

Title : Voltage Deviation Visualizer

CSE251 Lab Project

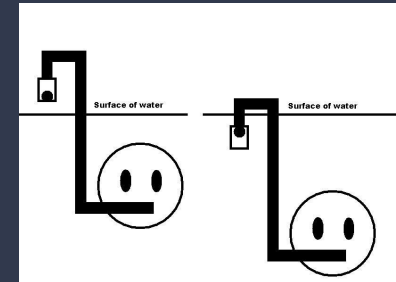
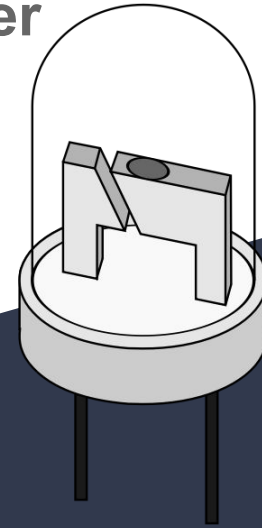
Instructor to:

- 1) Akib Anjum
- 2) Md. Tasnim Azad

Performed by: Group : 05

Members :

- | | | |
|----|-------------------|------------|
| 1) | Sadia Islam | (22101077) |
| 2) | Israt jahan lamia | (22101181) |
| 3) | Suraiya Shanaz | (22201313) |
| 4) | Adiba Mahbub | (21301005) |



Overview

- **Project goal:**

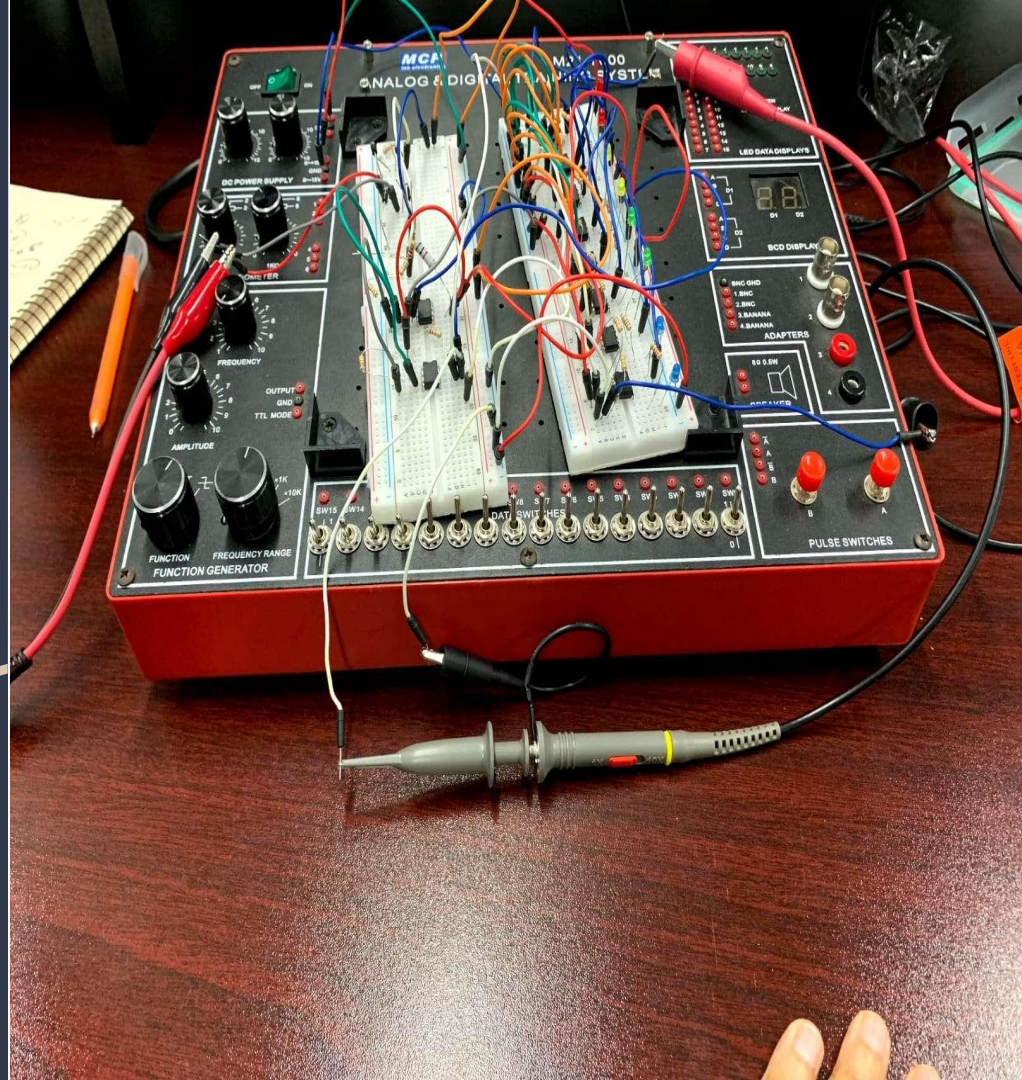
Design and implement a Voltage Deviation Visualizer circuit.

- **Circuit function:**

Takes analog input voltage varying with time to emulate pressure sensor output deviation.

Quantized deviations into different levels.

Visualizes quantized levels using an array of LEDs.



