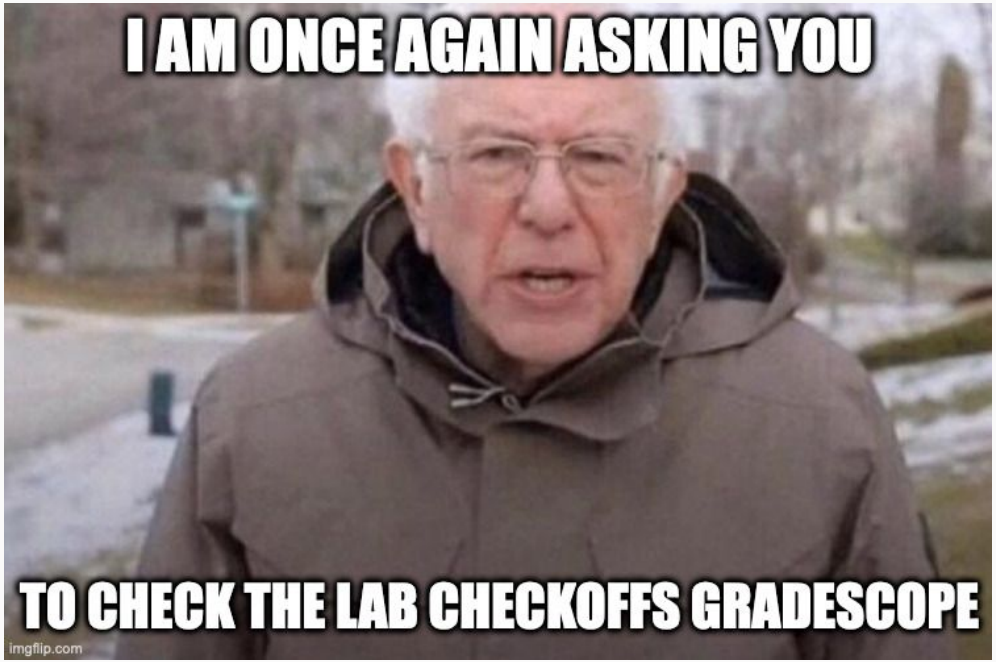
Lab 4: Sensing Part 1

EECS 16B Spring 2023

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

Administrivia

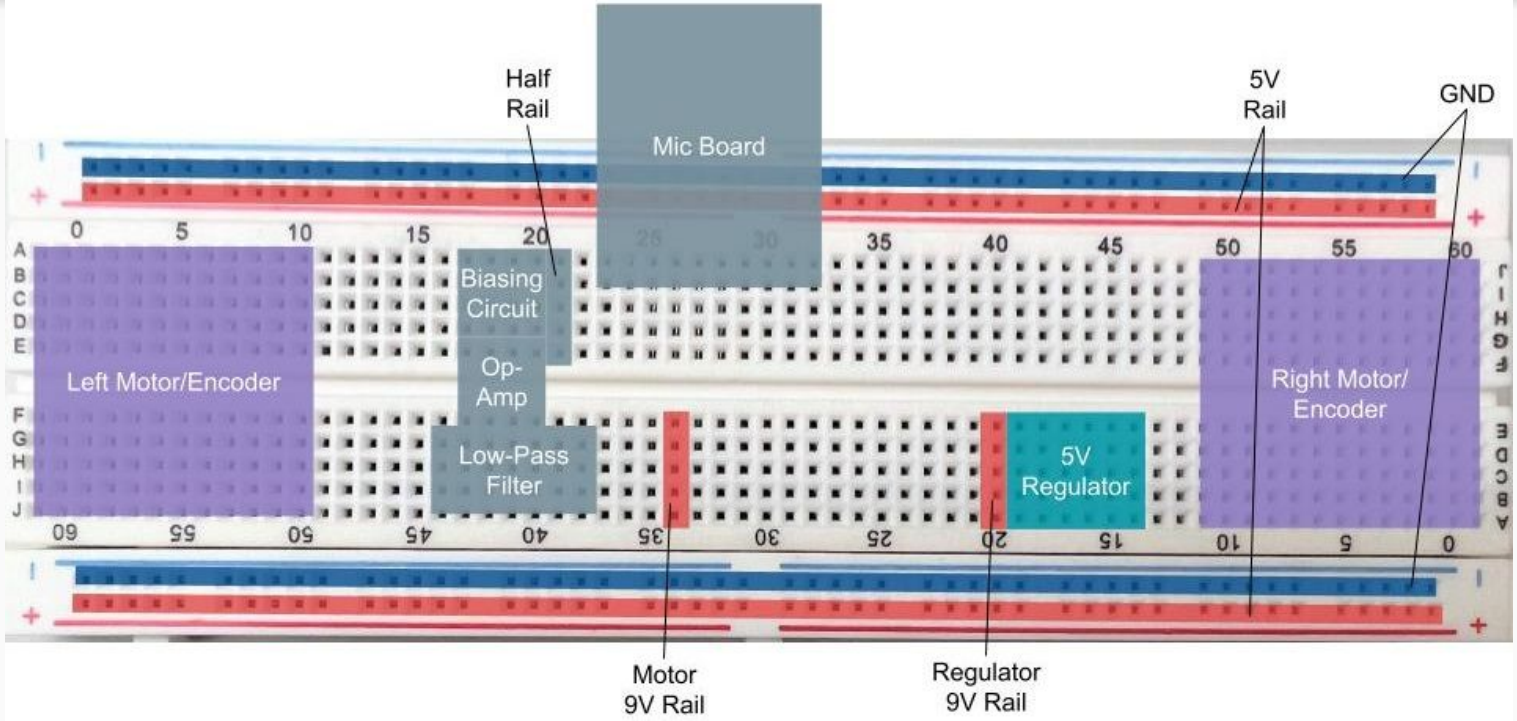
- What's that



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

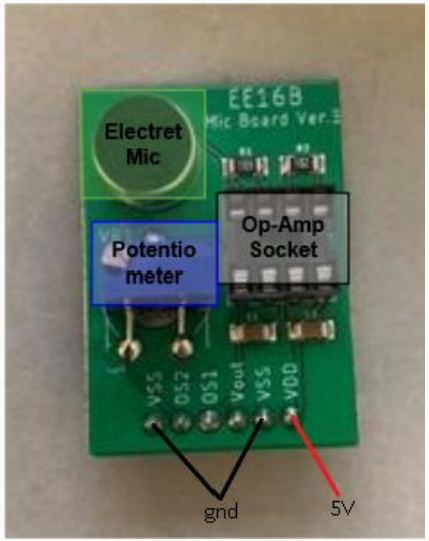


Mic Board Circuitry

