The IEEE Instrumentation & Measurement Magazine
August 2008 issue

AUTOTESTCON *2007*

From the Editor's Bench

Kim Fowler

AUTOTESTCON 2008

The IEEE Instrumentation and Measurement Society (IMS), which publishes this magazine, supports AUTOTESTCON in concert with the Aerospace & Electronic Systems Society (AESS). AUTOTESTCON is a highly successful conference that focuses on test equipment and military applications of the test market. Hundreds of industry professionals and about 275 exhibitor companies attend each year. Papers presented at the conference concentrate on the practical application of technology.

The IMS has also emphasized theoretical pursuits in research and development by its conferences and its publications. We will continue to do so, while providing practical applications in the magazine – hence this issue.

Continuing Education

The (IMS) strives to provide venues of education for you. During this past year, we have expanded these venues by having opportunities for concentrated continuing education and greatly expanding the number of tutorials at the I^2MTC conference. IMS also hosted a week long "International Measurement University" in July, 2008 in Sardagna, Trento, Italy.

If you have ideas about topics that might be interesting or topics that you hope to learn about, contact your local chapter or one of the officers of the society and express your thoughts.

This magazine

If you are reading this magazine, then most likely you are already trying to continue educating yourself. (For your colleagues who are not reading technical publications or attending

conferences or seminars, maybe you can pass some of this information along and encourage them to join you in pursuing knowledge.)

Think about how we can serve you better. Let us know. Encourage your colleagues. Let's work to improve our flow of ideas.

Kim

President's Perspectives

IEEE Instrumentation and Measurement Society President's Greetings

Alessandro Ferrero

Welcome to this issue of the Instrumentation & Measurement (I&M) Magazine dedicated to IEEE AUTOTESTCON 2007. AUTOTESTCON is one of the two major conferences that is sponsored by the I&M Society (IMS). The second one is I^2MTC (formerly IMTC). These two conferences cover all fields of instrumentation and measurement and exhibit the spectrum of the IMS. While I^2MTC is focused on the most advanced research results, AUTOTESTCON is focused on the most advanced applications of I&M technology in the test market. The modern keywords of industrial measurement applications, to quote just a few of them, are reliability, testability, and prognostics. These topics are considered and discussed at AUTOTESTCON where hundreds of industry professionals and exhibitor companies gather each year.

The members of the AUTOTESTCON Board of Directors, the General Chairs, the Technical Program Chairs and all Committee Members are the reasons for success of the conference. They all deserve our warmest "Thank you!" A special thank you also goes to the Aerospace & Electronic Systems Society (AESS) and its President, Bob Rassa, for co-sponsoring this Conference.

I hope you'll enjoy reading the magazine. It contains quality versions of some of the papers presented at AUTOTESTCON 2007. Maybe you'll consider attending future conferences of AUTOTESTCON and presenting your papers.

A*lessandro*

Greeting from the IEEE Aerospace & Electronic Systems Society President

Bob Rassa

The IEEE Aerospace & Electronic Systems Society has been a proud primary sponsor of IEEE AUTOTESTCON since its founding in 1964. This Conference is one of the IEEE's most successful applications-type conferences in the IEEE portfolio, and for good reason.

AUTOTESTCON brings together the US Department of Defense community that is actively engaged in automated test systems for military equipment – the vendors who provide the outstanding equipment, both primes and 2nd and 3rd-tier contractors; the users from the Services, the procurement organizations from the military, and the individuals from industry that designs and builds the systems.

Throughout the week, the excellent dialog continues, and all in a well-orchestrated setting that is conducive both to the exchange of technical and management information, and providing an excellent venue with a creative social environment to facilitate the personal enjoyment of attendees, thus providing an overall rewarding experience for all.

Our thanks go to the AUTOTESTCON Conference Committee and the AUTOTESTCON Board for their tireless support of this amazing Conference, and to our co-sponsor, the Instrumentation & Measurement Society, for their excellent magazine and this special issue dedicated to the furthering of the AUTOTESTCON objectives.

Bob

Column Summary

New Products

Robert Goldberg

(Summary)

Scalable RF/Microwave Switching Products and Design Tools by VTI Microwave
The EX7000 family of scalable open architecture RF interface unit (RFIU) subsystems developed to reduce non-recurring engineering costs (NRE) and aid in repeatable product development.
For more information please visit vtimicrowave.com or email sales@vxitech.com

Multi-Technology Receivers Support Wireless Technologies by Agilent
Six new models of the Agilent W1314A measurement receiver platform offer expanded band coverage. The Agilent receivers enable network equipment manufacturers and wireless operators' RF engineering teams to effectively deploy, optimize and troubleshoot all technologies in their own networks by quickly identifying coverage and interference problems.
More information about the W1314A can be found at www.agilent.com/find/e6474a.

