



Digital version

ENGS152 Circuits Lab

Basic OpAmp Circuits

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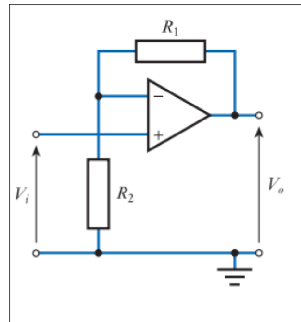
April 6, 2025

Step 1

Nothing to show.

Step 2

A non-inverting amplifier was built using a $10k\Omega$ fixed resistor and a $10k\Omega$ potentiometer to control the gain. A $1V$ amplitude, $1kHz$ sine wave was used as the input signal. By adjusting the potentiometer, the gain varied smoothly from $2V$ (output twice the input) to a point where the output signal saturated, as confirmed by the oscilloscope readings. When the potentiometer resistance was high, the output was twice the input, while at low resistance, the gain increased significantly, resulting in signal clipping around $15V$. The results matched theoretical expectations, demonstrating proper amplifier behavior and confirming the correct configuration where the potentiometer controlled the resistor to ground in the gain equation

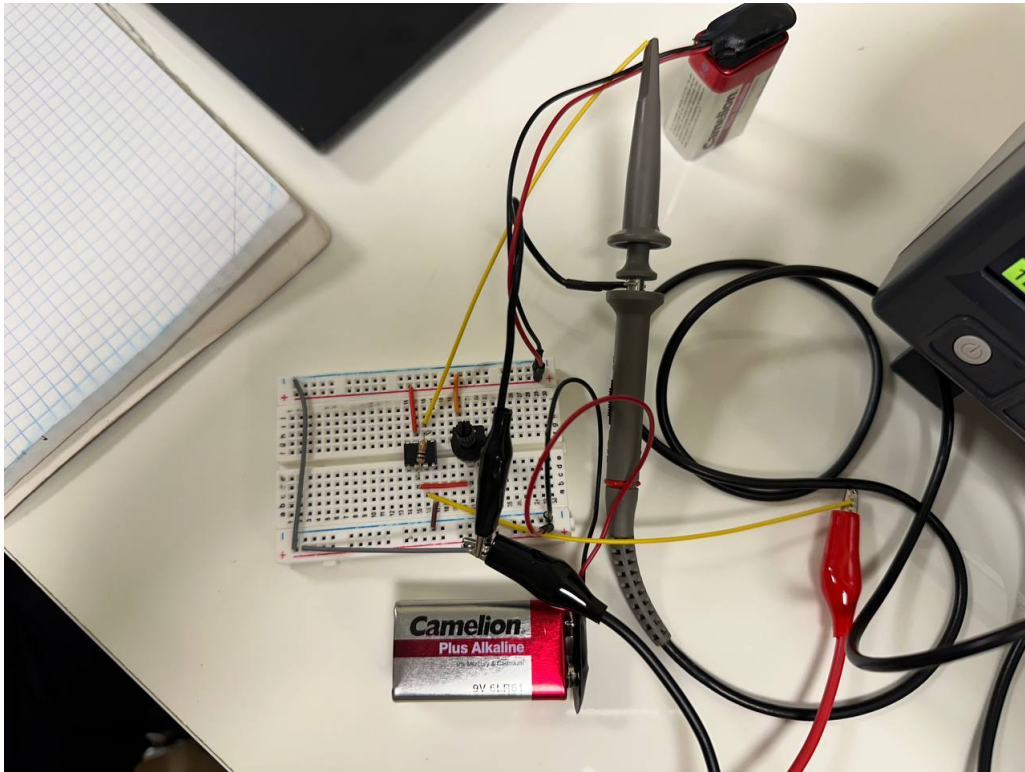


$$V_{\text{out}} = V_{\text{in}} \frac{R_1 + R_2}{R_2}$$

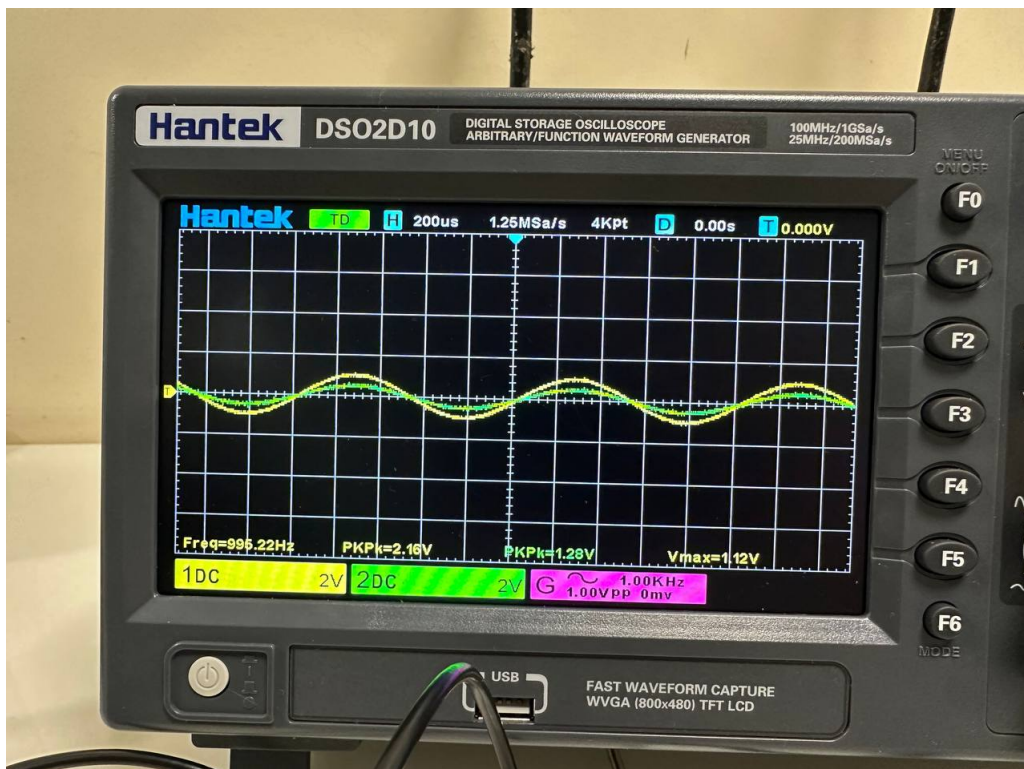
R_1 is the constant resistor, R_2 is the variable resistor.

The output was capped at around $14.24V$, because the datasheet states Maximum peak output voltage swing $14V$

