

TASK 1 : Analog Noise Analysis using 3 different OPAMPs

Objectives:

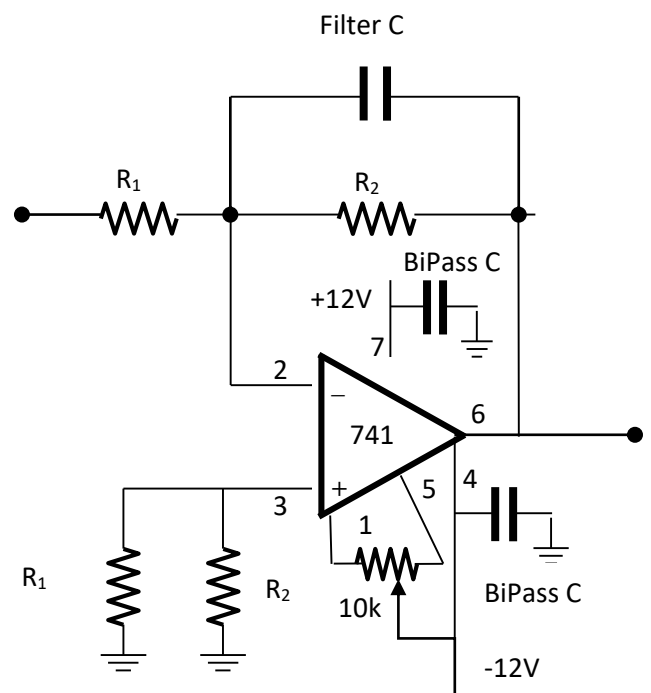
- Analyze OPAMP noise
- Measure frequency response of an amplifier for medical use
- Study effects of EM fields on your instrumentation
- Design a 50 Hz reject filter

OPAMP choices:

- 741 (a very low quality OPAMP)
- any medium quality OPAMP
- any (if possible chopper stabilized) good quality OPAMP

Setup for 741:

- Like the one seen on the right. **OR you might want to check some links¹...**
- Choose R_1 and R_2 between 1k and 1M.
- Add a null off-set potentiometer for large gain.
- Choose a gain between 1000 and 10000.



¹ <http://www.tmworld.com/design/design-and-prototyping/4389306/The-basics-of-testing-op-amps-part-1--br--Circuits-test-key-op-amp-parameters>
<http://www.tmworld.com/electronics-news/4389470/The-basics-of-testing-op-amps-part-2-br--Test-op-amps-for-input-bias-current>
<http://www.tmworld.com/design/manufacturing/4389588/The-basics-of-testing-op-amps-part-3-br--Configurable-circuit-tests-op-amps>

- BiPass C values may be 0,1 μF , whereas filter C may be 0,01 μF . You may need BiPass C for AD521, but not for AD293/AD294.
- Check datasheets for OPAMPs other than 741.

Noise Analysis:

- Find the bandwidth of the circuit for 741.
- Short the input to the ground and study the output for all 3 OPAMPs of your choice. Find the peak-to-peak noise amplitude, the average and RMS for all noise signals using a digital scope for example. Show your data in tabulated format.
- Repeat the above steps while operating an electrical motor, such as, a blow dryer, and other EM sources of your choice next to your setup.
- Design a 50 Hz reject analog filter. Use signals of 1,0 Hz, 1 Hz, 10 Hz, 30 Hz, 50 Hz, 80 Hz, 100 Hz, 1 kHz, and 10 kHz to study and plot the output characteristics.

TASK 2 :

Design an instrumentation amplifier using the OPAMP of your choice and measure the bioelectric signal of your choice. Suggested is that you study your own EKG. **You have to power everything using 9 V batteries. Otherwise you may electrocute yourself. Please be careful with electricity.** You need to measure frequency response of your design and study the effects of EM field/coupling.