

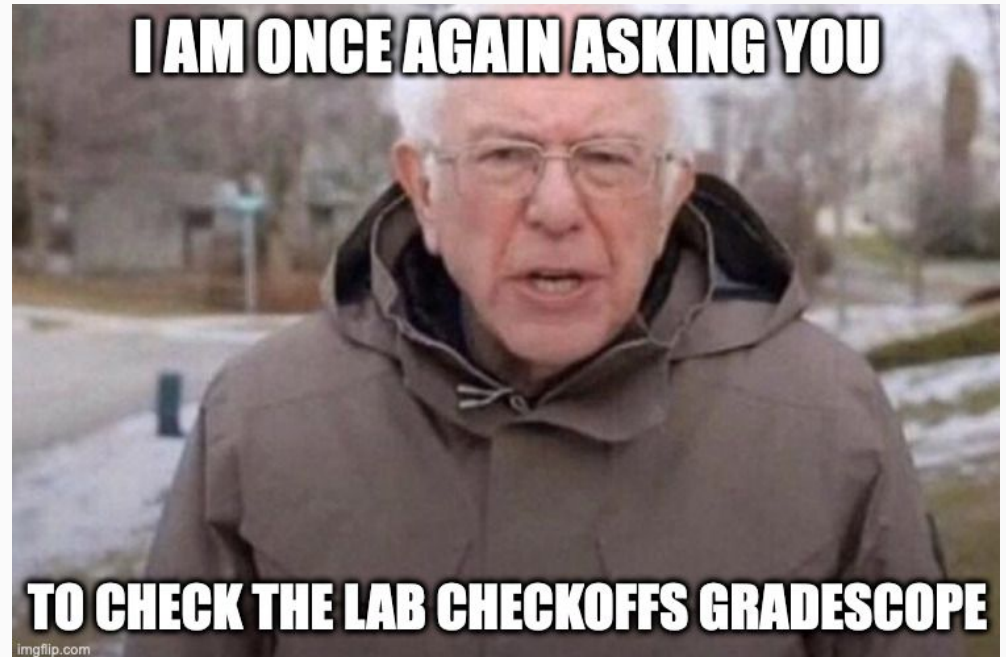
Lab 4: Sensing Part 1

EECS 16B Spring 2023

Slides: <http://links.eecs16b.org/lab4-slides-sp23>

Administrivia

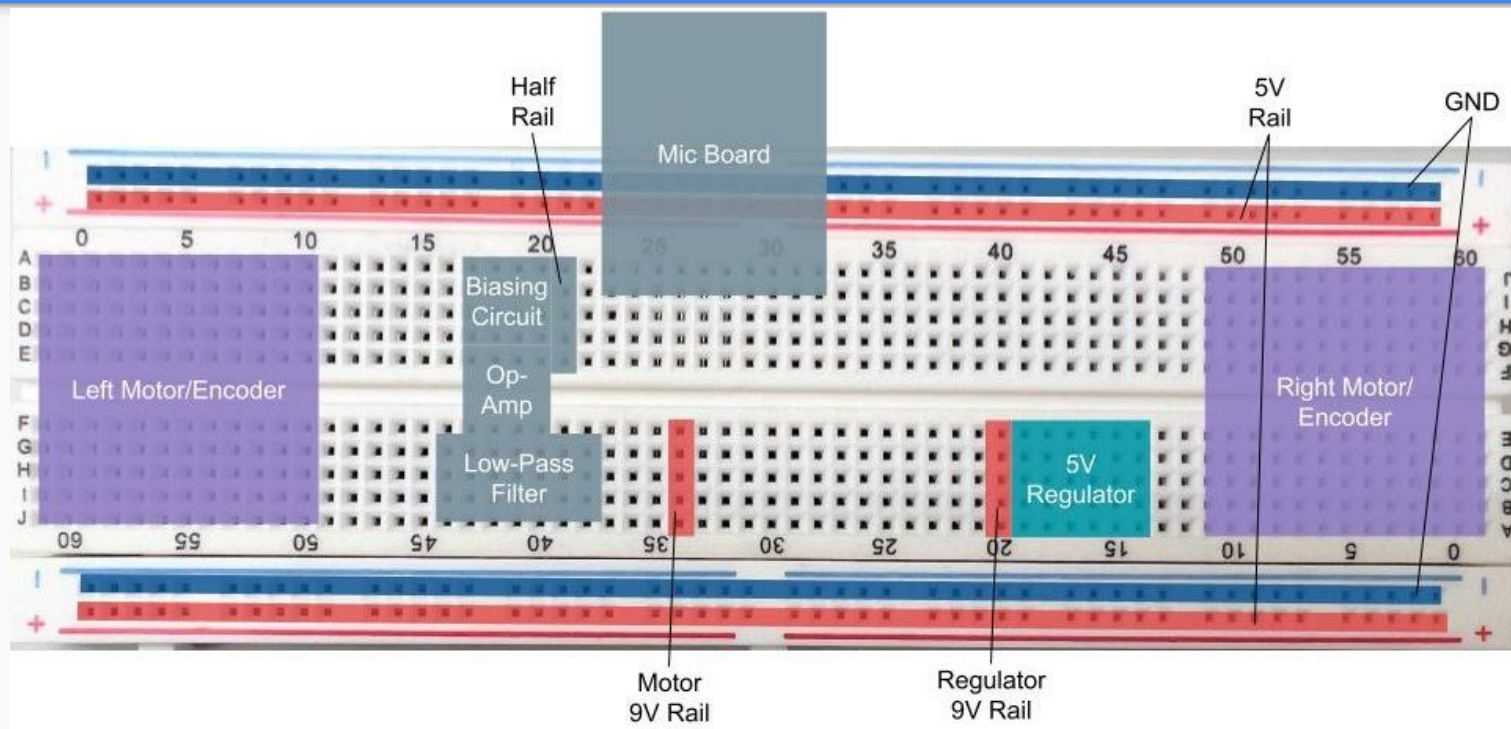
- What's that



Lab 4 Overview

- Build and test mic board circuitry
 - Build biasing circuit
 - Tune mic board
 - Measure the frequency response of the speaker-microphone system
 - Build Low Pass Filter

