Coming off the bench

Would you be better off using a modular oscilloscope? Some companies think so. By Graham Pitcher.

Many mid range oscilloscopes are essentially Windows pcs configured specifically for use in test and measurement. Embedding a pc within an oscilloscope makes sense; data needs to be captured, stored, processed, analysed and shared.

But if you already have a pc on your bench, why buy an oscilloscope to sit alongside it? That’s a question being asked by a range of companies making pc based – or modular – instrumentation, which communicate with the host over a USB interface.

Pico Technology is one of two European scope manufacturers. Managing director Alan Tong said one of the benefits of pc instrumentation is portability. “But they can also sit on the bench top, where they take up little space and there’s no point in having another display when you have one sitting there in the shape of a pc.”

Pico competes in the low to middle end of the instrumentation market. “In this sector,” Tong noted, “users can choose between pc based or bench top products. Low end bench top instruments often have limited processing ability because they are built to a price point; even a 200MHz scope is now a commodity item and, at that level, a pc scope will have the advantage.” And he believes that modular instruments offer a level of processing power that may not be available in low end products.

Neither are pc scopes limited to the low end, says Tong, claiming they can compete in the mid range. “Here, most bench top scopes are Windows pcs, so you pay quite a lot to have another pc sitting next to your pc.”

While the Pico name may not be recognised by everyone, Agilent and National Instruments are familiar names and both offer pc based instrumentation.

Jeremy Twaits, technical marketing engineer with National Instruments, said the company offered a broad range of pc instrumentation: from simple usb scopes to PXI systems. “It’s an area in which we see huge opportunities,” he claimed.

Jordan Dolman, NI’s product manager for digitisers and oscilloscopes, added: “NI started as an instrumentation control company and this heritage means we see value in virtual instrumentation.”

Agilent’s market development manager for basic instruments in EMEA is Ghislain Tietcheu-Moukoué. He sees growing adoption of modular instruments in a number of markets, including education and industrial. “USB scopes are part of wider move towards more modularity,” he claimed. “Customers often want to mix and match.”

Supporting this need, Agilent offers a chassis system which allows the user to plug in the modular instruments they need for a particular application. “It’s a parallel approach alongside bench instruments,” he continued. “Customers who use bench instruments often turn to a modular approach because these devices are smaller, easy to use and flexible. When taking this chassis approach, customers can use the modular instruments they need.”

Tong pointed to the benefit of using the large display associated with a pc or a laptop. “It’s a much bigger display than that of an average mid range scope. This allows for better resolution in both directions,” he said. “And pcs often have more memory than a bench scope.”

Tietcheu-Moukoué agreed: “The interface for a

Above: NI’s USB-5133 is an 8bit digitiser/oscilloscope which samples at 100Msample/s.
Below: Agilent’s U2702A is a two channel modular scope with a 200MHz bandwidth.
modular instruments makes it feel like you’re in front of a bench device.”

Have modular instruments such as these suffered from being regarded as something for the hobbyist, rather than engineers? Tong said: “When Pico started, its products were aimed at that end of the market. But that’s not the case now; we make usb scopes with bandwidths of up to 12GHz and deep memories in volume. These devices are very much not for hobbyists.”

So what do you get for your money? It depends upon how much you want to spend. At one end of the scale, Agilent’s and NI’s offerings come in at £1000 or less. NI’s USB-5133, an 8bit digitiser/oscilloscope, samples at 100Msample/s on two channels simultaneously. It has 10 input ranges and comes with 8Mbyte of memory. Agilent’s U2702A modular scope is a two channel device with a 200MHz bandwidth. Sampling at 1Gsample/s, it includes a 32Mpoint memory and a high speed USB2.0 interface.

The top end of Pico’s range is the PicoScope 9231 sampling oscilloscope. This two channel device has a bandwidth of 12GHz and, says the company, an equivalent sampling rate of 5Gs/s. But you’ll be paying around £14,000 for the privilege.

Pico also offers a range of real time devices, including the PicoScope 6404. With four channels and a bandwidth of 500MHz, the 8bit device has a sampling rate of 5Gs/s and a 16Gsample memory. This sells for around £5000.

Tong’s view is that modular instruments bring more flexibility, particularly when it comes to upgrades. “We release new features as software upgrades,” he pointed out. “For example, we have introduced functions such as a CAN decoder and mask limit testing as upgrades. These are typically $1000 options and if you need several of these, it becomes expensive. These features are introduced usually every three or four months.”

And, because Pico’s devices are fpga based, it also has the ability to upgrade the instruments themselves by loading a new fpga configuration.

While some might specify a modular instrument for bench space reasons, others are taking this route for portability. Scientists from a Canadian university used an NI-USB-5133 as part of a system to measure glacier thickness in the Yukon. Radar pulses were received and digitised at 100Msample/s using the USB-5133. Data was stored on an Asus laptop.

Tietcheu-Moukoué advised caution in how instruments are used in the field. “Will you be making bench or field measurements? Is the application manufacturing or R&B focussed? Different solutions may be more appropriate and there are safety issues.”

While using the USB interface brings some bonuses, it also has a downside. Tong said: “Some of our devices can be powered by the host; useful if you’re on the move and it requires only one cable. But it’s a challenge with higher specifications because you have to power the device from a 2.5W supply. Some of our devices use a 5Gsample/s a/d converter, which draws more than that. So we have to use an external power supply.”

How will new interface standards help this class of instrument? Yong Sheng, product planner for Agilent’s basic instruments division, said: “Better interfaces will play an important role in the future and Thunderbolt and USB3.0 will increase the data transfer rate.”

Are there limitations? Tietcheu-Moukoué said that it could be hard to provide benchtop functionality from small form factor device. Twists said: “USB products serve a purpose, but you need to know their limits.” However, Tietcheu-Moukoué believes the devices are versatile, easy to use and come with all drivers.

Concluding, Tong said that, when budgets become tight, bench top users look for better value for money. “Once they’ve used our devices, they don’t go back.”

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