Feng Chia University

Electrical Engineering Fundamentals I Lab

# Laboratory 3

# Oscilloscope

Instructor: Prof. Shyan-Lung Lin

Student Name: 周嘉禾

Student ID: D1166506

Experiment Date:12/10/2023

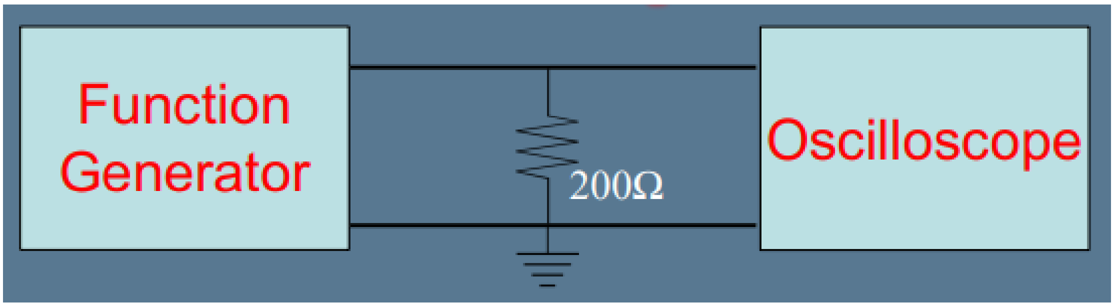
## I. Introduction

- To be familiar with operation of oscilloscope

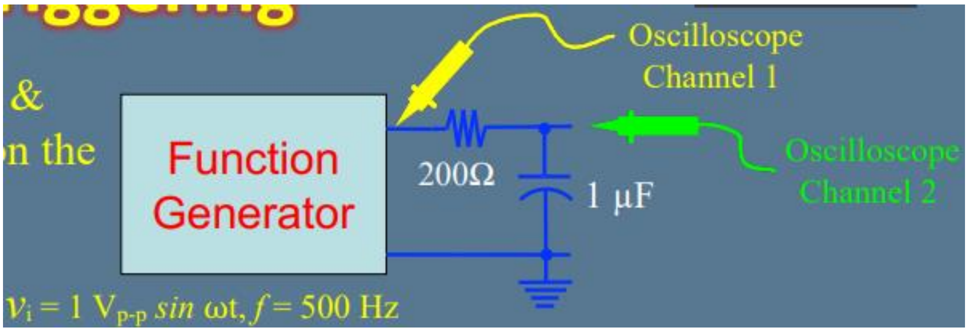
## II. Materials

- Waveform Generator
- Oscilloscope
- Devices
  a. Resistor R = 200 Ω
  b. Capacitor: C = 1 μF

## III. Circuit diagram




▲ Figure 1. Circuit of Experiment 3.a Graphing a signal on the oscilloscope




▲ Figure 2. Circuit of Experiment 3.b Triggering

## IV. Methods

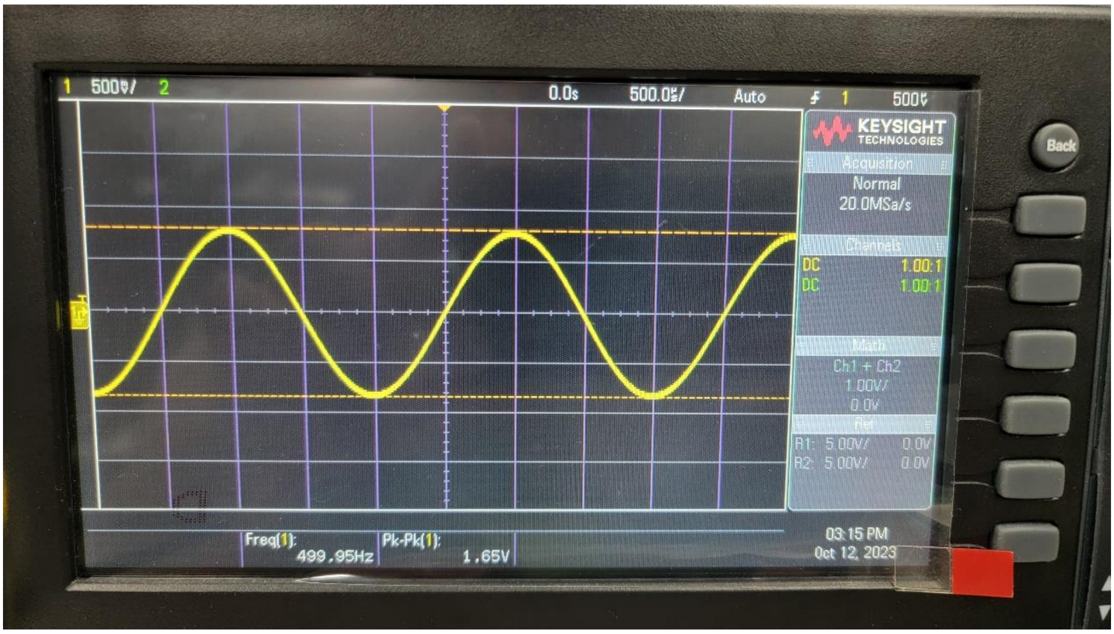
Use oscilloscope to observe and record the waves generated by function generator

