to Sections in all IEEE regions covering all continents, they provide a way of connecting local people with the same technical interests, and they organize many conferences, meetings and workshops. We have developed a pair of funding programs for Chapter activities, and that information has been uploaded to our web site for you to access. Do you know if there is a local chapter in your section? If there is one, is it easy for you to learn about their activities? Do you have any proposals for activities that can be organized by your chapter? I also invite and encourage you to contact your local organization and express your ideas. As usual, you can also contact Kristen Donnell, our Chapter Liaison, and tell her about your proposal. It will be evaluated according to the procedures established, and if it complies with the requirements, we can fund the activities proposed. This invitation is also extended to students. If there is a local student branch, be part of it. If not, talk to the Chapter or Section.

As a final comment, I think you may have already realized that our administrative committee is very interested in getting close to our members. We must understand your needs to focus our resources to help you develop your career. In the end, it always depends on your participation. I would like to thank all of you who are already contacting us with interesting ideas and others who simply want to help our society.

Best regards,

Jorge

Article Summaries

IEEE Survey Results for the Instrumentation & Measurement Magazine

(Summary)

Shlomo Engelberg

This article summarizes the results of an Instrumentation and Measurement Magazine readers' survey conducted by the IEEE Strategic Research group during late December 2011 and early January 2012. The report prepared for the society indicates that the magazine's readers desire additional technical articles with an increase in problem solving solutions, tutorials, and new product information. Although readers have access to electronic reader tools, the majority of respondents prefer to receive the magazine in print format.

Summary prepared by K. Virostek

Speech Processing Utilizing the Kalman Filter

(Summary)

Sharon Gannot

The Kalman filter is one of the most widely applied tools in the statistical signal processing field, especially in the context of causal online applications. This article presents an introduction to the Kalman filter; the desired signal and its corresponding measurements are modeled, the Kalman filter is formulated and presented with an intuitive explanation of the involved equations, applications of the filter are given in the context of speech processing, and examples of two popular applications in speech enhancement and speaker tracking are provided.

This summary includes text from the article.

Recent Advances in MEMS Sensor Technology- Thermo-fluid and Electro-magnetic Devices

(Summary)

Farbod Khoshnoud and Clarence W. de Silva

This is the final installment of a three-part series on micro-electromechanical systems (MEMS) sensor technology, specifically considering sensing in the thermo-fluid and electro-magnetic domains. Sensors for pressure, fluid flow, shear stress, viscosity, fluid concentration, humidity, temperature, thermal shear stress, ac current, microwave power, RF power, magnetoelastic parameters, and magnetic field measurement are discussed. The applications considered include measurement of the wing pressure and intramuscular pressure of insect-like flying robots, robotic liquid dispensing and drug delivery, respiratory flow sensing, controlling the methanol to water ratio in fuel cell membranes, monitoring gas in automobile cabins, and self-sustained current measurement.

This summary includes text from the article.

The Reality of Generation and Distribution of Electric Power, Part 2: The Other Face of Ultrahigh Voltage Power Transmission

Alex Hebra

(Summary)

This article is the second of two that introduces the concepts behind generating, propagating and measuring ultrahigh voltages from various energy sources. The author examines some of the equipment involved, including towers, pylons, conductors, accessories such as insulators, connectors, and splicers, and their importance. Special attention is given to the voltage limiting effects of Corona discharges. The pros and contras of power transmission with alternating current (ac) and direct current (dc) are discussed. Methods of generating ultra high voltage are brought into focus along with the principles of operation one needs to understand to deal with the equipment and instruments used in high voltage transmission. The author concludes the article

by suggesting that the details the paper presents are the ways and means of making hydro-energy in lakes and rivers readily available to industrial and private users all over the country.

This summary includes text from the article.

