

Systems & Biomedical Engineering Department

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Digital Filter Design

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Submitted to: **Dr. Ahmed Ehab**

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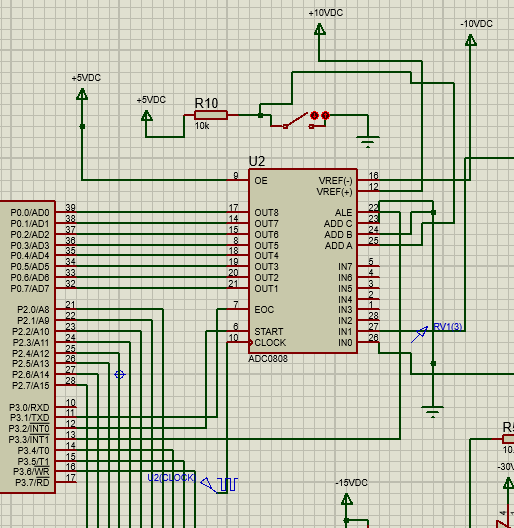
# Task Description

Our project aims to filter one of two given signals, which we could toggle between them using a switch, by utilizing some filters which could be toggled using switches.

# Used Components

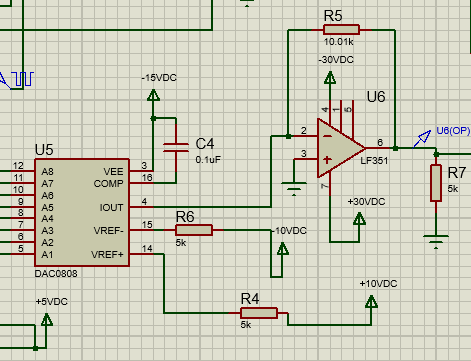
* 8051 Microcontroller (AT89C51)
* ADC0808
* DAC0808
* Op-Amp 741
* Op-Amp LF351
* Capacitors
* Resistors
* Crystal

## ADC



The ADC Converts Our Analog Signal into a Digital One, It has a built-in Multiplexer Which we use to toggle between our two input signals using the switch at the top, Vref is set at ± 10 Volts, An external Clock is using set at 800KHz, The Start and EOC are controlled by the microcontroller, to read a signal set ALE & SC to one, hold them for 100ns, the input value is recorded then we set the to 0, EOC outputs 1 signaling the start of the conversion, when it turns to 0 it means that the conversion process is complete, we than read the values outputted by the ADC.

## DAC



The DAC is connected to the same VRef as the ADC, the output is connected to an Op Amp, The DAC takes the digital values outputted by the Microcontroller and outputs an analog value proportional to it, the Op Amp amplifies this output so that it reaches the same values as the original signal or to a suitable value.

# Used Filters

* Filter idea and how it works
* Types of used filters

## Some issues about the filters order and limitations

Blah blah blah

# Issues

* Describe the limitations in the 8051 chip.
* And the clock problem

At first while using the converting the signal to analog, giving it to the Microcontroller then outputting the same signal again, we didn’t receive the same signal, it was clipped.



Figure Clipped Signal, Blue is the DAC Output, Yellow is the input

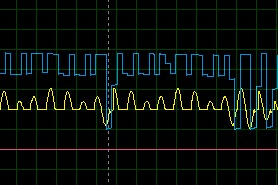


Figure Another Clipped Signal, Blue is the DAC Output, Yellow is the input

The Solution we did:  
After numerous attempts and researching, we discovered that one or more of the circuit’s components was reaching its saturation levels, after tweaking the gains of the Op Amps and increasing the Reference Voltage of the ADC & DAC, the signal was outputted as it should

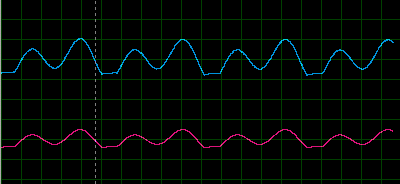
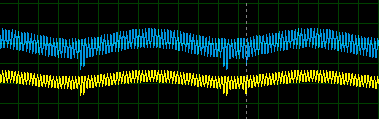
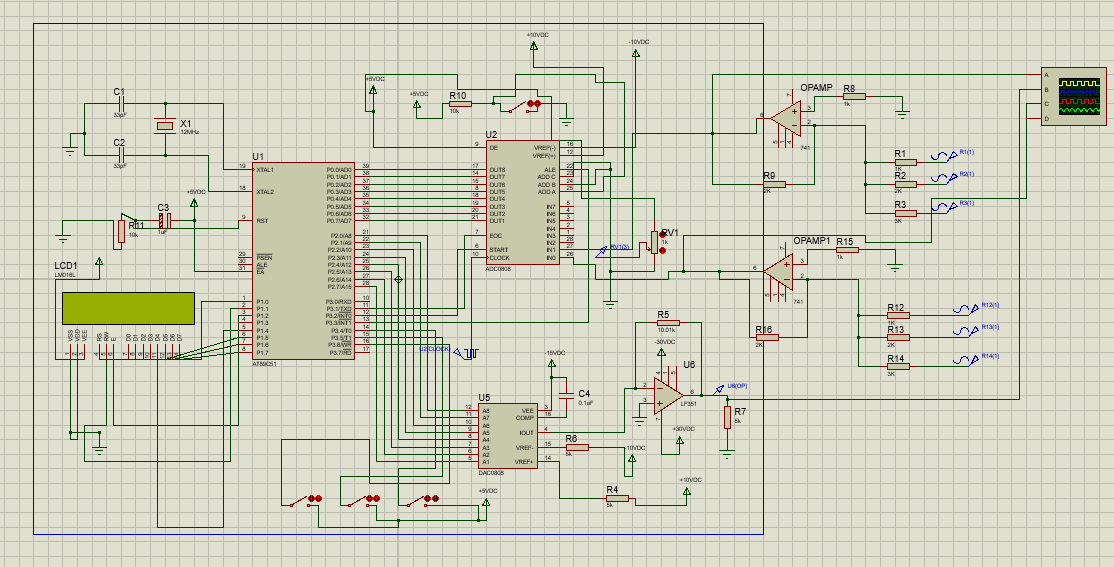


Figure Another Signal (Yellow) and its DAC Output (Blue), No Problems Too

Figure New DAC Output Signal (Blue), No Clipping is observed and the signal is as it should be.

# Schematic Diagram



# GitHub Repository