- **LED indication:**

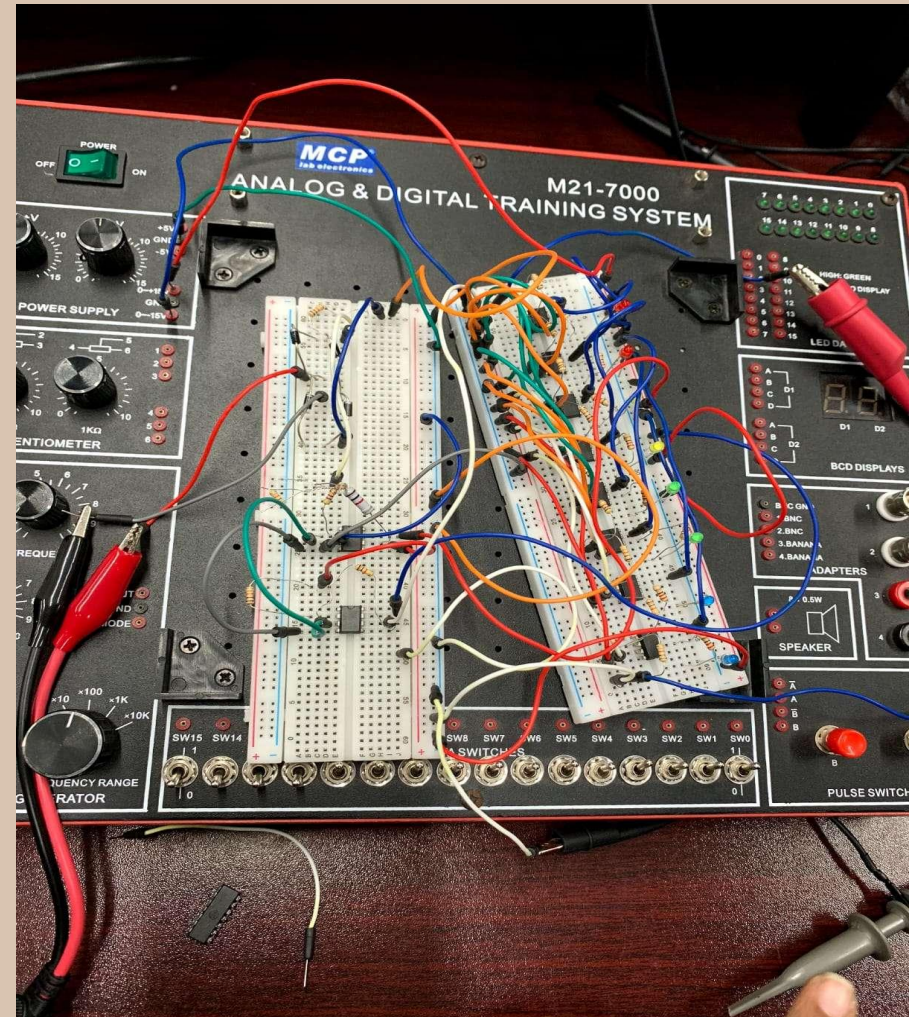
Different colors signify optimal or suboptimal pressure levels for easy comprehension.

- **Components:**

Utilizes diodes and op-amps from previous lab experiments.

- **Educational aspect:**

Students apply principles of electronics and circuit design to create a real-world applicable circuit.



[1]Rectifier Block

Israt jahan lamia(22101181)

According to given information we have to use a full wave rectifier without capacitor.

[4]Visualization Block

Sadia Islam(22101077)

This setup provides a visual indication of pressure deviation, allowing for quick assessment and adjustment as needed.

[2]Amplifier Block

Suraiya Shanaz(22201313)

We have to use amplifier block to confine the output of the rectifier within 0v to 5v.

[3]Quantizer Block

Adiba Mahbub(21301005)

The Quantizer block discretizes the input signal using a quantization algorithm.

