

ECE 214 – Electrical Circuits Lab

Lecture 1

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Announcements

- Class notes will be posted on the website:

http://web.eece.maine.edu/~vweaver/classes/ece214_2015s/

- Won't be printing out lab, it will be available on website.



Lab #1

- Getting used to the equipment
- Finding out if your measurement equipment alters the results you get during lab.
- You will need: Breadboard, DVM, probe, lab notebook
- No prelab this week; optionally watch the Oscilloscope video found on the references page of the website.

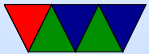
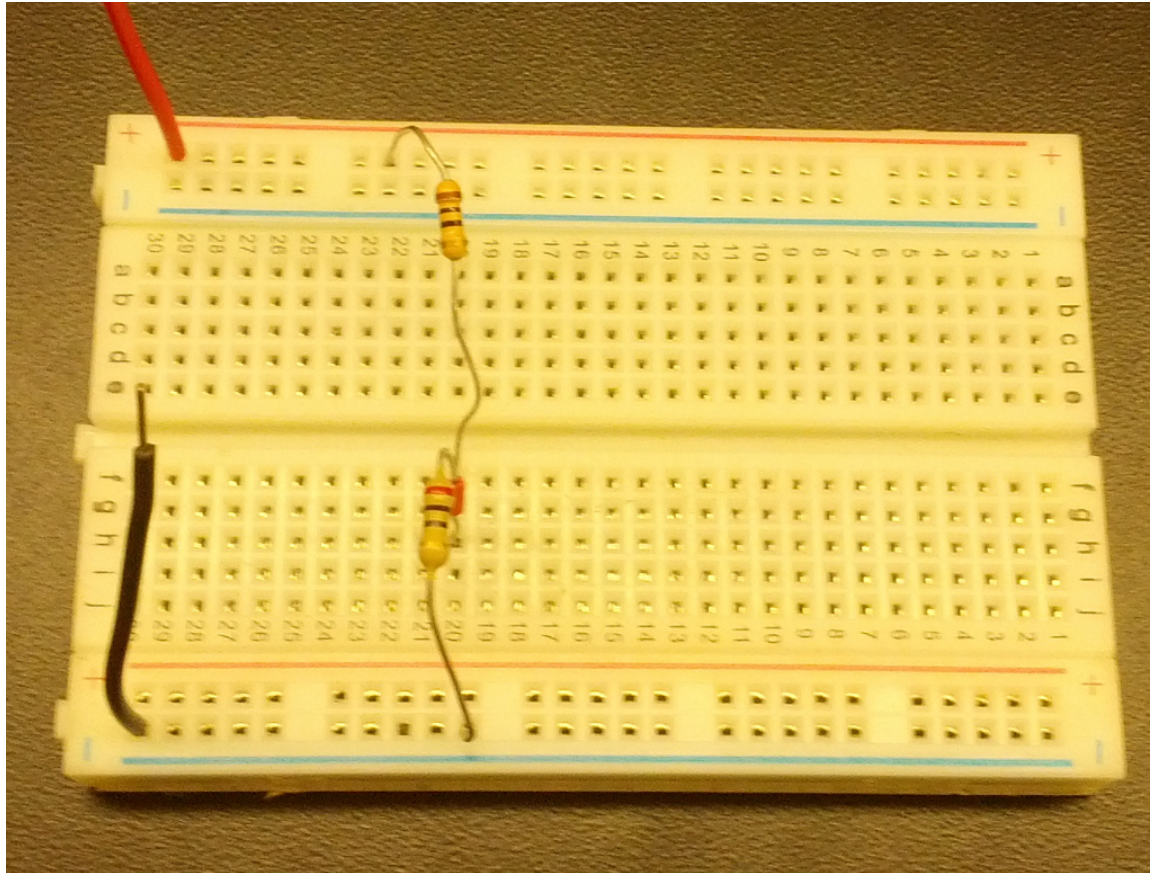


