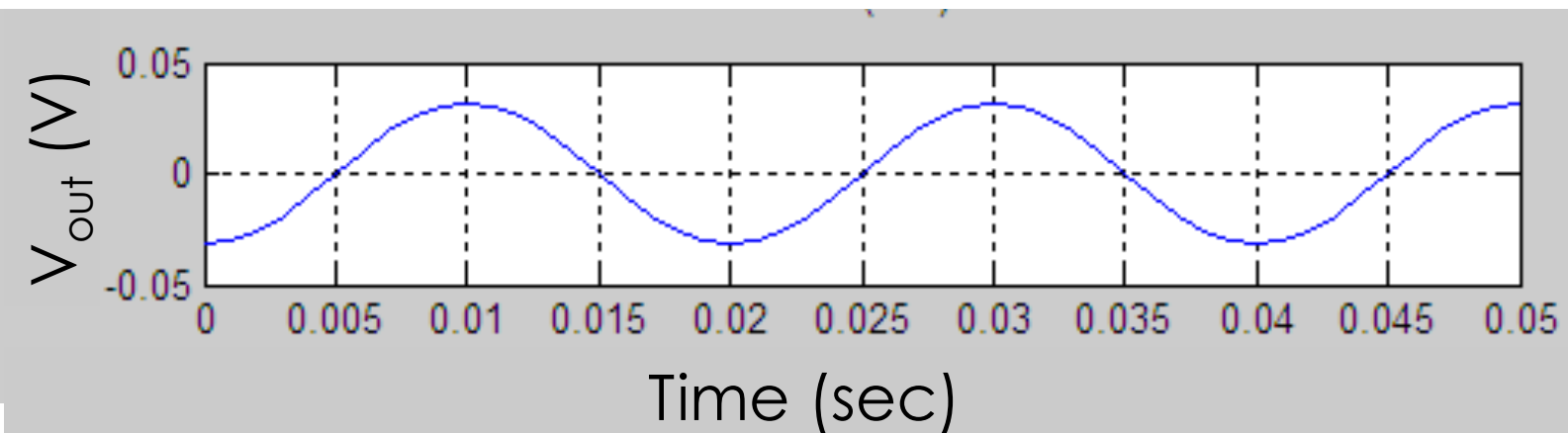
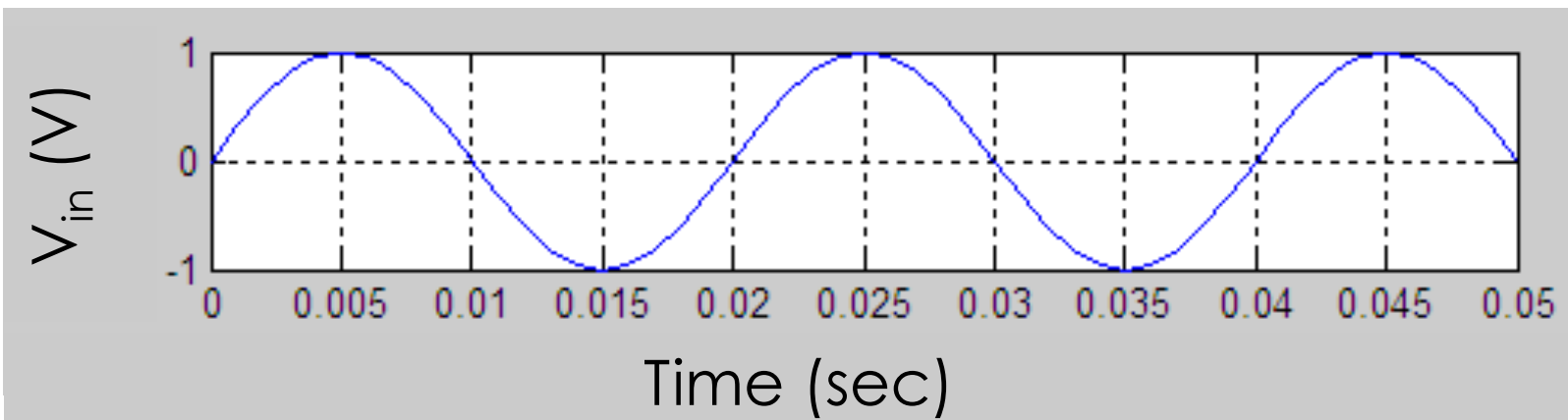


