

# Oscilloscopes

The ability to capture and analyse complex, high-speed electronic signals makes the oscilloscope one of the most useful and powerful tools in an engineer's laboratory, reports **The Scott Partnership**.

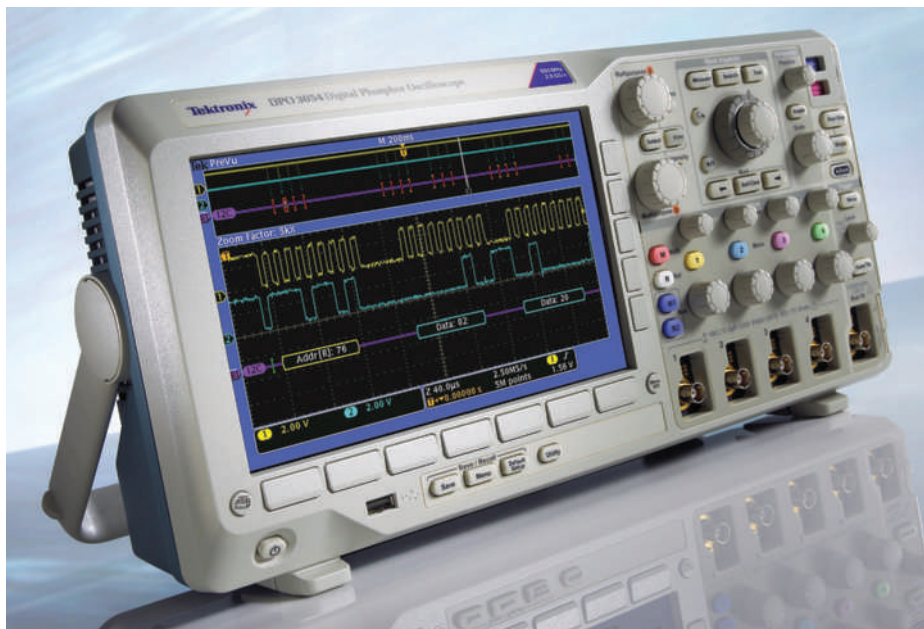
Oscilloscopes are used to measure and visualize how electrical signals evolve over time, and are considered by most engineers and physicists to be an invaluable tool in the laboratory. In their most common application, two probes are used to measure the electrical potential difference at a given point in an electronic circuit or device. Oscilloscopes are also capable of measuring non-electrical signals such as sound or light intensity, through the use of suitable detectors that can convert the signals into electrical waveforms.

One of the most important application areas for oscilloscopes is in telecommunications, where they play a vital role in testing and debugging electronic network circuitry. Over the years, as networks and related circuitry have become faster and more complex, the functionality and performance of oscilloscopes has also increased, allowing them to capture and analyse ever-faster electrical waveforms of both an analog and digital nature.

"There is a constant requirement for tools to debug and validate the next generation of high performance, mixed signal and energy-efficient embedded systems," explains Mark Edwards, sales director of Thurlby Thandar Instruments, the UK distributor for Tektronix, a major manufacturer of advanced oscilloscopes. Edwards says that the need to simultaneously visualize multiple digital buses at gigabit speeds, while performing analog debugging beyond 4 GHz, is often necessary.

Today's modern oscilloscopes are now able to digitally store and manipulate captured waveforms, allowing them to perform a wide variety of analytical tests, including various statistical and mathematical functions. A recent trend is the advent of USB oscilloscopes, which store output signals on a PC and allow the signals to be directly observed on a PC monitor. The Handyprobe HP3 and Picoscope 6000, both mentioned in this month's product round-up, are examples of this type of instrument, and connect to a PC via a USB interface.

Because oscilloscopes are considered such an essential item, it is not unusual for a laboratory to have several, each with a range of specifications and features for accommodating a diverse set of measurements and applications.



