California State University, Northridge

College of Engineering & Computer Science

Electrical and Computer Engineering Department

ECE 443L Digital Electronics Laboratory Report 9

CMOS based ADC Circuit Design, Simulation and Experimental Test as well as Analysis

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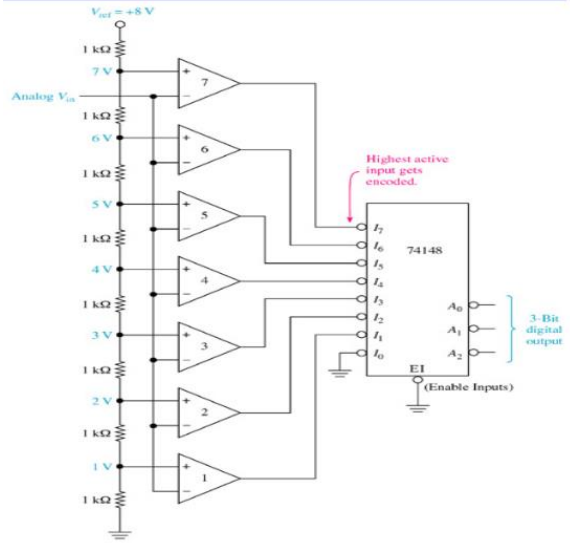
Abstract:

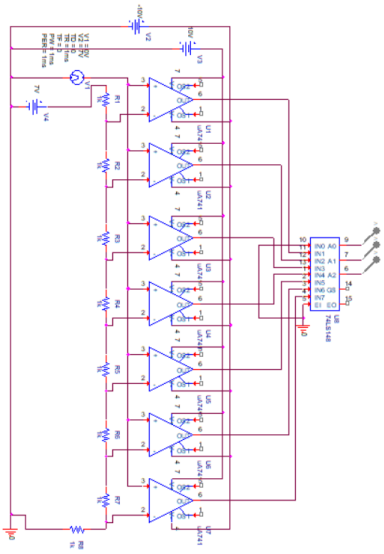
An analog signal can be represented with digital values at some time interval. There are four binary positions that give us a 4-bit resolution that has 16 representations. An 8 bit resolution would give us 256 different combinations. Parallel encoding also called simultaneous, multiple comparator, or flash converting is used to convert from analog to digital. Several comparators with different reference voltages make up a priority encoder.



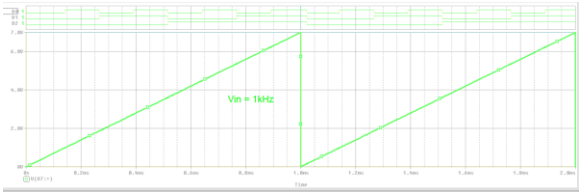
In this picture we can see that the analog range is from 0 to 7 volts and has a 3 bit or 8 level resolution. Using this configuration, we can get the analog signal converted into a digital output that can open up many possibilities for practical application.

Author 1 Case 1 and 3:

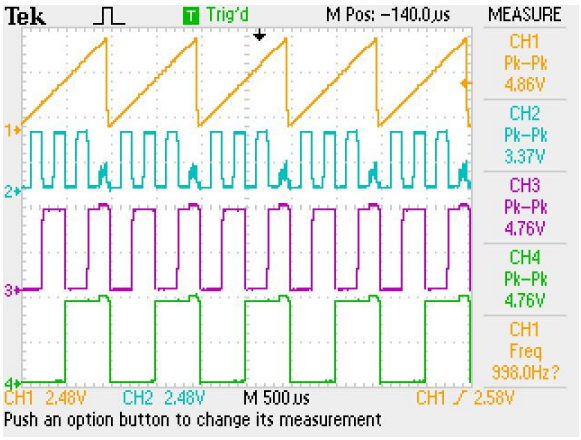
Assignment for Lab # 9 – Pspice & Experimental Individual Work – CMOS based ADC Circuit Design, Simulation and Experimental Test as well as Analysis