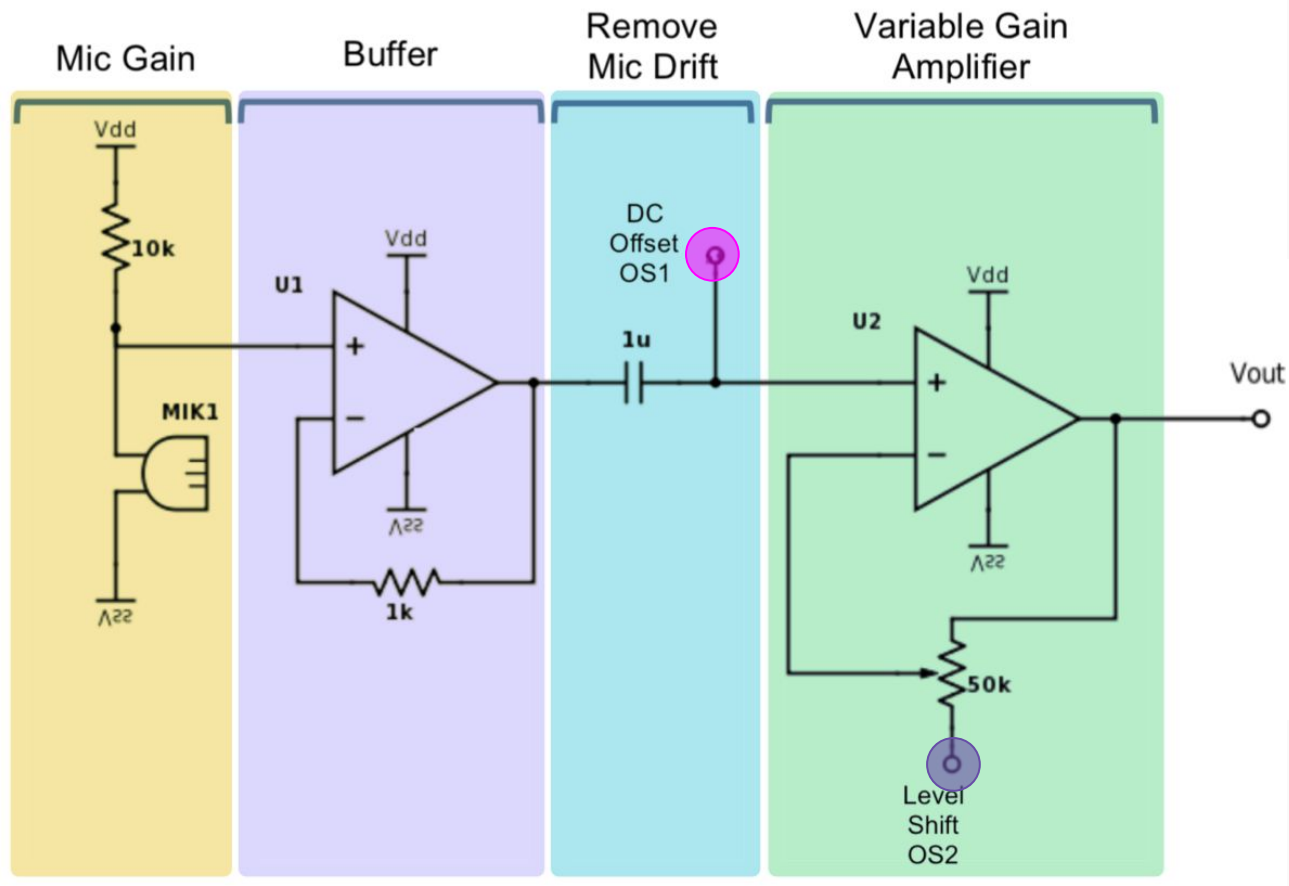
An annoyingly loud journey

What’s a Mic Board?

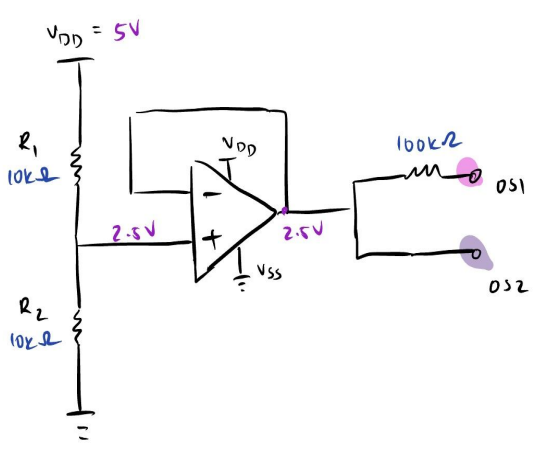
Mic board circuits pick up voice and sound signals and then convert them into electrical signals, which are amplified.



Mic Board Schematic



We're building this!