Equalizers in Mobile Communications: Tutorial 38

(Summary)

Markus Rupp and José A. García-Naya

This tutorial serves as an introduction to the challenging design of equalizers. By introducing a general framework based on the Bezout Theorem, the authors show that the most sophisticated equalizer concepts can be derived, thus allowing finite length solutions to be found. Based on a canonical receiver structure, they also show how equalizers improve the Signal-to-Interference and Noise Ratio under different sources of interference such as temporal, spatial, code and multiuser. Challenges of adaptive equalizers as they are currently used in typical solutions for low-cost devices are discussed.

This summary includes text from the article.

Pulse Metrology, Part 2: Tutorial 39

(Summary)

Nicholas G. Paulter and Donald R. Larson

This article is the second part of a two-part series discussing pulse metrology. Part 2 continues with topics within the pulse metrology standards, with a bias toward the work performed by the authors, formerly in the area of pulse measurements in support of the digital telecommunications industries, and presently in the areas of weapons testing, concealed weapon detection, through-barrier imaging, and imaging metrology. The authors address parameter computation, test methods, and the use of artifacts (test objects), and conclude the tutorial with discussions of traceability, and measurement uncertainty.

This summary includes text from the article.

Columns

Instrumentation Notes

Measurement Systems as Foundations for Reliable Decision Support Systems

(Summary)

Andrzej Michalski and Lukasz Makowski

What does “to measure” actually mean? In this article, the authors look at measurement systems

as a crucial part of a decision support system (DSS) which can shape rational judgment and ensure sensible progress in various activities. Presenting applications in environmental and medical systems, they illustrate that the dividing line between measurement systems and DSSs is becoming thinner, offering an opportunity for engineers who are working in the field of instrumentation and measurement to create more advanced solutions for improved satisfaction of users and customers of their products.

This summary includes text from the column.

History of Physical Standards

Mingling with the Masses

(Summary)

James F. Schooley, Sr.

From the time of the ancients to the present, the evaluation of weight progressed from two-pan balances to single-pan scales involving springs or counterweights, along with electronic readouts. Eventually, the major scientific laboratories developed counterweights specifically prepared as standards for the calibration of weight scales. This illustrative article surveys the history of the development of units for distinguishing weight from mass and producing measurements with increased certainty.

Summary prepared by K. Virostek and includes text from the column.

Departments

New Products

Robert Goldberg

New 4th Generation “Smart” Dynamic Signal Analyzers

VTI Instruments Corporation has announced the introduction of the Sentinel EX Series of “Smart” Dynamic Signal Analyzers (DSA). Sentinel EX, VTI Instruments’ 4th generation of “Smart” dynamic signal analyzers, continues to deliver the most trusted solutions to the noise, vibration and harshness (NVH) marketplace.

Measurement performance is elevated to new levels with 625 ksamples/second/channel data rates, true differential inputs with superior common mode performance (CMRR of -120 dB) reducing unwanted noise and interference, an industry leading spurious free dynamic range (SFDR of -125 dB) offering exceptional measurement fidelity, and uncompromised IEP excitation flexibility that is fully programmable from 2 mA to 20 mA to maximize transducer performance and response.

Access to corporate-wide cloud data management delivers advanced test data availability, security and storage services throughout the organization, while AXI-based open-platform FPGA synthetic instrument customization extends traditional hardware performance by combining nearly unlimited user-defined computational, processing, and control possibilities.

Industry standard MATLAB®, Simulink®, and other model based design tools simplify implementation, maximize reusability, and provide access to hundreds of standard filters and algorithms such as real-time distributed analysis.

Hardware enhancements also include comprehensive run-time health monitoring and self-calibration, without the need to disconnect external transducer cabling, for uninterrupted system level confidence and peace of mind. Precision distributed measurement synchronization is accomplished utilizing IEEE 1588 (precision time protocol) to ensure that test data are time correlated.

All development activities have been based on open-architecture design methodologies, resulting in a level of hardware and software independence not available in previous generations of DSA instrumentation. Industry standard drivers and programming interfaces support all major programming environments and complete turn-key solutions, such as open-source X-Modal III. For more information, visit www.vtiinstruments.com.