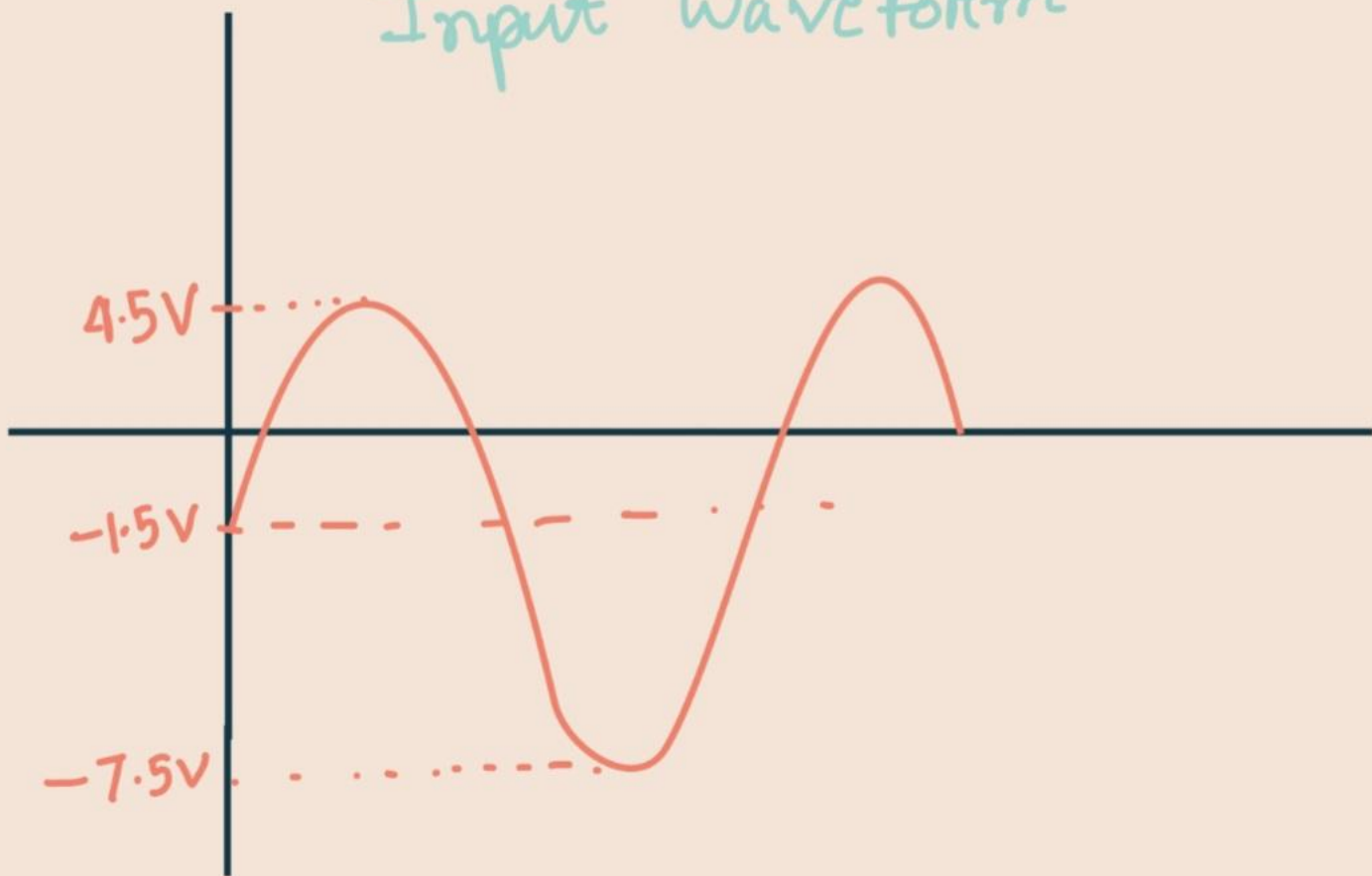
Input voltage reflects pressure deviation from optimal. For the sinusoidal input we use amplitude of 6 volt rectifier and DC offset is $-(1.5)$ and frequency is 1 hz.



Analogue Input Voltage

- Amplitude **6V**
- DC offset **-1.5V**
- Frequency **1 HZ**
- **Max 4.5 V, Min -7.5 V**