E80 Spring 2013

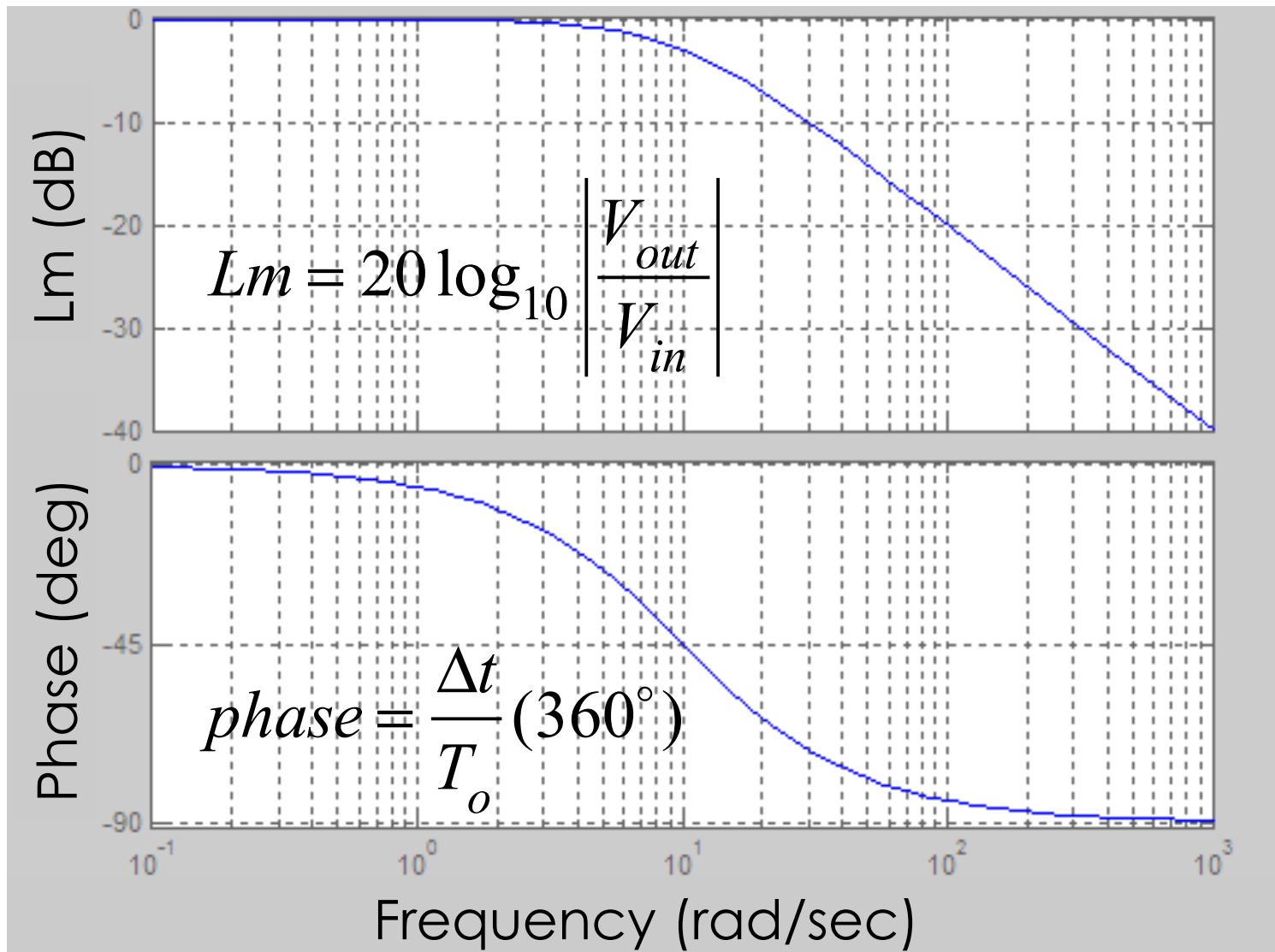
Basic Electrical Measurements

Prof. Katherine Candler

Time-Domain Plots



Frequency-Domain (Bode) Plots



Instrumentation

- Instruments that **GENERATE** signals
 - Signal generator (AC or DC)
 - Power supply (DC)
- Instruments that **MEASURE** signals
 - Multimeter (AC/DC voltage/current, resistance)
 - Oscilloscope (AC)

Signal Generator



- Waveforms: Sine, square, triangle, sawtooth
- Parameters: Amplitude (Vpp), Frequency (Hz), Out Term (High-Z or 50 Ω)

