



Volume 8 Number 11

An A.T.E. Solutions, Inc. Internet Publication

June 1, 2004

Reach the thousands of test professionals w e mail to.
[Sponsor](#) The BestTest New sletter and w e w ill place your logo here.

Upcoming courses

[Optimizing Electronics Vibration HALT, HASS, ALT and ESS](#)

**June 8-10, 2004,
Minneapolis, MN**

[Fundamentals of Random Vibration and Shock Testing, HALT, ESS, HASS Measurement, Analysis and Calibration](#)

**August 24-26, 2004,
Santa Barbara, CA**

Courses taught by
Louis Y. Ungar of A.T.E. Solutions, Inc. at



AutoTestCon 2004

San Antonio, Texas
9/20/2004

8:00 AM - 12:00 PM
Design for Embedded and Built-In Test

Bring ATE, Test and Testability courses to your site. [How?](#)

Visit BestTest - A Test Community Web Site

[Test Vendor Directory](#)
[Products/Services Directory](#)
[Test Dictionary](#)
[Test Events](#)
[Test Publications](#)
[JobExchange](#)

Literature

[Test related books](#)
[Test/Testability Software](#)

How We Can Help

[Test Requirements Analysis](#)
[Test Related Courses](#)
[ATE and Test Market Help](#)
[Design for Testability](#)
[Built-In Self Test](#)

Your Opinion

Digital Multimeters (DMMs)

This Issue's Feature Article

Choosing a Digital Multimeter

[Paul Lantz](#), VP Engineering , Signametrics Corp.

What's New in Test

Announcement

- 5/31/2004 [Lauterbach announces sale of 25000th debugger](#)
- 5/31/2004 [Testbench integrated on emulator](#)
- 5/26/2004 [DDI licenses ThermalWorks PCB technology](#)
- 5/25/2004 [ASAT's Fiscal '04 Revs Up 43%](#)
- 5/25/2004 [DiagnoSYS adds Aegis Software to test and inspection systems](#)
- 5/24/2004 [Blue Pearl Software to Automate the Process of RTL Closure for IC and Electronic System Design](#)
- 5/24/2004 [Synopsys releases design platform upgrade](#)
- 5/21/2004 [Frost & Sullivan names Agilent Technologies 2004 Preferred Test and Measurement Vendor of the Year](#)
- 5/20/2004 [Machine Vision Products to display GEM series at Nepcon UK](#)
- 5/19/2004 [STATS Gets into the DFT Biz](#)
- 5/19/2004 [T-Com places deployment order for Teradyne's new test head](#)
- 5/18/2004 [Agilent Orders, Revs Highest in Three Years](#)
- 5/17/2004 [Agilent ships 800th 93000 SOC series tester](#)
- 5/17/2004 [Amkor Enters Into Long-Term Semiconductor Assembly and Test Services Agreement With IBM](#)
- 5/17/2004 [Mania Technologie appoint EMX Enterprises as exclusive channel partner](#)
- 5/17/2004 [Teradyne Scores Volume Deal with ASE](#)
- 5/16/2004 [LTX Back in Black](#)

Application Note

- 5/21/2004 [Turn Desktop PCs into Mixed-Signal Instruments](#)
- 5/20/2004 [The RF Power analyzer: An alternative to spectrum analyzer](#)

CD,DVD,Tape

- 5/19/2004 [National Instruments Sound and Vibration Resource CD Available](#)

Conference Article

- 5/27/2004 [Calibration Papers Available for Download](#)

FREE Giveaways

- 5/27/2004 [FREE Calibration Fitness Poster Available from Agilent](#)
- 5/27/2004 [Receive Keithley's Four Step Error Checker Poster](#)
- 5/22/2004 [Learn More from Keithley's FREE Making Measurements With Confidence CD](#)

Magazine Article

- 5/27/2004 [Industry View point: Nanometer test methodology and economics](#)
- 5/27/2004 [What does the ADC SNR mean?](#)

Press Release

- 5/28/2004 [Small part Vision Inspection System is low cost, high speed and flexible](#)
- 5/27/2004 [SUSS CPS integrates multiple test configurations](#)
- 5/24/2004 [PCI-Express Test/Debug App Enhances SDAs](#)
- 5/20/2004 [Synopsys Delivers Galaxy 2004 With 2x Performance, 2x Capacity and 2x Yield Enhancement Features](#)
- 5/19/2004 [Agilent 14-bit digitizer offers high testing performance](#)
- 5/19/2004 [X-Ray System Gains Digital Detector](#)
- 5/18/2004 [Anritsu Ushers in "New Era" of Signal Analyzers](#)

Report

- 5/17/2004 [Offshoring debate: Merely an election gimmick?](#)

Web posting

- 5/27/2004 [Selecting Military ATE](#)
- 5/21/2004 [UNDERSTANDING HANDHELD DMM SPECIFICATIONS](#)
- 5/16/2004 [Flying Probe Testers in Production](#)

White Paper

- 5/25/2004 [What is Your Company's Cost of Poor Quality](#)

Unsubscribe

Email The BestTest New sletter to a Friend w hose email is

[Email Friend](#)

Online Bookstore

Get the widest selection of test related books and software at the [BestTest Online Store](#).

