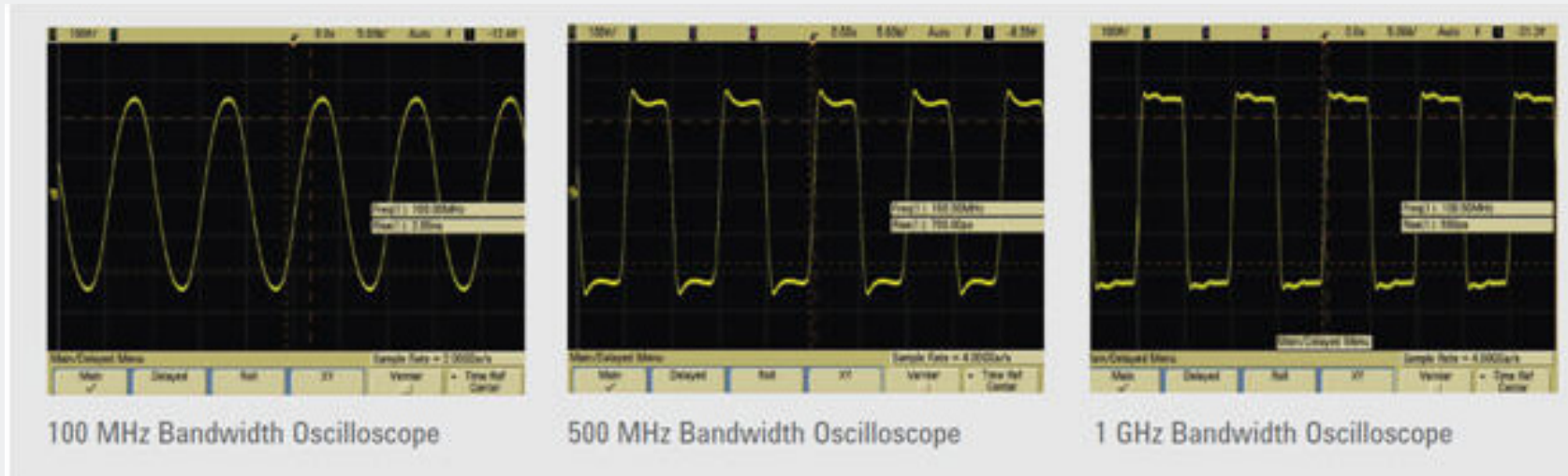


Digital Oscilloscope Characteristics

1 Bandwidth

Signal: 100 MHz Square Wave

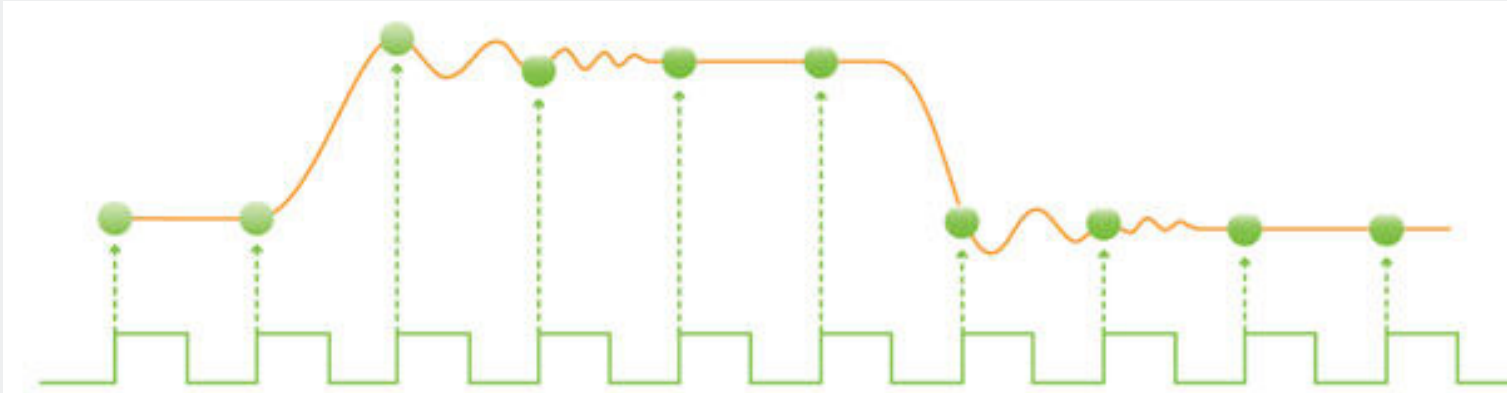


Suggested Bandwidth = 3x the Clock rate for analog signals or 5x Clock rate for digital signals

Rule of Thumb: Choose your bandwidth based on the edge speed (rise-time) of your signal. If you are unsure of your edge speed, utilize the suggested bandwidth.