PXI-Based Systems Bring Flexibility to RF Navigation/Communication Systems Test from Aeroflex: The Avionics Test Bench and Avionics Test Studio is the first reconfigurable PXI-based test platform for avionics navigation and communications that addresses test compatibility by leveraging PXI's common platform and flexibility to the entire product lifespan, including design, production testing and maintenance of avionics navigation and communications systems
More information may be found on the company's website: www.aeroflex.com.

The INFINITE 2.0 Measuring Arm by ROMER Inc.: The sleek, redesigned six- and seven-axes arms offer high precision probing and optional scanning capabilities for mobile measurement, inspection, and reverse engineering on the shop floor or in the metrology lab.
More information can be found at www.ROMER.com.

Dynamic ICP® pressure sensors Detect Combustion Instability & High Intensity Acoustics in Rocket Motor Testing by The Aerospace & Defense division of PCB Piezotronics (PCB®): The series of dynamic ICP® pressure sensors, Series 106, 116, 122, 123 and 124, are designed expressly for measurement of combustion instability and high intensity acoustics in rocket motors.
For detailed specifications, drawings, or additional information, please visit the website at www.pcb.com.

A new line of Multifunction Data Acquisition Devices with USB Provide Highest Accuracy by National Instruments: A new line of M Series USB data acquisition (DAQ) devices with 18-bit analog input accuracy at sampling rates up to 625 kS/s. The NI USB-6281 and USB-6289 feature an 18-bit ADC, which provides a 4X increase in resolution over traditional 16-bit devices, equivalent to more than 5½ digits of resolution for DC measurements.
Find more information at www.ni.com/usb.

Diode Laser System Now Available At 488 nm by TOPTICA. Photonics AG extends the diode laser series iBeam / iPulse by the wavelength 488 nm, a crucial excitation line for biophotonics and bioanalytics. Typical applications include flow cytometry, confocal microscopy and high throughput / high content screening (HTS / HCS).
For more information please visit www.toptica.com.

New Laser Safety Goggle for Alignment of "Red" Lasers by LASERVISION
P1004 comes now in both LASERVISION frame styles for plastic absorption filters SKYLINE and LAMBDA ONE and with both alignment protection level R1 for 625-650nm, and R2 for 660-675nm acc. to EN 208 and with L protection levels DIR L5 for full protection acc. to EN 207.
For further information please visit www.lvg.com/uvex/laservision/intl/en/home.nsf.

Image-Based Id Readers by Cognex.
The DataMan® 700 series is two models of handheld ID readers that can read any code, any surface and any marking method; from printed barcodes on labels to the most challenging 2D codes directly marked on metal parts for industrial ID reading.
Visit Cognex on-line at http://www.cognex.com for more information.

Panel Meter Features Built-In Outputs With Dual Setpoint Capability by Red Lion Controls, Inc. The PAXLA is an extension of the company's series of cost-effective PAX Lite panel meters that control capability by adding two Form C relays capable of switching up to 5 amps. The PAXLA can accept DC current, DC voltage or process input signals, scaling them to a desired readout for a wide range of applications. Plus, the PAXLA is simple to program using its front panel buttons and jumpers. It meets CE requirements and features a NEMA 4X/IP65 sealed front bezel, providing excellent reliability in harsh industrial environments.
For more information go to www.redlion.net.

New ThermPaq Software Accelerates Thermal Characterization of Semiconductor Packages by Flomerics: ThermPaq provides a fast, simple, proven, automated process that reduces the number of distinct steps required to be performed by thermal experts, reducing the risk of modeling errors. The web-based tool is entirely wizard-driven. The result is a fully automated process for generating accurate package models and computing the complete set of JEDEC-compatible thermal characterization data.
Find more information at www.thermpaq.com.

