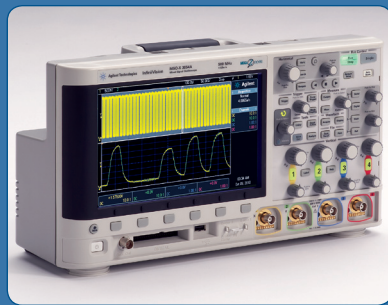


Oscilloscope Selection Tip 3: Acquisition Memory

Part 3 of a 12-part series

Tip 3 *Select a scope that has sufficient acquisition memory to capture your most complex signals with high resolution.*



Agilent's 2000 and 3000 X-Series oscilloscopes optimize your deep memory oscilloscope measurements by using MegaZoom technology to make the most effective trade-offs in sample rate, memory depth and waveform update rate.

Closely related to a scope's maximum sample rate is its maximum available acquisition memory depth. Even though a scope may have a maximum sample rate that might be considered fast enough to capture your highest speed signals, this does not mean that the scope always samples at this high rate. Scopes sample at their fastest rates when the timebase is set on one of the faster time ranges. But when the timebase is set to slower ranges to capture longer time spans across the scope's screen, scopes automatically reduce sample rates based on the available acquisition memory.

For example, let's assume that an entry-level scope has a maximum sample rate of 1 GSa/s and a memory depth of 10 k points. If the scope's timebase is set at 10 ns/div in order to capture 100 ns of signal activity across the scope's screen (10 ns/div x 10 divisions = 100 ns time span), the scope needs just 100 points of acquisition memory to fill the screen while sampling at its maximum sample rate of 1 GSa/s (100 ns time span x 1 GSa/s = 100 samples). No problem! But if you set the scope's timebase to 10 μ s/div to capture 100 μ s of signal activity, the scope will automatically reduce its sample rate to 100 MSa/s (10 k samples/100 μ s time-span = 100 MSa/s). Maintaining the scope's fastest sample rate at the slower timebase ranges requires that the scope have additional acquisition memory. Determining the amount of acquisition memory you require involves a pretty simple equation based on the longest time span of a complex signal you need to capture and the maximum sample rate at which you want the scope to sample.

$$\text{Acquisition Memory} = \text{Time Span} \times \text{Required Sample Rate}$$



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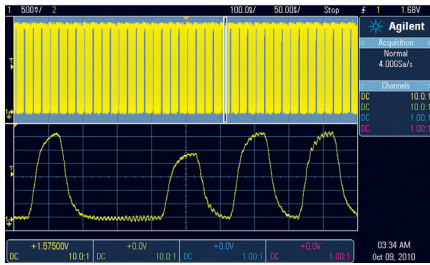
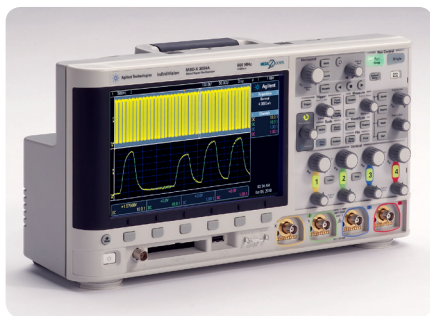


Figure 1. Capturing a complex stream of digital pulses using deep memory.



In Figure 1, we show an Agilent 3000 X-Series scope capturing a complex digital signal at 100 $\mu\text{s}/\text{div}$ for a total capture time of 1 ms. Since this scope has up to 4,000,000 points of acquisition memory, it can maintain its maximum sample rate of 4 GSa/s at this timebase setting. In the upper half of the scope's display, we can see the entire captured waveform. In the lower half of the scope's display, we can see a "zoomed-in" display of a small portion of the captured waveform, revealing a runt pulse that is approximately 100 ns wide.

Although intuitively you might think that deeper is always better, using deep memory means making tradeoffs when using many scopes on the market today. First of all, scopes with deep memory are typically priced higher. Second, acquiring long waveforms using deep memory requires additional waveform processing time. This typically means waveform update rates will be reduced, sometimes significantly. For this reason, most scopes on the market today have manual memory-depth selections, and the typical default memory depth setting is usually relatively shallow (10 to 100 k). If you want to use deep memory, then you must manually turn it on and deal with the update rate tradeoff. This means you must know when it is important to use deep memory and when it is not. With Agilent's exclusive MegaZoom technology, you don't have to be a scope expert. MegaZoom automatically selects deeper memory when needed in order to maintain fast sample rates. And with this custom technology, the scope always remains responsive—even when using deep memory.

Deep Memory Is Always Enabled and Always Responsive in Agilent InfiniiVision 2000 and 3000 X-Series Oscilloscopes

If you are in the market today to purchase your next oscilloscope, Agilent Technologies' newest 2000 and 3000 X-Series oscilloscopes come in various bandwidths ranging from 70 to 500 MHz. The entry-level InfiniiVision 2000 X-Series scopes come with 100 k points of acquisition memory, which is the deepest available acquisition memory for this class and price range of oscilloscope.

The higher performance InfiniiVision 3000 X-Series scopes provide up to 4 M points of acquisition memory. And with Agilent's exclusive MegaZoom technology, update rates are always responsive. Agilent's InfiniiVision 2000 and 3000 X-Series scope are also available with a segmented memory acquisition option. With segmented memory, the scope is able to optimize acquisition time by capturing only important segments of signals while ignoring idle time. Applications for segmented memory include low-duty cycle events, as well as many packetized serial-bus applications. Agilent's InfiniiVision 2000 and 3000 X-Series scopes are the only scopes in this class that offer segmented memory acquisition.

To learn more about oscilloscope segmented memory acquisition, refer to Agilent's application note *Evaluating Oscilloscope Segmented Memory for Serial Bus Applications* (Agilent publication 5990-5817EN).

To learn more about Agilent's InfiniiVision 2000 and 3000 X-Series oscilloscope and mixed signal oscilloscopes, go to www.agilent.com/find/2000X-Series or www.agilent.com/find/3000X-Series.

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