# CG1111: Engineering Principles and Practice I

Preparation for Week 7 Studio

## Laboratory Oscilloscope Familiarization

-By Dr Henry Tan

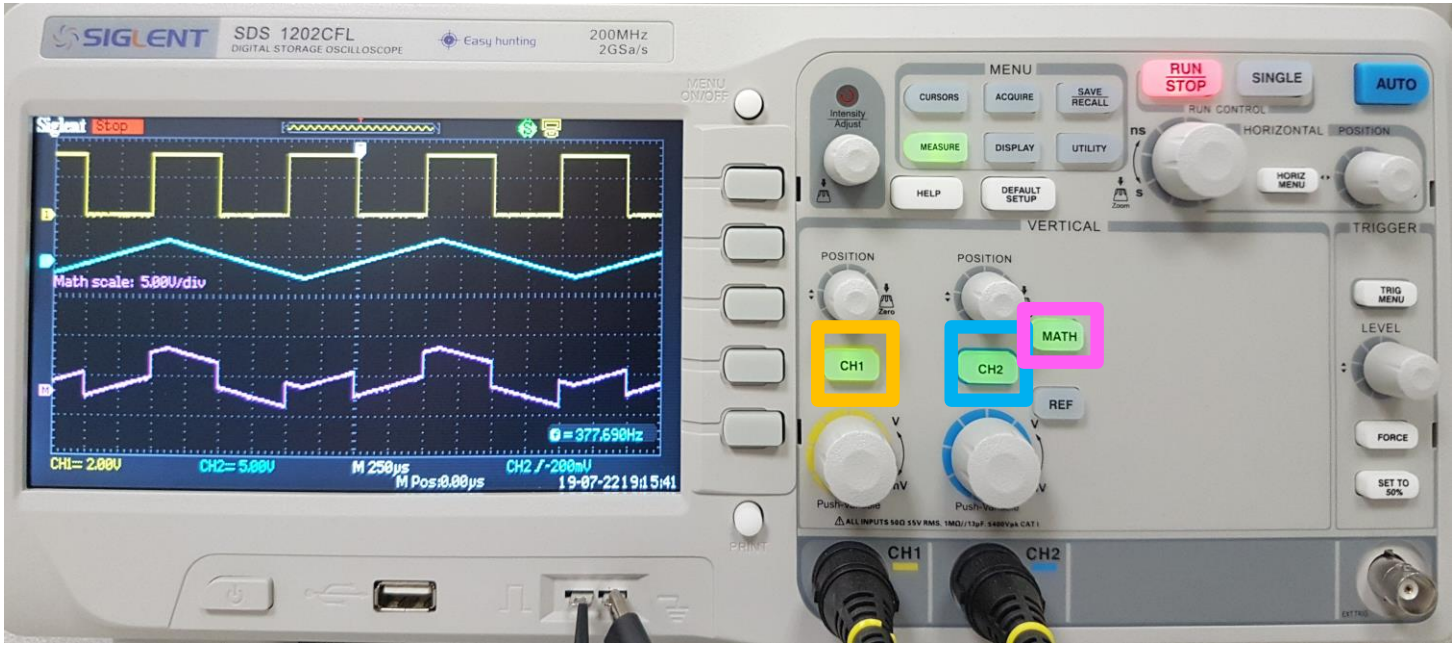
NUS National University of Singapore

# Oscilloscope

Oscilloscopes are useful for looking at very fast changes in voltage over time that we could not measure with the multimeter.