## V. Experiment data

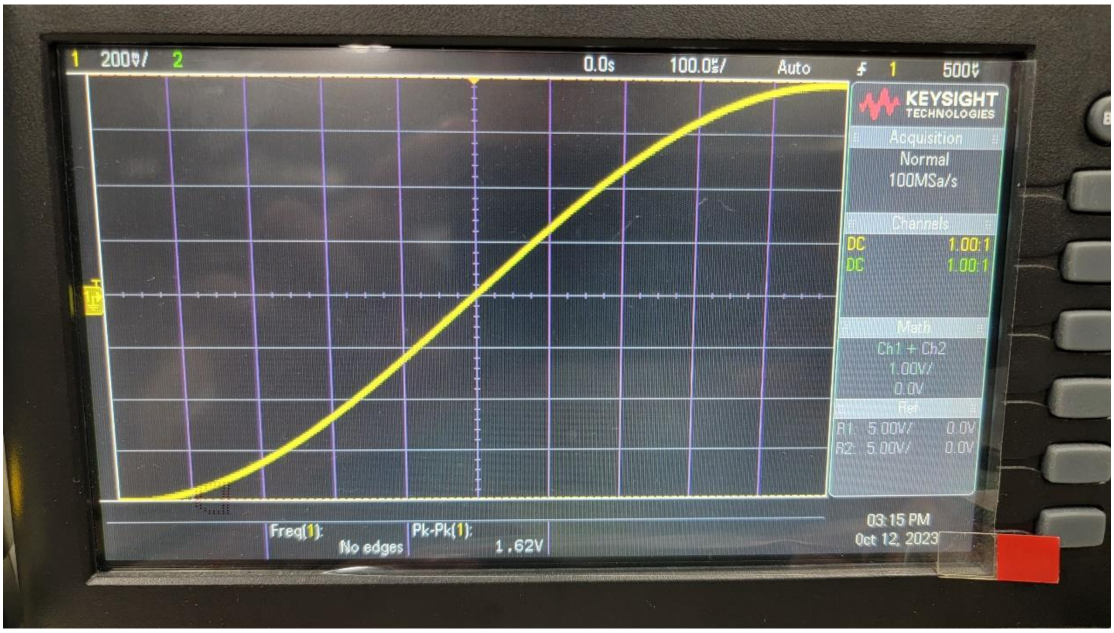
- 500 Hz
  1. channel 1 amplitude: 1.97 V
  2. channel 2 amplitude: 155 mV
  3. channel 1 to 2 phase: 33.46 °
- 5 kHz
  a. channel 1 amplitude: 1.77 V
  b. channel 2 amplitude: 34 mV
  c. channel 1 to 2 phase: 78.4 °
- 50 kHz
  a. channel 1 amplitude: 1.73 V
  b. channel 2 amplitude: 10 mV
  c. channel 1 to 2 phase: low signal

## VI. Results

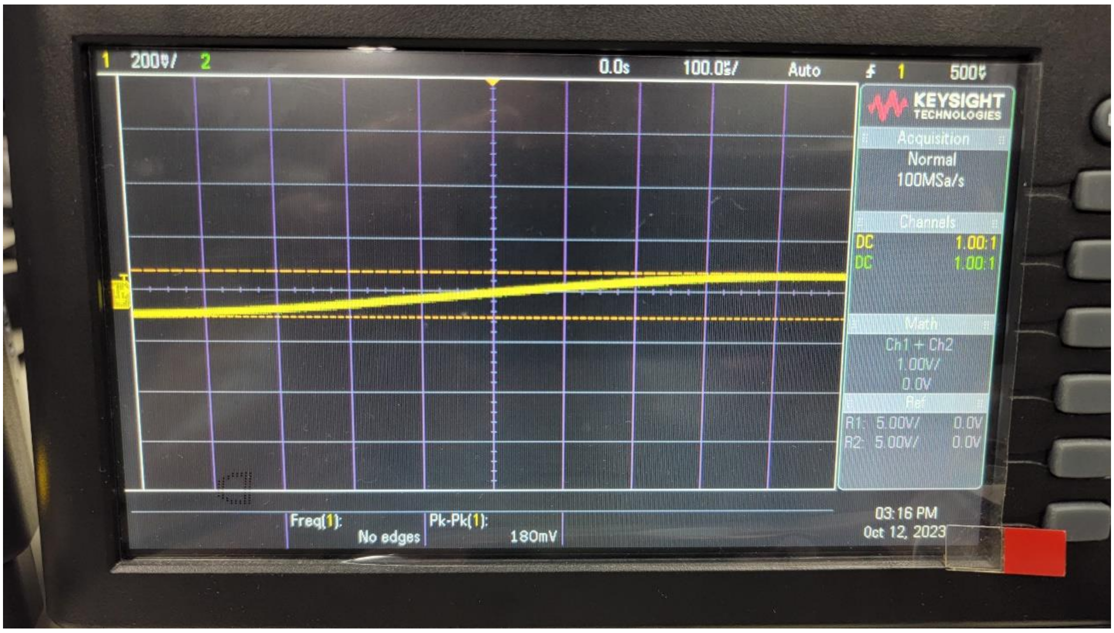

▲ Figure 3. Build the circuit shown in Figure 1.



