

Voltage Dividers and Oscilloscope Probes

For credit complete the following tasks and document all your work and observations. Make sketches of what you see on the scope - do not forget to label your axes as you do this. It makes a huge difference whether the full range of your scopes y-axis is 5 mV or 5 V. Always make sketches of the circuit and indicate where you inserted the probes.

Task 1: Verify that all sections of your breadboard are functioning correctly:

1. use a DMM to check the ± 5 V and ± 12 V supplies.
2. connect the DATA SWITCHES to the LOGIC INDICATORS; test both by switching the switches.
3. repeat 2. using the LOGIC SWITCHES instead of the DATA SWITCHES.
4. using a scope observe the clock signal at 1 Hz, 1 kHz, and 100 kHz: Measure and record amplitude and frequency both at 1 kHz and 100 kHz.
5. repeat 4. using the LINE SOURCE.

Task 2: Design and build a voltage divider which produces (5 ± 1) V “output” and draws (12 ± 1) mA from the 12 V supply on your breadboard. Why is it important to specify the tolerances?

Task 3: Repeat task 2, but draw only (1.2 ± 0.1) mA.

Task 4: Repeat task 2, but draw only (1.2 ± 1) μ A. What is wrong with task 4? Identify the problem and discuss with your TA.

Task 5: Connect a $1\text{ M}\Omega$ resistor to the clock signal on your breadboard. Set the frequency selector to 1 kHz and use the scope to measure the voltage (amplitude) between the resistor and ground, using both the 1x and the 10x scope probes. Explain your observations. Keep in mind that the probes have an “input impedance” (resistance). Estimate the input impedance at the 1x setting.

Task 6: In the setup of Task 5 use a small screwdriver to study and document the effect of the compensation adjustment on the 10x scope probe. Explain your observations.