BREADBOARD LAYOUT

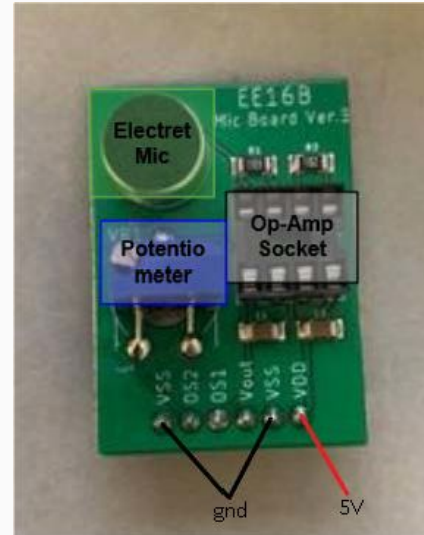


Mic Board Circuitry

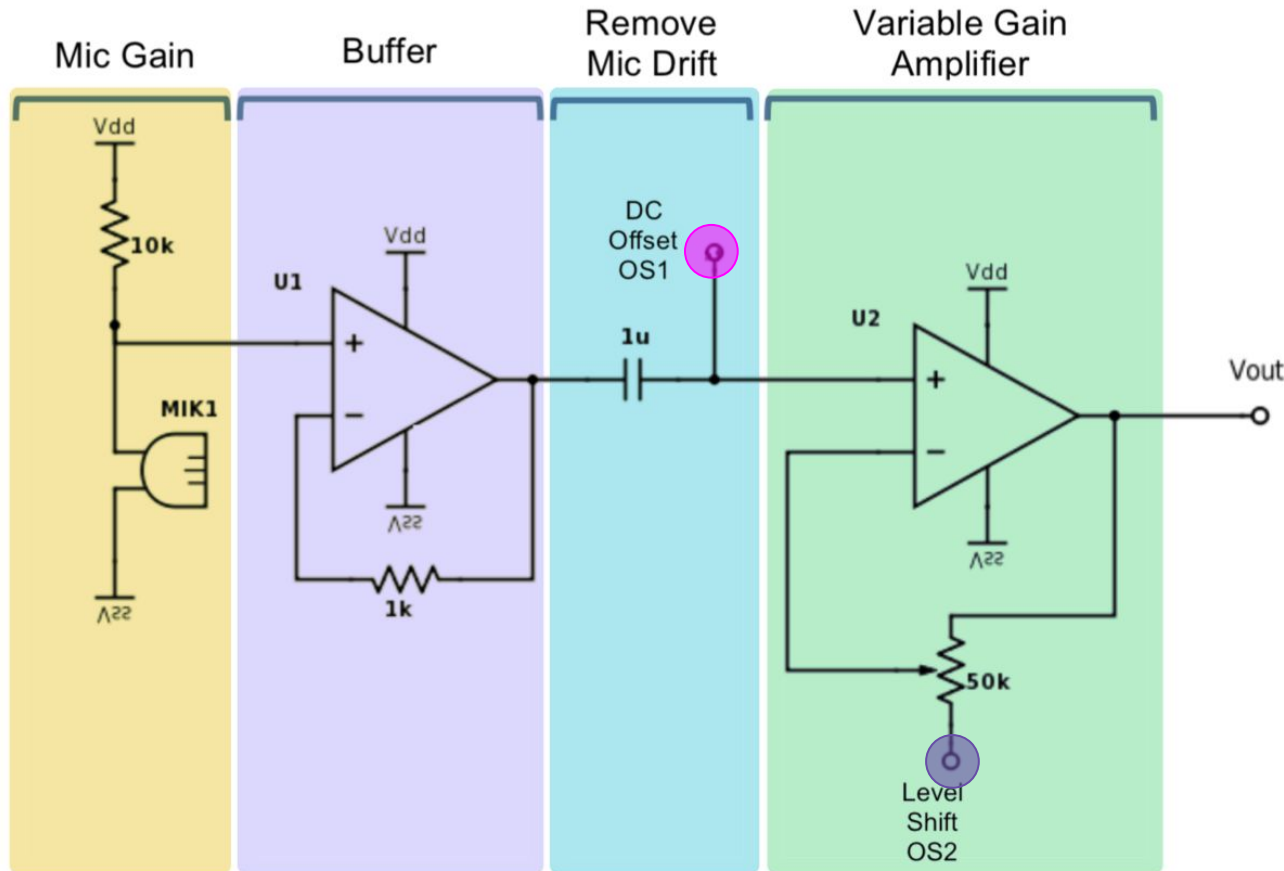
An annoyingly loud journey

What's a Mic Board?

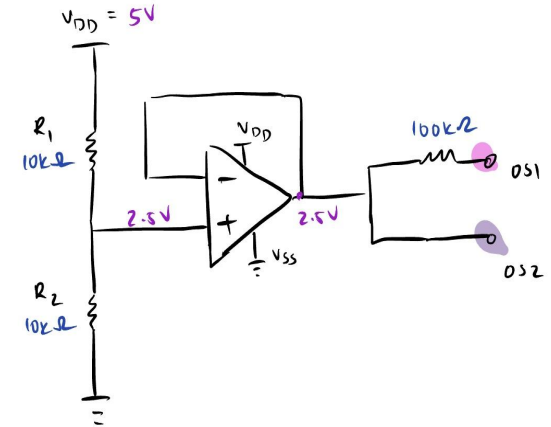
Mic board circuits pick up voice and sound signals and then convert them into electrical signals, which are amplified.



Mic Board Schematic

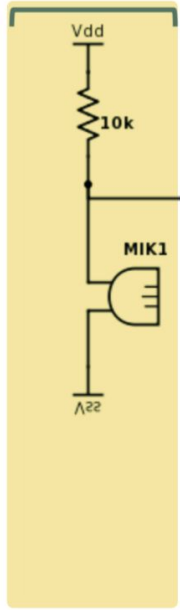


We're building this!