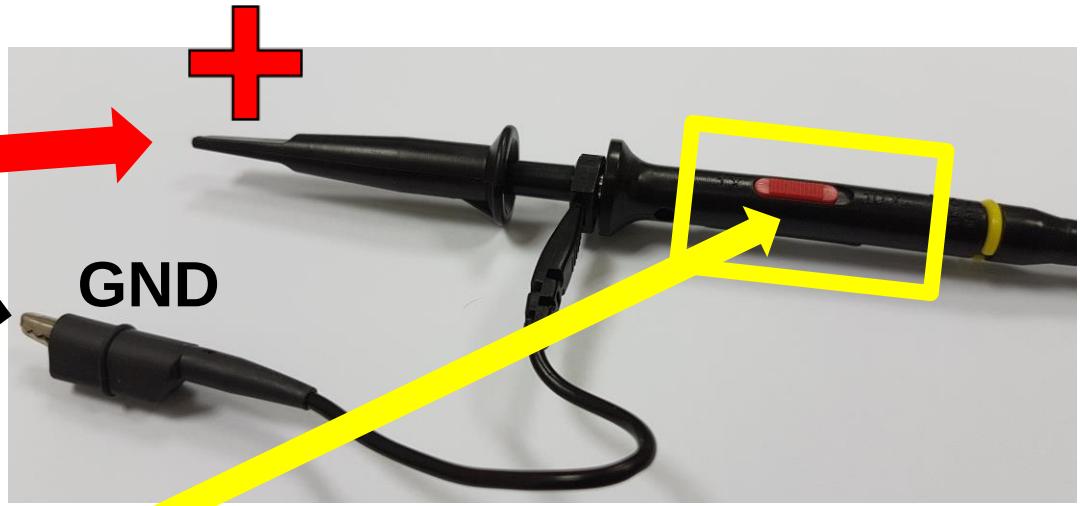
- Channel Buttons* & Signals Colors
  - Channel 1 (yellow)
  - Channel 2 (blue)
  - MATH (pink)

* For toggling the channels/math on & off.



# Oscilloscope Probe

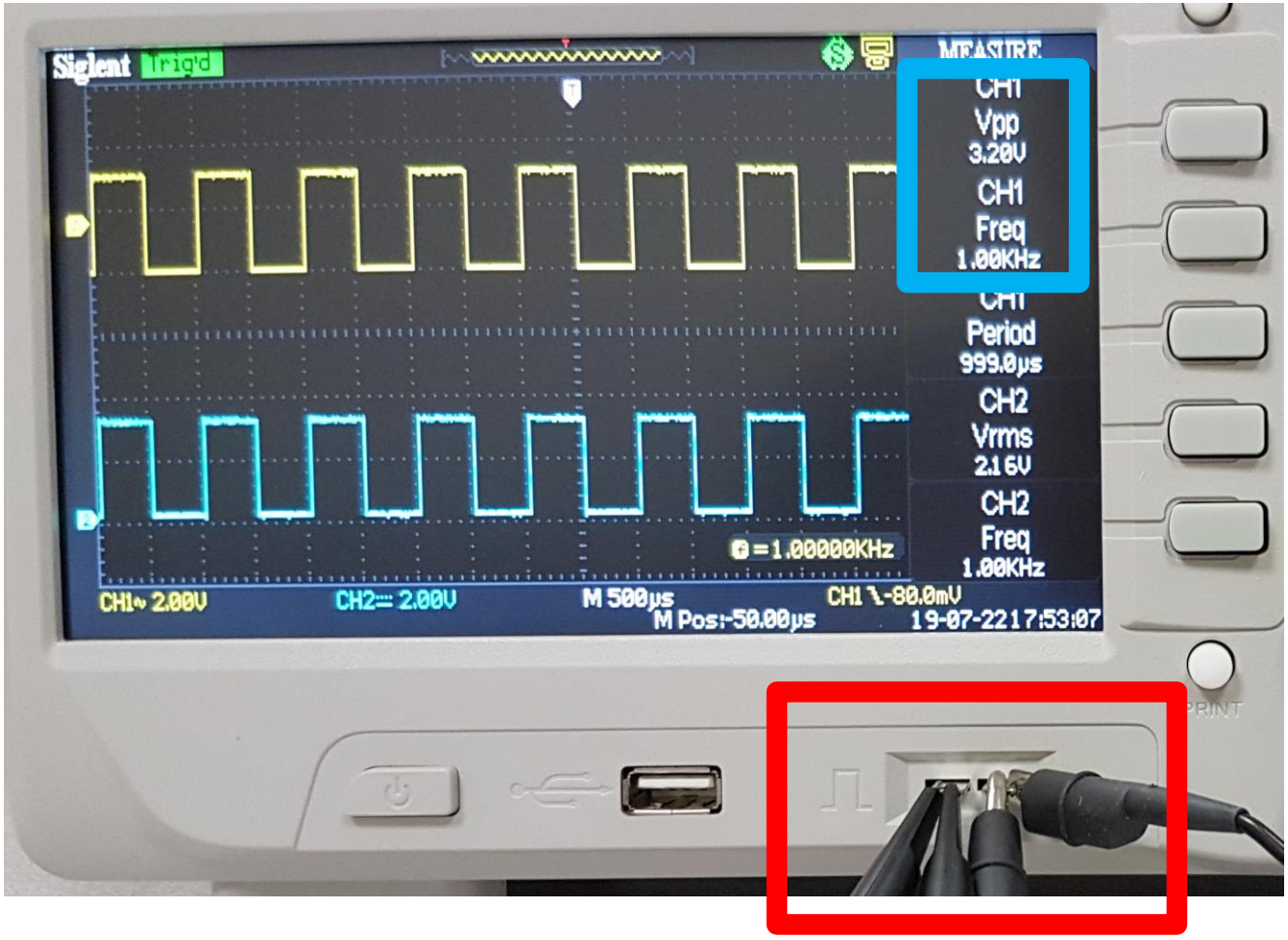
- Two Ports
  - Positive
  - Ground
    - ✓ This terminal of both channels are internally connected to ground