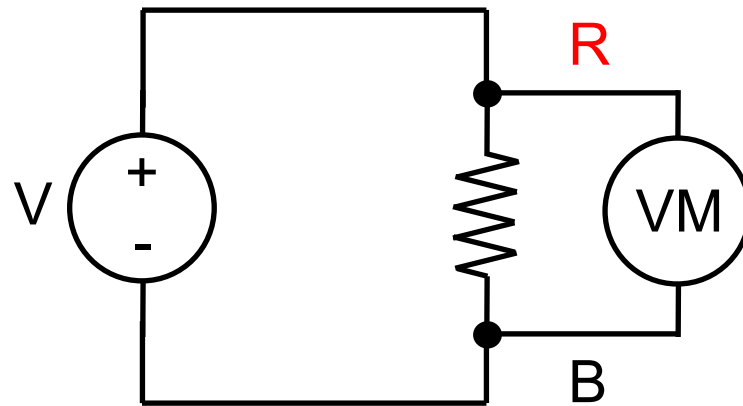
Power Supply



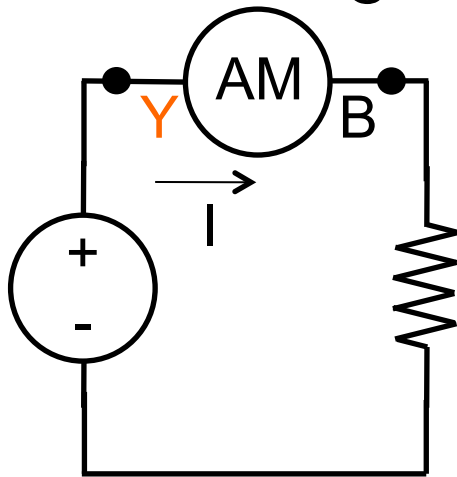
- COM = common reference node of circuit
- \perp = chassis/earth ground

Multimeter

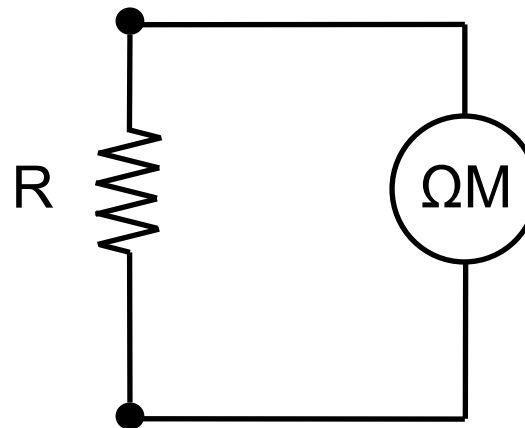
Measuring V:



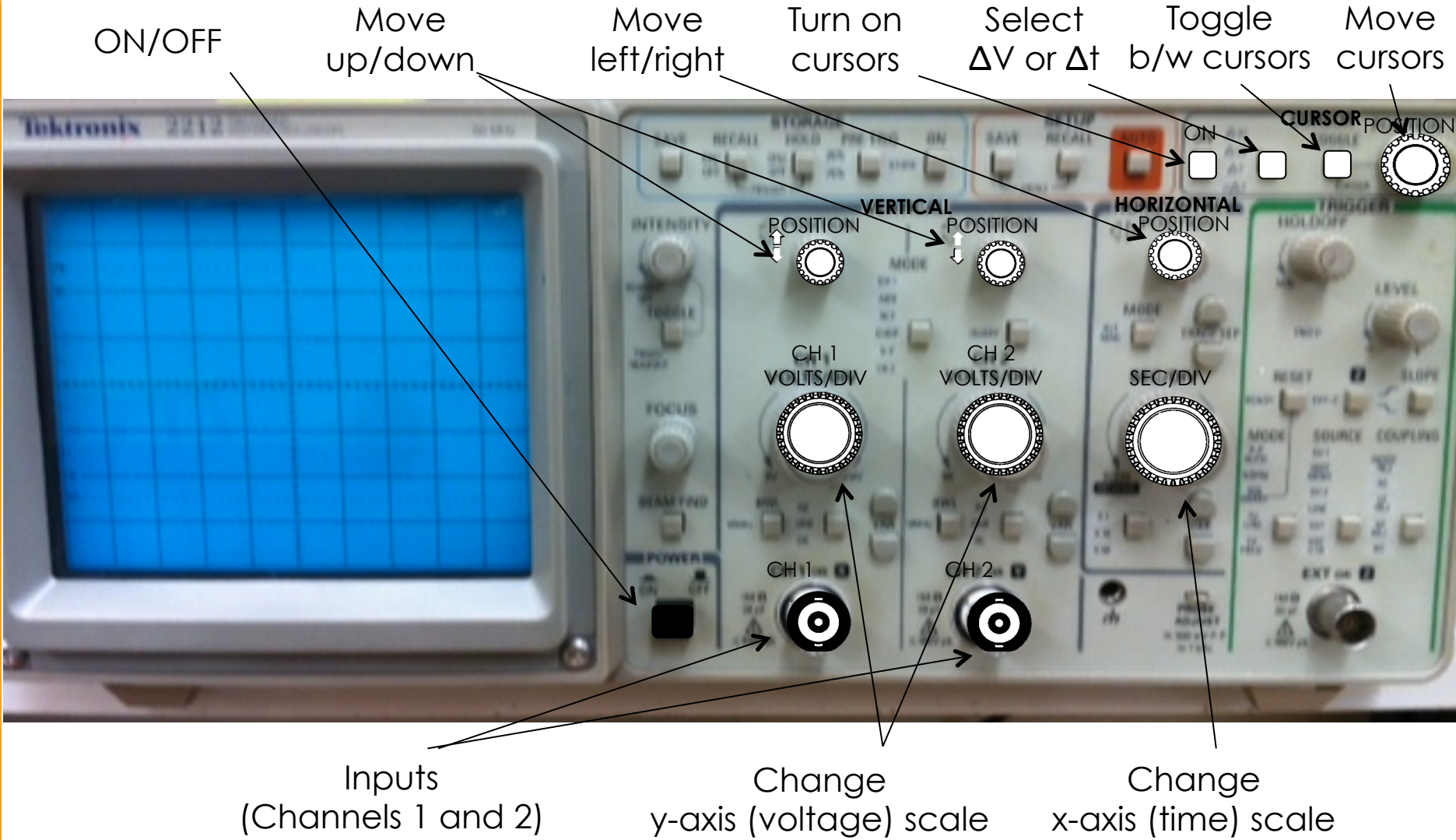
Measuring I:

