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## Oscilloscope Terms and Definitions

### OSCILLOSCOPE USE

B+K PRECISION offers one of the industry's broadest lines of oscilloscopes with models ranging from a 20 MHz analog dual-trace unit to a versatile 150MHz digital storage oscilloscope, and a 100MHz lab scope. No matter what your application-design, service, production or hobbyist, B+K PRECISION has an oscilloscope to more than meet your requirements.

An oscilloscope is a test instrument that visually displays an electronic signal on a display screen. The display shows voltage (vertical) and time (horizontal). You can view the screen and through interpretation of the settings on the oscilloscope determine the instrument's voltage, and the general characteristics of the signal.

### WHERE ARE OSCILLOSCOPES USED?

An oscilloscope is a test instrument that can be used in a wide variety of applications:

- **EDUCATION** - used in technical schools to demonstrate electrical theory
- **DESIGN** - used in circuit design to verify design parameters
- **SERVICE** - used for the repair of electronic equipment
- **MAINTENANCE** - used to verify operation for set-up or repair equipment
- **FIELD SERVICE** - used for in-the-field repair of equipment
- **MANUFACTURING** - used as part of the manufacturing process to verify performance parameters of designed equipment
- **QUALITY CONTROL** - used for final testing of equipment.

### WHAT IS BANDWIDTH?

Bandwidth is the frequency range of signals that can be viewed on the oscilloscope. When selecting an oscilloscope, consider present and future bandwidth requirements of the instrument.

### ANALOG VS. DIGITAL STORAGE

B+K Precision provides analog, digital, and analog/digital operation oscilloscopes. ANALOG Oscilloscope - range from 30 MHz to 100 MHz in bandwidth ANALOG / DIGITAL Oscilloscopes - range from 20 MHz to 150 MHz in bandwidth with 200 MS/s sampling rate. The prime benefits of an analog/digital or digital oscilloscope are:

- capability to store waveforms for analysis
- ability to view / store pre-trigger information
- ability to detect / display / capture glitches
- ability to get a hard copy printout of the capture signal
- ability to view slow event
- ability to view one time event

### **ARE ANALOG/DIGITAL AND DIGITAL OSCILLOSCOPES HARD TO USE?**

B+K Precision analog / digital or digital oscilloscopes have a number of features that provide ease of use. These features include:

- **AUTOSET** - provides automatic setup of time base, vertical axis and trigger parameters of the signal being viewed. This allows most signals to be displayed. You can then readjust the timebase and vertical axis as you require.
- **AUTOMATIC MEASUREMENTS** - Up to 17 automatic measurements are displayed by readouts on the screen.
- **ANALOG OR DIGITAL OPERATION** - B+K Precision analog / digital oscilloscopes provide the benefits of both analog and digital operation in one unit. A single button is used to go from analog to digital storage operation.

### **OSCILLOSCOPE SELECTION**

Refer to the following page for definitions of common digital terminology. When selecting an oscilloscope, answer these questions: Considering present and future needs, what maximum bandwidth will be required? Will you need to store and view the signals you are viewing? (consider present and future needs) Review the [selection chart](#) for a preliminary choice. Then turn to the specific model number page for complete specifications.

### **OSCILLOSCOPE TERMS**

#### **ACCELERATING VOLTAGE**

The internal voltage that causes trace illumination on the oscilloscope display. A higher voltage is needed at fast sweep speeds.

#### **BANDWIDTH**

The frequency range of signals that can be observed on the oscilloscope with minimal degradation. Typically, bandwidth is specified in megahertz (MHz) and is the maximum frequency at which signals are within 3 dB in amplitude.

#### **DELAYED TIME BASE**

Allows a single signal to be viewed at two different sweep speeds, by expanding a portion of the waveform and starting at some point after the main time base begins. This is more useful

than merely magnifying the display because it allows all parts of the main sweep signal to be observed with any desired amount of expansion or horizontal magnification.

### **DUAL TIME BASE**

A dual time oscilloscope allows you to view one signal at two different sweep speeds simultaneously, with delayed trigger. One sweep can be used to observe a complete waveform (such as a full frame of a video signal) while the second sweep is used to expand the signal and view only a portion of it (such as a single line of the same video signal).

### **EXTERNAL TRIGGER**

Externally supplied signal that starts the sweep.