2 Sample Rate

Real-time (or Single-shot) Sampling Mode

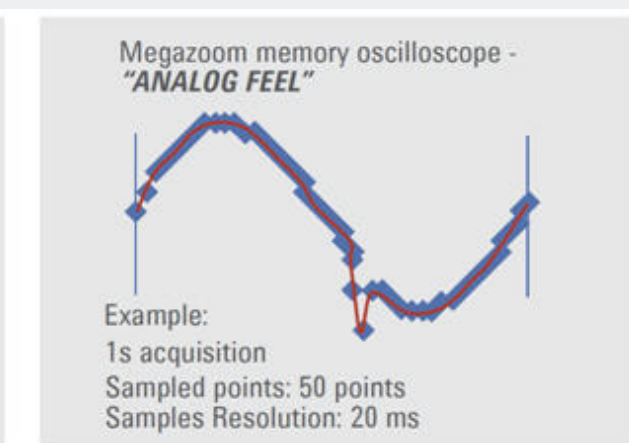
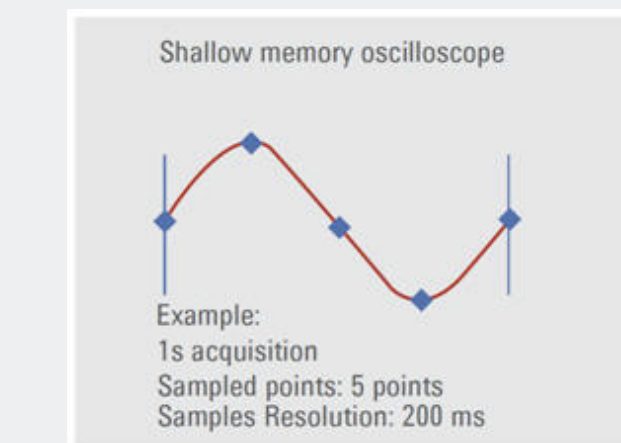
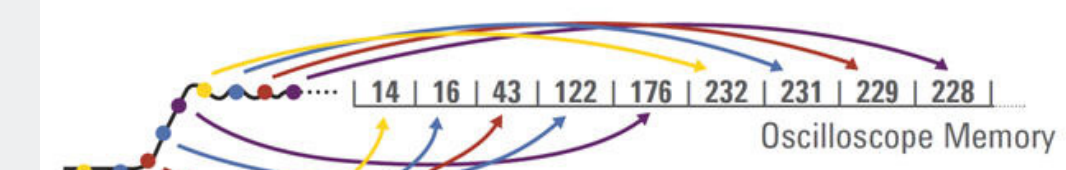


Suitable for repetitive and non-repetitive signals.
All samples are taken from a single trigger event.
 $\text{Sin}(x)/x$ digital filtering accurately reconstructs shape of the digitized waveform.