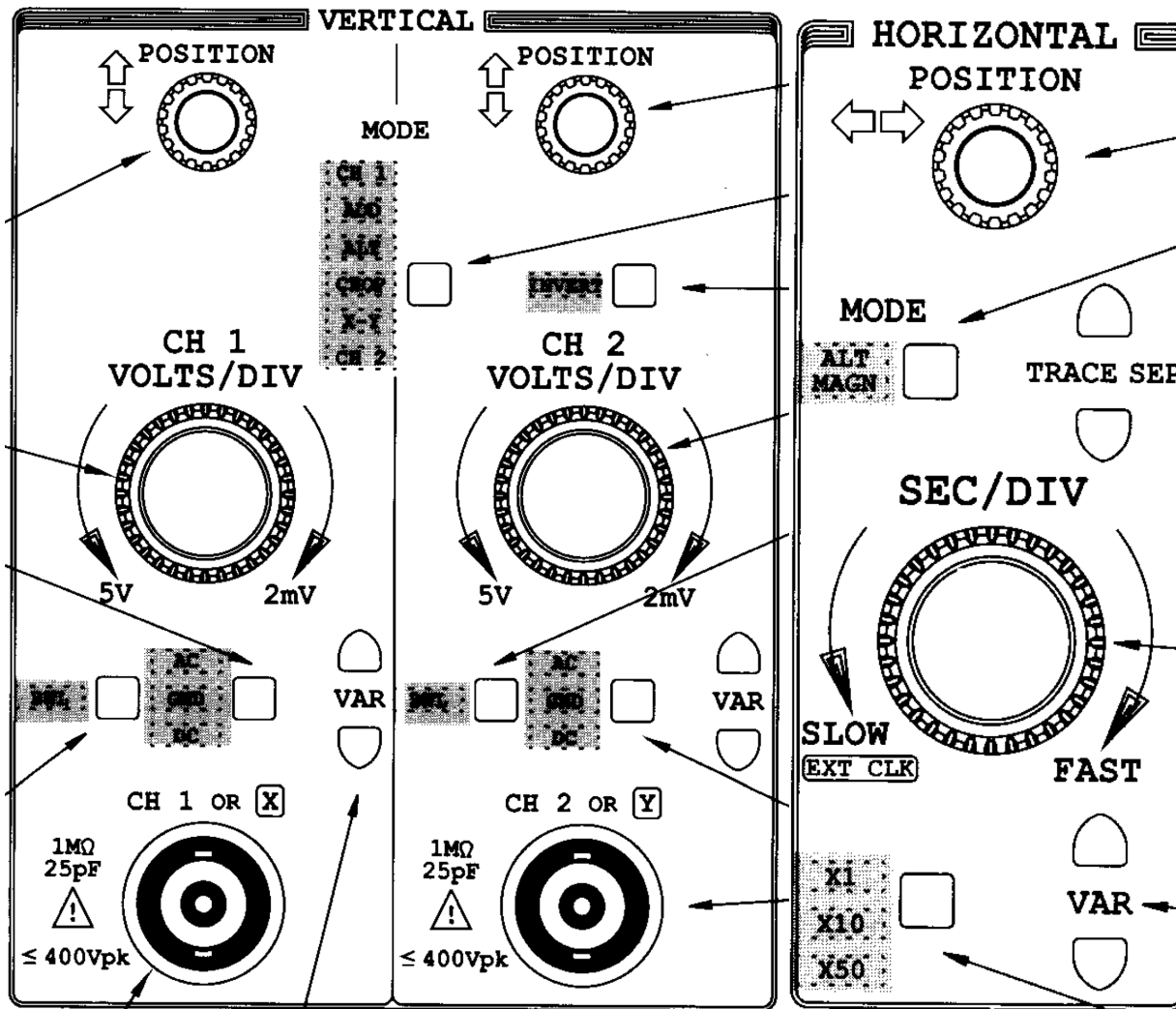
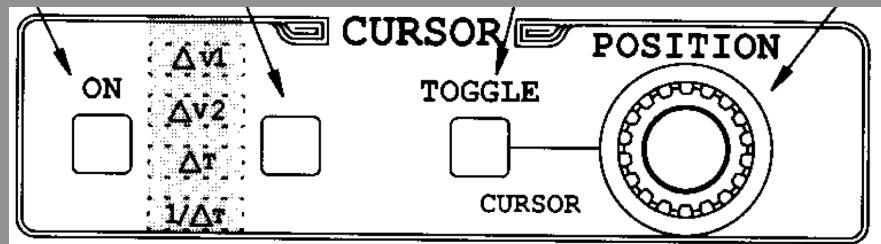