Harsh Duty Single-Turn Magnetic Absolute Encoders by TURCK: The new Sendix® encoders with 12-bit analog and 14-bit CANopen outputs are designed for applications requiring rugged, high-resolution encoders and are exceptionally suitable for outdoor use. These Kübler by TURCK single-turn magnetic absolute encoders use patented Sensor-Protect™ technology to deliver fully encapsulated electronics and separated mechanical assembly, providing a high resistance to shock (rated to 500 g) and vibration (rated to 30 g).
For other technical information please visit www.turck.com

New Antennas for RFI/EMI Field Testing by AR RF/Microwave Instrumentation: The two compact, lightweight antennas for RFI/EMI field testing are models, AT4418 and AT4403. They

are designed to supply a constant high intensity field necessary for testing within and beyond the confines of a shielded room. They can also be used to perform emissions measurements and to generate the response required for many common tests in their frequency ranges.
For more information please visit www.ar-worldwide.com.

Mission Critical Power Distribution Unit by Power Distribution Inc. (PDI): The Wavestar™ Mission Critical 500 KVA Power Distribution Unit (PDU) is an industry first with the ability, through the Wavestar™ monitoring system, to locally display both PDU critical functions and PDI's patented Branch Circuit Monitoring System (BCMS) in a single device.
For more information please visit the PDI website at www.pdicorp.com.

Surface Probe Calibrator by Omega: The CL 1600 is a surface probe calibrator that is designed to calibrate and verify surface probe readings from 25to 450° C (77 to 842° F). Each unit comes with RS-232 communication, cable, free measurement and control software, 5-point NISTG Traceable Calibration Certificate and an operator's manual.
Find more information at www.omega.com

Article Summaries

Design for Diagnosability Guidelines

Louis Y. Ungar

"[This] paper offers specific design guidelines to achieve a more diagnostic-friendly circuit design. It provided an examination of the diagnoses and its associated complications. The costs associated with lack of good diagnoses, misdiagnoses, and incorrect maintenance actions can be prohibitive in expensive and critical systems, such as avionics and military applications. Medical systems are also dependent on comprehensive and accurate maintenance and repair. For such systems, diagnostic complications cannot be tolerated.

"There are many instances where diagnoses are either partially inhibited or completely unachievable. This is usually discovered during fielding. The remedy, however, must start at the time of design. …Design for Diagnosability guidelines [are presented] for each diagnostic complication… examined. Design for Diagnosability is arguable a subset of Design for Testability, but there are sufficient differences to create this new class of DFx. While this is only

a small sample of the DFD guidelines that could be used, we hope it will be the start of a more formal effort to solve this problem."

This summary was written by Caitlin Woody

DEFECT PREVENTION AND DETECTION IN SOFTWARE FOR AUTOMATED TEST EQUIPMENT

Eric Bean

The high demand for automated test equipment in manufacturing yields a high demand for proper test equipment applications, a tricky subject that usually lacks complete confidence. In some cases, this is because a test application is written in a script incompatible with the equipment in question, or simply because software is written by people, and people make mistakes.

This article focuses on PACRAT, a test application development tool created to tackle issues typically faced in the development process. Key points addressed are these issues and their possible solutions, cost cutting, maintenance, and productivity. PACRAT is specific to one universal tester, but takes a basic approach that can be imitated by other applications.

This summary was written by Caitlin Woody

Prognostics in Battery Health Management

Kai Goebel, Bhaskar Saha, Abhinav Saxena, Jose R. Celaya, and Jon P. Christophersen

Accurate techniques for testing the life of batteries are difficult to come by because their systems are elaborate and inaccessible, even when not being operated. Methods that could consistently predict a battery's performance, especially within aerospace systems, would provide much greater security to the functions they perform as well as the industries they support.

In this article, four members of the Prognostics Center of Excellence as well as research engineer Jon P. Christophersen investigate several ways to manage and regulate battery health via the development of prognostics algorithms. Both simple and sophisticated techniques are described.

This summary was written by Caitlin Woody

Statistical Measurement Analysis of Automated Test Systems

By Michael J. Flynn

As Automated Test System (ATS) technology moves forward, so must its test program software. One of the biggest goals when improving ATSs is verifying its software's reliability so that its performance does not interfere with the subject it is testing. That is, the test system should not impact the pass/fail criteria of the subject, otherwise resulting in improper recalls and diagnostics. Flynn suggests that the best tool to combat this problem is statistical measurement analysis. In this article, he reviews measurement evaluation methods, paired observations to compare default performance, gauge repeatability and reproducibility, and variance analysis. Flynn also suggests possible routes to take with further research on the subject.

This summary was written by Caitlin Woody
