The Oscilloscope
Basic Features & Functions

Capturing Your Signal:
Easy as 1, 2, 3
1. Set the vertical scale (volts/div).
2. Set the horizontal scale (sec/div).
3. Set the trigger type, source and levels.

Acquisition Modes
Determine how the oscilloscope digitizes the signal before displaying it. Typically chosen in the "Acquire" menu.

- **Sample:** Samples are taken in evenly spaced intervals to construct the waveform. This mode accurately represents signals most of the time.
- **Peak Detect:** The highest and lowest values of the input signal are captured and used to construct the waveform. This mode will capture narrow pulses that may be missed in Sample Mode.
- **Average:** Several waveforms are acquired and averaged point-by-point to obtain the average voltage at each time sample in the acquisition. This mode is used to reduce random noise.

Probing Tips
- Choose a probe that exceeds the signal's bandwidth by 5 times for accurate reconstruction of the signal.
- Remember to connect the probe's ground clip to a known ground in the circuit under test. Measuring a signal requires two connections: the probe tip connection and the ground connection.
- Don't forget to compensate passive voltage probes to the oscilloscope.

Tektronix Oscilloscopes
Tektronix' oscilloscopes are easy-to-use, with dedicated front-panel controls, automatic measurements including FFT, and intuitive user-interfaces. To find which oscilloscope is right for you, visit us at:
www.tektronix.com/oscilloscopes

Tektronix TDS 2024B FOUR CHANNEL DIGITAL STORAGE OSCILLOSCOPE — 200 MHz 2 GS/s
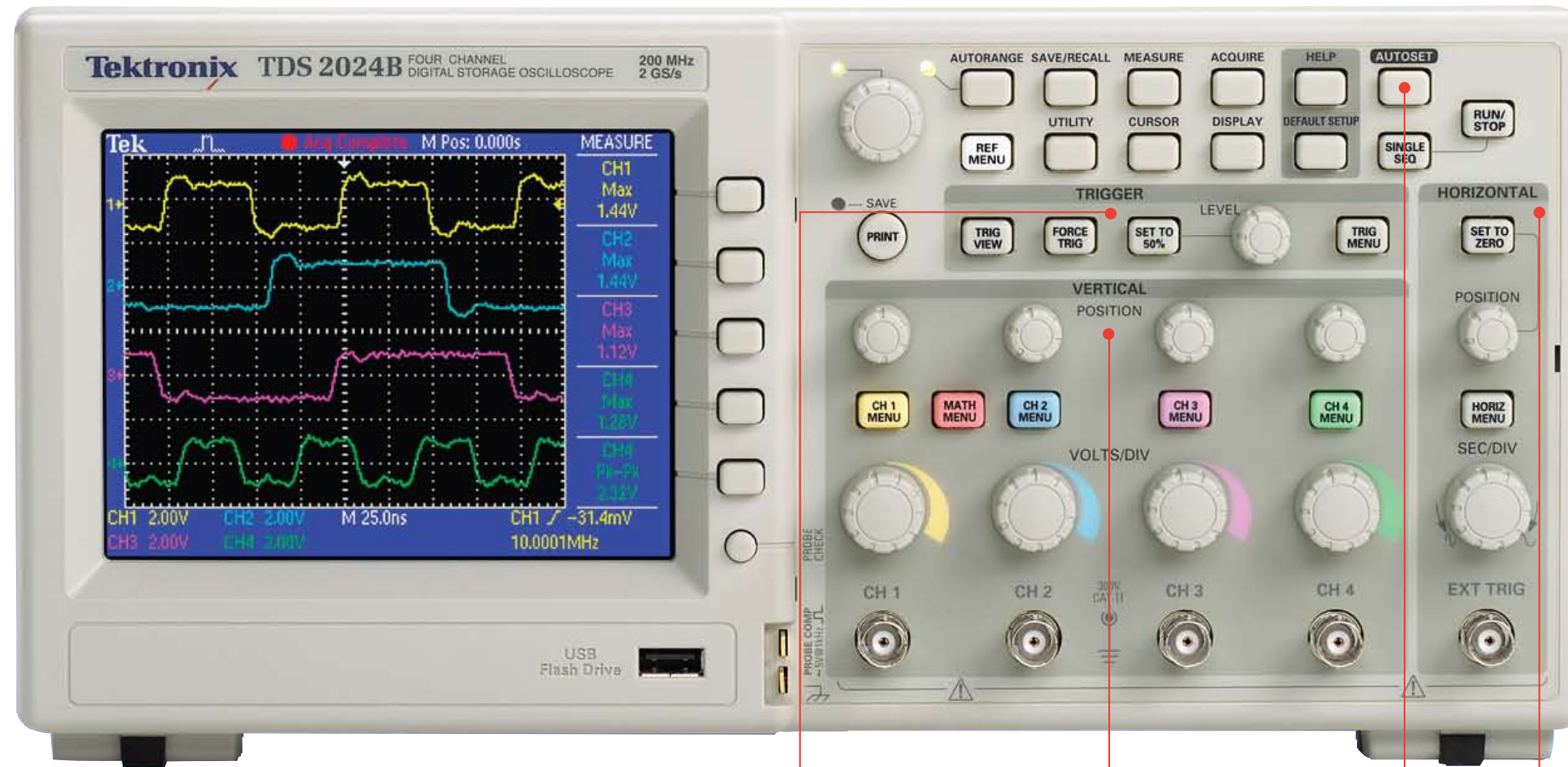
Trigger Controls
The trigger circuit acts as a comparator. When the signal matches the trigger setting, the oscilloscope generates a trigger and captures the signal. Edge triggering is used most often; it captures the signal on a rising or falling edge.