Test Equipment Overview

- How much overhead is there in the test equipment?
- We will measure a simple voltage divider and see how it behaves with different values, and compare against the ideal.
- Manuals will be linked on webpage



Breadboard



Breadboard Notes

- Metal lines running vertically (and two typically used for Vdd/gnd running horizontally)
- Solderless is the big benefit
- Don't force too big wires in, will break
- Don't put huge voltages in
- It does have certain amount of resistance/capacitance but usually not a problem unless high frequency designs



DVM – Digital Volt Meter

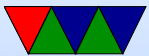


DVM Notes

- Assuming you've used one before
- Don't blow it up
- Only measuring Resistance in this lab. Try not to stick in powered circuit when measuring R.
- Careful when measuring, especially voltages
- When measuring resistances don't hold to probe with finger, especially with high resistor (Megaohm) values.



Why?

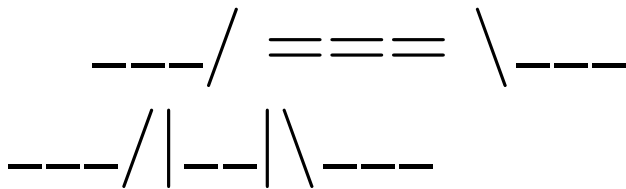


Resistor Digression



Resistor Digression

Brief aside on the actual resistance of 5% tolerance resistors. What do the bands mean? The gold band?



Function Generator



Function Generator Notes

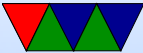
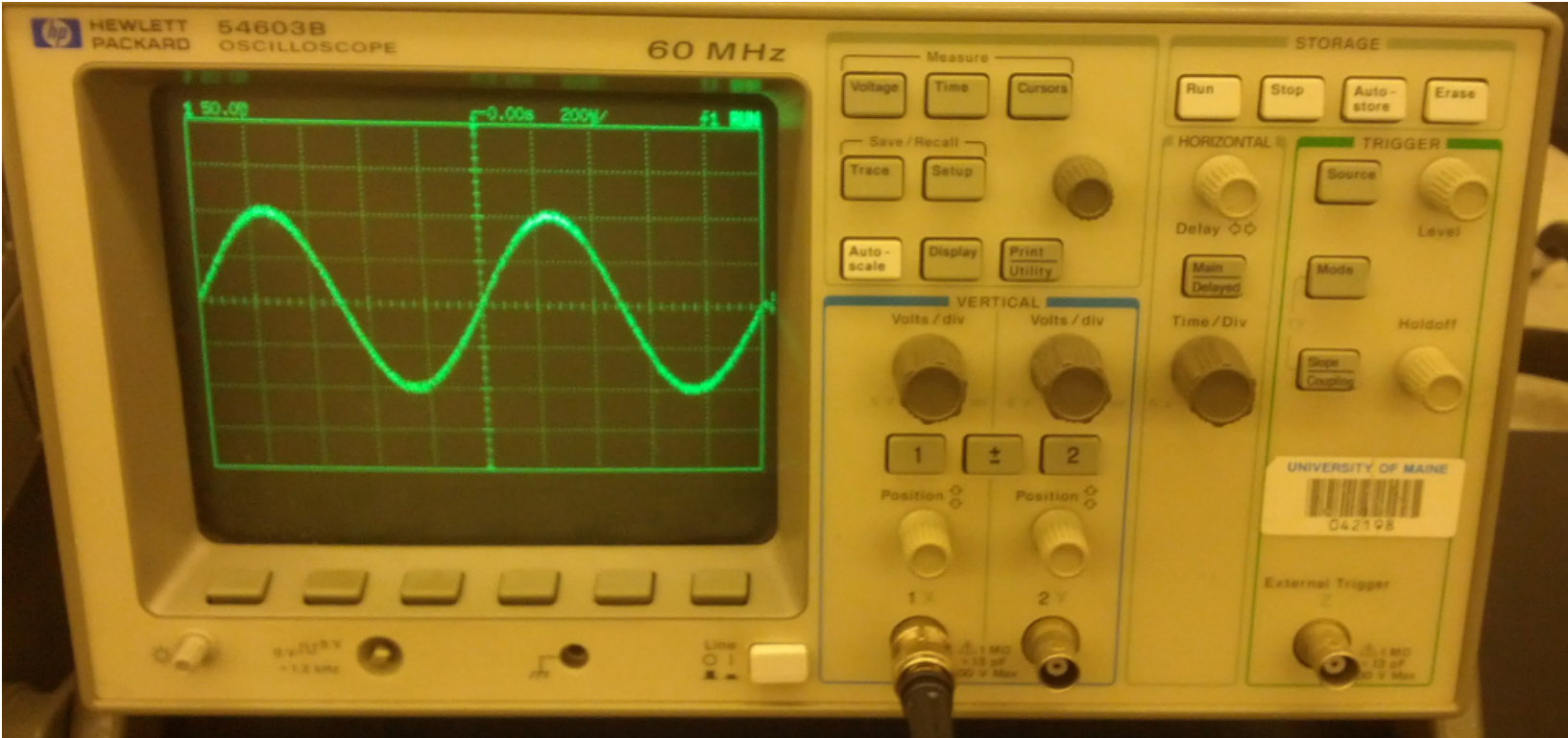
- Plug in your probe to the bottom connector, labeled “output”
- First pick the type of waveform (sine, square, triangle, etc)
- Then choose frequency. Can spin the dial, or push the green “Enter Number” button and press number and MHz/KHz buttons
- Amplitude button. Set same as frequency.