- Attenuation Factor
  - Ensure 1x is selected for our measurements; **not** 10x, which is meant for signals exceeding the scope's limits, e.g. 50 V

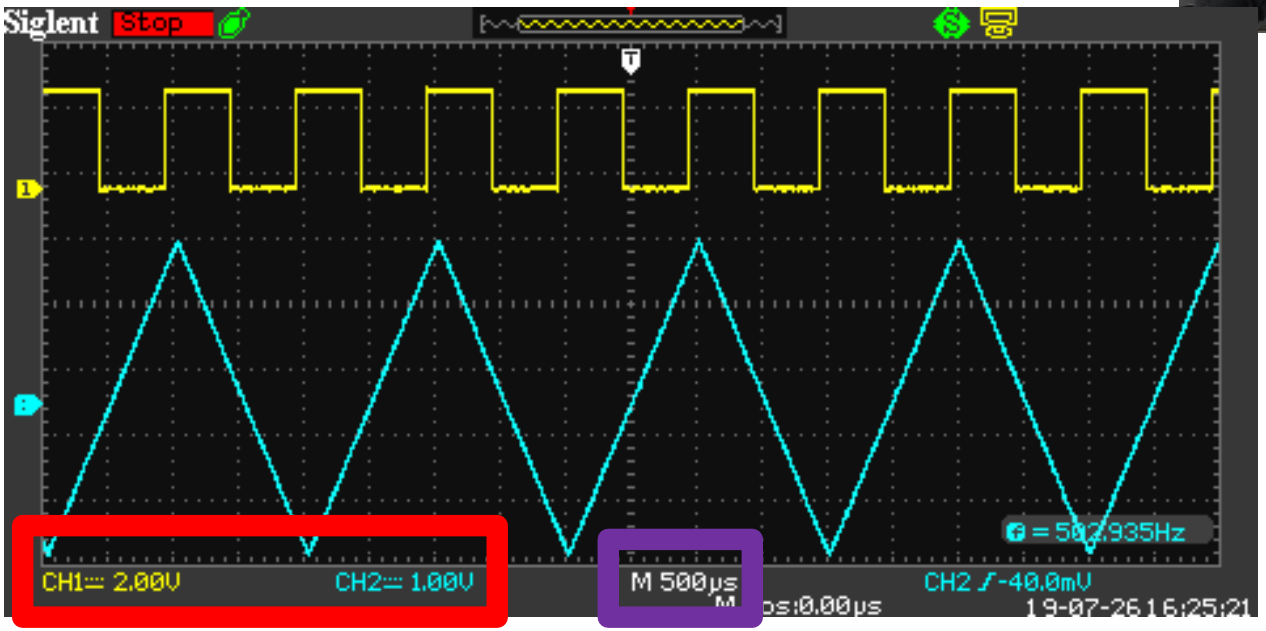
# Oscilloscope

- Test Signal
  - For probes compensation and testing
  - Approximately 3.2Vpp, 1kHz square wave
  - But can also be used to check scope display and settings