Family of Low-Cost Broadband Signal Analyzers

Aeroflex Incorporated has announced a new family of three low-cost broadband signal analyzers. These analyzers locate, record, and analyze complex communications signals for commercial, military, and aerospace applications.

Scout, Hunter, and Explorer Signal Analyzers cover a wide range of applications. The new signal analyzer product family consists of a portable signal analyzer, the Aeroflex Scout CS1104, and two rack-mountable signal analyzers, the Aero-flex Hunter CS1207 and the Aeroflex Explorer CS1247. The Scout CS1104 is a portable signal analyzer designed for the user who wants to go out in the field and find signals of interest.

Whether the task is collecting RF signals on the move or analyzing them in the lab, the Aeroflex Scout allows ultimate flexibility. Scout's RF coverage extends from 20 MHz to 3 GHz with 40 MHz instantaneous bandwidth, an 8 GB signal capture RAM, and a 1 TB removable data storage disk. Scout is targeted to provide data analysis and recording for portable applications.

The Hunter CS1207 and Explorer CS1247 are rack-mountable signal analyzers. Hunter is ideal for users who wish to search for a specific signal, hone in on a narrow frequency range around that signal of interest, and analyze it. Hunter's RF coverage extends from 10 MHz to 6 GHz with 70 MHz instantaneous bandwidth, a 32 GB signal capture RAM, and an 8 TB removable data storage disk. It is designed for applications that need greater RF bandwidth than Scout and adequate memory for longer signal recordings.

The Explorer CS1247 combines Hunter's existing narrow-band capability with additional wideband capability. The Explorer is designed for the user who needs to explore, record, and analyze across a wide frequency range. Explorer's RF coverage extends from 10 MHz to 6 GHz with operator-selectable 70 MHz or 400 MHz instantaneous bandwidths, a 32 GB signal capture RAM, and an 8 TB removable data storage disk. Like Hunter, Explorer can zero in on a narrow spectrum range to look at a specific signal, record it, and analyze it.

For more information, contact your local Aeroflex sales office by calling Aeroflex Sales at +1 (800) 835-2352 or email bsa@eroflex.com.

Adding Frequency Spectrum to Arbitrary Waveform Generator Enhances Versatility

Agilent Technologies, Inc., has announced enhancements to its high-resolution, wide-bandwidth M8190A arbitrary waveform generator (AWG). The enhancements give engineers greater flexibility and make it possible for them to create signal scenarios using the 5 to 7 GHz spectrum.

The Agilent M8190A is a source of high fidelity because it simultaneously delivers wide bandwidth and high resolution with up to 80 dBc of spurious-free dynamic range. This unique combination lets engineers create signal scenarios that push their designs to the limit and bring new insights to their analyses.

An AWG is the most versatile signal scenario generator possible. Capabilities such as easy switching between 14-bit output at 8 GSa/s and 12-bit output at 12 GSa/s help engineers handle multiple applications and measurement requirements.

Because every application calls for different signal characteristics, the Agilent M8190A contains three amplifiers that are optimized for different applications. The latest enhancements take the instrument's versatility one step further with support for various output formats, including NRZ (no return to zero), DNRZ (double no return to zero), RZ (return to zero) and doublet mode. Engineers working on applications that require the highest spurious-free dynamic range can use the DNRZ format. For time-domain applications requiring the best pulse performance, engineers can use the NRZ format. If they need a higher frequency spectrum, they can switch into doublet mode, which allows them to use the 5 to 7 GHz spectrum. Find additional information at www.agilent.com/find/M8190.