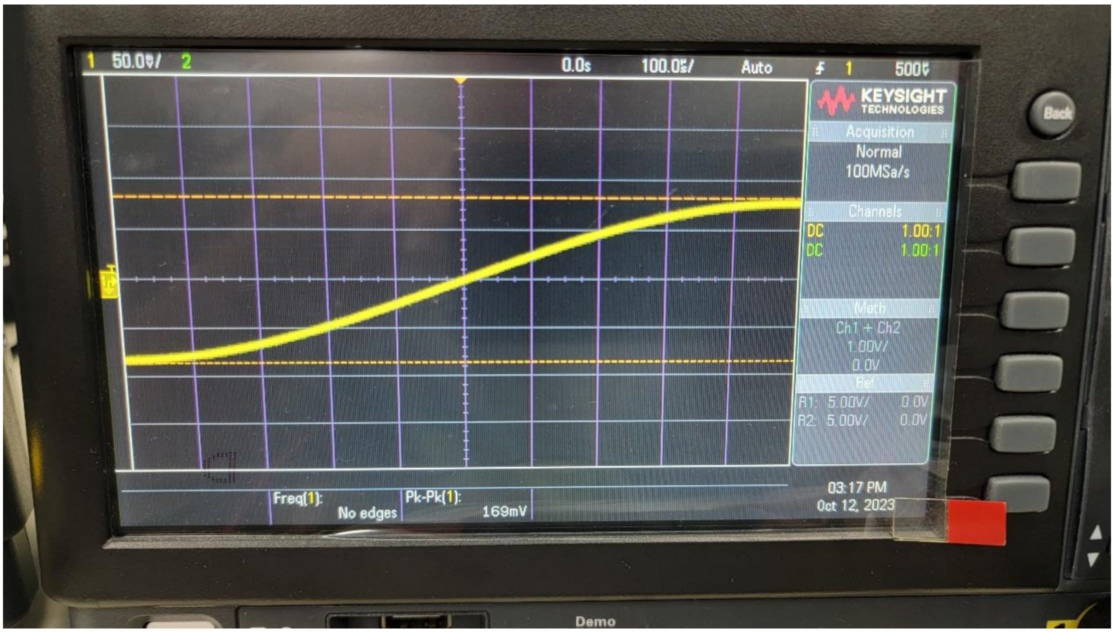

▲ Figure 4. $V_i$ = 1 $V_{p\text{-}p}$ sin ωt, f = 500 Hz generated by function generator



