

# Oscilloscope Fundamentals

## Capturing Your Signal

### What is an oscilloscope anyway?

An oscilloscope is a diagnostic instrument that plots the amplitude of an electrical signal as it changes over time. The picture below shows the block diagram of an oscilloscope.



### Avoiding Pitfalls

- No Signal:**
  - Is the channel / device under test turned on?
  - Is the waveform off the screen? Try the Autoset feature of adjusting the vertical position / scale.
  - Is the instrument waiting for trigger? (Is it displaying "Ready"?). Verify trigger source; try adjusting the trigger level, forcing a trigger or switching to auto mode.
- Aliasing:** If the frequency of the signal on the screen seems too low, or it is difficult to get a stable waveform on the screen, adjust horizontal scale to increase the sample rate.
- Unexpected measurement results:** Verify that probe is compensated, verify measurement settings such as ref levels and gating, verify the probe attenuation.
- No stable signal:** Verify trigger source, trigger level.



Connect the instrument to circuit	
1.	Connect the probe to the input channel of the instrument.
2.	Check probe compensation: Attach the probe tip to the probe compensation test point on the instrument. Adjust the probe compensation until you see a clean square wave on the screen.
3.	Connect probe ground to the circuit ground and probe tip to the signal you want to view / measure.

Set the total amplitude to be displayed on the screen	
<b>Scale</b>	Adjusts the size of the waveform on the screen per channel, a larger waveform gives better measurement resolution.
<b>Position</b>	Moves the waveform up and down on the screen.
<b>Attenuation</b>	Sets the maximum voltage that can be displayed; scope attenuation setting needs to match probe attenuation.
<b>Input Coupling</b>	Use DC coupling to see all the input signal. Use AC coupling to see only the AC signal riding on top of a DC offset.

Set the total time to be displayed on the screen	
<b>Scale</b>	Sets the amount of time displayed on the screen for all channels.
<b>Position</b>	Moves the waveform left or right on the screen.

Stabilize the waveform on the display	
<b>Source</b>	Select which input signal is compared to the trigger settings.
<b>Type</b>	Edge trigger is the most commonly used trigger type; trigger on rising, falling or both edges. Other more advanced triggers such as Pulse Width, Runt Timeout, Setup and Hold, Rise/Fall Time, Logic and Pattern trigger types are available for capturing more complex events.
<b>Level</b>	Determines the voltage level on the input signal at which the trigger occurs.

### Measure voltage and time characteristics of signals

Using cursors: 5 Horizontal div x 200ns/div = 1us

Using Graticule: 8 vertical div x 65mV/div = 520mV