# Oscilloscope

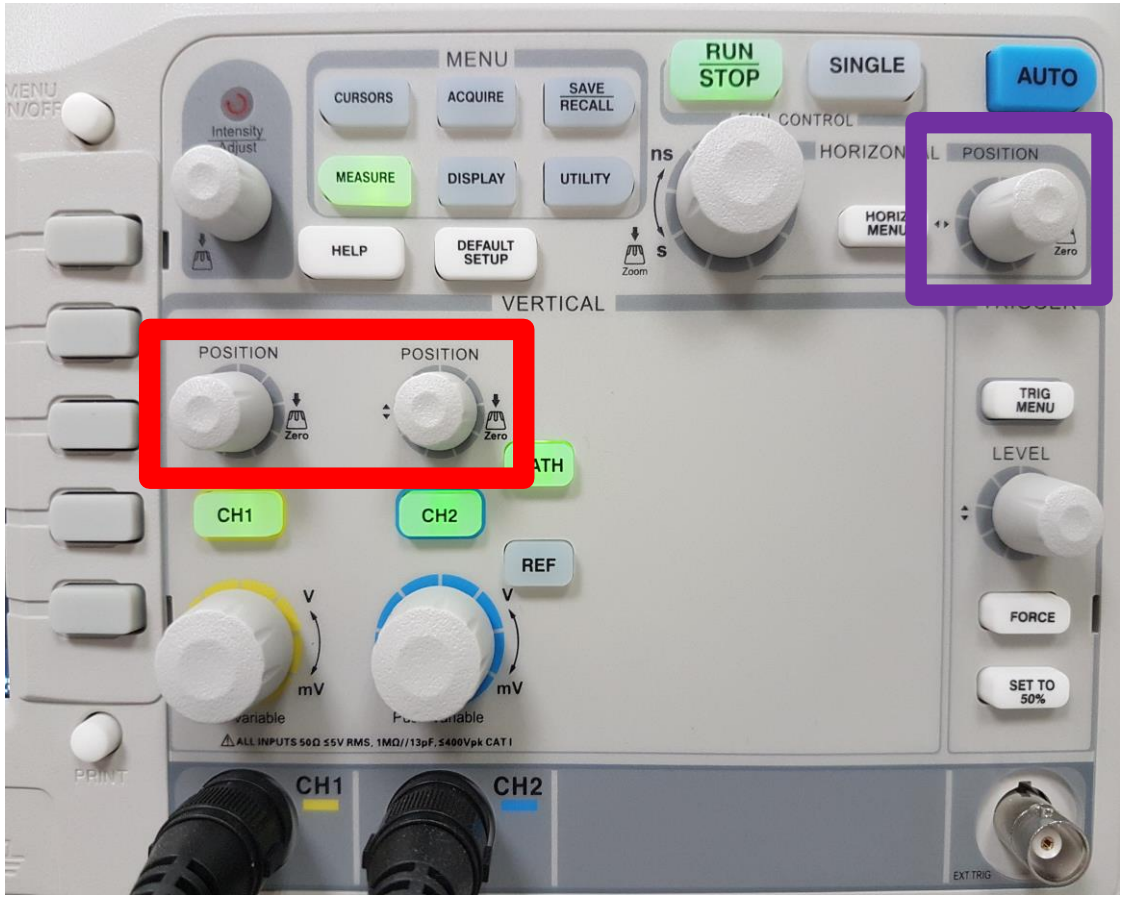
- Scale Knobs
  - Vertical scales (volt/div)
    - ✓ 2 mV to 5 V range
    - ✓ Tap the knob to toggle between fine and coarse adjustments
  - Horizontal scales (time/div)
    - ✓ 1 ns to 50 s range


*The selected scale settings can be verified from the status bar below the plots.*