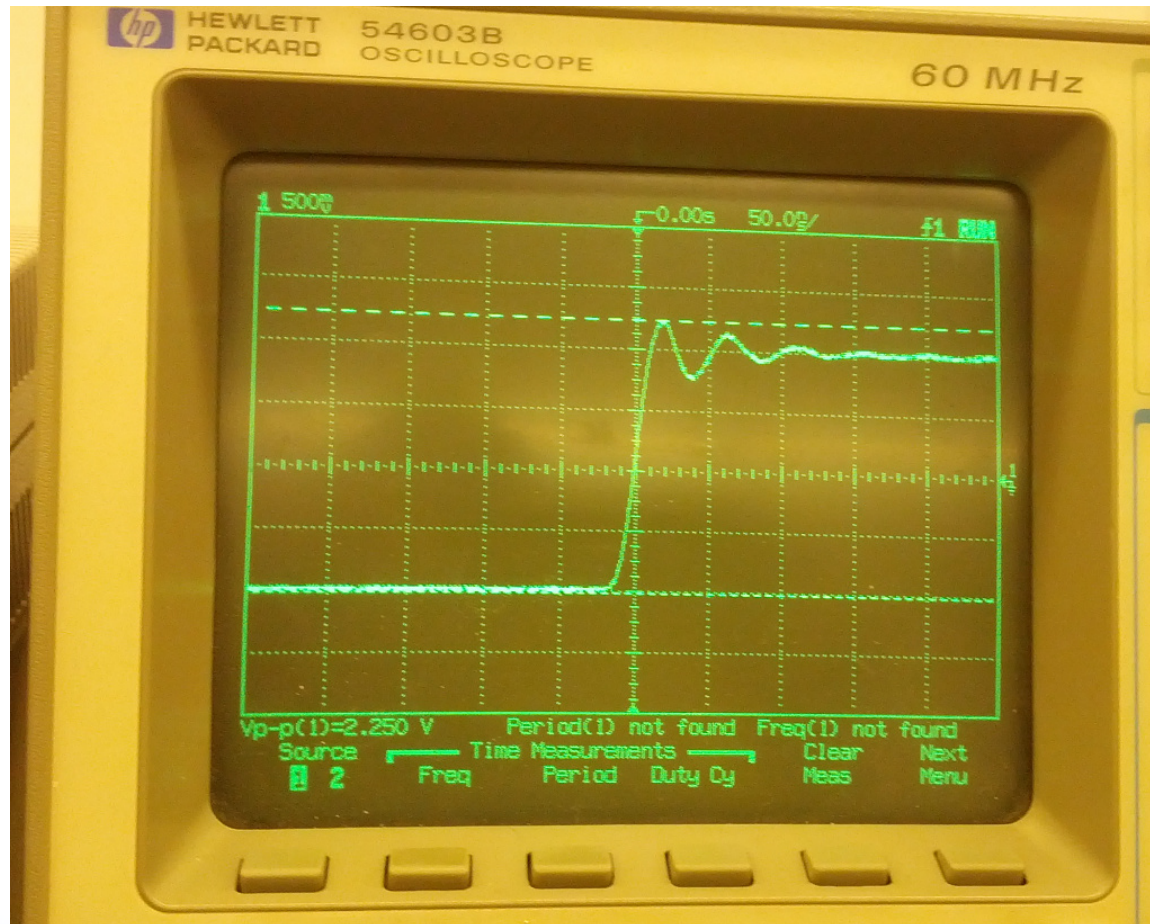
- Note: amplitude assumes 50 Ohm load. When hooking to o-scope is High-Z load. Therefore in this lab peak voltage is twice what you expect when reading on o-scope.
- Question: difference between “peak” voltage and “peak-to-peak” voltage.



