



Faculty of Engineering
Cairo University



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Systems and biomedical department

ECG Circuit

Final Project - Bioelectronics (SBE3130)

Done by:

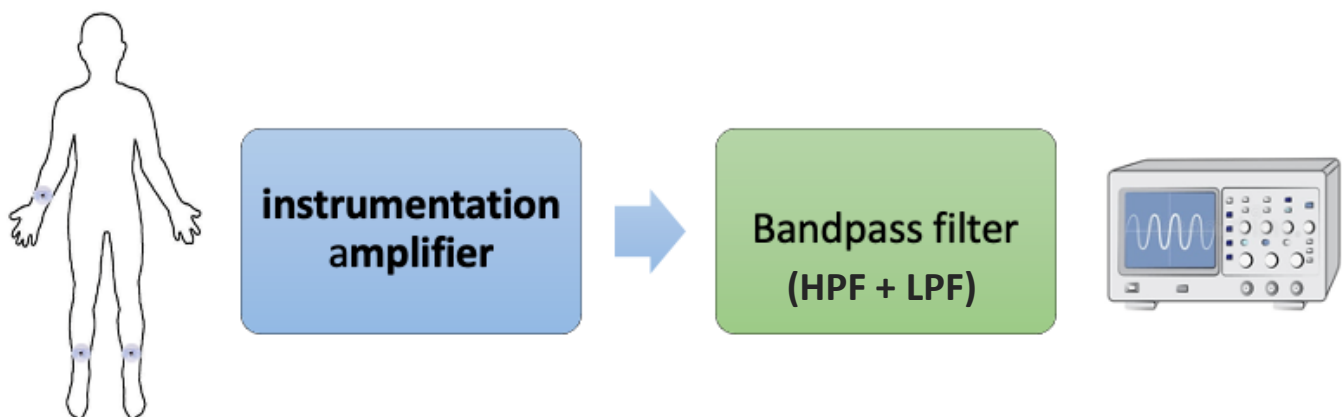
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We designed a prototype circuit for an ECG in order to assess how the heart is functioning and can be used to diagnose a variety of cardiac diseases. It turns out that an ECG is very easily obtained with a few common circuit components, we use the following components to build our circuit:

1. Hardware components

Component	Value	Quantity
Op Amplifier	“TL084CN”	1
Capacitors	22 nF	1
	100 μ F	2
Resistor	10 k Ω	3
	1 k Ω	2
	9 k Ω	2
	100 k Ω	1
	2 k Ω	1
	5 k Ω	1
	90.0 k Ω	1
Electrodes		3
Crocodile probes		3
Jumpers		1

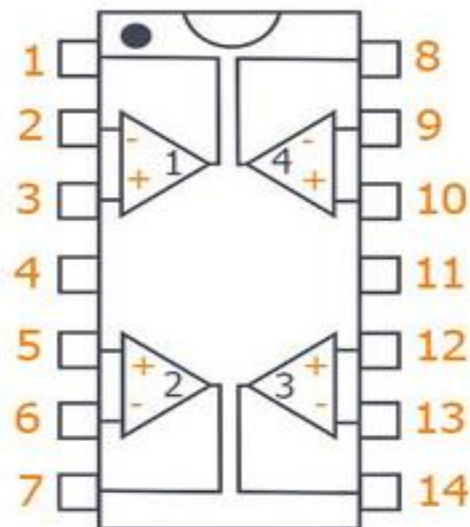
2. ECG main circuit:





3. Circuit description:

Our circuit mainly depends on “TL084CN” op amp. as it can replace the 4 amplifiers that we need in our circuit:

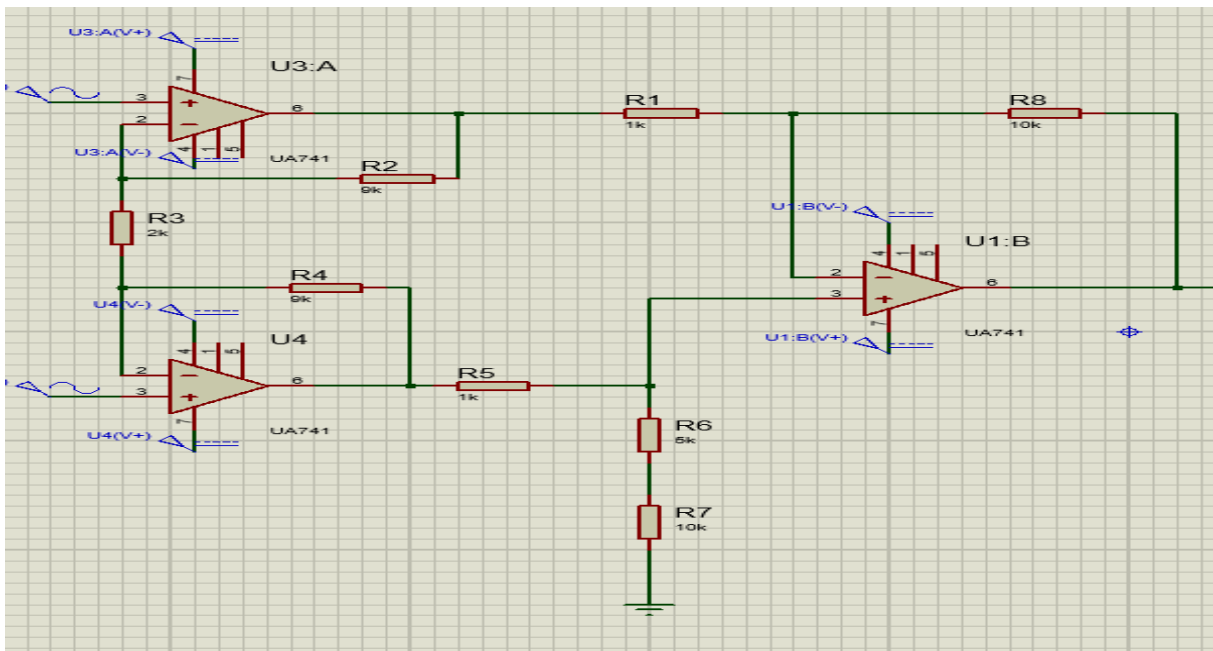


PINOUT TL084CN	
1. OUT 1	8. OUT 3
2. - INPUTS 1	9. - INPUTS 3
3. + INPUTS 1	10. + INPUTS 3
4. VCC	11. VEE , GND
5. + INPUTS 2	12. + INPUTS 4
6. - INPUTS 2	13. - INPUTS 4
7. OUT 2	14. OUT 4

3.1 instrumentation amplifier:

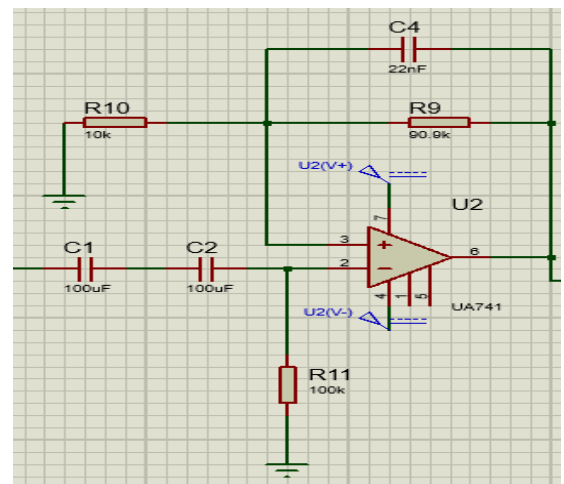
The fundamental component of an ECG is the instrumentation amplifier which probably the hallmark amplifier for bioelectrical measurements for a number of reasons, most notably: (1) high input impedance and (2) very good common mode rejection. then it is responsible for taking the voltage difference between leads and amplifying the signal.

It's basically built from 3 amplifiers and resistors, then first 3 amp in TL084CN amp are used to build the instrumentation amp.



3.2 Band-pass filter

A bandpass filter which combines from high and low pass filters only allows those frequencies within a certain band around (0.03~80 Hz) to pass through(Our ECG signal). It's built from an amplifier, resistors and capacitors.