Input waveform

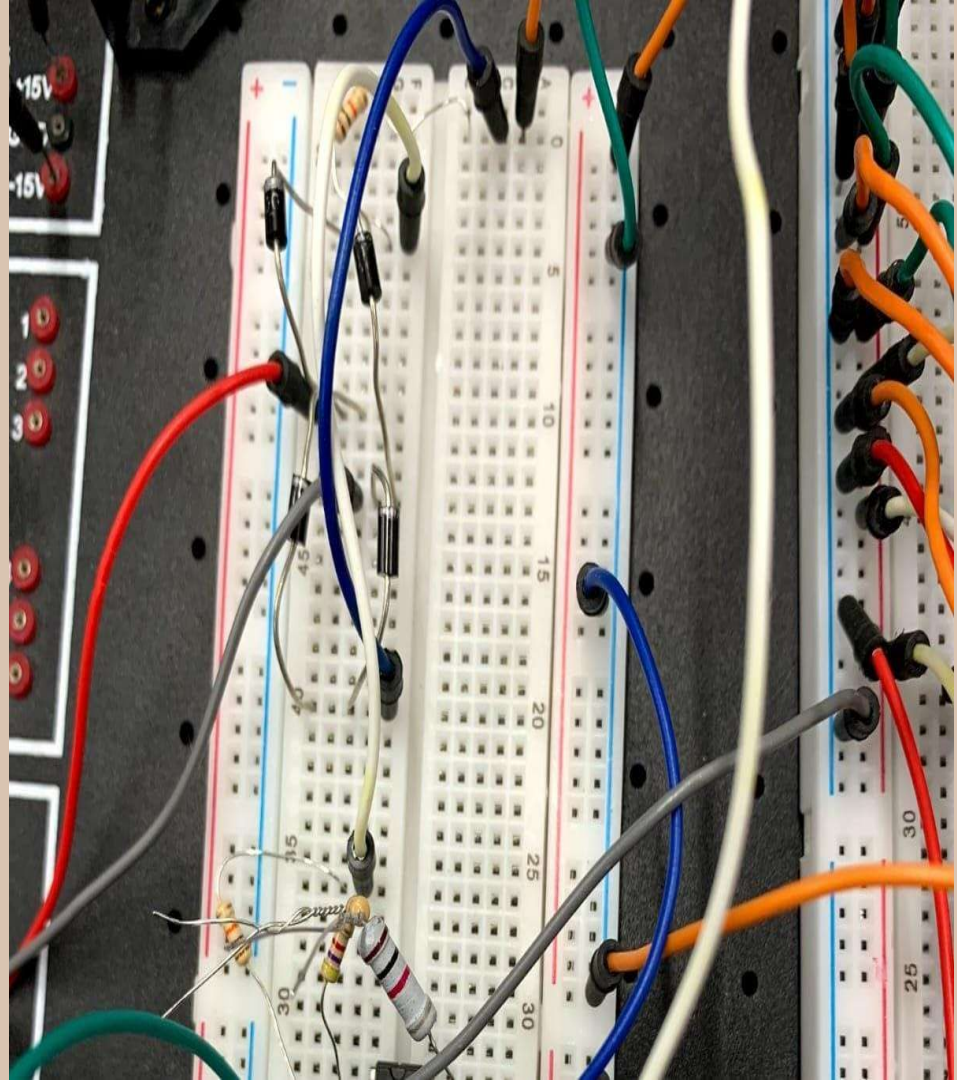


Rectifier Block

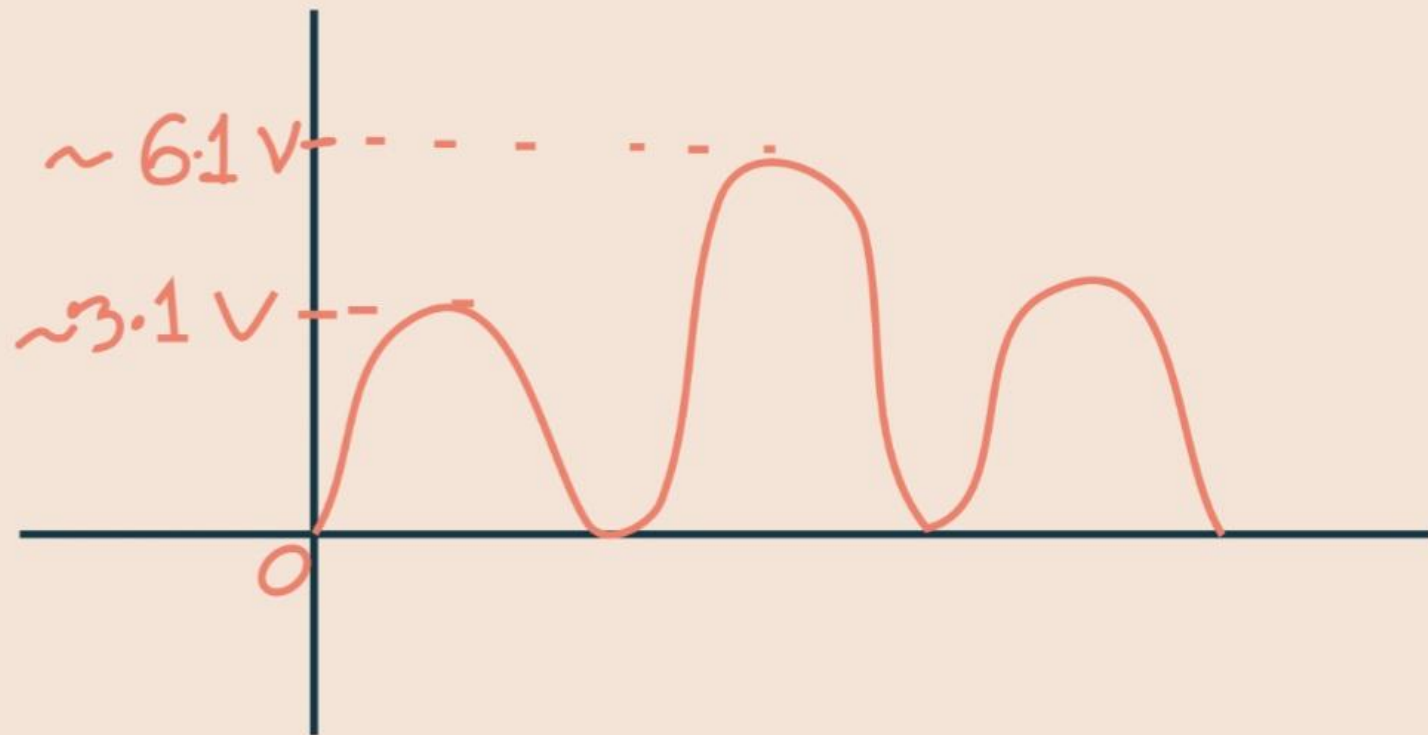
Full-wave rectifier (without capacitor)
used to convert input to unipolar.
Prepares input signal for further
processing and visualization.