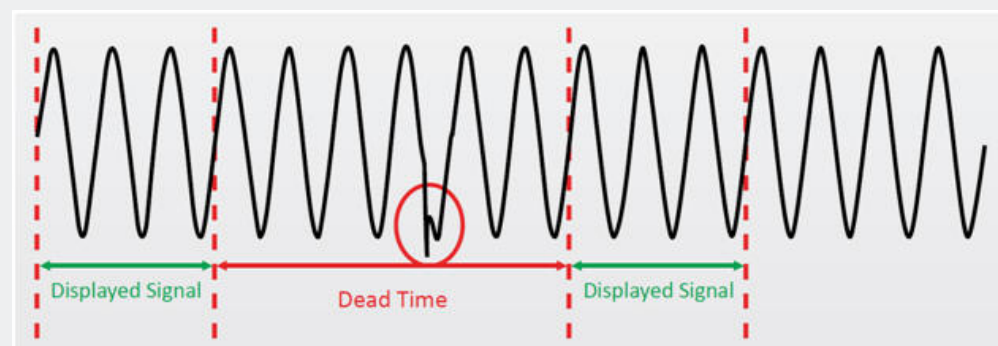
Rule of Thumb: In practice: For a Gaussian front end, use 4x the bandwidth. For a maximally flat (or brick wall) front end, use 2.5x the bandwidth.

3 Memory Depth

Acquisition memory is the place where the digitized samples are stored. Deeper memory allows you to keep your sample rate higher at slower timebase settings, which allows you to maintain full bandwidth longer.



4 Waveform Update Rate



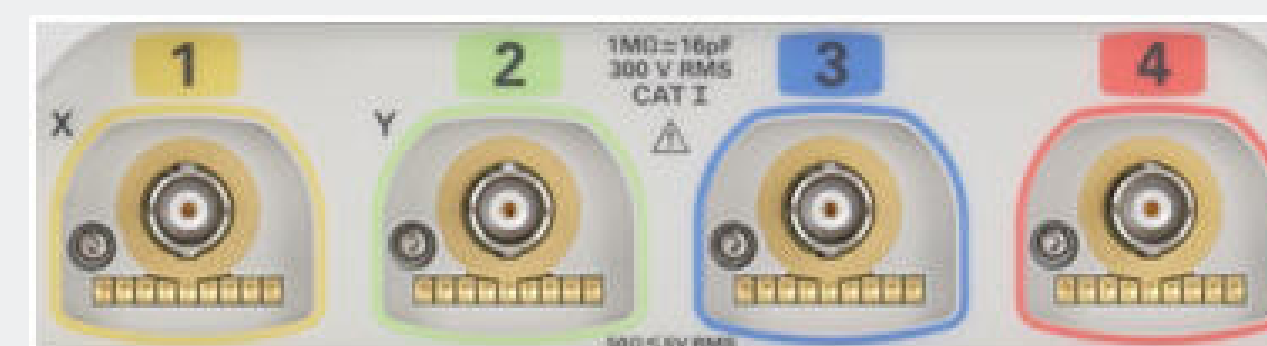
When oscilloscopes are processing data, they cannot capture and display signals. Processing time is known as dead-time.



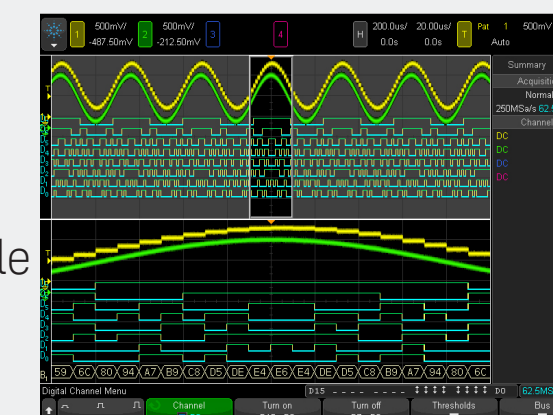
In order to capture an infrequent signal, check if the oscilloscope slows down when you use features like measurements and memory depth. The higher the waveform update rate in deep memory, the better the scope.