Mic Board Schematic

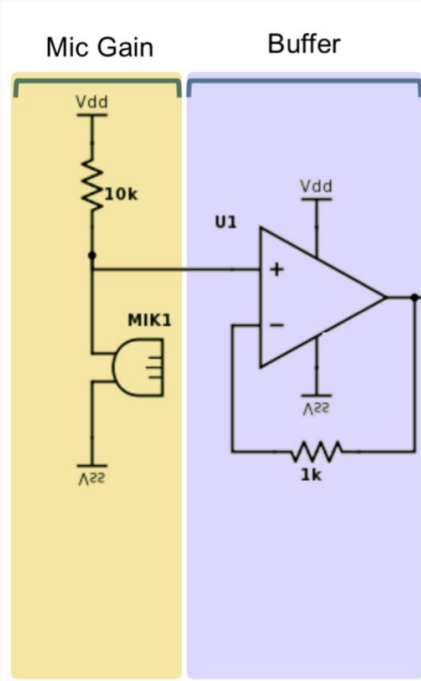
Mic Gain



1. Mic Gain

- Our mic is a variable current source, but we convert it to a voltage signal by placing it in series with a 10K resistor.

Mic Board Schematic



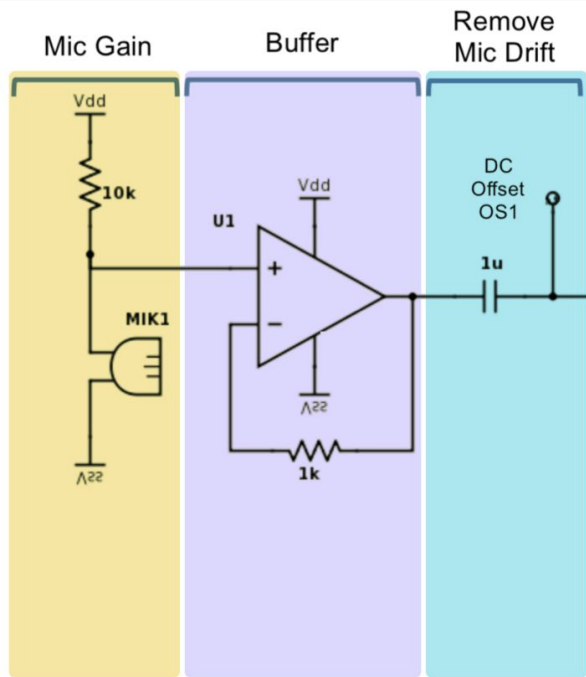
1. Mic Gain

- Our mic is a variable current source, but we convert it to a voltage signal by placing it in series with a 10K resistor.

2. Buffer

- This keeps the rest of the circuit from affecting our mic board signal

Mic Board Schematic



1. Mic Gain

- Our mic is a variable current source, but we convert it to a voltage signal by placing it in series with a 10K resistor.