$$V_{in} = |V_{in}| - 2V_d$$

Max~ 6.1

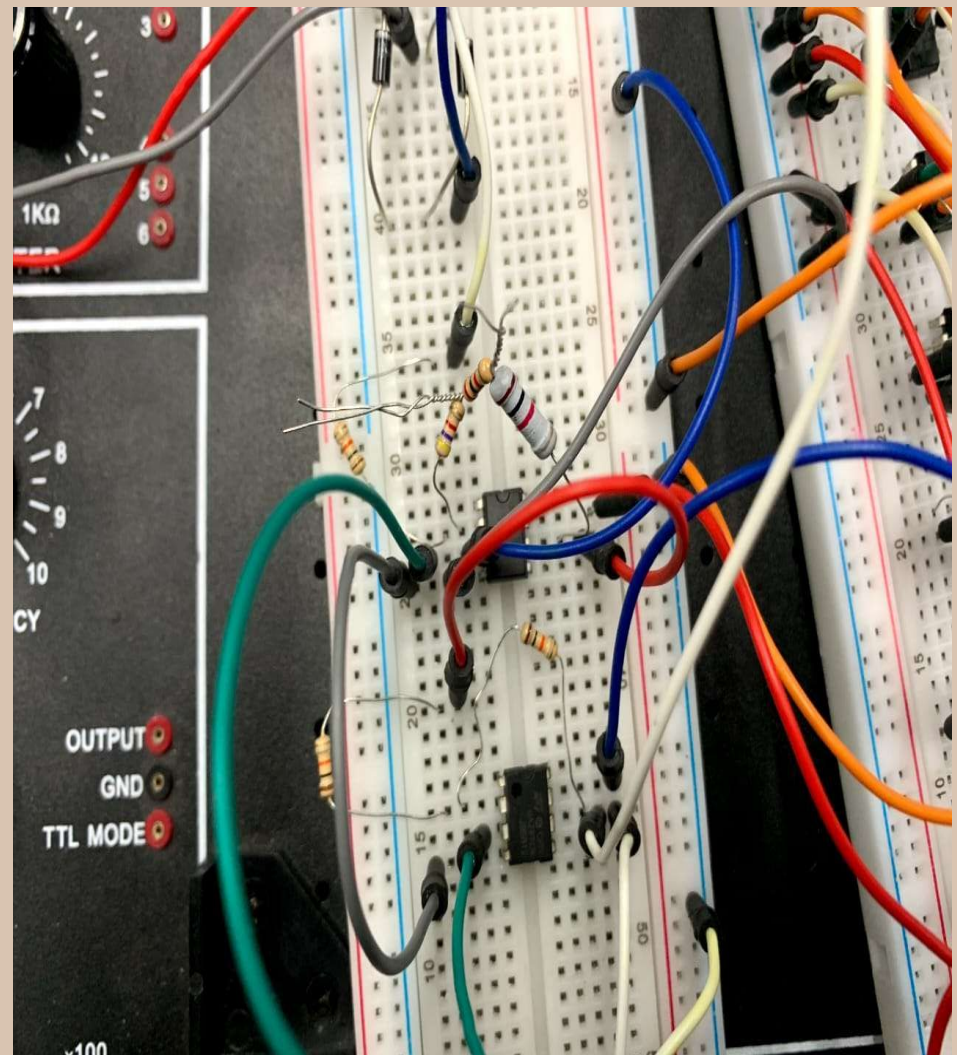


Rectified waveform



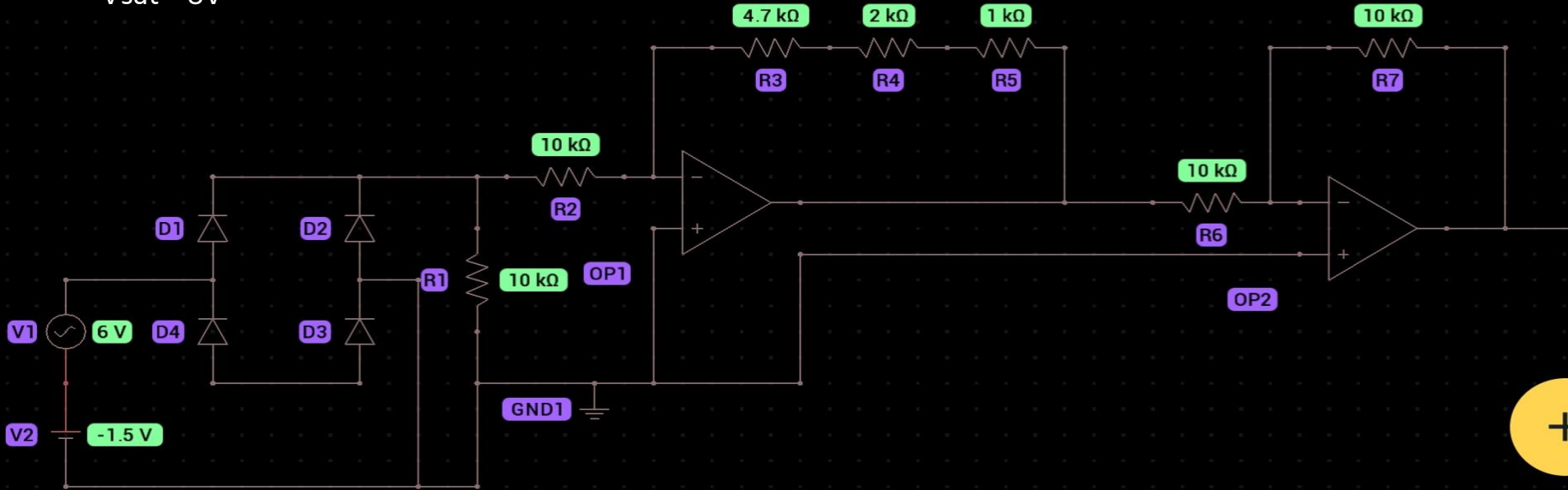
Amplifier Block

The function of the amplifier block is to restrict the output voltage of the rectifier block within a specified range, in this case, 0 volts to 5 volts. We will configure the amplifier block based on the output of the rectifier block.