- **Source**
  - Determines which signal is compared to the trigger settings.
- **Level**
  - Determines where on the edge the trigger point occurs.
- **Slope**
  - Determines whether the trigger point is on the rising edge (positive slope) or the falling edge (negative slope) of a signal.

Vertical Controls
- **Position**
  - Moves the waveform up and down on the display.
- **Scale (Volts-Per-Division)**
  - Varies the size of the waveform on the screen.
- **Bandwidth Limit**
  - Limits the bandwidth of the oscilloscope to the frequency selected to reduce displayed noise. Restricts frequencies above the limit from being displayed and also from affecting the trigger.
- **Input coupling**
  - Determines which part of the signal is displayed.
  - **DC Coupling:** Shows all of the input signal.
  - **AC Coupling:** Blocks the DC component of the signal, centering the waveform at 0 volts.
  - **Ground Coupling:** Disconnects the input signal to show where 0 volts is on the screen.

Autoset
- Identifies the type of waveform and adjusts controls to produce a usable display of the input signal.

Horizontal Controls
- **Position**
  - Moves the waveform left and right on the display.
- **Scale (Seconds-Per-Division)**
  - Determines the amount of time displayed.

Aliasing
- Aliasing occurs when the oscilloscope does not sample the signal fast enough to construct an accurate waveform record. When this happens, the oscilloscope displays a waveform with a frequency lower than the actual input waveform, or triggers and displays an unstable waveform.

← Aliased Waveform
← Actual Waveform
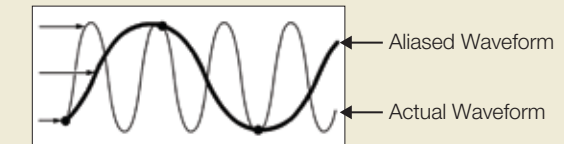
- To avoid aliasing, the oscilloscope must sample the signal more than twice as fast as the highest frequency component of the signal (Nyquist Theorem). Tektronix oscilloscopes sample at least five times as fast as their highest bandwidth, substantially minimizing the chance of aliasing.

Advanced Triggering
- **Modes**
  - **Auto Mode:** The oscilloscope sweeps, even without a trigger.
  - **Normal Mode:** The oscilloscope only sweeps if the input signal reaches the set trigger point; otherwise the last acquired waveform remains on the display.
  - **Single Sequence Mode:** After a trigger is detected, the oscilloscope acquires and displays one waveform.
- **Coupling**
Note: Trigger coupling only affects the signal passed to the trigger system, not the bandwidth or coupling of the signal on the screen.
  - **DC Coupling:** Passes all components of the signal.
  - **AC Coupling:** Block DC components.
  - **HF Reject:** Attenuates the high frequency components of the signal.
  - **LF Reject:** Blocks the DC component and attenuates the low-frequency components of the signal.
  - **Noise Reject:** Adds hysteresis to the trigger circuitry to reduce the chance of falsely triggering on noise.

Having Problems?
- If you do not see a signal, check the following:
  - Is the channel on?
  - Is the waveform off screen?
    - Adjust the vertical position and scale.
    - Adjust vertical coupling if the signal has a large DC component.
- If your waveform is indistinguishable, adjust the horizontal scale.

Tektronix®