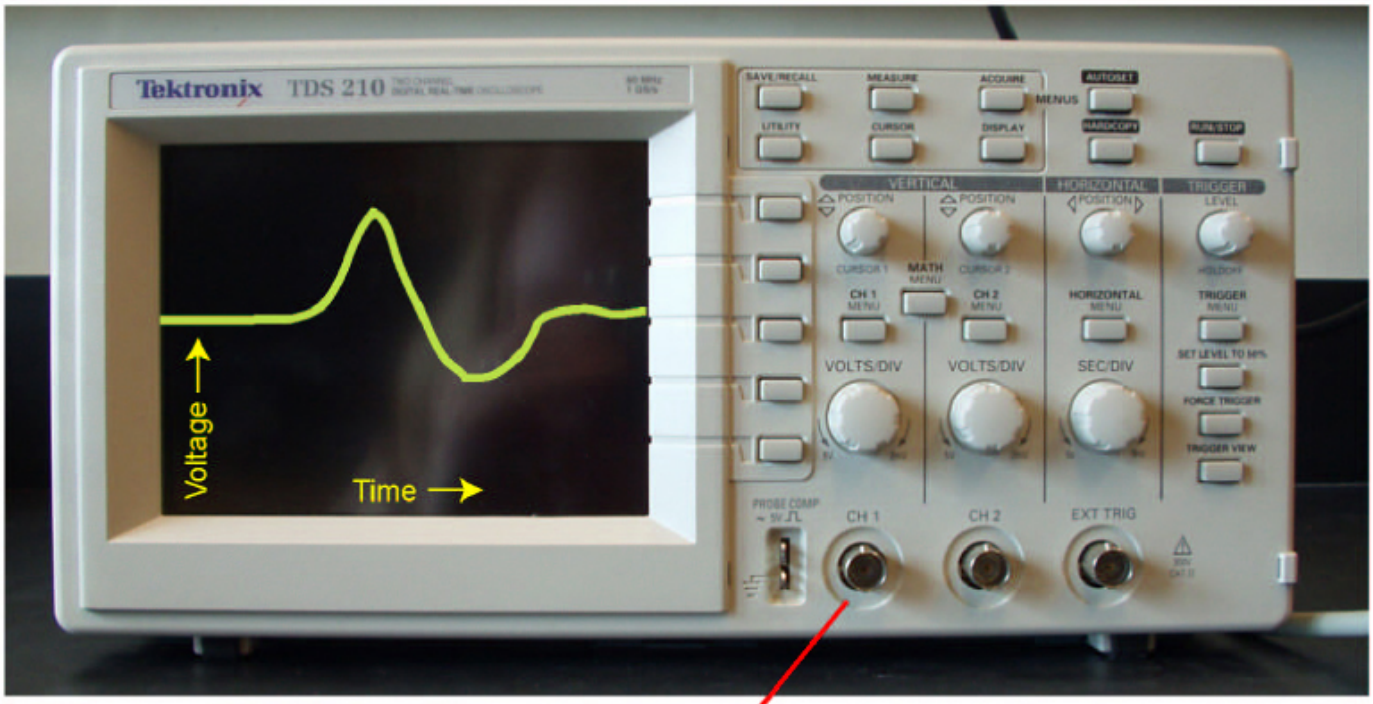
Digital oscilloscope

An oscilloscope is one of the central tools in electrophysiology. **It takes an input line and displays the voltage on that line as a function of time.** Typically, the scope is configured so that time is on the horizontal axis (x axis) and voltage is on the y (axis). Simply put, an oscilloscope is a voltmeter with the ability to show voltage in time.

Earlier oscilloscopes used the input voltage signal to bend a beam of electrons either up or down. That beam was projected onto a phosphor screen (from behind the screen) and scanned from left to right (i.e. time). Each pixel on the screen (containing phosphors) would emit visible light when it was struck by the electron beam light (like a TV screen). Thus, when the voltage went up, the beam would bend up and the trace of phosphors would move toward the top of the screen (and likewise for decreasing voltage).

Your oscilloscope is digital. The voltage is converted to a digital value and used to light a pixel on a liquid crystal display (LCD) screen. This allows waveform storage and computations not easily caaried out with earlier scopes.

As computers and analog to digital converters have improved, traditional oscilloscopes may soon disappear altogether in electrophysiological experiments. Instead, your computer screen will function as a virtual oscilloscope.



