# LXI-compliant oscilloscope boosts efficiency in ATE systems

Application Note 1590

A new type of instrumentation for building automated test systems has emerged that is based on LAN (Ethernet) technology. The LXI (LAN eXtensions for Instrumentation) standard specifies the interaction of proven, widely used standards to enable fast, efficient, and cost-effective creation and reconfiguration of test systems. LXI-based instruments combine built-in measurement science and PC-standard input/output (I/O) connectivity that uses the Ethernet communications interface. LXI instruments come in compact, flexible packages with high-speed capabilities and reliable measurements. This article examines how LXI-based oscilloscopes can benefit you when you are building automated test systems.

## Transition from R&D to manufacturing

When you develop a product in R&D and then transition it to manufacturing, one of the biggest challenges you face is the smooth transition of the R&D test system to the manufacturing line. In R&D, test engineers typically spend more time troubleshooting products with bench-top test
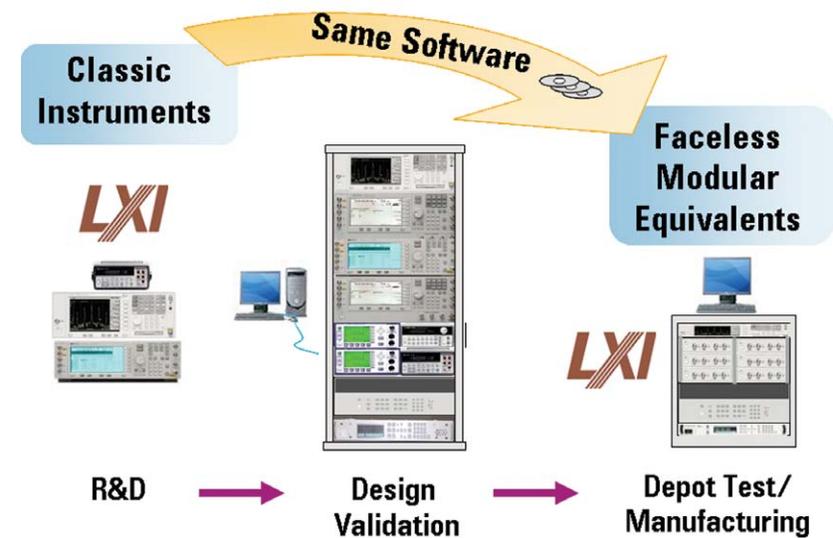


instruments, while manufacturing engineers focus more on building efficient, automated test systems.

LXI instruments provide a new level of flexibility in test system setup. With LXI, you can make the transition much more easily and cost effectively than with cardcage-based PXI or VXI systems. LXI instruments are available in a couple different formats to make it easier for you to test your product across its entire product lifecycle. In an R&D environment, you can use a classic test instrument on the

bench or in a rack to develop and refine the test program that can then be used with an equivalent modular, faceless instrument in the final manufacturing test system.

For example, Agilent's 6000L Series faceless oscilloscopes are 100% software compatible with Agilent 6000A Series portable oscilloscopes, which offer displays and front-panel control knobs and buttons. Engineers can use a 6000A Series oscilloscope during the R&D design phase. When the product moves to

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Because the 6000A and 6000L are completely software compatible, the manufacturing team can use the software and test routines developed in R&D without any major modification. That's a very big opportunity to reduce the time and money spent moving from R&D to manufacturing.



Figure 1. The 6000A and 6000L Series from Agilent Technologies are 100% software compatible, enabling smooth test system transition from R&D to manufacturing.

## Rack space considerations

In applications such as depot testing and contract manufacturing, the smaller the system, the better. Unlike cardcage-based systems that limit the size and power of the instrument hardware, LXI's modular instruments such as 6000L Series oscilloscopes let you reduce the size, weight and footprints of the system without sacrificing measurement quality.

Because they are intended primarily for automated applications, faceless LXI instruments have no display and no buttons. Typically, they are 1U (4.45cm) or 2U in height and come in half-rack or full-rack width. The 6000L Series low-profile oscilloscope provides up to 1 GHz bandwidth and 4-channel acquisitions in a space-saving 1U-high, 19-inch wide package, so it saves valuable rack space. The 6000L Series oscilloscopes offer the same acquisition and measurement power as their siblings, the 6000A Series bench-top oscilloscopes, but they consume 80% less rack space.

