

ECE 327: *Electronic Devices and Circuits Laboratory I*

Procedure for Lab 0 (Instrumentation Refresher Lab)

Complete the following with the other students at your table.

Function generator and oscilloscope

1. Generate $5V_{\text{peak-to-peak}}$ (i.e., 2.5 V amplitude) 1 kHz **triangle wave** with your *function generator*.
 - **New models:** Use , and then turn on.
 - Use output to generate a .
 - Make sure or is set to 50%.
 - **Old models:** *Vernier* (*ver-nee-er*) knob adjusts if *pulled out* and locks to 50% otherwise.
2. Acquire waveform on the *oscilloscope* using 1:1 coaxial cable or probe.
 - Press to see the signal.
 - Select channel (i.e., press or).
 - Make sure *soft button* is set correctly (i.e., set to 1:1).
 - Turn channel display **off** and **on** by selecting channel **again** and **again**.
 - For **help** on buttons, hold them down until dialog box appears.
3. Change oscilloscope's divisions by adjusting *large* knob at **top** of panel.
 - Repeat after turning on in the settings. Effect?
4. Change oscilloscope's **vertical divisions** by adjusting knob *above* **channel** button.
 - Repeat after turning on in the **channel** settings. Effect?
5. Change channel's **vertical position** by adjusting knob *below* **channel** button.
6. Use the oscilloscope's feature to verify and of the waveform.
7. Change *function generator*'s or to generate **sawtooth** wave.
8. Using the **sawtooth** input, experiment with the oscilloscope settings under .
 - Explain what the trigger does.
 - Select **rising edge** and then adjust trigger .
 - Select **falling edge** and then adjust trigger .
 - Move the outside of the waveform's -2.5 V -to- 2.5 V envelope. What is the effect?
 - In this case, determine what does.
 - With set to **run** (i.e., button is **green**), determine what does.
 - With set to **stop** (i.e., button is **red**), determine what does.
 - * In other words, press it *again* and *again*.
9.

Using the 10:1 probe

10. You can find the 10:1 probes in the *zipper pouch* above your oscilloscope.
 - These probes have been *calibrated* for each scope.
 - These probes should *never* leave the bench.
11. Acquire waveform using 10:1 probe. Make sure **Probe** setting is still at 1:1. What is the impact?
12. Change **Probe** setting to 10:1 (i.e., the *correct* value for this probe).
 - These oscilloscopes *can* automatically determine probe setting if special probes are used.
 - Age has degraded the oscilloscope's ability to properly determine probe setting.
 - If the scope detects an *AutoProbe*, it will override your settings.
 - The scope **AutoProbe** choice is often incorrect.
 - Small pieces of paper have been placed over oscilloscope inputs. They prevent the automatic probe detection. **DO NOT REMOVE THEM!**
 - You will **always** use the 10:1 probes, so your **Probe** setting should be always be set to 10:1.
 - **NEVER** connect the *coaxial* end of the 10:1 probes to the function generator.
13. Again, use the **Quick Meas** feature to verify amplitude and frequency of waveform.
14. Determine the purpose of the orange **Ref** button on the 10:1 oscilloscope probe.
15. **Ask the instructor to verify that your results are correct.**

DC power supply

16. Power down your function generator. You do not need it anymore.
17. Generate 10 V_{DC} and -10 V_{DC} signals from your *DC power supply*.
18. **USING A BANANA CONNECTOR**, connect the 0 V (i.e., “ground”) reference on the DMM (i.e., “digital multimeter”) to the 0 V reference on the power supply. **You should be able to “plug” both ends of the banana connector in without any additional wires.** Note that breadboards usually have built-in female banana connectors for frequently connecting and disconnecting power supplies.
19. Using **another banana connector** and your DMM, verify the 10 V_{DC} and -10 V_{DC} signals.
20. Using *two* separate 10:1 probes, view the 10 V_{DC} signal on channel 1 of the oscilloscope and the -10 V_{DC} signal on channel 2 of the oscilloscope.
21. Watch the signals as you adjust power supply knobs. Determine the purpose of the **Tracking** knob.
22. **Ask the instructor to verify that your results are correct.**

Graded portion of lab

23. Clean up. You get a clean-up grade for today.
 - Place your 10:1 oscilloscope probes in the *zipper pouch* above the oscilloscope.
 - **DO NOT** hang your 10:1 oscilloscope probes with the other laboratory cables.
 - The 10:1 oscilloscope probes **MUST STAY AT THE TABLE.**