Circuit Diagram of Rectifier and Amplifier Blocks

$+V_{sat}=8V$
 $-V_{sat}=-8V$



1st Op-Amp

- $R_f \sim 4.61K + 1.91k + .98K$
- $R_i \sim 9.91K$

2nd Op-Amp

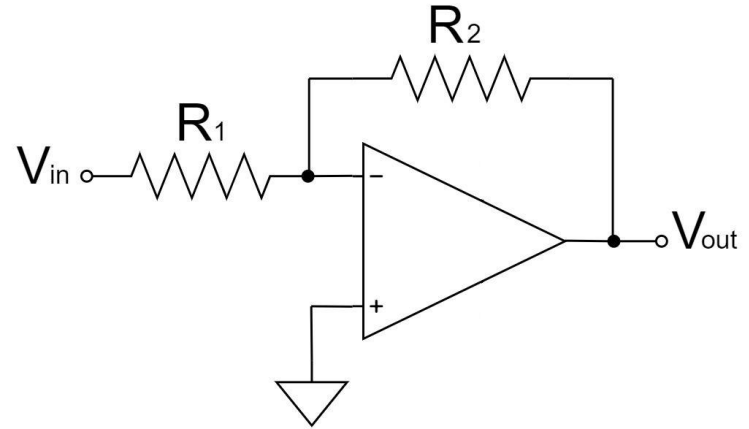
- $R_f, R_i \sim 9.92K$

Output of Amplifier block

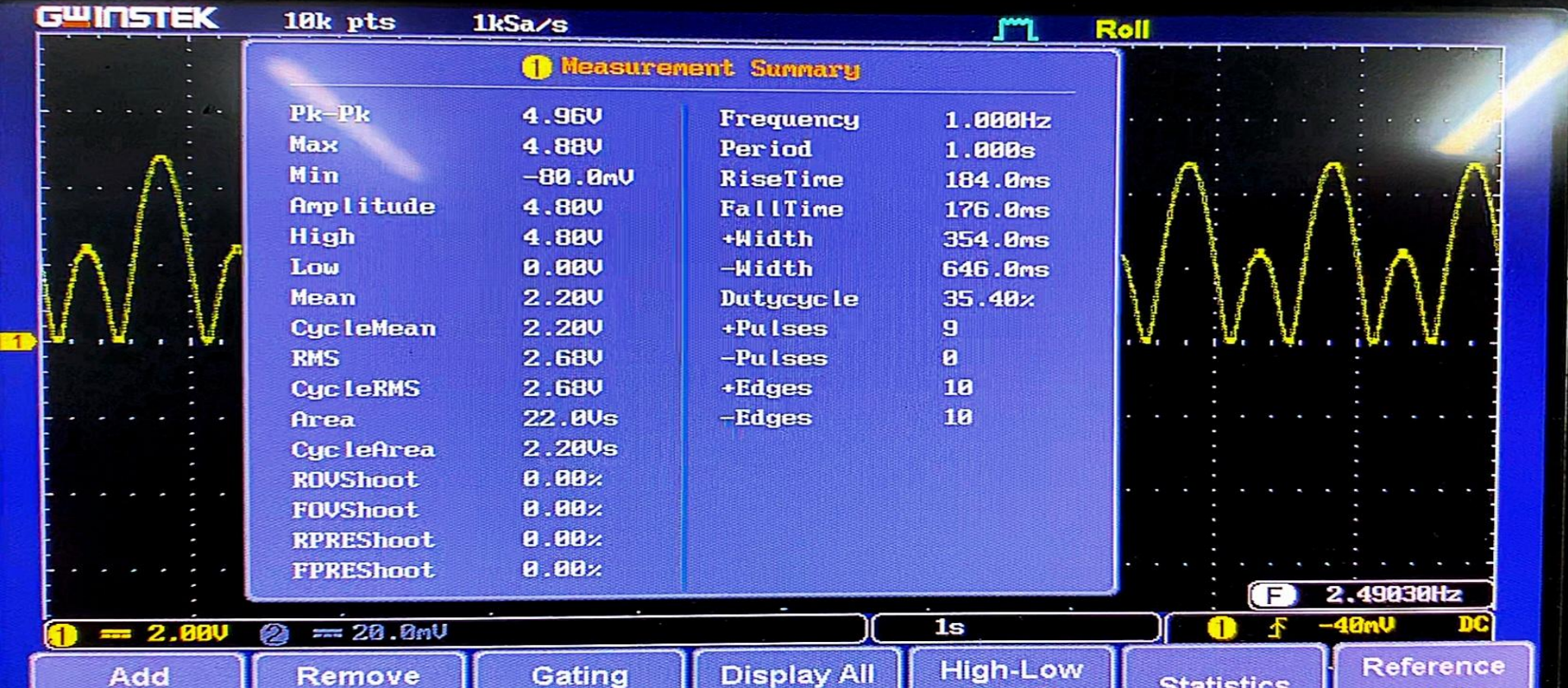
New Max $\sim 4.88\text{ V}$

Pk-Pk $\sim 4.96\text{ V}$

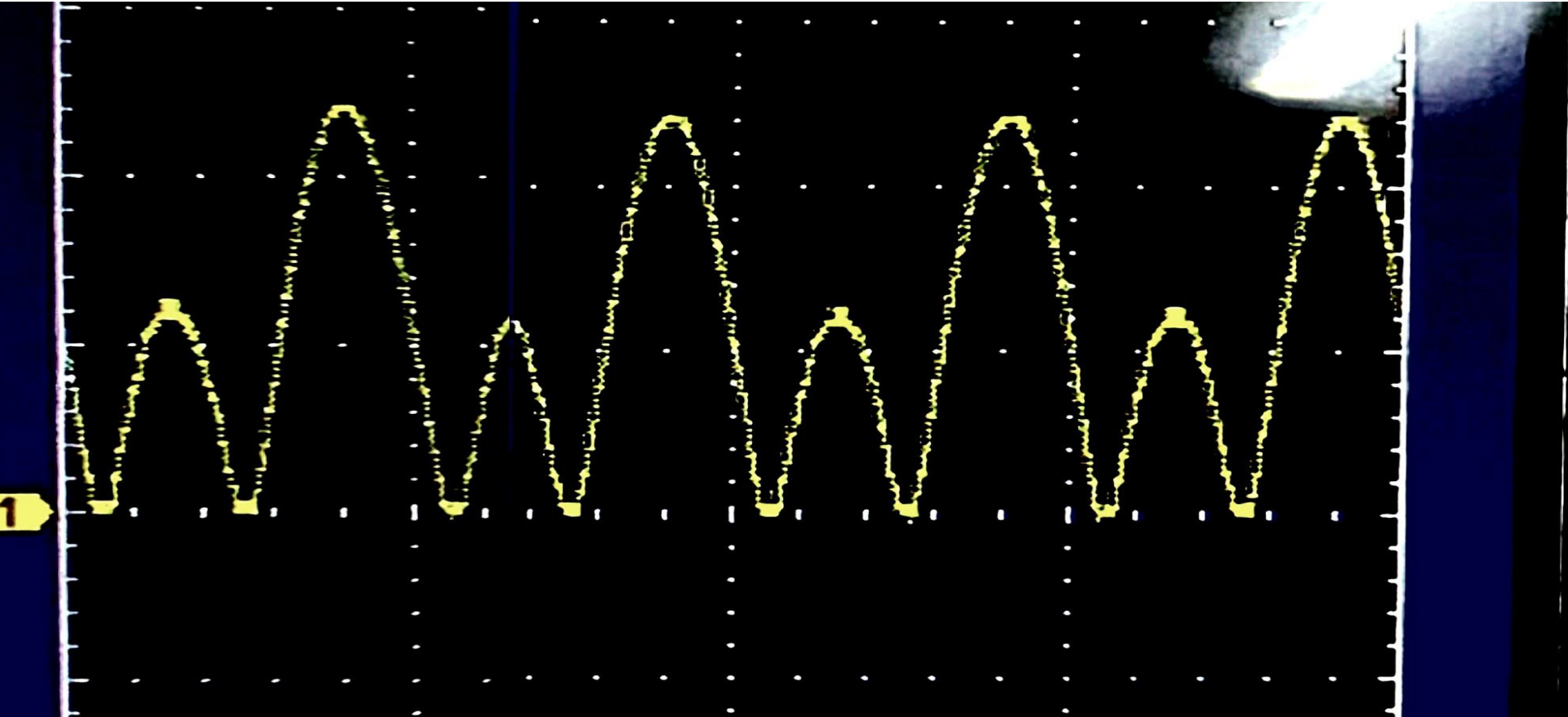
Inverting Amplifier Circuit



Amplifier block out put summary and waveform