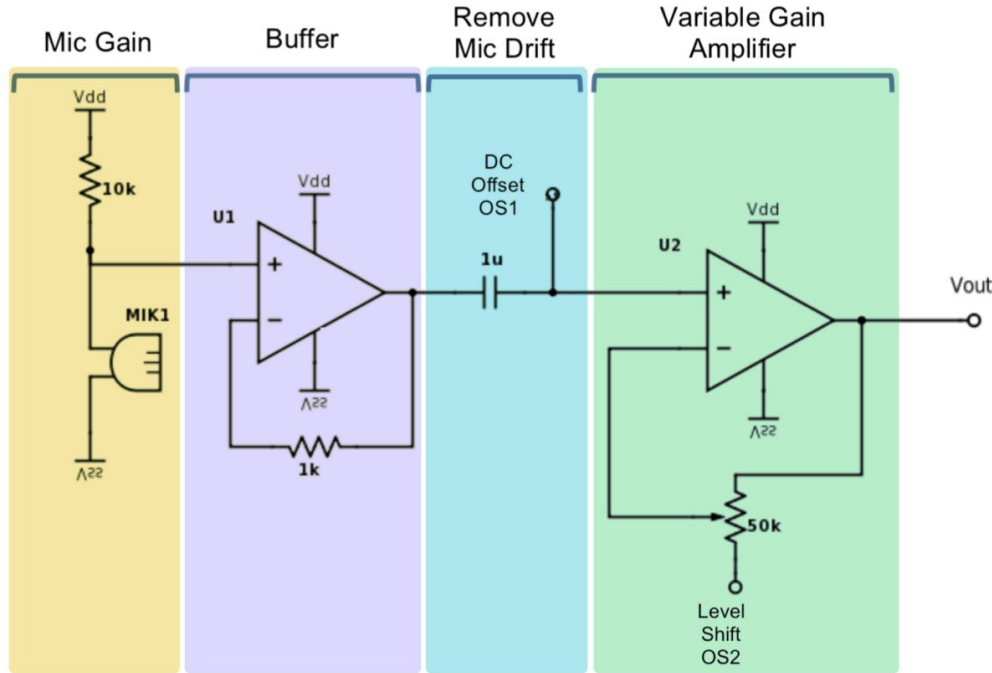
2. Buffer

- This keeps the rest of the circuit from affecting our mic board signal

3. Removing Mic Drift

- The 1 μ F capacitor is a *coupling capacitor*, meaning it serves as a short to AC voltage but blocks DC voltage. Used to remove unpredictable mic offset so we can add our own via OS1
- **OS1** - centers signal at 2.5V. Connected through a 100k Ω resistor, since OS1's voltage isn't equal to our signal.

Mic Board Schematic



1. Mic Gain

- Our mic is a variable current source, but we convert it to a voltage signal by placing it in series with a 10K resistor.

2. Buffer

- This keeps the rest of the circuit from affecting our mic board signal

3. Removing Mic Drift

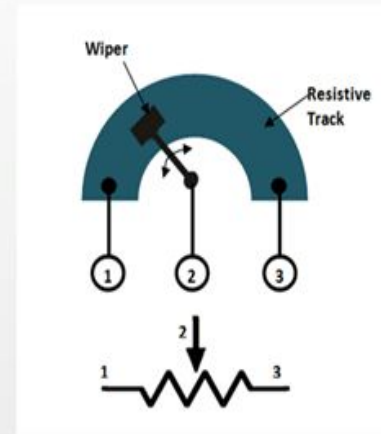
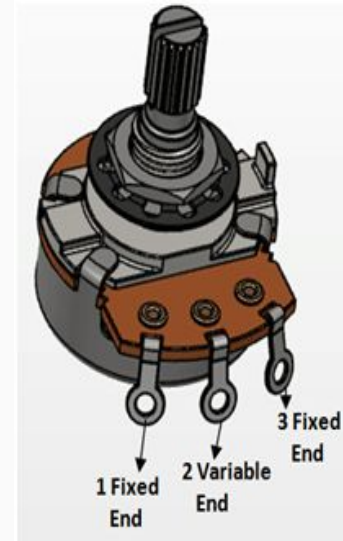
- The 1μF capacitor is a *coupling capacitor*, meaning it serves as a short to AC voltage but blocks DC voltage
- **OS1** - centers signal at 2.5V. Connected through a 100kΩ resistor, since OS1's voltage isn't equal to our signal.