Reach the thousands of test professionals w e mail to.
[Place Ad here.](#)

Events/Announcements

This month:

- 6/2 - 6/10 [Quality Expo Detroit](#)
- 6/6 - 6/11 [International Microwave Symposium](#)
- 6/7 - 6/9 [IEEE 2004 International Interconnect Technology Conference](#)
- 6/7 - 6/11 [41st Design Automation Conference](#)
- 6/7 - 6/10 [Sensors Expo & Conference](#)
- 6/7 - 6/11 [Multiscale Modeling and Simulation of Nano Mechanics and Materials](#)
- 6/15 - 6/17 [SMT/HYBRID/PACKAGING 2004](#)
- 6/21 - 6/24 [SuperComm 2004](#)
- 6/21 - 6/24 [IMAPS Flip Chip 2004](#)
- 6/23 - 6/24 [Equipment Protection 2004](#)
- 6/23 - 6/25 [International Mixed-Signal Testing Workshop](#)
- 6/27 - 7/2 [Precision Electromagnetic Measurements Conference](#)
- 7/11 - 7/15 [NCSL \(National Conference of Standards Laboratories\) International](#)
- 7/12 - 7/14 [International On-Line Testing Symposium](#)
- 7/12 - 7/16 [SEMICON West 2004](#)
- 7/18 - 7/21 [World Multi-Conference on Systemics, Cybernetics and Informatics](#)
- 7/20 - 7/21 [Harsh Environment Electronics Workshop](#)
- 7/25 - 7/28 [International Midwest Symposium on Circuits and Systems \(MWSCAS 2004\)](#)
- 7/28 - 7/29 [Automation & Test Expo - Taiwan](#)
- 8/9 - 8/13

Digital multimeters (DMMs) are generally used to measure resistances and voltages. What other measurements do you regularly make with your DMMs?

- Audio signal measurements
- Capacitance measurements
- Current measurements
- Data acquisition measurements
- Frequency measurements
- Inductance measurements
- Logic High and Low measurements
- Temperature measurements
- True RMS measurements
- Voltage and Resistance measurements only
- x - Other measurements

[Vote](#)

[View Results](#)

Voting ends 15 days after the date of this issue. You may only vote once, but you may come back and check the results any time by pressing the View Results button.

Choosing a Digital Multimeter

[Paul Lantz](#), VP Engineering, Signametrics Corp.

How you choose a Digital Multimeter (DMM) is mainly driven by your application. If you are doing field service work you probably need a portable handheld DMM. If you are working in a calibration lab you probably need a bench-system DMM. If you are doing lab-automation or production testing you have more choices to make. If your application requires very high accuracy and low throughput you may prefer a bench-system DMM with an IEEE-488 or RS-232 control interface. If your application requires high throughput, has limited space or has a tight budget, you want a DMM that plugs into a computer bus. This article deals with how to choose a plug-in DMM for an automated test application.

Choosing a computer bus

The PXI and PCI buses are the most popular computer buses for integrating instrumentation systems, today. The VXIbus is still used mainly for military applications, but it tends to be expensive and rather specialized.

PXI can integrate from 6 to 18 instruments into a single chassis, providing high density for medium sized systems. However, PXI requires either a PXI compatible computer or a bridge from the PCI bus of a PC, raising its cost. If you only require 2 or 3 instruments, you may be able to plug them into the PCI motherboard of your computer. This is a very cost-effective way to integrate a small system. Most manufacturers offer both PXI and PCI products.

DMM selection criteria

Manufacturers typically highlight their highest accuracy and their highest speed. Unfortunately you don't get both at the same time. Sometimes it is difficult to understand what accuracy goes with the speed you want. The user needs to make sure that the DMM has a mode that is fast enough and accurate enough for the application. Some manufacturers specify accuracy with background zeroing turned on and reading rates with it turned off. How fast does it go with background zeroing turned on? How accurate is it with it turned off? Sometimes you have to ask questions.

Does your workload include more than the standard measurements of Voltage, Current, Resistance and Frequency? Perhaps you need to:

- Measure capacitance or inductance?
- Measure temperature with a Thermocouple or RTD (Resistive Temperature Detector)?
- Provide a programmable audio signal source or an accurate DC current or voltage source?

The [Signametrics SMX2044](#), for example, can measure and source these parameters and some more. That ability might save you from adding another instrument to your system.

Some DMMs have measurement ranges that go up to 1V, 10 V and 100 V while others go to 3 V, 30 V and 300 V. All these DMMs are described as having 6-1/2 digits resolution, but the higher range limits are more convenient to work with in some applications.

Measurements below 3 Volts frequently involve sensitive circuits which have high output resistance. To measure them accurately, you want a DMM with at least 1000 MegOhms input impedance. Better DMMs automatically provide this high input impedance. There are DMMs which let the user select the impedance. But we know of one case where the DMM defaults back to 10 MegOhms input impedance, potentially altering the measurement accuracy by orders of magnitude. We have seen cases where a DMM emits pulses from its measurement terminals, potentially altering your measurement results.