“All in One” Portable Accelerometer Shaker and Calibration System

Meggitt Sensing Systems introduces the Endevco® model 28959F/28959FV, a portable accelerometer shaker and calibration system with integral signal conditioning, designed to provide both excitation and high-precision NIST-traceable calibrations of charge mode piezoelectric, voltage mode piezoelectric (ISOTRON®), piezoresistive, and variable capacitance accelerometers within a convenient “all-in-one” unit that facilitates compliance with ISO 17025 and A2LA requirements. The fully self-contained Endevco® model 28959F/28959FV calibration system consists of a built-in vibration exciter, signal generator, computer-controlled amplifier and servo mechanism, along with an internal reference accelerometer, thermal printer, RS-232 serial interface, LCD display screen (in English or metric units), signal conditioners and all necessary connectors and mounting accessories. This complete package requires no additional accessories for a lower total cost of ownership. With internal memory capacity for more than 1,600 tests, the system can effectively support amplitude ranges of up to ten g and frequency ranges of 10 Hz to 10 kHz, with an RS-232 interface that efficiently transfers field data. In addition, the unit can be powered by either AC line voltage or its internal rechargeable batteries.

With its high-performance and portability, the Endevco model 28959F/28959FV may be used as both an in-house laboratory system or as an onsite calibrator for field checks of individual measurement chain components. For detailed technical specifications, drawings or additional information about the Endevco model 28959F/28959FV or other products available from Meggitt Sensing Systems, visit www.meggittsensing.com/.

New Version of Data Logging Software

Onset has announced HOBOWare 3.3, a new version of the company's graphing and analysis software that dramatically speeds up deployment time in energy and environmental monitoring projects.

HOBOWare 3.3 includes a number of time-saving features that make it faster than ever to configure HOBO® data loggers and weather stations in the field, and analyze the collected data.

Key features include:

- Batch configuration and readout – Users configure and readout multiple data loggers in a fraction of the time it would take with previous generations. This time-saving feature is a particular advantage in applications requiring hundreds of data loggers such as building energy audits or monitoring stream temperatures.
- Pre-launch filtering and scaling – These tools enable users to preconfigure their data loggers so upon readout, the data will display max/ min/average readings at set intervals (per hour/ per day) and will be automatically plotted to scale in real-world engineering units.
- Bulk export – This enables users to quickly and easily export HOBOWare files to text format for use in Microsoft Excel and other programs. The tool automates file naming and management tasks to streamline the export process and save time.

HOBOWare 3.3 also provides support for Onset's new HOBO UX90 Series, the industry's most comprehensive family of time-of-use data loggers. The series includes data loggers for monitoring light usage, room occupancy, motor on/off status, state changes, pulse signals, and more. Visit www.onsetcomp.com/products/software to learn more.

Pressure Gauge with Metric Fittings and Ranges

Omega introduces the DPGM409 Pressure Gauge that covers the full spectrum in pressure measurement with Gage, Sealed Gage, Absolute, Compound Gage, Vacuum, and Barometric pressure ranges. Its core is a highly stable micromachined silicon sensor with a very high 0.08% accuracy. Each unit is supplied with a 5-point NIST traceable calibration certificate and is tested to industrial CE standards. A user selectable analog output of 0 to 5 Vdc, 0 to 10 Vdc, or 4 to 20 mA is standard on all models, and a built-in wireless transmitter option is also available.

The electronics are enclosed in a stainless steel and ABS housing that is washdown rated and has a unique magnetic stylus system for programming that prevents accidental programming changes. The display has large 25.4 mm digits plus a 0 to 100% bar graph. MIN/MAX/ AVG readings are front panel programmable, and free data logging and charting software is included. A wireless transmitter option is available to transmit the readings to a receiver in your control room. Power comes from a long-life lithium battery (included) with a typical life of 4 years.

For more information, visit www.omega.com.

Transient Recorders Add PCI Express for Increased Data Precision

Elsys Instruments has expanded its family of LAN-controlled transient recorders to include high speed PCI Express (PCIe) data transfer on its data acquisition modules. The new TPCE data acquisition modules are high-precision and high-resolution digitizers with sophisticated features such as advanced trigger modes, continuous data acquisition mode, single ended and differential inputs, digital input lines, and ICP coupling for piezo sensors. They enable the development of scalable systems that can be expanded to meet growing data acquisition needs.