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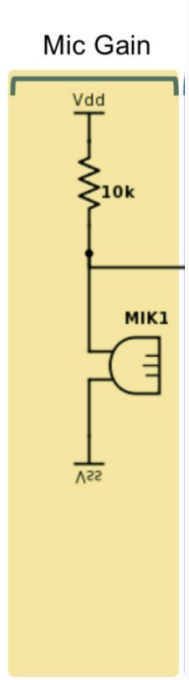
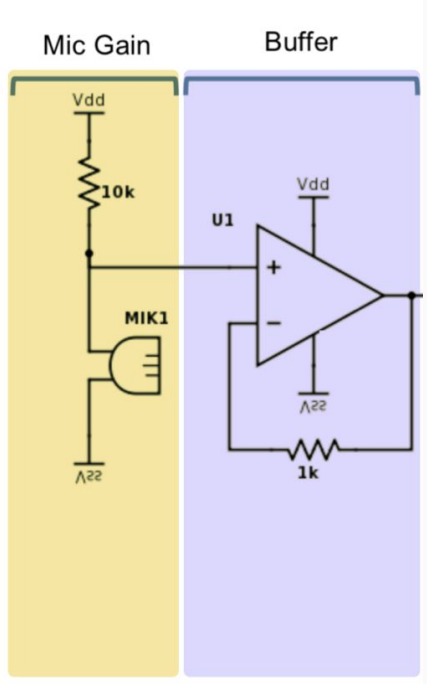


1. Mic Gain

- 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



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2. **Buffer**
   - This keeps the rest of the circuit from affecting our mic board signal