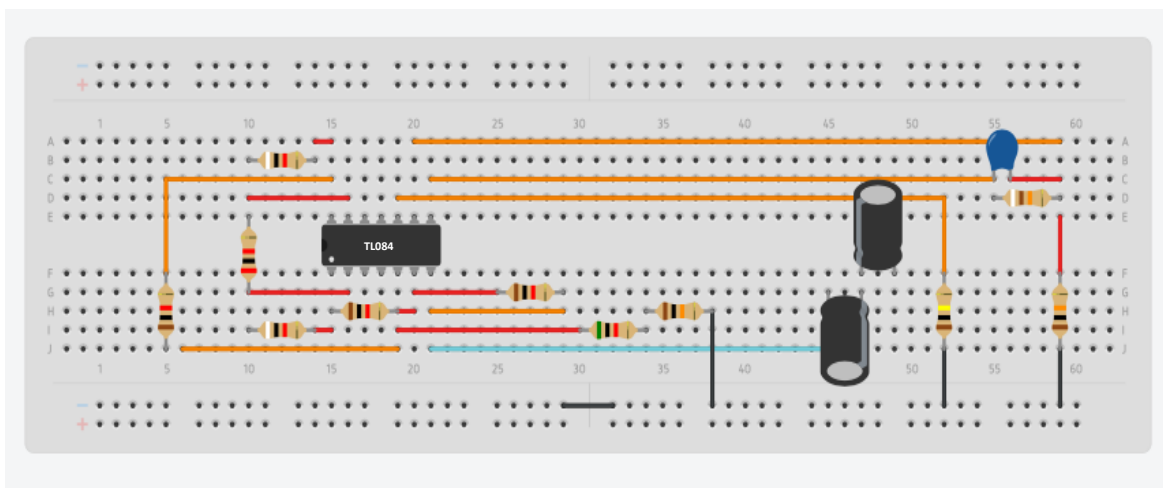
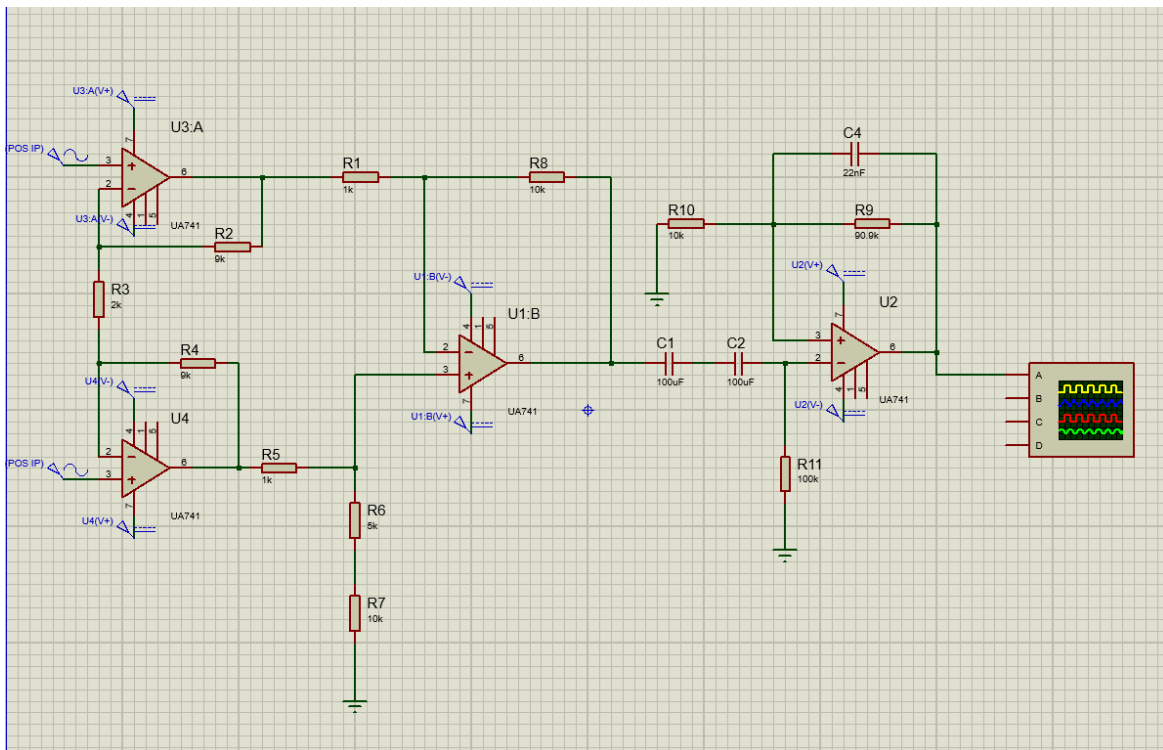


4. Limitations:

We used just one lead (lead II) and 3 electrodes. Also we used a band-pass filter not high-pass filter, so normal ECGs only will be displayed on this circuit.