With the modules' fast PCIe 4 lane architecture, the recorders provide real-time data streaming in a continuous acquisition mode that appeals to applications requiring exceptionally rapid data acquisition such as signal intelligence (SIGINT), communication intelligence (COMINT), spectral monitoring, RF recording, and IF/baseband streaming.

The new PCIe modules can be housed in Elsys' TraNET FE transient recorders that hold

4 to 32 single-ended channels or 2 to 16 differential channels in the TraNET EPC industrial computer frame with 16 slots, for a total of 64 channels, or in the TraNET PPC ruggedized portable computer system with 6 slots, for a total of 24 channels.

Up to eight systems, of TraNET FE and/or EPC, totaling up to 512 channels, can be synchronized for clock and trigger by applying Elsys' unique Sync-Link Box. Modules with different sampling rates, from 10 MS/s to 240 MS/s, and different vertical resolutions, of 14 bits or 16 bits, may be combined to match various application needs. Standard memory is 32 MSample per channel and is expandable to 128 MSample per channel.

The recorders also feature several data acquisition modes including scope mode, similar to an oscilloscope that enables the quick configuration of the acquisition parameters before working in a different mode or simply the ability to visualize and analyze single-shot events. Time-stamped events are recorded first in the onboard memory and then written off to the internal hard drive. As long as the streaming rate keeps up with the data trigger rate, this mode can run for a very long time or until the hard drive is full. For additional information, visit www.elsys-instruments.com/products/tpce.php.

Quartz High-Pressure Sensor

Kistler North America has announced the availability of its Type 6215. Type 6215 is a quartz-based, high-precision pressure sensor known as a field-proven industry gold standard for meeting the rigorous application demands of internal ballistics, closed bomb testing, weapons discharge and cartridge chamber testing, and other extreme high-pressure measurement requirements. Design of the Kistler Type 6215 incorporates a quartz crystal sensing element and front sealed diaphragm, pack-aged together within a rugged, stainless steel housing.

This technology is industry exclusive to Kistler in North America and allows for low mechanical and thermal stresses upon the sensor, with no mounting gap (small dead volume) and a largely reduced surface pressure within the sealing part. The result is a finished product with long useful service life, excellent long-term measurement stability and highly repeatable extreme precision pressure measurement capabilities. Small caliber weapons users have reported more than 20,000 rounds of extreme high accuracy results.

Offered with a measurement range from 0 to 6,000 bar (0 to 87,000 psi), the Type 6215 features a high-impedance output and sensitivity of -1.4 pC/bar (-0.1 pC/psi) with a natural frequency of >240 kHz. Units are rugged to 25,000 g shock, with a 1 μ rise time and < \pm 1% FSO linearity specification across all pressure ranges. Depending upon desired measurement configuration, the Type 6215 may also be installed with an optional (sold separately) protective shield or diaphragm protection. In particular, thermal shields or plates further reduce the potential for thermal shock errors, and diaphragm protection provides resistance to mechanical damage from metal fragments and powder particles.

All U.S. sales and promotion of the Kistler Type 6215 are conducted in full compliance with International Traffic in Arms (ITAR) and other export control regulations with an approved commercial license required for all non-U.S. shipments and with other potential restrictions on customer sale and end use. For additional details, please visit www.kistler.com.