Oscilloscope



Oscilloscope Zoomed



Oscilloscope Notes

- Nice vintage scopes with green CRT displays. Would have been newish when I was an undergrad.
- Still, they are somewhat advanced. Not just wires connecting more or less directly to the CRT deflector plates like in old days.
- Many advanced features (see the manual). For this lab we are just doing simple measurements.
- Hook your probe to the 1x Input



- Black lead to ground, red to signal you want to probe.
- “Auto-Scale” button is your friend.
- Can eyeball voltage from the display. To measure you can press “Voltage” then pick corresponding V_{p-p} on button on bottom of screen.
- Measuring time (frequency, period) is similar.
- Zooming: to zoom in/out voltage wise twirl the volts/div knob
For time, using the time/div knob



- The scope can measure rise time. Press time / measure / more options / rise time.
- On some (but not all?) of the scopes in the lab you can use the “cursor” button to set high and low voltage references, set a 100% mark, and easily find where things like the RC time constant happen at a specified percentage.



LCR Meter

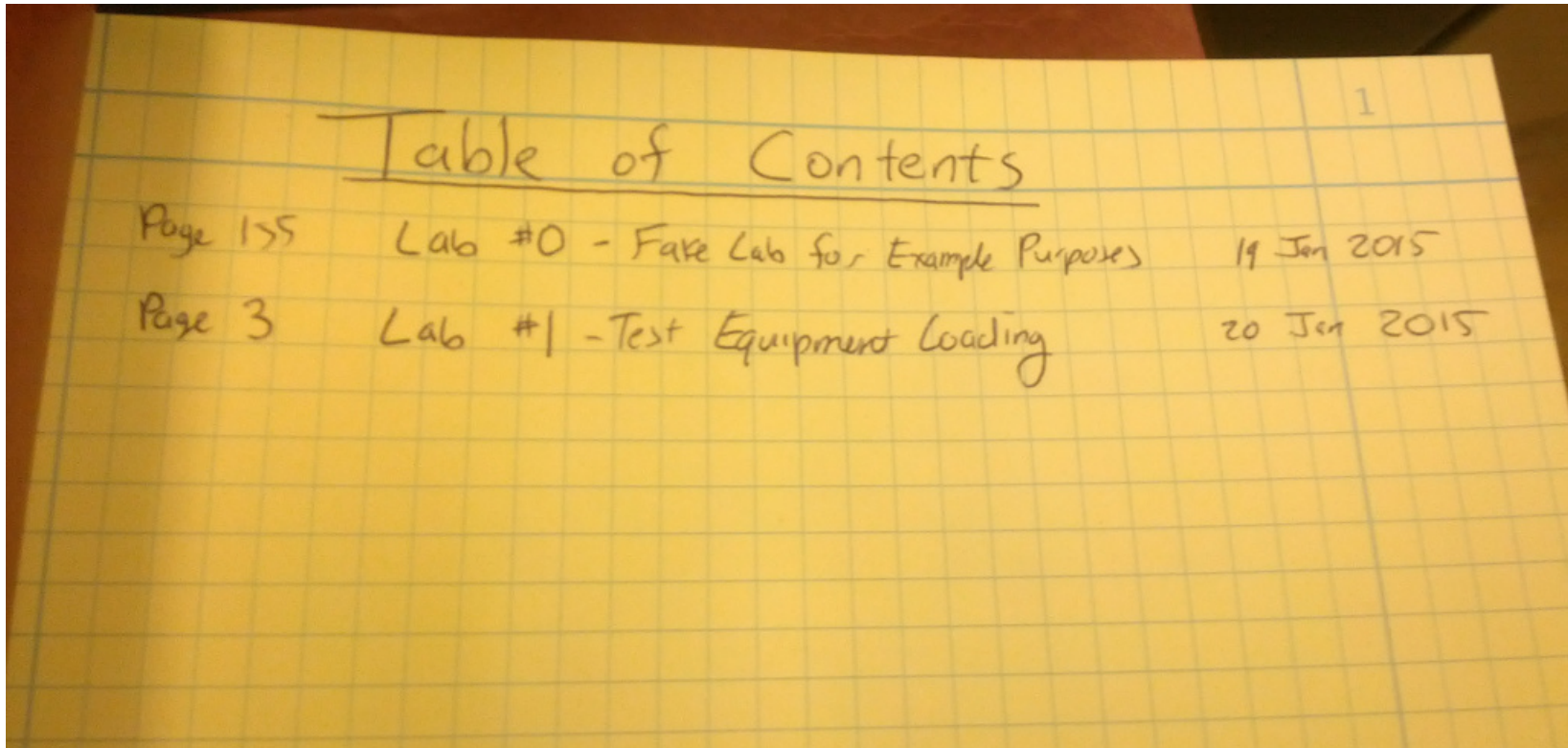


LCR Meter Notes

- Only one in lab, in front left station
- Hook device to measure between probes