4. Non-inverting amplifier

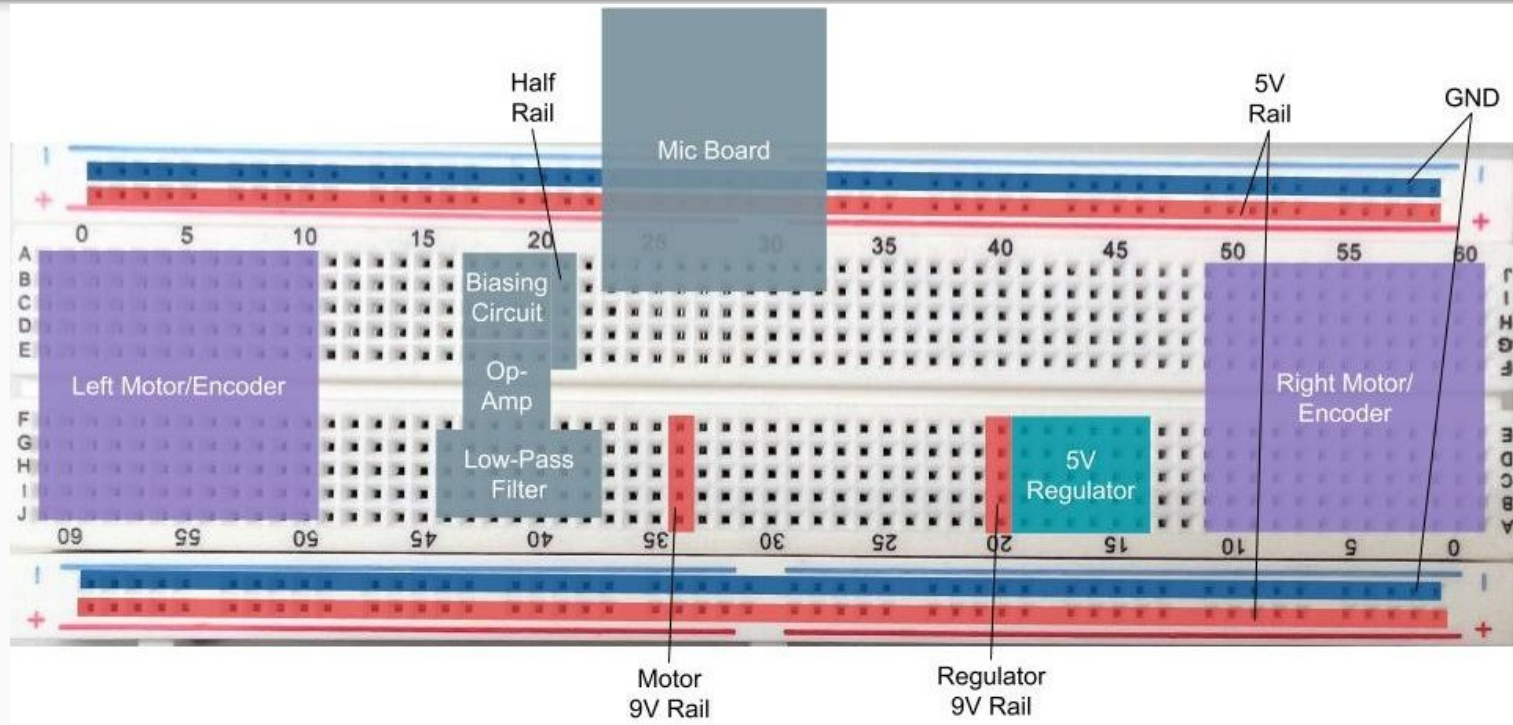
- Uses a potentiometer for variable gain
- **OS2** - serves as a virtual ground so we don't amplify the 2.5V offset

Review: Potentiometers

- Wiper divides resistive material, creating two resistors with variable length
- Resistance is proportional to length, so wiper changes the **resistance ratio**!
- Resistors form a **voltage divider**



REMINDER: BREADBOARD LAYOUT



Important Forms/Links

- Help request form: <https://eecs16b.org/lab-help>
- Checkoff request form: <https://eecs16b.org/lab-checkoff>
- Extension Requests: <https://eecs16b.org/extensions>
- Makeup Lab: <https://makeup.eecs16b.org>
- Slides: <http://links.eecs16b.org/lab4-slides-sp23>
- Anon Feedback: <https://eecs16b.org/lab-anon-feedback>
- Checkoff Error: <https://eecs16b.org/lab-checkoff-error>