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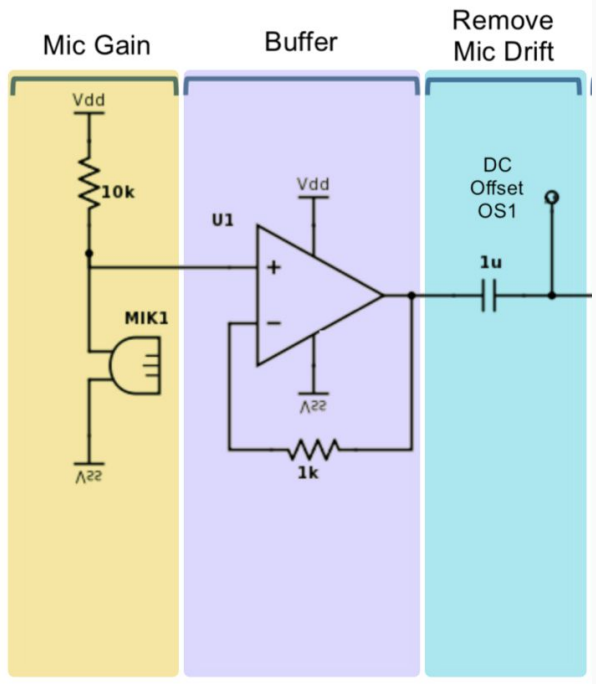

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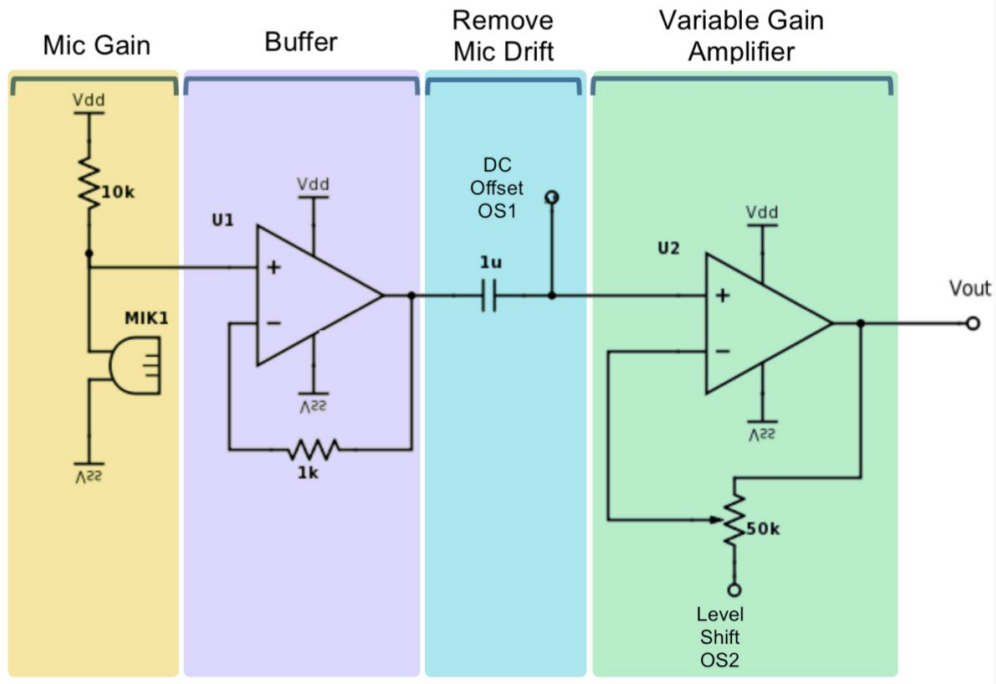
   - Our mic is a variable current source, but we convert it to a voltage signal by placing it in series with a 10K resistor.
2. **Buffer**
   - This keeps the rest of the circuit from affecting our mic board signal
3. **Removing Mic Drift**
   - The 1μF capacitor is a *coupling capacitor*, meaning it serves as a short to AC voltage but blocks DC voltage. Used to remove unpredictable mic offset so we can add our own via OS1
   - **OS1** - centers signal at 2.5V. Connected through a 100kΩ resistor, since OS1's voltage isn't equal to our signal.

