

“A Fully-Differential Biopotential Amplifier with a reduced number of parts”

Supplementary material: It includes simulation models, experimental data, scripts, and PCB designs to reproduce the results in the article.

1. Simulation Models

Some simulation circuits (TINA by Texas Instruments) are provided to reproduce the results presented in the manuscript.

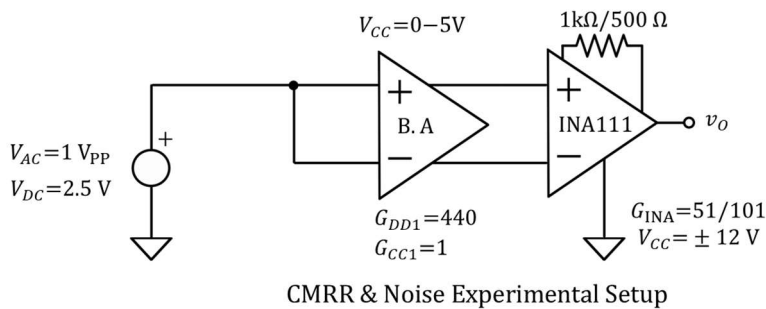
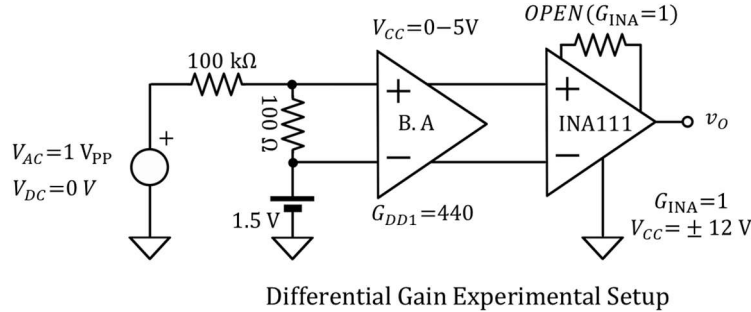
[DifferentialModeGain.TSC](#): It allows to obtain frequency and transient responses.

[NoiseAnalysis.TSC](#): Amplifier noise simulation for TLC2274 and OPA4344.

[CMRR.TSC](#): This circuit allows to simulate the CMRR of the amplifier. The model of A1H was lightly modified to introduce a CMRR imbalance between A1H and A1L.

2. Experimental setup

The following test circuit was used to measure the Differential Gain GDD, CMRR, and Noise. The circuit was placed inside a grounded metallic cabinet (an old PC) to avoid power-line interference. Measurements were made with an Agilent DSO-X 2024A and its built-in signal function generator.



3. Experimental data

[Measured_Noise_TLC2274.txt](#): Noise spectral density of the built amplifier.

Column #1: Frequency [Hz]; Column #2: PDS at the output x 51 [nV/sqrt(Hz)]

[ecg03.txt](#): ECG signal acquired at 512 samples/sec.

Column #1: amplifier output voltage [V]

[Pulse_IEC.mat](#): Experimental transient response to a 3 mV 100 ms width pulse. A 3V pulse with a 1000x attenuator was used and a 1.5V battery was added to produce a DC shift. A periodic 1 Hz pulse train was applied for averaging. Agilent Oscilloscope in Average Mode (32 frames)

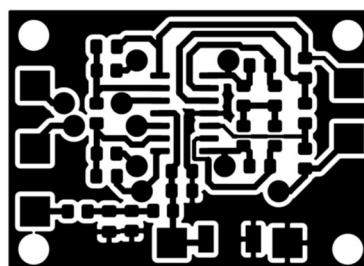
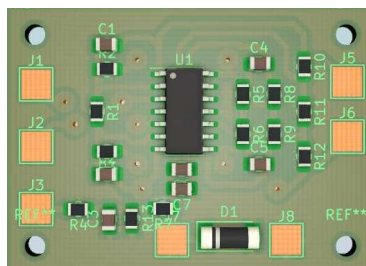
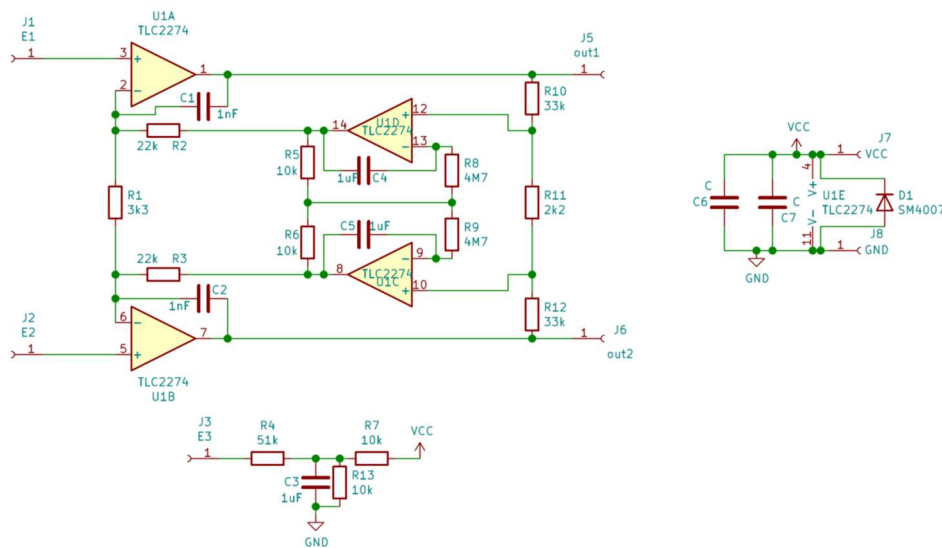
Column #1: time [s], Column #2: vin [mV], Column #3: vOUT [V]

4. MATLAB script

[Paper_Figures_R3_F](#): This script was used to produce the figures of the manuscript. Some experimental data such as Differential Gain (GDD) and CMRR measurements are embedded in the script.

5. Printed Circuit Board (PCB)

[PCB_Design.zip](#): This zip contains a proposed PCB design and all the files to reproduce it.



NOTE: Do not hesitate to contact me (enrique.spinelli@gmail.com) if you have any problems when using this material.