TEKTRONIX

## PRODUCT ROUND-UP

The MSO/DPO3000 series of performance oscilloscopes from **Tektronix** offers a fast sample rate of up to 2.5 giga-samples per second ( $\text{GS s}^{-1}$ ), thus allowing the nature of device faults to be revealed through the fast identification of infrequent transients. A digital phosphor display with intensity grading shows the history of a signal's activity by intensifying areas of the signal that occur more frequently, providing a visual display of anomalies. The MSO/DPO3000 series provides a complete set of triggers, including runt, logic, pulse width/glitch, setup/hold violation, serial packet and parallel data, and also provides integrated support for a broad range of serial buses. To help troubleshoot system-level interactions in complex embedded systems, the MSO3000 series offers 16 digital channels, in addition to its analog channels. As the digital channels are fully integrated into the oscilloscope, all input channels can be triggered, thus automatically time-correlating all analog, digital and serial signals. The DPO3000 series is available in two- and four-analog-channel models, with bandwidths in the range of 100–500 MHz.

[www.tek.com](http://www.tek.com)

**Yokogawa Electric Corporation** has introduced two new series of oscilloscopes: the DLM6000 Mixed Signal Oscilloscope and the DL6000 Digital Oscilloscope series, both offering faster computation and analysis over the company's previous products. The joint release of the DLM6000 series, which is capable of simultaneously observing multiple points in mixed signal devices and electronic circuits, and the DL6000 series, which excels at observing analog signals, allows the user to choose the model that best matches their application. DLM6000 and DL6000 units can record either 5 or 10  $\text{GS s}^{-1}$ , respectively, for simultaneous multichannel measurements and analog logic mixed-signal measurements. This enables high-speed signals to be precisely captured and displayed so that no unusual events are overlooked. Furthermore, up to 2,000 waveforms can now be stored in memory, allowing unusual events to be verified individually and correlations between channels to be displayed and verified. Models in the DLM6000 series can monitor up to 16 or 32 digital channels and four analog channels simultaneously, significantly increasing the efficiency of the development and evaluation of mixed signal devices and electronic circuits. For both the

DLM6000 and DL6000 models, the front panel has numerous dedicated knobs and switches that make it possible for operators to directly configure the measurement parameters for frequently used functions. In addition, there is now a wider variety of mathematical functions to choose from. These enhancements make it possible for operators to carry out more sophisticated computation and analysis than older models.  
[www.yokogawa.com](http://www.yokogawa.com)

**Agilent Technologies** has introduced 14 new models to its InfiniiVision 7000B series mixed-signal and digital-storage oscilloscope portfolio. These new oscilloscopes offer bandwidths from 100 MHz up to 1 GHz. In addition to traditional analog signal representation, they provide digital signal capture, serial bus triggering and decode functions. Custom integrated circuits deliver hardware-accelerated operation and can display up to 100,000 waveforms on screen per second to help designers capture rich signal detail and intermittent events. The InfiniiVision 7000B series features a biggest-in-class 12.1-inch display and an innovative front panel design with automatic search-and-navigate capability, helping users to display up to 20 channels simultaneously with serial protocol. The series also features fast sustained update rates — up to 100,000 waveforms per second — thus eliminating common errors that can cause engineers to miss critical information, such as unresponsive controls with deep memory turned on, and traditional architectures that are blind to changes in the signals being tested. For designs with both digital and analog signal measurements, the update rate is 5,000 times faster than other available oscilloscopes. This fast update rate allows users to view critical signal detail. In addition to their numerous general purpose features, InfiniiVision 7000B series oscilloscopes can be equipped with a number of unique software options to shorten debug cycles.  
[www.agilent.com](http://www.agilent.com)