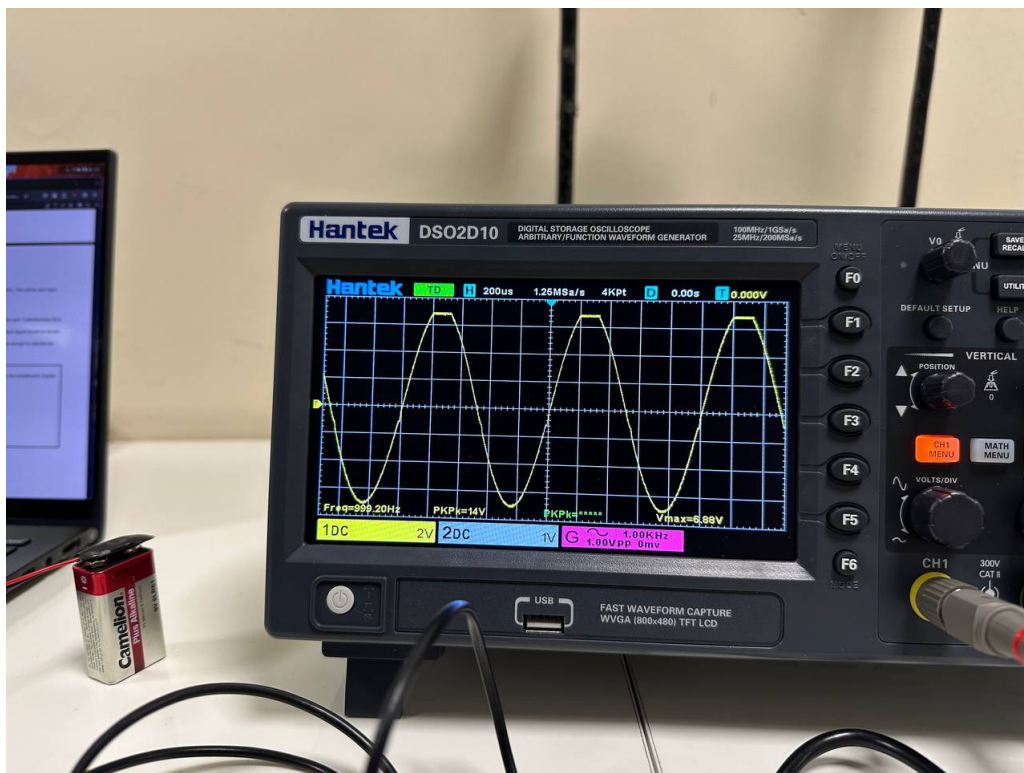
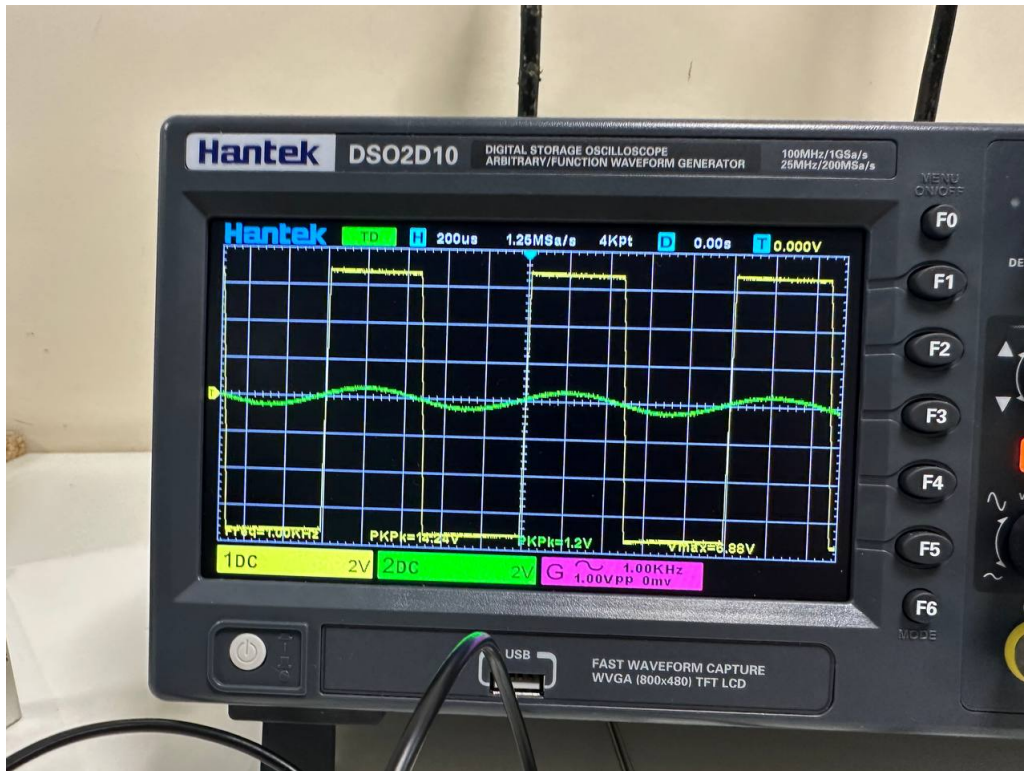
Circuit.



Very low (2x) amplification.



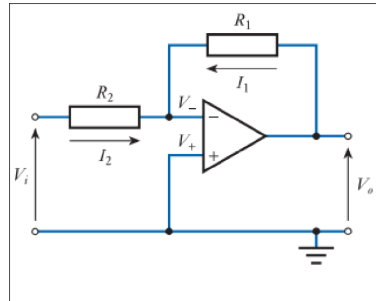
Maximum amplification and saturation.



The top battery had a smaller voltage, compared to the lower battery, which is why the top of the amplified signal clipped earlier than the bottom part. Extra credit would be appreciated :).