Lead II: one of limb leads. Lead II is the voltage difference between the left leg (LL) electrode and the right arm (RA) electrode.

Finally, we got our ECG circuit:





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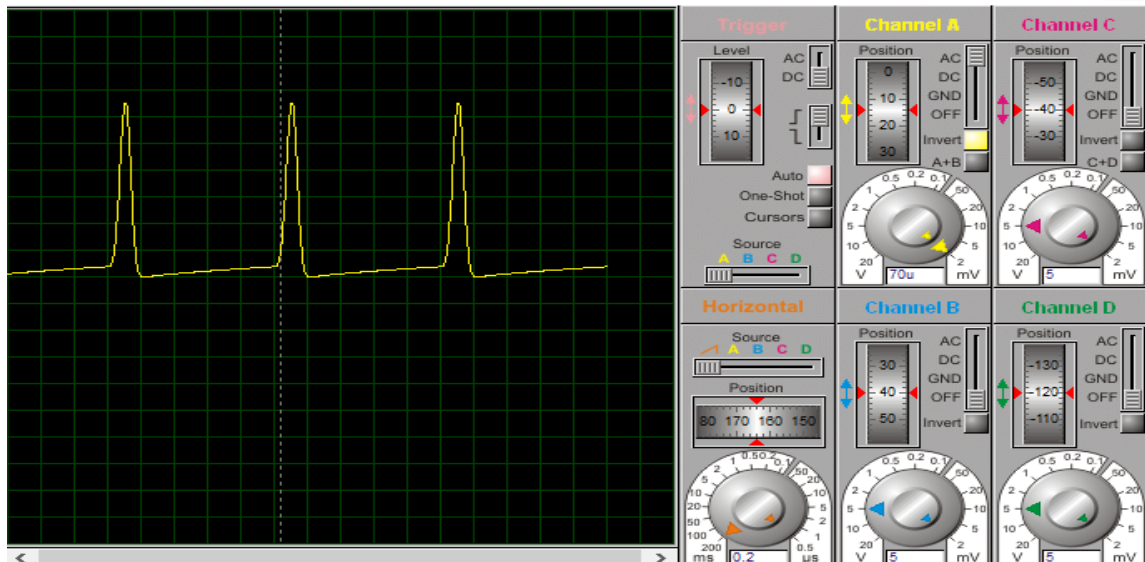


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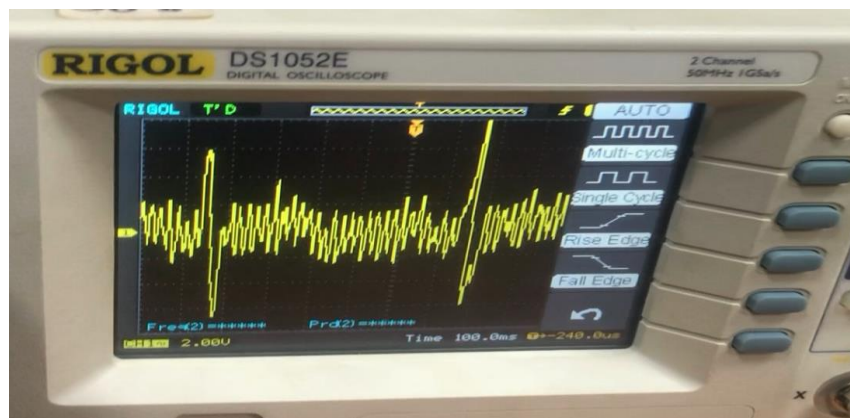
The output:

a. Using Proteus

Digital Oscilloscope



b. In lab



Another Scale:

