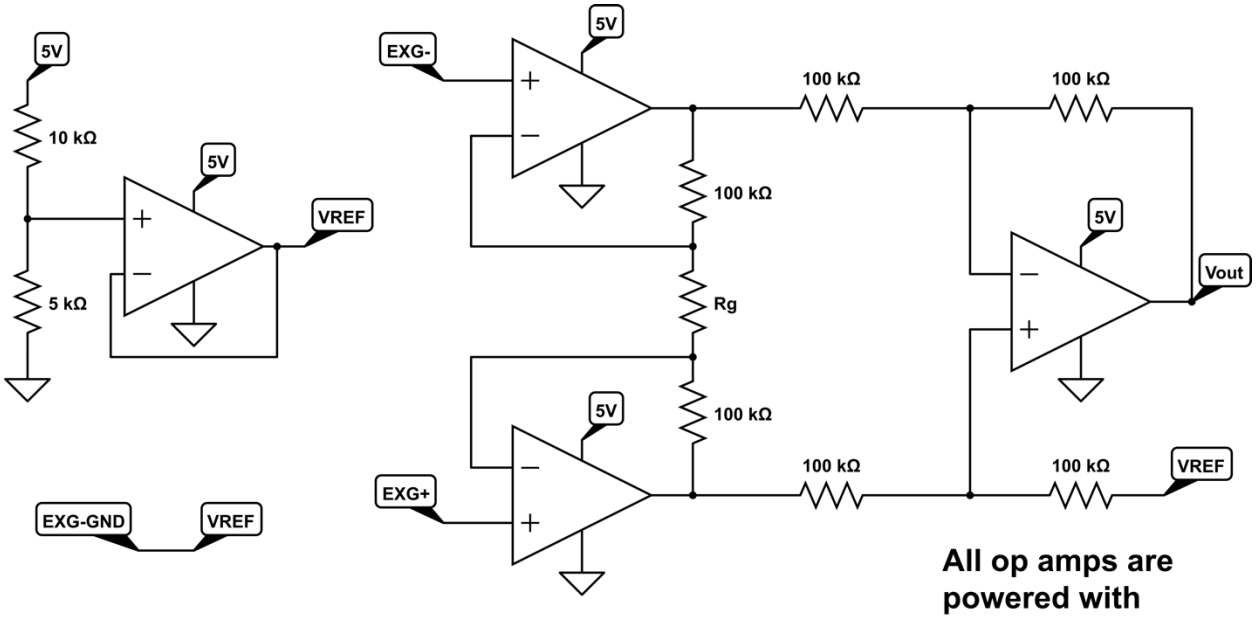
Smart Healthcare Session 5 Handout

Adapted / Taken from previous handouts.

1. **Build your circuit in Tinkercad following this video: https://youtu.be/ruJxBuEUzIM**
    a. Please actually watch the video and not just skip to the end to see the circuit. The video explains the process, not just gives you the answer.
    b. Feel free to watch the video at accelerated speed (1.25x, 1.5x, etc.). But please watch the entire video. Don't skip around because you think, "I know this part."
    c. Please use the values you calculated in LTspice. Don't use the values I show you in the video.
    d. There are a few discrepancies in the video that you should be aware of:
        i. Keep in mind that the component values that I use will be different than the component values you use. That's fine.
        ii. The video was made with an older capacitor kit. Please use the values ranges that we've been discussing throughout the workshop
        iii. Use 10k and 5k for the voltage divider that's connected to the VREF op amp. I change that in a later video, but using 10k and 5k now, will save you the trouble. The 5k resistor goes to GROUND and the 10k resistor goes to POWER.
        iv. The photoresistor is connected to 3.3 V not 5 V. I change that in a later video, but changing it now, will save you the trouble. However, all other components in your circuit are powered with 5 V and GND. **Only the photoresistor is powered with 3.3 V.**
        v. The first video mentions using an LED as the illumination source, but a later video will move to using your phone's flashlight instead. As a result, no need to add the LED in Tinkercad as we'll just remove it later.
2. **Please send your Tinkercad information to the teaching team for review before building your circuit on a breadboard.**
3. **PLEASE NOTE THAT THE LEDs / PHOTOTRANSISTORS ARE FOR THE PPG.**
    a. If you're not doing the PPG, just follow the tutorial for the BANDPASS FILTER (everything but the LEDs)
    b. The EXG circuit uses the same bandpass circuit. Just don't include the LEDs

4. **Cascade the OUTPUT of Instrumentation Amplifier (AD623) to the INPUT of the BANDPASS FILTER**
    a. For the AD623: Gain = 1 + 100k/Rg



Gain = 1+(200k/Rg) **Vout = (EXG+ - EXG-)*Gain**

b. For tinkercad, just use a general op-amp

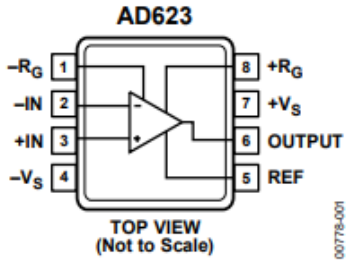
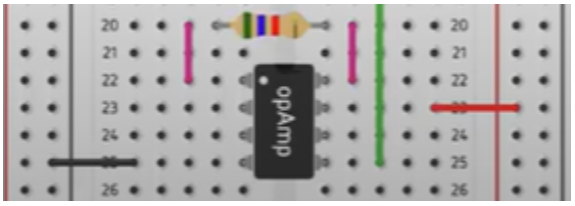


Figure 2. Pin Configuration

c. Make the AD623 circuit in TinkerCAD



NOTE: REF IS CONNECTED TO THE OUTPUT OF VREF!

OUT IS CONNECTED TO THE INPUT OF THE BANDPASS FILTER

d. Show us the INA and Bandpass Filter TinkerCAD

5. Do by end of class
   a. Gain of INA
   b. Gain of Bandpass filter
   c. Type of EXG
   d. Picture of TinkerCAD