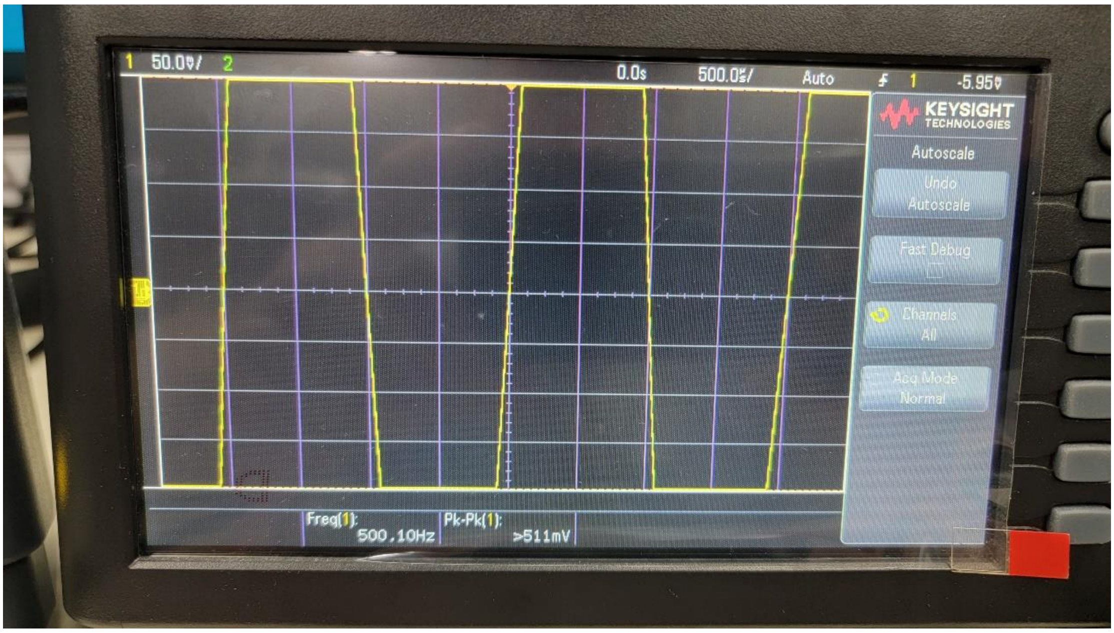

▲ Figure 5. Change division into 200mV/ and 100µs/



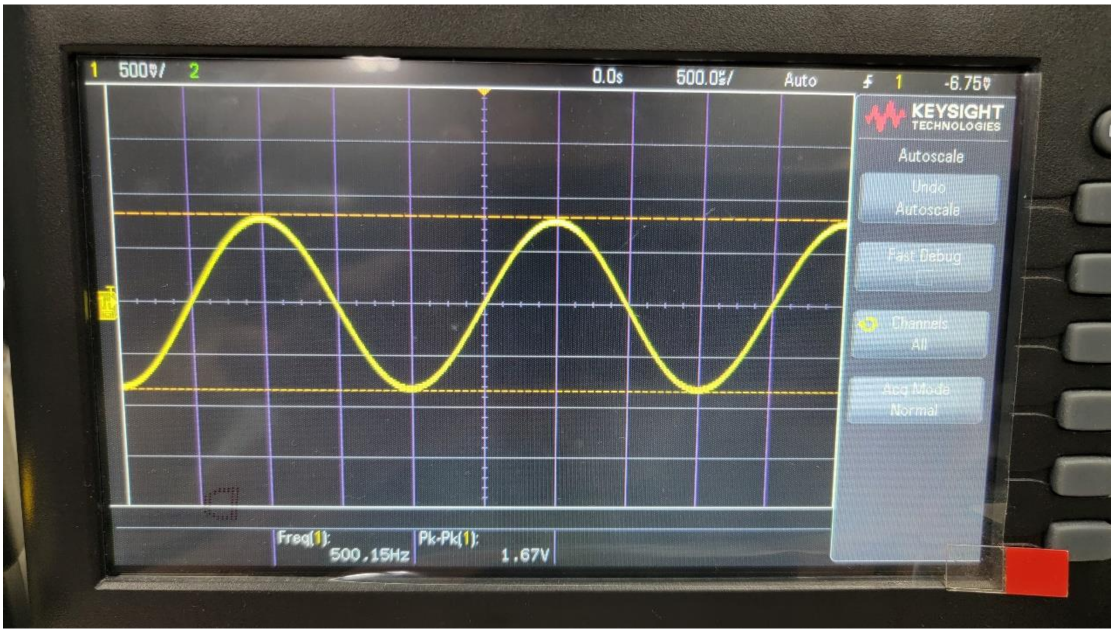

▲ Figure 6. Adjust the amplitude of the signal to $100mV_{p-p}$



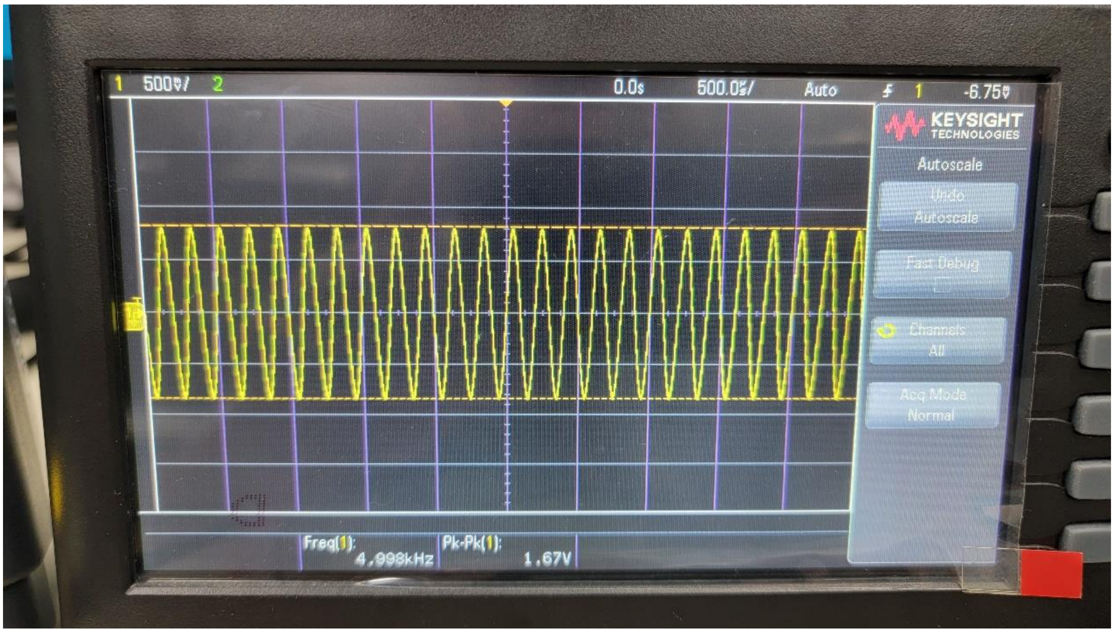

▲ Figure 7. Adjust Volts/Div to 50.0 mV/



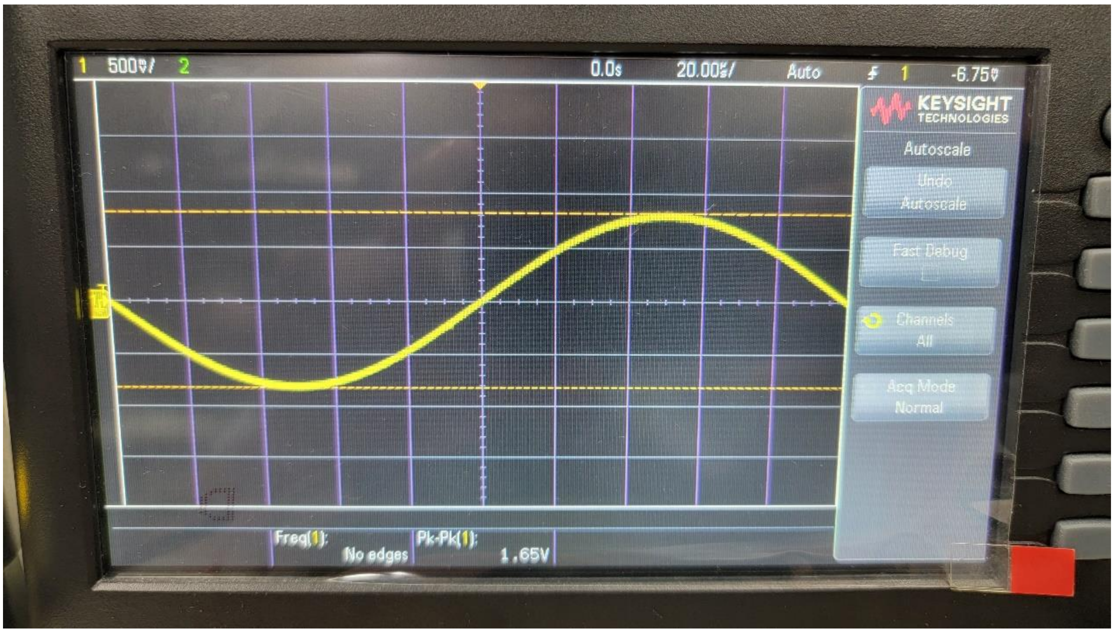

▲ Figure 8. Reset amplitude to 1 $V_{p\text{-}p}$ on function generator



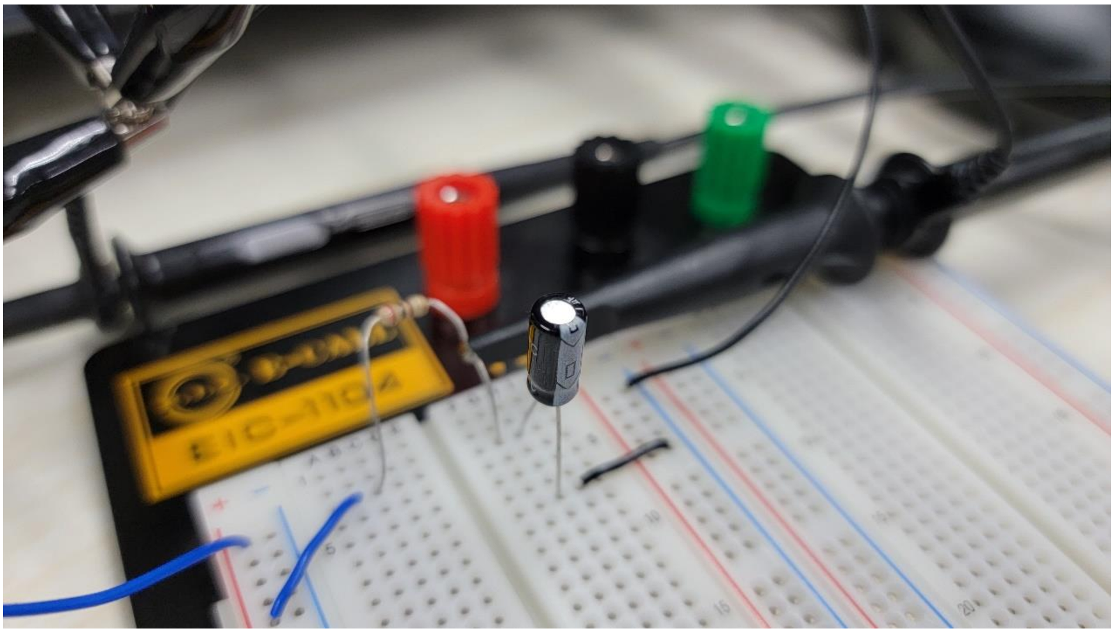

▲ Figure 9. Hit autoscale button to adjust the graph



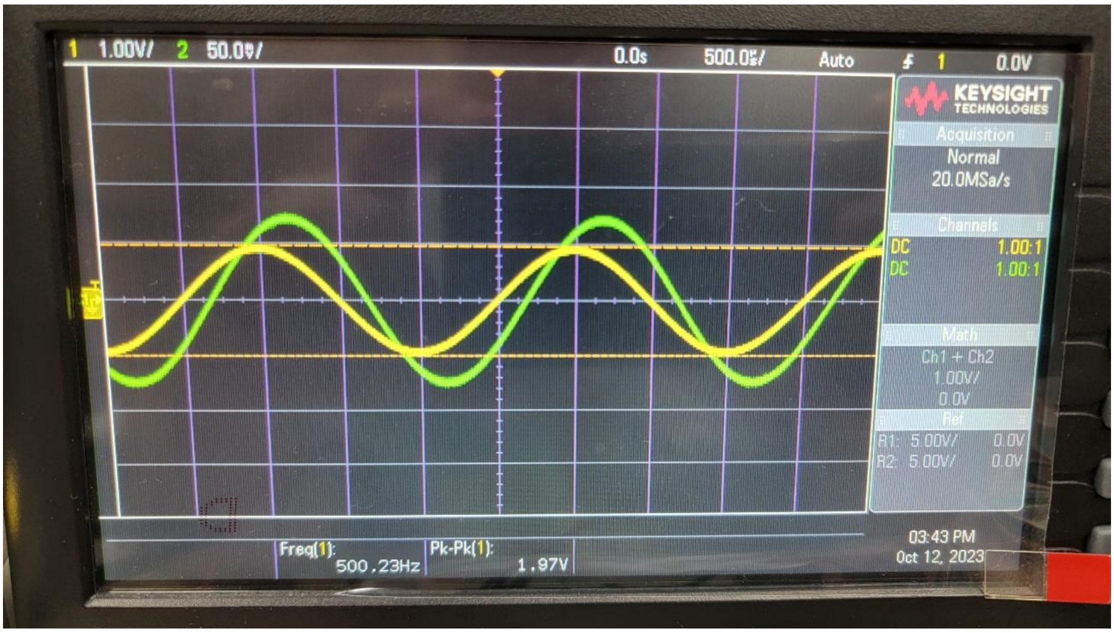
▲ Figure 10. Change the frequency of the signal from 500 Hz to 5 kHz



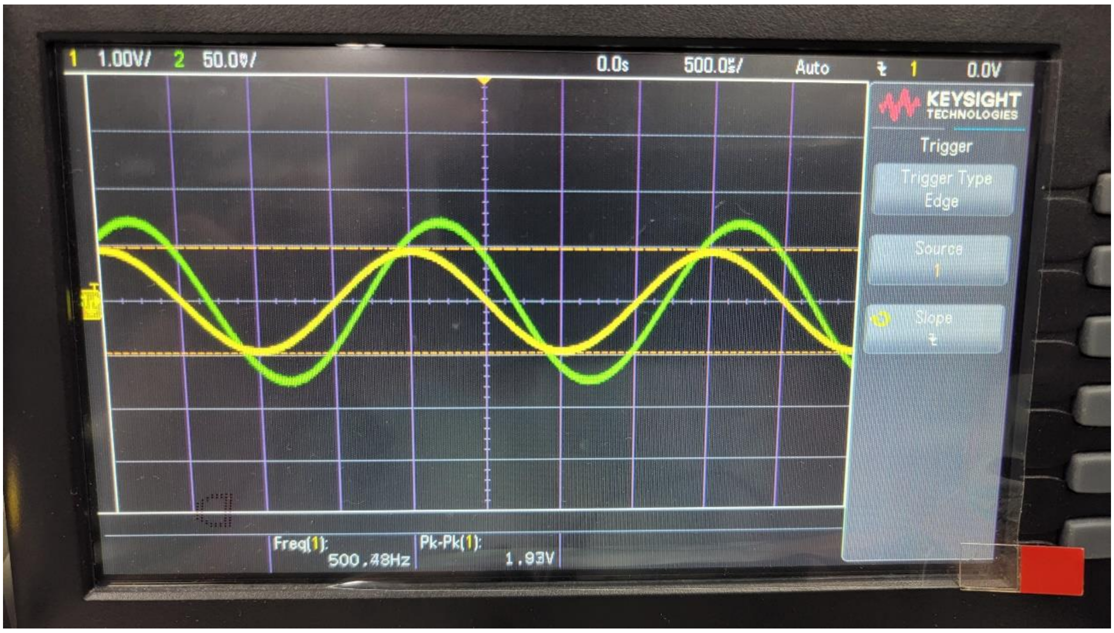
▲ Figure 11. Adjust the time scale to 20.0 µs/



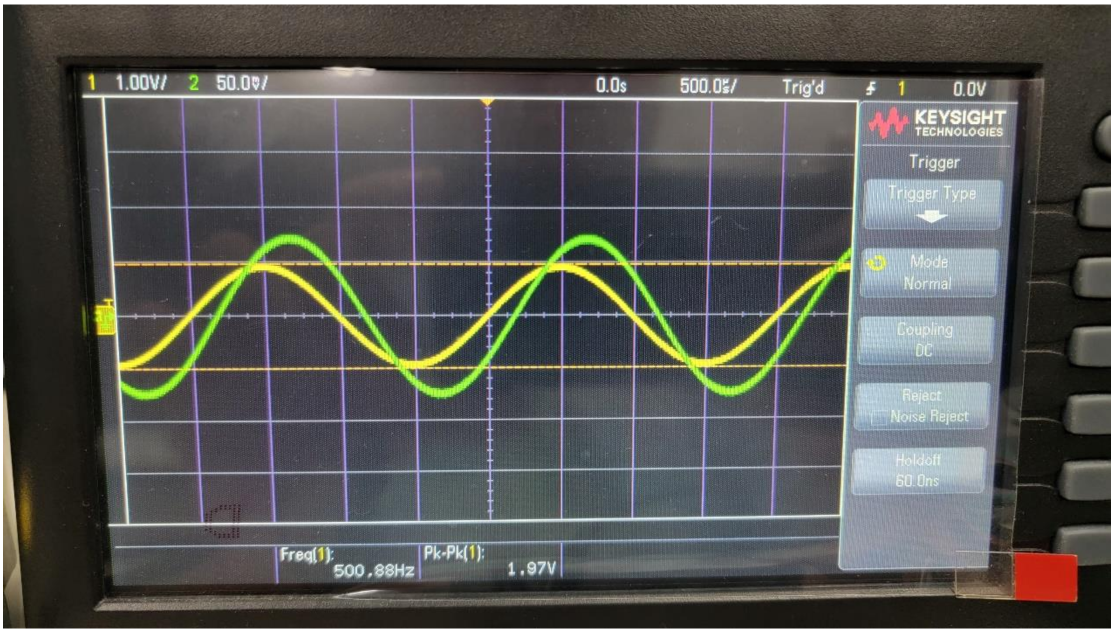
▲ Figure 12. Build the circuit shown in Fig. 2.