The Handyprobe HP3 from **TiePie Engineering** is a PC oscilloscope that allows voltages from 200 mV up to 800 V d.c. (566 V a.c.) to be measured without external attenuators or probes. The USB-interface-based unit has a differential input, which means that both sides of the input have high impedance. Unlike conventional oscilloscopes, which generally use coaxial cables to transfer data, the Handyprobe HP3 uses a specially developed cable that is very insensitive to external interfering

signals; the two ends of the cable can even be placed two meters apart from each other without picking up any interference. It is possible to connect the negative terminal of the input to one side of the test object and the positive terminal to a different point up to two meters away. This is not possible with standard oscilloscopes, which become very susceptible to interference at distances above 20 cm. The 10 bit resolution of the Handyprobe HP3 ensures high measurement accuracy, with an amplitude accuracy of around 0.3%. Advanced driver technology makes it possible to continuously measure at a sustained rate of 10 million samples per second, with a maximum measurement time that is limited only by the available data storage space.  
[www.tiepie.com](http://www.tiepie.com)

The Picoscope 6000 series is the latest range of PC-based oscilloscopes from **Pico Technology** in the UK. With a 350 MHz analog bandwidth and a real-time sampling rate of 5 GS s<sup>-1</sup>, models in the 6000 series can display single-shot pulses with a time resolution of 200 ps. The 6403 scope features a 1 GS buffer, a zoom factor of 100 million and a built-in set of advanced triggers for capturing waveforms. It connects to a PC via a USB interface and comes complete with a set of oscilloscope probes.  
[www.picotech.com](http://www.picotech.com)



**Lecroy Corporation** has introduced its WaveMaster 8 Zi series — digital oscilloscopes that provide bandwidths of up to 30 GHz, sample rates of 80 GS s<sup>-1</sup>, memory analysis of 512 million points per channel and edge triggering greater than 15 GHz. The 8 Zi series features exceptional instrument responsiveness, analysis processing times that are 10–100 times faster than older models, a large 15.3-inch 16:9 high-definition touch screen display and 50 Ω/1 MΩ inputs. With the precision of Eye Doctor signal integrity analysis tools, the WaveMaster 8 Zi series is a highly versatile oscilloscope. Features previously announced with the Zi platform, such as TriggerScan rare event capture, removable front panel, integrated second display and fast LSIB external data transfer, are

also available. Designed for long memory operation and responsiveness, X-Stream II technology enables high throughput of data, even when the oscilloscope is analysing eight waveforms. This architecture uses variable waveform segment lengths to improve the cache memory efficiency of the CPU, eliminating trade-offs between long memory length and quick processing times. The proprietary architecture design of the WaveMaster 8 Zi series is augmented with an Intel Core 2 Quad processor, high-speed serial data buses, a 64-bit operating system and up to 8 GB of RAM.  
[www.lecroy.com](http://www.lecroy.com)

**Exfo** has released the PSO-200 Optical Modulation Analyzer, a direct 'optical oscilloscope' that allows the characterization of any optical signal with minimal distortion. Its effective bandwidth is broad enough to allow constellation and eye diagram analysis of signals with rates of up to 100 gigabaud, thus enabling signals to be analyzed at up to 400 Gbit s<sup>-1</sup> when using a four-bit-per-symbol modulation format such as dual-polarization quadrature phase-shift keying. Detailed and accurate amplitude and phase patterns can also be obtained to offer powerful pulse-shape analysis for transmitter optimization and troubleshooting. Very high speed transmission over networks is enabled through efficient phase/amplitude modulation of signals. According to Exfo, to design 100 Gbit s<sup>-1</sup> systems based on such advanced modulation schemes and to make sure they are ready for deployment, network equipment manufacturers have so far worked with in-house test solutions, which are often complex and limited. The introduction of the PSO-200 Optical Modulation Analyzer allows engineers working in research labs or manufacturing environments to access a comprehensive turn-key test instrument that makes bandwidth limitations irrelevant. The PSO-200 makes it possible to test high-speed systems based on advanced data modulation schemes at all stages, from early system development to field deployment.  
[www.exfo.com](http://www.exfo.com)

**THE SCOTT PARTNERSHIP** is a scientific business-to-business PR consultancy with offices in the UK, China and North America. For more information about their services, please visit [www.scottpr.com](http://www.scottpr.com).

*The mention of a company's name or product is not an endorsement by Nature Photonics and Nature Photonics takes no responsibility for the accuracy of the product information or the claims made by companies.*