Mic Board Schematic



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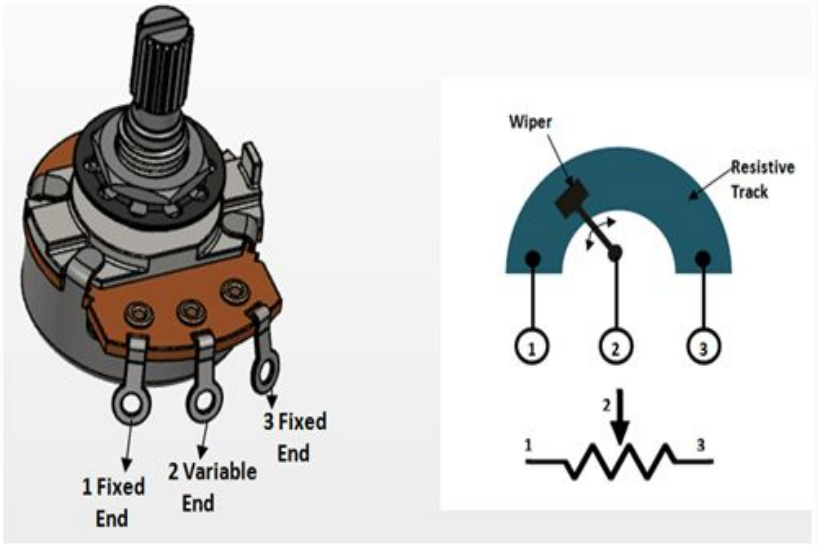
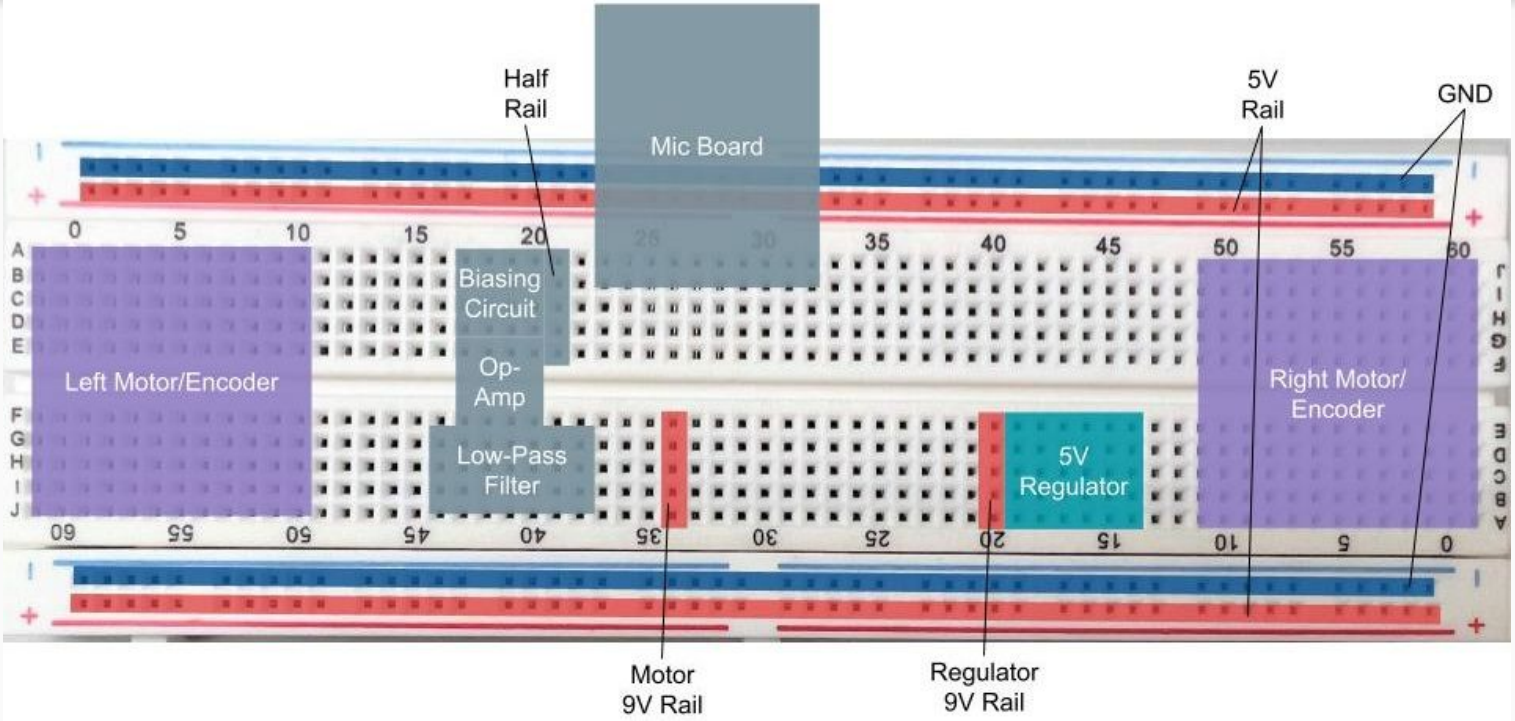
4. **Non-inverting amplifier**
   - Uses a potentiometer for variable gain
   - **OS2** - serves as a virtual ground so we don't amplify the 2.5V offset

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