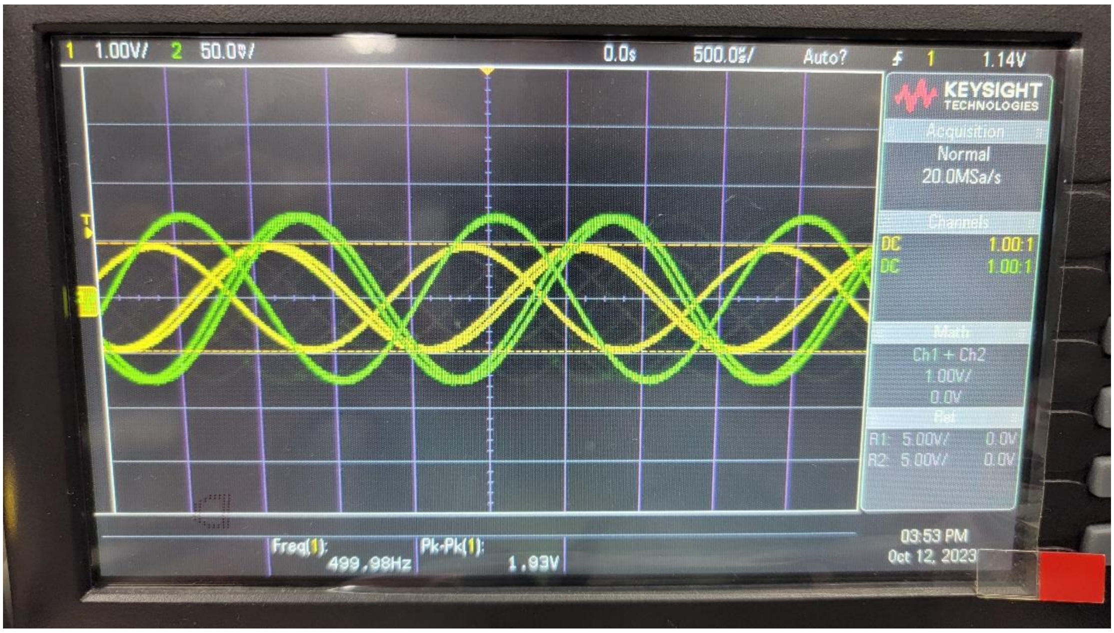

▲ Figure 13. Input signals and hit autoscale button



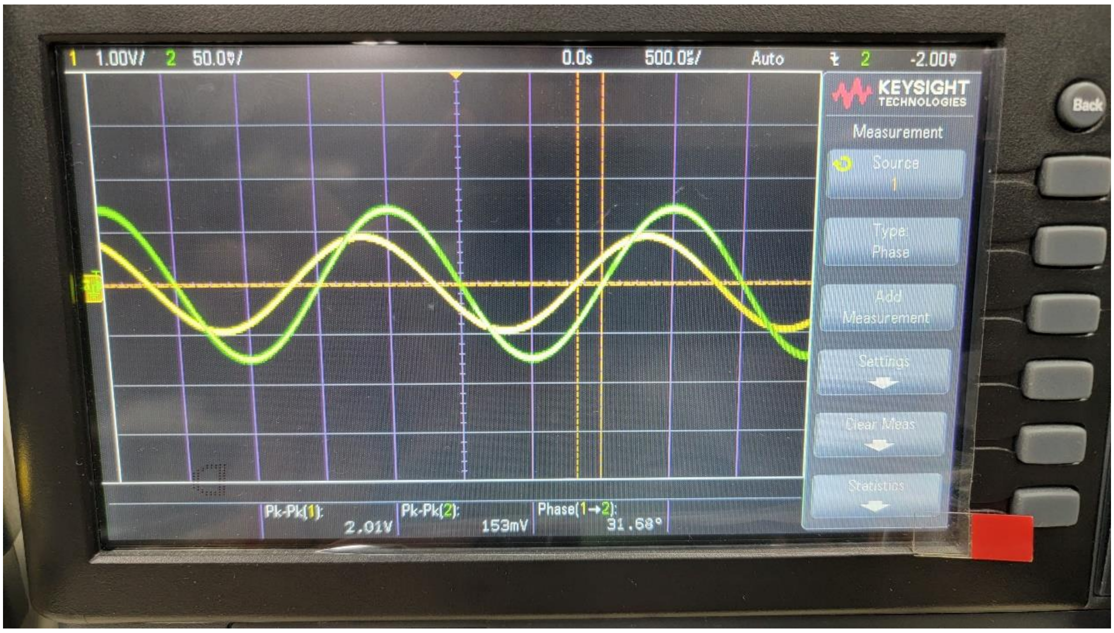
▲ Figure 14. Signal waves in falling edge trigger mode



