Lab #4 – RC-CIR

YOU WILL NOT HAVE TO WRITE A LAB REPORT FOR THIS EXPERIMENT. YOU WILL HAVE TO HAND IN THE WORKSHEET AND GRAPHS A WEEK FROM THE DAY YOU PERFORM THE LAB.

You do not have to switch rooms for Lab #4. Each station in both rooms contains all of the equipment you will need.

Section E.2:

You will measure the capacitance of the 47-μF capacitors with the LC meter; there is only one per room, so groups will have to share. You can measure the capacitance of the 0.47-μF capacitors for part I with your DMM using the procedure below.

Note that most of the 47-μF capacitors are polarized. One side may have either arrows with a "-" inside, or a painted dot. That side should be inserted into the "more negative" port on the Pasco board. That means that the wires coming from the negative side of the batteries should be connected to the marked side of the capacitor.

To measure the capacitance, you need to place your capacitor leads into the removable socket above the bottom left input jacks on your DMM. This socket obscures the Cx label. You can remove this socket from your DMM if that makes it easier to insert your capacitor but **don't lose this socket -** be certain it is plugged back into your DMM when you finish! Also, the selector knob on the DMM should be in one of the 'F' or Farads positions when measuring capacitance.

When you measure your resistor, be certain to use the 20 MΩ scale on the DMM. For some reason, the 200 MΩ scale gives false, high readings. **Don't plug the resistor into the Cx socket**! Use the input labeled for ohms, as you have been doing since the first lab of the semester. You may notice that the DMM takes several seconds to stabilize when measuring a large resistance, this is normal.

Section E.6.1

In *LoggerPro*, you may need to turn triggering off in order to do the cycling test. If, after hitting the "collect" button, *Logger Pro* says "Waiting for Trigger," then you need to turn triggering off. To do this, go to EXPERIMENT/ DATA COLLECTION. Choose the "Trigger" tab. Uncheck the "Enable Triggering" box and click the "Done" button.

Section E.7.2

At the end of this section you are asked to discuss whether the charging and discharging voltages add to give the charging voltage or zero. The underlining of this sentence means that you are supposed to include this discussion in your notebook. You do not have to do a careful analysis for this discussion. In principle, if you started your data collection perfectly each time, you could use Origin to add the data in each pair of plots to prove this point. In practice, it's much harder than this. You may satisfy this requirement by simply pointing out in your notes how your plots for the resistor and capacitor, during charge and discharge cycles, *qualitatively* substantiate the point about the sum of the voltages across these two circuit components.

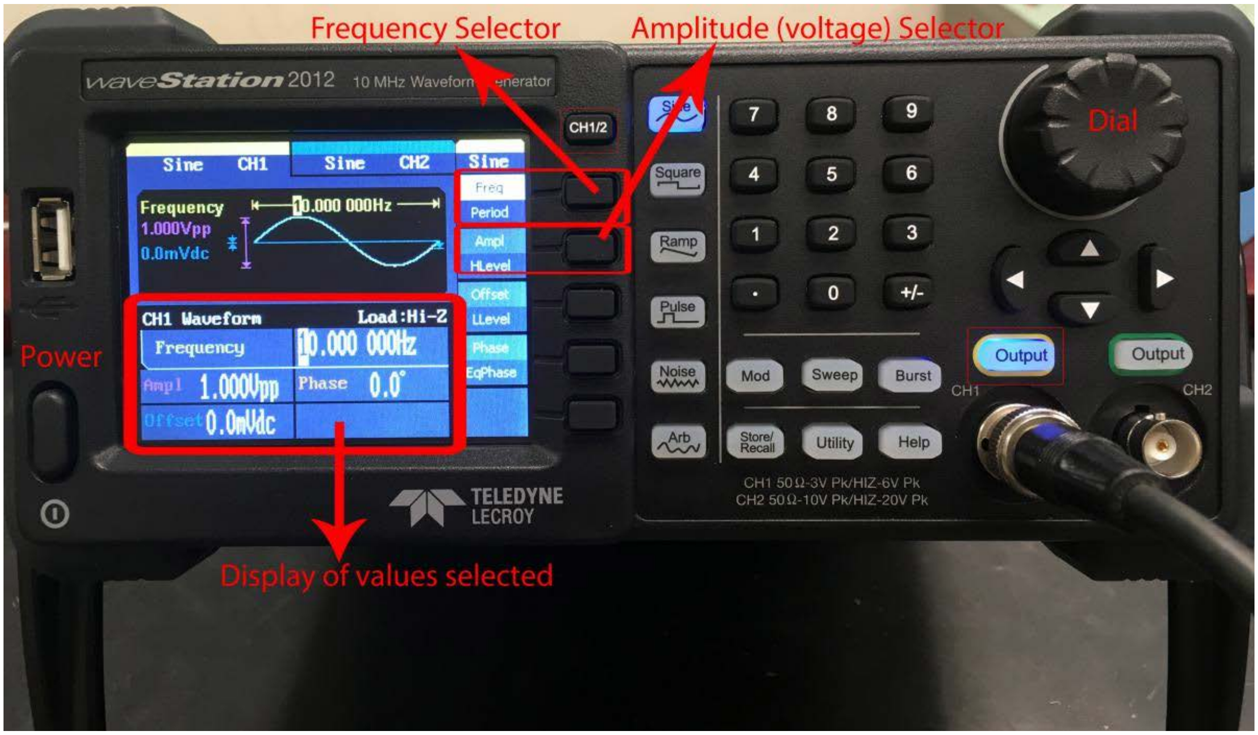
Section F.2: Origin Plots:

Note you will have to delete the first few rows after pasting into *Origin*.

Your Origin plot should have error bars in the y-coordinate (don't worry about x errors).

Section I

Below is a picture of the function generator with some of the controls that you will need to use labeled. Note that the types of waves you can generate are sine, square, and "ramp," which we call "triangle."



The image below shows what you want to obtain when you connect both function generator and scope across BOTH resistor and capacitor.

When you move the scope "hot" wire across the capacitor only, you will see the following. The signal seen in the function generator is the signal that you input into the low pass filter, and the signal in the scope is the result of the "filtered" signal.

The two analog differentiators are displayed below. The first one is a square wave input, the second a triangle wave input.

The Origin guide for this lab is similar to that in the EPF lab, so look it up under the EPF announcements.