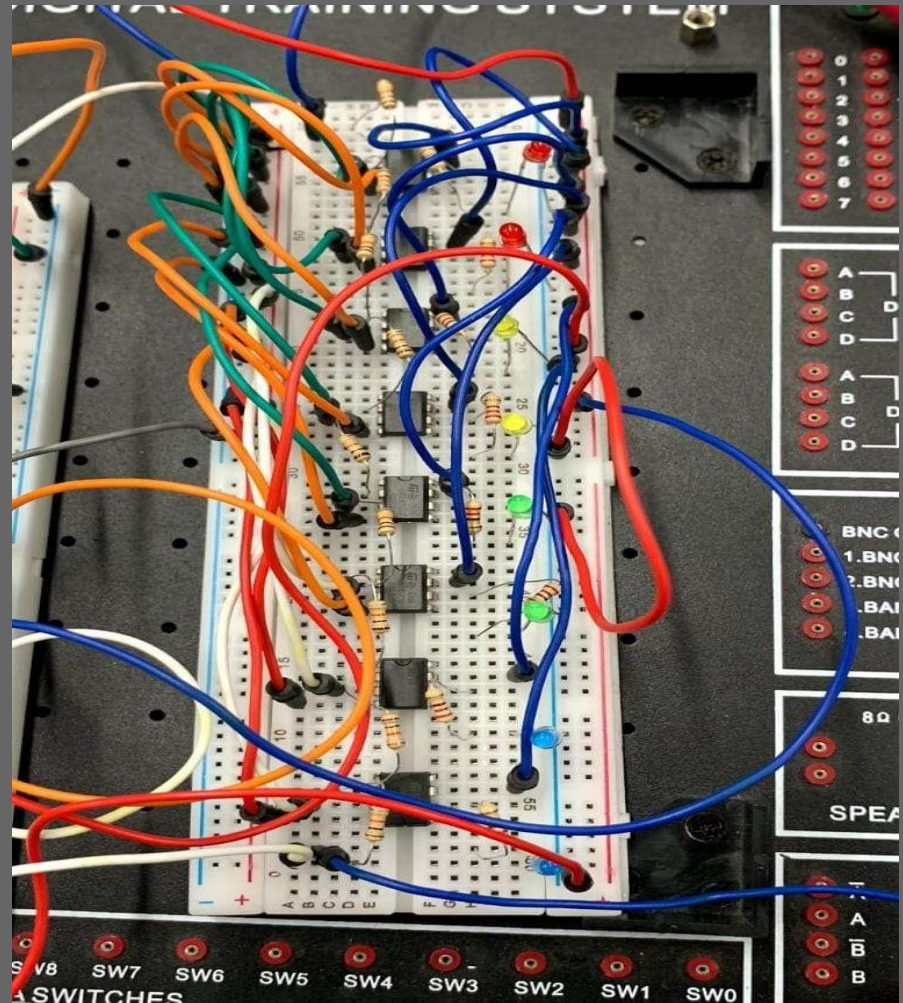


Amplifier Block waveform



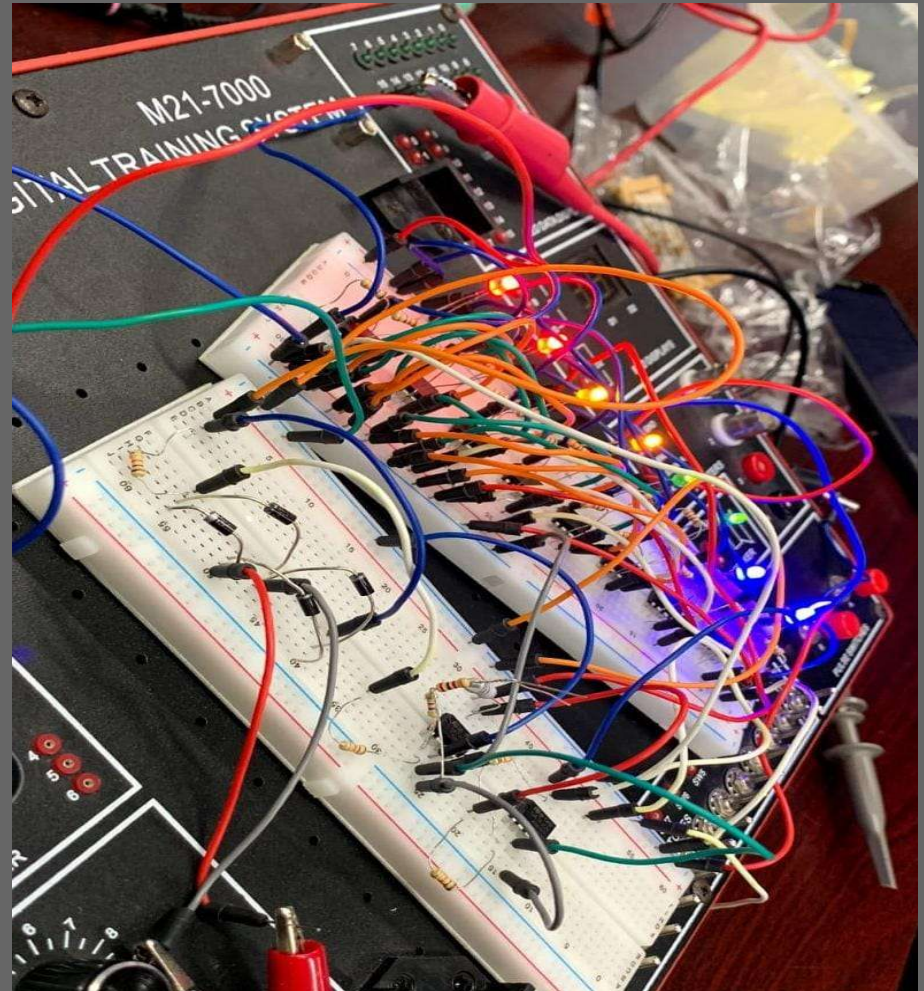
Quantizer block

The quantizer block transforms the continuous output voltage from the amplifier into distinct output levels. Purpose of quantization: Integrating seamlessly with the prior amplifier and rectifier blocks ensures The quantizer block transforms the continuous output voltage from the amplifier into distinct output levels.



Visualization Block

The primary purpose of this visualization block is to provide a quick and intuitive indication of the pressure deviation. The deviation from the optimal pressure using multiple LEDs. The block receives input from the quantizer block, which converts the pressure readings into discrete levels. Based on these levels, the LEDs are activated accordingly.



Challenges:

- Virtual Visualizer
- Ground
- Op-Amp
- Inverting Signal
- Load Resistance

Thank you !