Optically Isolated Data Acquisition System

OMICRON Lab's new product, the optically isolated data acquisition system ISAQ 100, serves for analyzing and/or recording voltage signals under challenging conditions. The accurate (2 MSps sampling rate, 18 bit resolution) ± 250 V inputs of the two channel system can be used to analyze any physical or chemical process. A data recorder and analyzer, as well as a real-time scope and FFT analyzer, are provided by the controlling software which runs on any standard Windows PC. The full potential of the ISAQ 100 is acquired by making use of the fiber optic link of up to 3 km used for the data transfer between the acquisition units and the control unit. These enable the ISAQ 100 to be used as an isolation amplifier and make it the perfect solution for measurements in EMC critical areas and for high voltage applications. The hardware concept of the ISAQ 100 allows unlimited potential free measurements and even ensures safe operation for on-desk applications with up to 1000 V to ground. The battery-powered acquisition units enable 8000 hours of data recording and, combined with the ISAQ 100's light weight and compact design, the ISAQ 100 assures outstanding flexibility.

For more information, visit www.OMICRON-Lab.com.

Electric Power “Black Box” Detects Crashes for Government Users

This new tiny electronic instrument from Power Standards Lab (PSL), called the PQube, detects and records power glitches that crash sensitive electronics like radar systems and computers. When a mountain-top radar system crashes and then restarts as though nothing happened, it's dangerous. It can be really tough to figure out if the crash was caused by a software bug, loose cable, bubble in the cooling water or power glitch.

The tiny PQube solves this problem by capturing complete information about every power disturbance. The tough PQube functions like the black box in an airplane, recording the reason for every crash. Government technicians and engineers use PQubes to increase the reliability of airport systems, data centers, sophisticated medical electronics and building automation systems.

Using miniaturized technology, the PQube power monitor is about the size of a large digital camera and costs about the same as a high-end digital camera. The unit replaces older portable instruments the size of a suitcase which cost as much as a small car. The PQube automatically writes reports to pop-in, pop-out digital camera memory cards. If an Ethernet port is available, the PQube will even automatically email photographs of every power disturbance to its user. No software is required; everything is built into the PQube. It even functions as an ultra-accurate, ultra-high-resolution energy meter with a built-in web server. For more information about PSL and the PQube, visit www.powerstandards.com.

Wireless Sensor System Provides Web-Based Monitoring

The new NEWPORT® zSeries wireless sensor system provides web-based monitoring of temperature, humidity, and barometric pressure in critical applications. The compact wireless “End De-vices” mount discretely on the wall in clean rooms, laboratories, and any remote facility. The End Devices transmit up to 300 feet (without obstructions) to a “Coordinator” connected directly to an Ethernet network and the Internet. The wireless system complies with IEEE 802.15.4, operating at 2.4GHz.

With this new zSeries system from NEWPORT, users can monitor and record temperature, relative humidity, and barometric pressure over an Ethernet network or the Internet with no special software—just a Web browser.

The device can trigger an alarm if variables go above or below a set point that the user determines. The alarms can be sent by email to a single user or to a group distribution list,

including text messages to Internet enabled cell phones and PDAs. For information, visit www.newportus.com/ppt/ZSERIES.html.

Fast Lock-in Amplifier

Zurich Instruments claims the fastest commercial lock-in amplifier of all time. The UHFLI (Ultra-High Frequency Lock-in Amplifier) performs measurements as high as 600 MHz, which is three times faster than the capabilities of the closest competitor.

The UHFLI demodulates signals of up to 600 MHz using fully digital signal processing, while providing 100 dB dynamic reserve over the entire frequency range. Furthermore, the instrument is equipped with an integrated tool-set for time and frequency domain signal analysis: an oscilloscope, a frequency response analyzer and an FFT spectrum analyzer. For these reasons, the UHFLI also simplifies many laboratory setups with its all-in-one-box concept.

Scientists have previously had to design, build, and test their own measurement instruments to achieve the frequencies supported by the UHFLI. Physicists, chemists, and biologists will now be able to spend more time advancing their research, rather than developing custom circuits. With the introduction of the UHFLI, Zurich Instruments is broadening its support of high-end research in the fields of quantum and nanophysics, sensors and actuators, laser spectroscopy, and bio-engineering. For more information about the product, visit www.zhinst.com/products/uhfli.