- Discharge capacitors before measuring!
How? Across resistor. If a bigger sized cap, things like screwdrivers, wire, your fingers, all bad ideas.
- Use the L/C/R button to choose C.
- There's a D// button to get to Dissipation factor



Lab Notebooks – Table of Contents



Lab Notebook – Barebones Sample



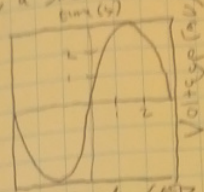
Lab #0 - Fake Lab

Tom Pank
19 Jan 2015

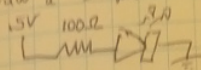
Introduction
This is a placeholder Lab, not a real one,
mainly to show one example of what a Lab
Notebook might look like.

Pre-Lab

1. Draw a sine wave:

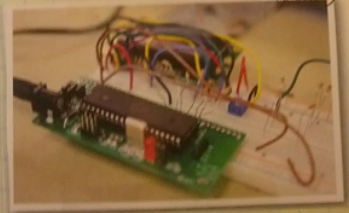


2. Draw a simple LED circuit:



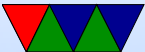
Lab Procedure

1. Build the circuit from your pre-lab
2. Measure the value of the resistor with the DMM
 $R_1 = 99.8 \Omega$
3. Measure the Voltage drop across the resistor.
test $1.5V$
4. Include picture of circuit



Post Lab

1. My favorite part of this lab was the LEDs



Lab Notebook

- Reserve room for ToC
- Date and sign each page
- Do not skip pages or leave blank space
- Always use ink
- Any extraneous work should be taped in place (initial)
- Write the lab procedure (What you did). Someone should



be able to reproduce your work.