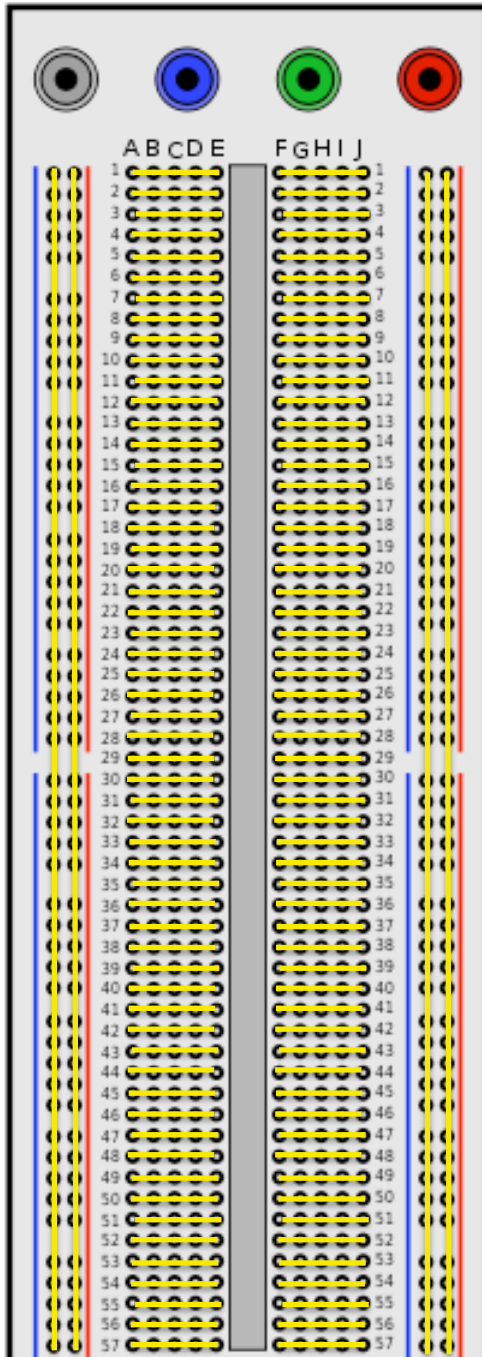
Measuring R:



Oscilloscope







Use long busses for power and ground:
Don't use them for signals

Color-code wires:
Red = V+ power
Black = V- power
Green = ground
White or Blue = signal

Keep components close to the board:
Trim resistors,
capacitors, wires

Breadboard (Protoboard)