Step 3

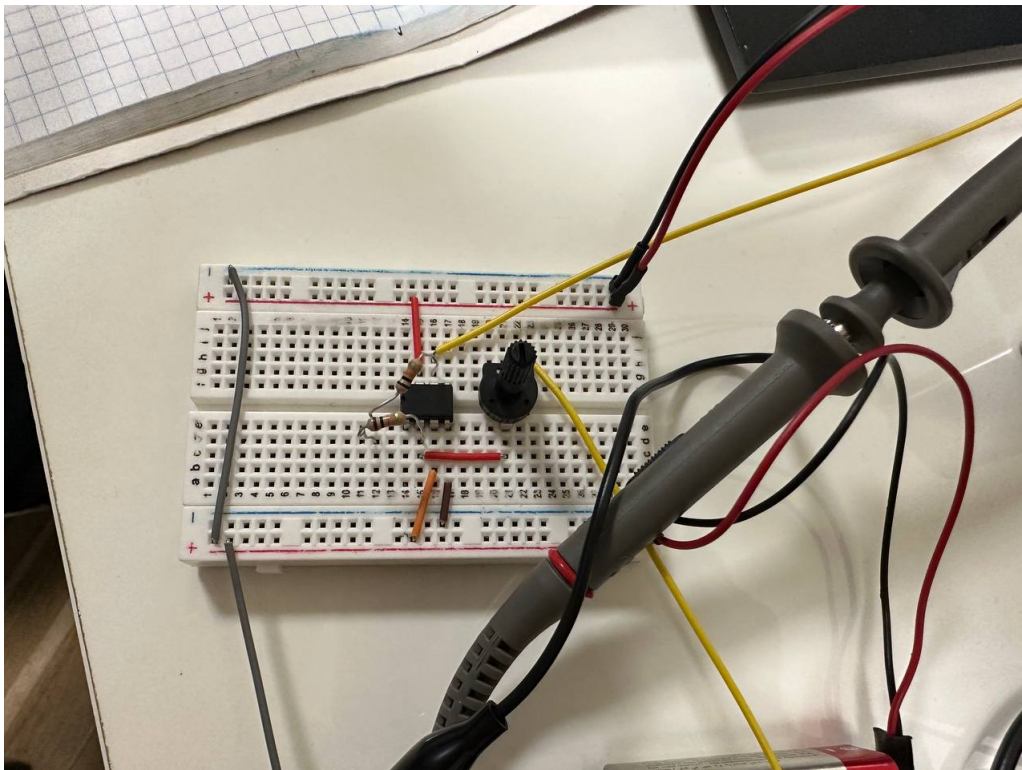
A $20k\Omega$ resistor and a $10k\Omega$ potentiometer were used, with the same input signal. With the pot fully turned one way, the output was inverted and $2V$ as expected. Fully turning it the other way increased the gain and caused output saturation. Results matched expectations, showing smooth gain transition and correct saturation behavior.



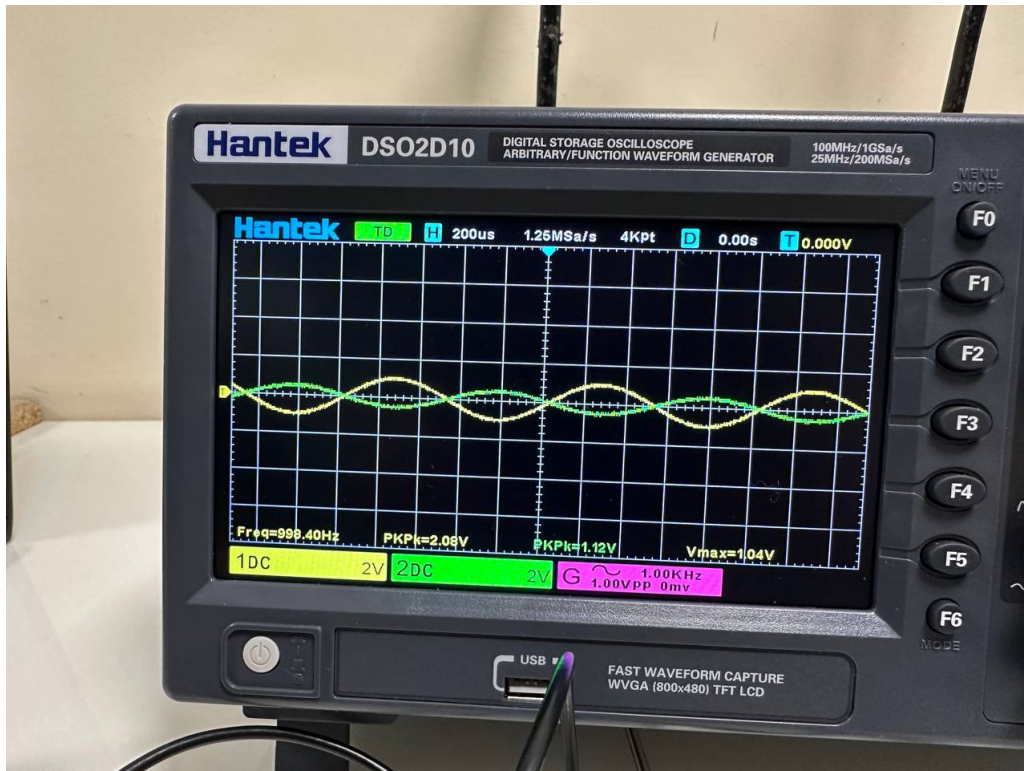
$$V_{\text{out}} = -V_{\text{in}} \frac{R_1}{R_2}$$