The absence of a cardcage also saves rack space. In many cases, cardcages are not fully used, either because the application didn't require the full capacity or because the system developer

Figure 2. Spanning 100 MHz to 1 GHz, and varying in height from 1U to 5U, Agilent's 6000L and 6000A LXI class C compliant oscilloscopes can accommodate many automated testing applications.
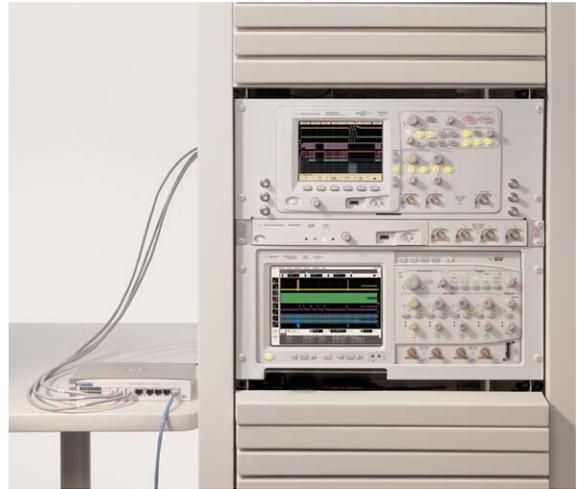


intentionally chose to leave a few slots empty for future enhancement or extension. With LXI, future test system additions will be easier and the system will consume only the space you need.

## Fast system setup and easy connection

With conventional test-system architectures, system setup can be time consuming, especially when you are trying to get your PC to communicate with the instruments or get the instruments to work with the system software. The task is even more time consuming and frustrating with systems that include multiple interfaces such as GPIB, RS-232C, VXI, PXI, MXI, FireWire, USB and LAN. Add in multiple I/O libraries and instrument drivers from multiple manufacturers, and it may take

you days or weeks to troubleshoot the system and get it to work as expected. LXI test systems overcome these challenges and make it possible to set up a system in considerably less time.

With a Web server built into every LXI instrument, a standard Java-enabled Web browser on your computer is all you need to take full control of the instrument over the instrument's built-in LAN interface. You can view instrument information, change instrument configurations, monitor waveforms, capture screen images and operate the instrument remotely from anywhere on the network. This encourages real-time troubleshooting from multiple sites, even when your team is not all at one site.

You can also send SCPI commands over the LAN to control your oscilloscope. You can also use proven tools such as LAN hardware, LAN cables and ping servers to communicate via LAN and troubleshoot local or remote systems.

To simplify system development, LXI instruments come standard with an IVI (interchangeable virtual instruments) driver. The IVI-COM driver provided standard with most Agilent instruments enables easy programming in Visual Studio® .NET languages such as Visual C++, Visual Basic and C# as well as Agilent VEE Pro or National
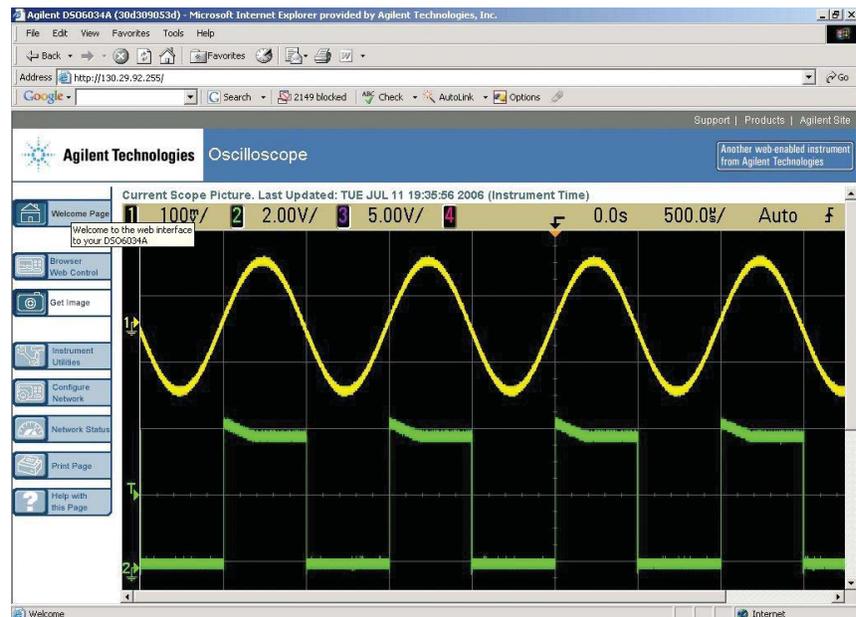


**Figure 3. Remotely display and control the oscilloscope from any java-enabled web browser over the LAN interface**

Instrument LabVIEW. The LXI instruments and IVI-COM driver let you use the test software you already know and communicate with instruments you already have.

Also, the standard Agilent I/O Library Suite makes it easy for you to configure and integrate instruments into your system – even if your system includes instruments from multiple vendors. Whichever instruments and interfaces you use, the Agilent I/O Library Suite software lets you make quick connections every time. In less than 15 minutes or so, your PC can be up and running, and communicating with the instruments in your system.

## Summary

The new LXI oscilloscopes offer a number of advantages for engineers who build and use test systems. Among other benefits, LXI instruments make it easy to setup and reconfigure test systems. The new architecture simplifies the transition of test programs from R&D to manufacturing and allows you to conserve valuable rack space.

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**LXI**

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**Taiwan**:
(tel) 0800 047 866
(fax) 0800 286 331

**Other Asia Pacific Countries:**
(tel) (65) 6375 8100
(fax) (65) 6755 0042
Email: tm_ap@agilent.com
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