5 Number of Channels

2 or 4 analog channel oscilloscopes are the most common.



To get more than 4 channels, use an MSO (Mixed Signal Oscilloscope), with 8 or 16 digital channels in addition to 2 or 4 analog channels. Typically you want to look for a MSO that is fully integrated and upgradeable in case you need digital channels sometime after the initial purchase.



6 Probes

The oscilloscope probe is an integral part of the measurement system. They are classified as:

A) Passive probes

Benefits: durability, high voltage range, high input resistance, affordable and general purpose.
Trade-offs: limited bandwidth, high probe loading.

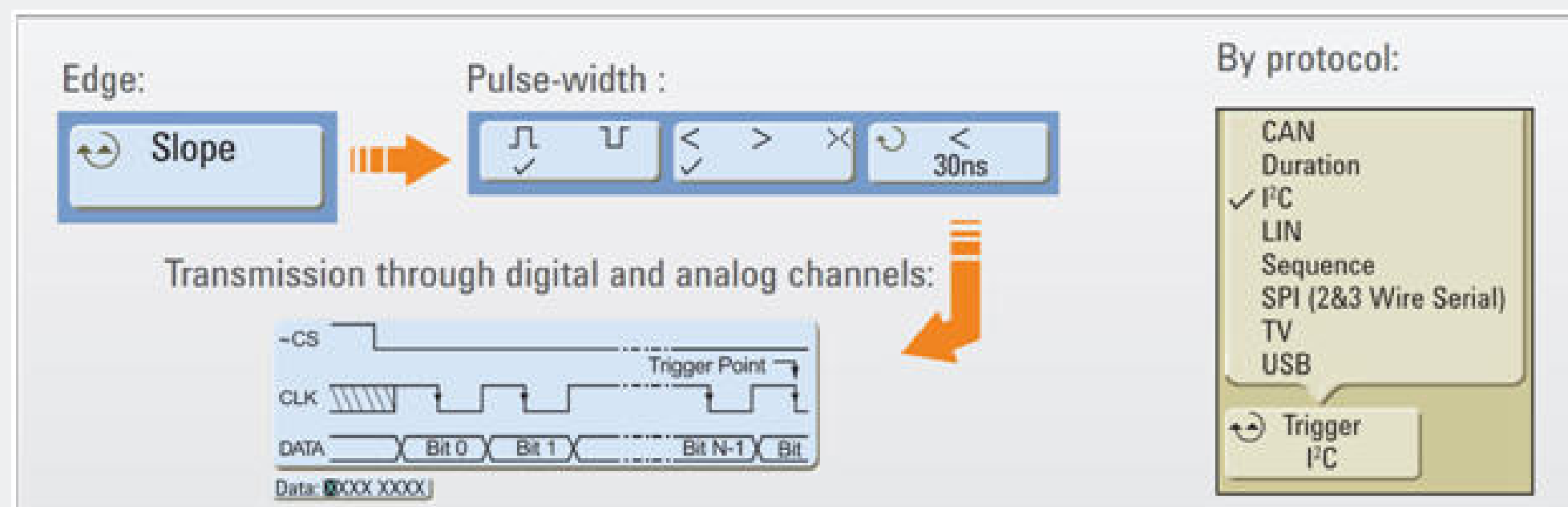
B) Active probes

Benefits: high bandwidths, low loading at high frequencies, low input capacitance, documented accessories.
Trade-offs: less durable, more expensive, lower voltage range.



7 Trigger

This is a specific control that allows you to tell the oscilloscope under what conditions you want to start an acquisition. Many types of triggers can be used to start the capture.



8 Connectivity

The oscilloscope communicates with computers and printers in two ways:

- A) Legacy: via GPIB interface and/or RS-232
- B) New: USB and LAN

By integrating other instruments with you oscilloscope, you can add additional functionality. For example, integrated digital channels make it easy to time correlate analog and digital signals.