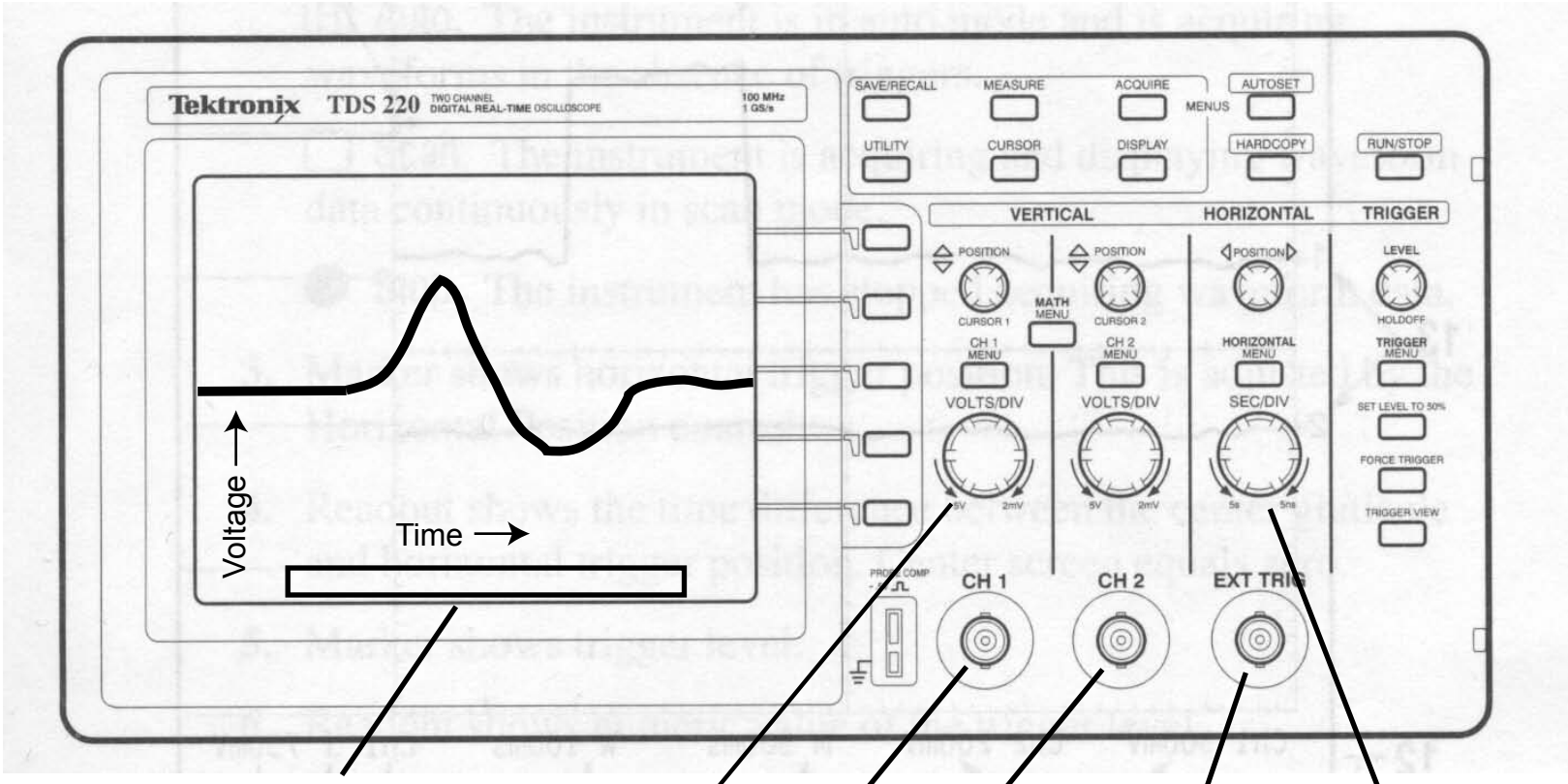
Digital oscilloscope (cont.)

"CH 1" BNC connector: input line is attached here (displayed as channel 1)
"CH 2" BNC connector: a second input line can be connected here (displayed as channel 2)

EXT TRIG: a line can be connected here that instructs the scope when to start (i.e. trigger) its display sweep. For example, an electronic stimulator can be used to trigger the display of the waveform evoked by that stimulator.

"VOLTS/DIV" dial: (Volts per division) Determines how much display is used to display the input channel. For example, if the "VOLTS/DIV" is set at 1.0 V/div, then each of the vertical boxes (divisions) on the scope equals 1 volt. The current setting is shown at the bottom of your scope (see illustration). If you are using two input channels, be aware that each channel has its own volts per division setting.

"SEC/DIV" dial: (Seconds per division). This is often refered to as the "Time base". The current setting determines how fast the "beam" sweeps from left to right. Thus, it determines how much time is dispalyed on one screen. For example, if the "SEC/DIV" is set at 1 ms (1 millisecond), then each of the horizontal boxes (divisions) on the screen displays 1 millisecond of data. Because there are 10 divisions across the entire display, the total display duration is 10 milliseconds. This is why oscilloscopes are great -- you could never see the voltage dynamics of such a short duration with your naked eye.



current volts/div and time base are displayed here

VOLTS/DIV

Input line(s) connect here (CH1 CH2)

External trigger

Time base (SEC/DIV)

9.17 Systems Neuroscience Lab

Spring 2013