R_1 is the constant resistor, R_2 is the variable resistor.

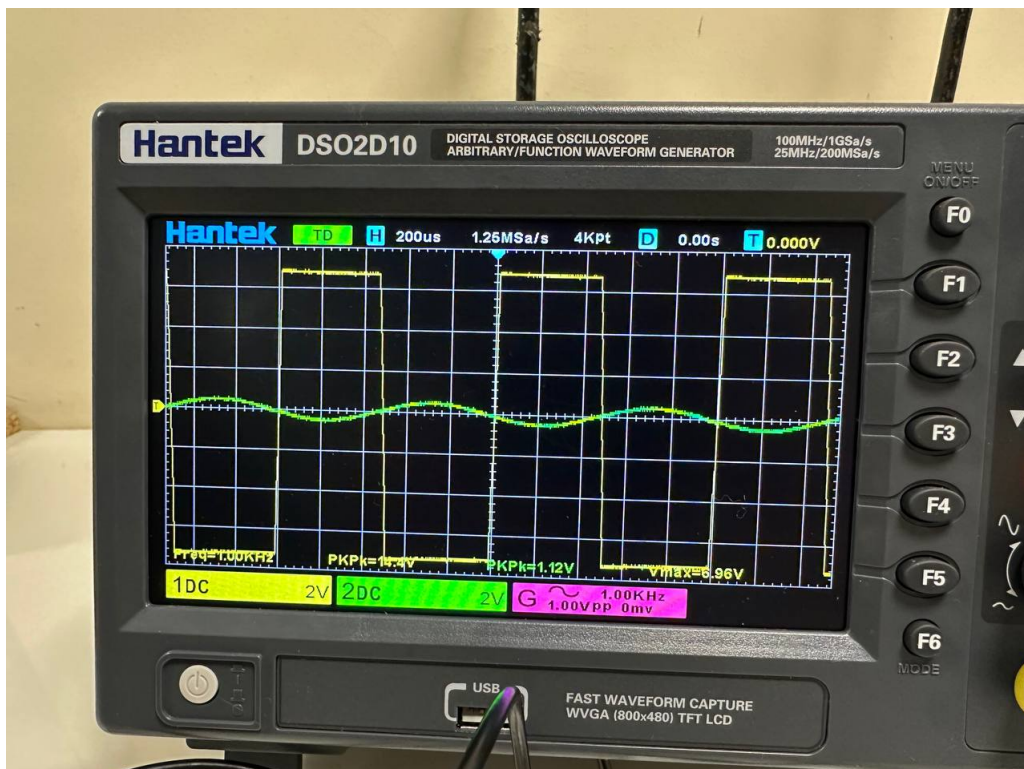
Circuit.



Very low (2x) amplification.



Maximum amplification and saturation.



The output was capped at around 14.4V, because the datasheet states Maximum peak output voltage swing 14V