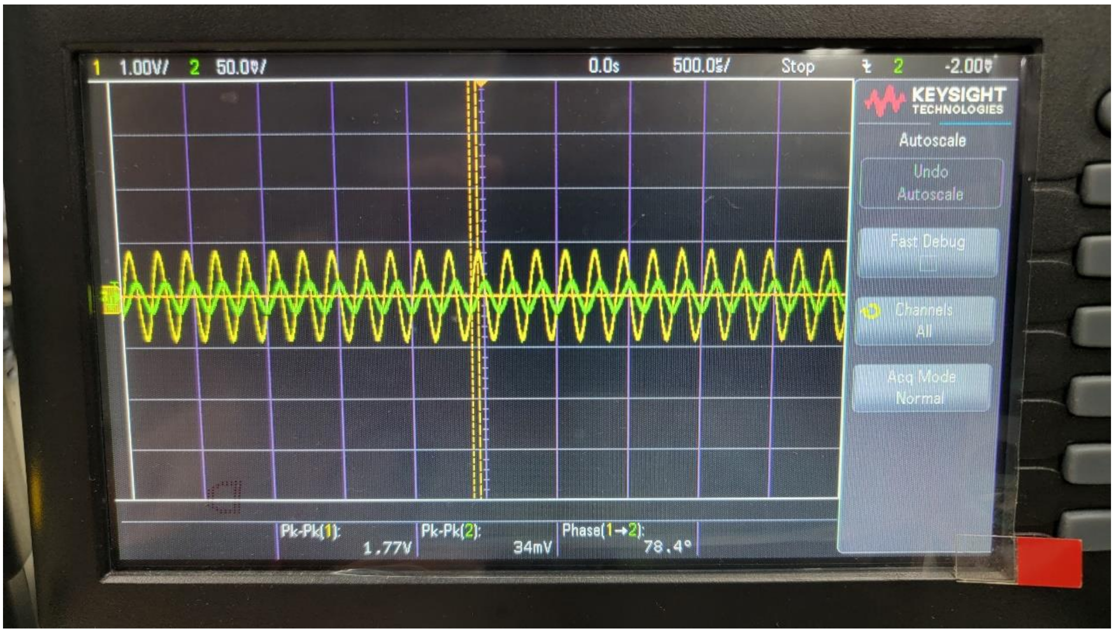
▲ Figure 15. Set trigger mode to normal, coupling to DC



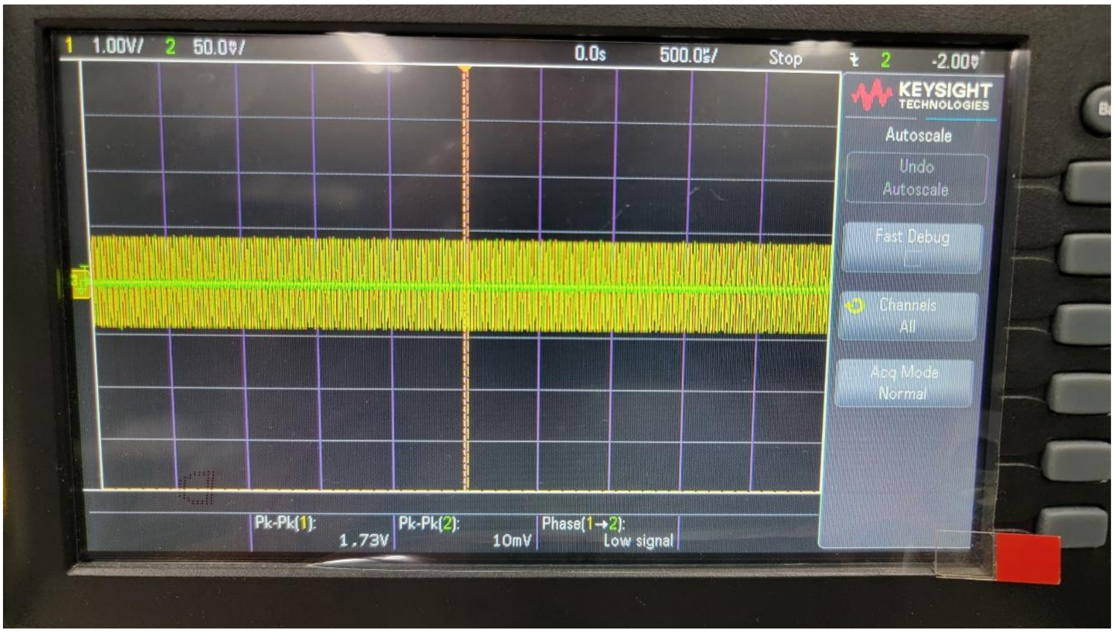

▲ Figure 16. Adjust analog level knob to change the trigger level




▲ Figure 17. Measure amplitudes and phase shift between input and output




▲ Figure 18. Measure amplitudes and phase shift of 5 kHz




▲ Figure 19. Measure amplitudes and phase shift of 50 kHz

# VII. Discussion

- Experiment 3.b
    5. What happens when the trigger level is beyond that of the signal?
       The signal will stop shifting and stand still at the same position
    6. What happens now when the level is beyond the voltage signals?

The signals become chaos and unreadable

8. Observe and try to discuss what’s going on.
   All the signals will shift left since the center will align the signal of channel 2
11. Does the RC circuit pass low-frequency signals, or does it pass high-frequency signals?
   low-frequency signals

## VIII. Conclusion

With oscilloscope, we can observe signal waves and calculate amplitude or phase shift easily.