### **INPUT IMPEDANCE**

The AC and DC resistance that a signal "sees" at the oscilloscope input.

### **RISE TIME**

The minimum time that it takes the CRT beam to rise from the 10% mark on the CRT graticule to the 90% mark on the graticule. Oscilloscope rise time specifications are directly related to bandwidth.

### **SWEEP**

The motion of the CRT beam from left to right that causes the trace to appear. A sweep time of 0.1 ms/div means that the beam moves across one division of the CRT in 0.1 ms. Faster sweep speeds are required to view higher frequency signals.

### **SWEEP MAGNIFIER**

Allows a portion of a displayed waveform to be magnified (typically X10) without actually shortening the sweep time setting. This is an advantage over simply increasing the sweep speed because increasing the sweep speed can result in the desired portion of the waveform disappearing off the screen. Additionally, this feature increases the maximum sweep speed by the magnification factor.

### **TRIGGER**

Signal that starts the sweep of the oscilloscope CRT beam across the display. The trigger level controls the amplitude at which the sweep will begin.

### **VERTICAL SENSITIVITY**

The signal level required to cause a single division of vertical deflection. For example, for a vertical attenuator setting of 5 mV/div, a 5 mV peak signal will produce one division of vertical deflection.

### **V MODE TRIGGERING**

V mode triggering permits each waveform viewed to become its own trigger signal. In dual trace operation, the trigger source alternates between channels. Sometimes referred to as alternate triggering.

### **VERTICAL ATTENUATOR**

The precision input circuit controls the level of the input signal. Usually this circuit consists of calibrated steps in a 1-2-5 sequence (i. e., 10 mV/div, 20 mV/div, 50 mV/div. etc) which allow the oscilloscope to display signals with levels from many volts to only a few millivolts.

### **VIDEO SYNC**

Allows vertical (TV V) or horizontal (TV H) video sync pulses to be selected for triggering. Vertical sync pulses are selected to view vertical fields or frames of video and horizontal sync pulses are selected for viewing horizontal lines of video. Sometimes referred to as TV sync.

### **X-Y DISPLAY**

Mode of operation which displays a graph of two voltages. The Y axis is the vertical axis (usually channel 1) and the X axis is the horizontal axis (usually Channel 2).

### **Z-AXIS**

Allows an external signal to control the intensity of the CRT beam. Also referred to as intensity modulation.

### **DIGITAL OSCILLOSCOPE TERMS**

#### **BYTE**

Usually contains eight bits of digital information (sometimes contains 10 to 12 bits). Also referred to as a word.

#### **EQUIVALENT TIME SAMPLING**

A method of sampling used by some Digital Storage Oscilloscopes to allow them to capture repetitive waveforms with frequencies that are higher than the sampling rate.

#### **HARD COPY**

A paper copy of the displayed waveform made by an external plotter.

#### **HORIZONTAL RESOLUTION**

The number of points possible across the oscilloscope display. Usually, if the horizontal resolution is 1 K (1024), there will be 1000 points (samples) plotted across the display from the far left vertical graduation to the far right graduation. (100 points or samples per division).

#### **INTERFACE**

Ability to talk to and/or receive commands from an external computer or other electronic device.

### **MEMORY**

The electronic circuitry that stores the digitized signal. For DSO's, memory is usually specified in kilobytes. One kilobyte contains 1024 bytes of information.

### **PRE-TRIGGER**

The ability of a DSO to view signals before the trigger. This allows the user to determine the cause of many undesired effects in electrical and electronic equipment.

### **REFRESH MODE**

The trace moves across the CRT from left to right (just like a conventional oscilloscope) and the display is refreshed (updated) each time a trigger occurs.

### **ROLL MODE**

The trace moves across the CRT from right to left (like a chart recorder) and is continually updated.

### **SAMPLE**

The digital representative of an instantaneous value of the digital storage oscilloscope's input signal. The DSO works by taking sample of the waveform at various points.

### **SAMPLING RATE**

The rate at which the input signal is converted to a digital signal. Maximum sampling rate is usually expressed in MS/s (megasamples per second).

### **SINGLE SHOT MODE**

Used for capturing one-time events or pre-trigger information.

### **VERTICAL RESOLUTION**

The number of vertical points that are possible on the oscilloscope display. An eight bit DSO allows a vertical resolution of 256, a ten bit DSO allows 1024 points, and a twelve bit DSO allows 4096 points.

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