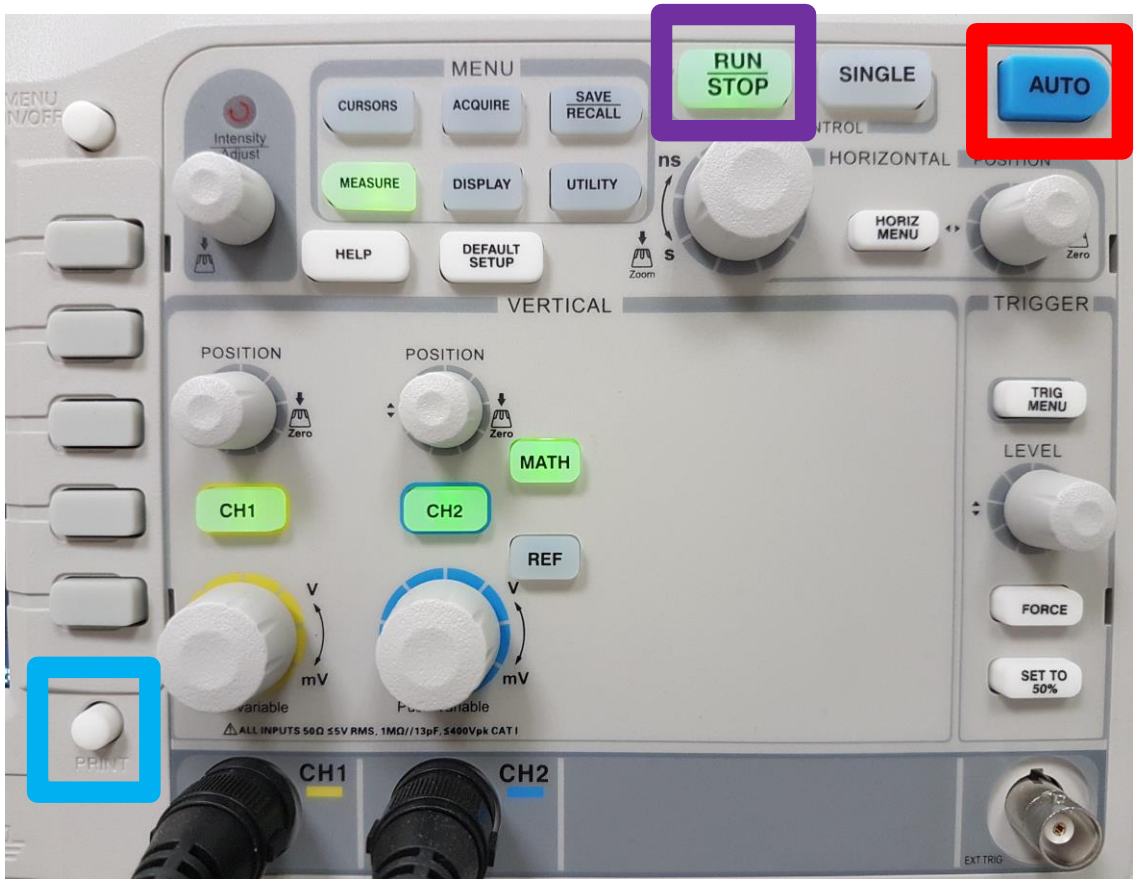
# Oscilloscope

- Position Knobs
  - Vertical position
  - Horizontal position
    - ✓ All three knobs allow quick reset to their respective zero positions by tapping the knob once



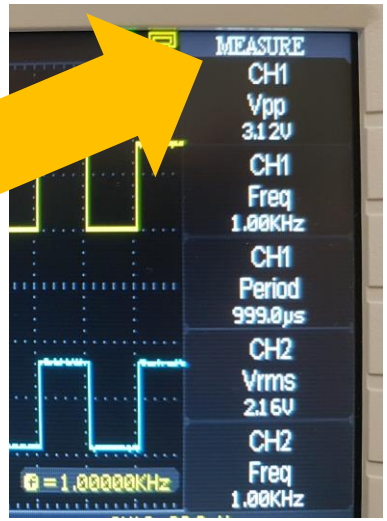
# Oscilloscope

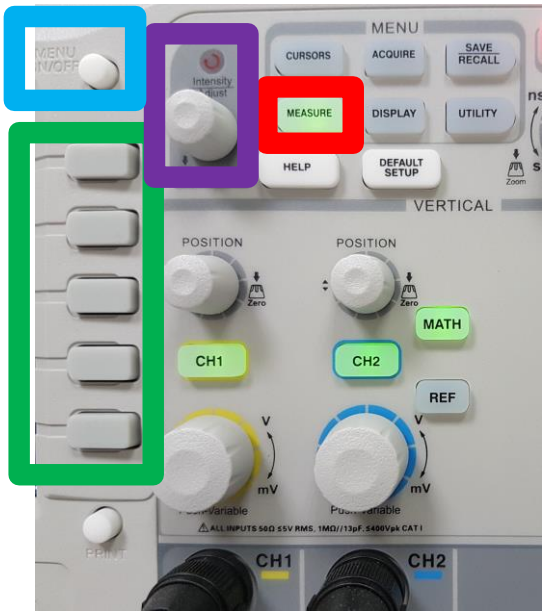
- Run Control
  - Auto Set
    - ✓ Auto set time/volt scales to best fit of input signal
    - ✓ Recommended if signal is unknown
  - Run/Stop
    - ✓ Run/stop the waveform
- Save Display as BMP
  - Print to USB Device
    - ✓ USB device has to be connected in advance