Are you testing low value resistances such as the contact resistance of a connector, a socket or a relay? Or perhaps the resistances of a wire harness? In these applications you care about the *resistance floor of the DMM*, and the *resolution* of the lowest range. 10 microOhm resolution can be very helpful here. The ability to resolve small differences is usually more important than high accuracy.

What software will you use to implement your test system? System integrators tend to use Visual Basic or C++ because they are easy to use, they are widely understood and what you see is what you get. There are other software alternatives available but they are not something every engineer learns in school.

If you are measuring current, make sure the DMM has current shunts suitable for your measurements. Some DMMs require a voltage drop of 0.1 Volt when measuring 1 Ampere, while others require a voltage drop approaching 1 Volt. If you are measuring the load on a power supply, a 1 Volt drop will alter the behavior of the circuit under test.

Conclusion

PXI DMMs and PCI DMMs provide fast and accurate solutions for many automated test applications. They are affordable, reliable and compact. But they are not all the same and you will have to make a choice based on your application. To find the best fit, you may have to talk with support people as well as sales people. Don't hesitate to ask questions and critically evaluate the answers you receive.

Product/Service Focus

This issue's focus is **Measuring Equipment/Digital Multimeters (DMMs)**. You can [view or add](#) to our existing list of these Products.

Next Issue's Product/Service Focus

In our next issue of Product/Service Focus we will cover **Inspection Equipment/X-Ray Inspection Equipment**. You can [add or upgrade](#) an inspection equipment before the next issue comes out.

[EMC International Symposium](#)

8/18 - 8/20

[NI Week 2004](#)

9/12 - 9/16

[National Fiber Optic Engineering](#)

[Conference](#)

9/20 - 9/24

[AutoTestCon 2004](#)

9/21 - 9/23

[NANOWorld 2004](#)

9/21 - 9/23

[Wescon 2004](#)

9/26 - 9/30

[SMTA International](#)

9/27 - 9/30

[Global Signal Processing Expo &](#)

[Conference](#)

New Definitions

New terms added to the Test Definition section:

[Cost of Poor Quality](#)

[Count](#)

[Crest Factor](#)

[Form Factor](#)

[Telecommunications Electronics](#)

[Material Protected From Emanating](#)

[Spurious Transmissions](#)

[Uncertainty](#)

[Vector Signal Analyzer](#)

We now have 1646 test terms in our Test Definition section.

[Share](#) your definitions with the test community.

Test Vendors

We now have 3534 test vendors listed in the Test Vendor Directory. [Check](#) for accuracy.

The following companies have recently placed advertising with us:

Vendors:

[A.T.E. Solutions, Inc.](#)

[AESOPS Inc.](#)

[BDQ](#)

[Elanix](#)

[IEST \(Institute of Environmental Sciences and Tech](#)

[Intellitech Corporation](#)

[JTAG Technologies, Inc.](#)

[MPI Melting Pressure](#)

[National Instruments](#)

[Qualtech Systems, Inc.](#)

[Testel Systems Corp.](#)

[Tiepie Engineering](#)

[WesTest Engineering Corp.](#)

Products/Services:

[A.T.E. Solutions, Inc.](#)

[Consulting Services](#)

[Consulting, Training and Books](#)

[The Testability Director](#)

[Digitaltest](#)

[CONDOR MTS500](#)

[GOEPEL electronic GmbH](#)

[SCANPLUS Board Grabber](#)

[Intellitech](#)

[Eclipse](#)

[PT100 Parallel Tester](#)

[SystemBIST](#)

If you would like to include an exclusive article on how to best select **Inspection Equipment/X-Ray Inspection Equipment**, please contact LouisUngar@ieee.org.

-
- If your friend forwarded this newsletter to you, please [register](#) as a member and receive The BestTest Newsletter -- absolutely free!
 - If you wish to update your news preferences or cancel the subscription, please [unsubscribe](#).
 - If you have any questions, please email experts@BestTest.com

[Intellitech corp.](#)

[PT100 Rack](#)

[Scan-Ring-Linker & multi-PCB linker](#)

[SystemBIST](#)

[Interpoint Corp.](#)

[LCM120](#)

[JTAG Technologies](#)

[JT 37x7 DataBlaster boundary-scan controllers](#)

[JTAG Technologies, Inc.](#)

[JT 3710/PXI](#)

[Testpro AS](#)

[TP2101 Testsystem](#)

[UltraTest International](#)

[MultiTrace](#)

[WesTest Engineering](#)

[WT2000](#)

Links Worth a Click

Test sites of interest:



[AutoTestCon](#)

[Cable Test Systems, Inc.](#)

[Chroma USA](#)

[Evaluation Engineering](#)

[International Test Conference](#)

[IPC - APEX Conference Organizers](#)

[Powell-Mucha Consulting, Inc.](#)

[Test & Measurement World](#)

Want to trade links? We'll list yours here and you list ours at your site.

A.T.E. Solutions, Inc. - ©2003
experts@besttest.com