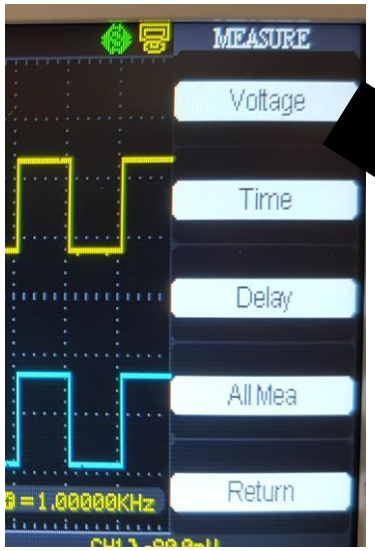
# Oscilloscope

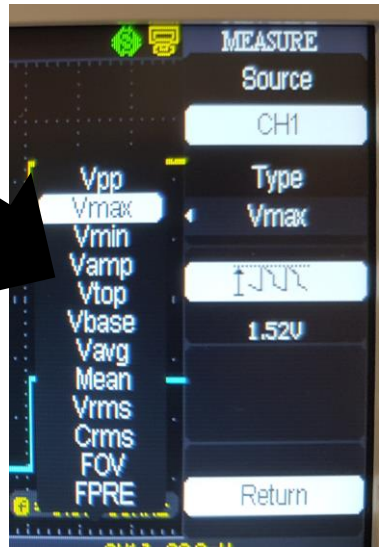
- Measure Control
  - Measure button
    - ✓ To display the measurements
    - ✓ MENU ON/OFF button toggles the menu on & off



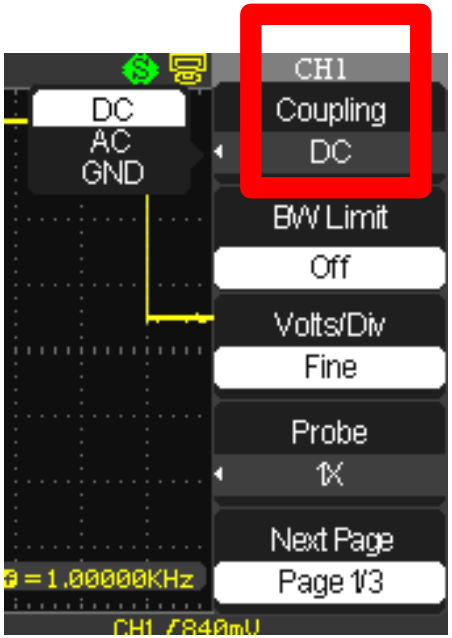

  - Entry knob
    - ✓ Used together with the softkeys to select a measurement of interest from the submenu
    - ✓ Rotate anticlockwise to scroll down the list
    - ✓ Tap once to select

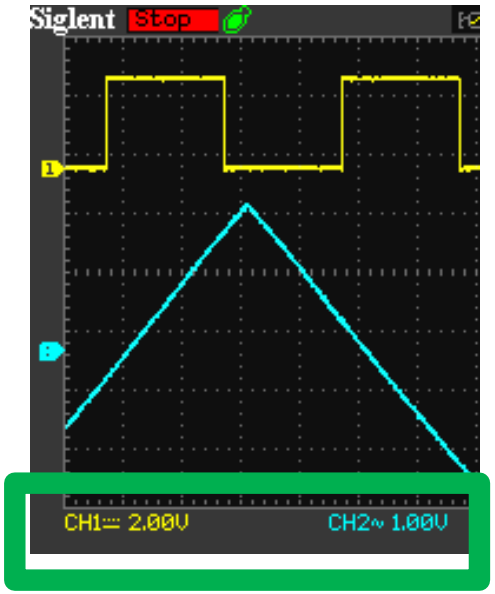


# Oscilloscope

- Coupling
  - Channel Coupling
    - ✓ **DC coupling** is useful for viewing waveforms that contain AC and DC signals
    - ✓ **AC coupling** is useful for viewing waveforms without DC component (i.e. DC offset removed)




  - Coupling choices are available in the individual channel menu, invoked by pressing the respective Channel Buttons
  - DC coupling is shown with a bar & dots while AC coupling is shown with a tilde sign (~) next to the channel number, located at bottom left corner of the display