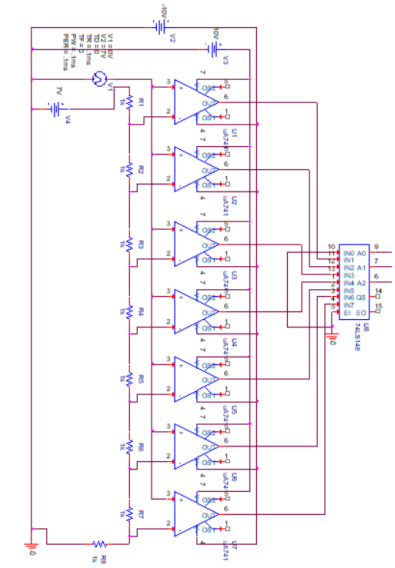
Case 1 @ 1kHz Analog to Digital Circuit



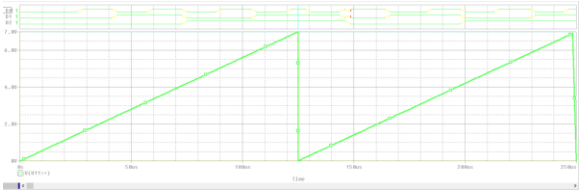
Case 1 waveform of ADC Circuit



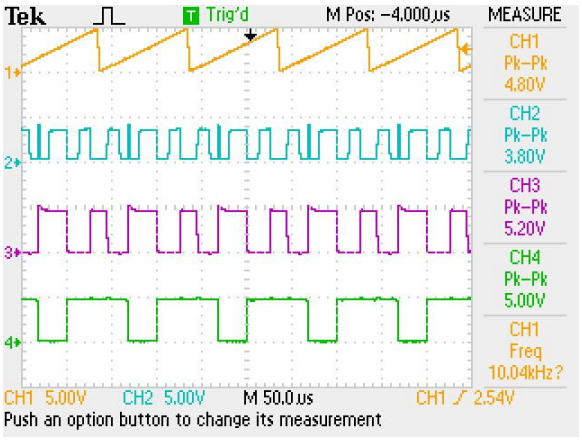
Case 1 Experimental Result @1kHz



Case 3 @ 10kHz ADC Circuit



Case 3 ADC Waveform



Case 3 experimental result @ 10kHz

Author 2 case 2 and 4:

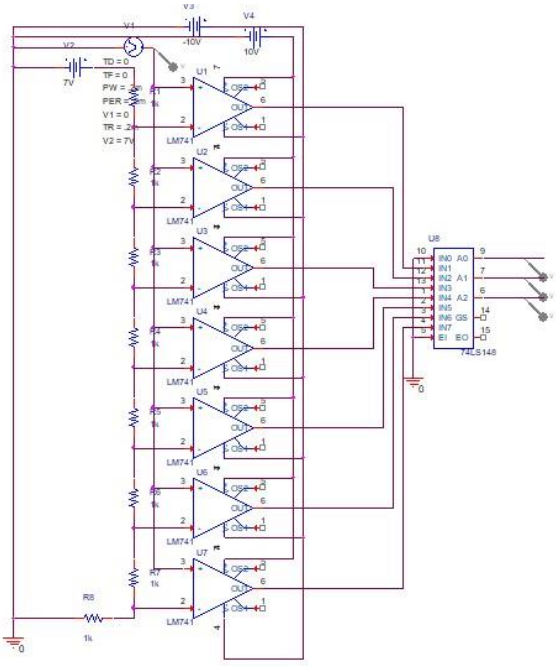


Figure 9.1 Case 2 7V Ramp Schematic with a freq @ 5kHz ADC Circuit

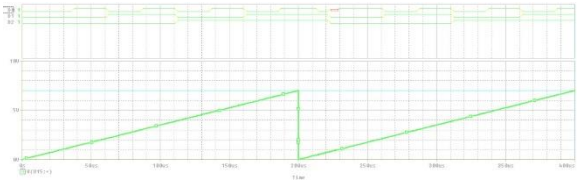
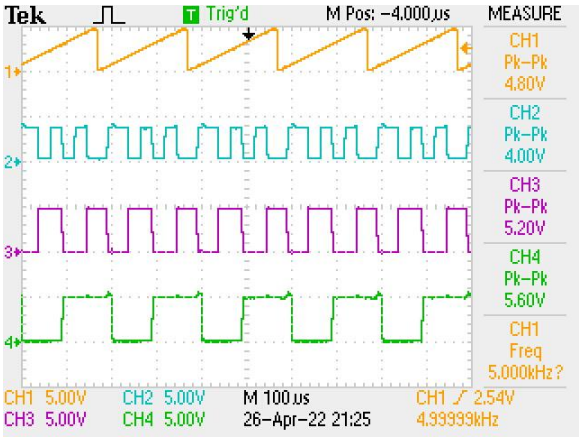


Figure 9.2 Case 2 Waveform 7V Ramp with a freq @ 5kHz ADC Circuit



Case 2 Experimental

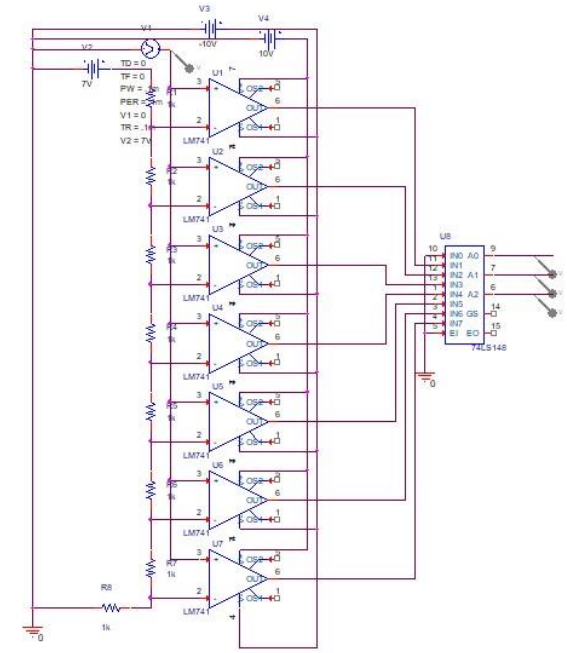


Figure 9.3 Case 4 7V Ramp Schematic with a freq @ 15kHz ADC Circuit

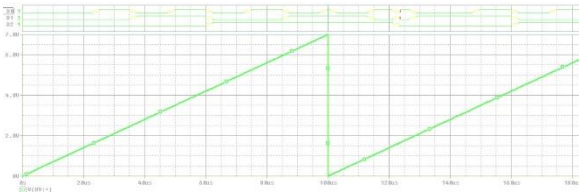
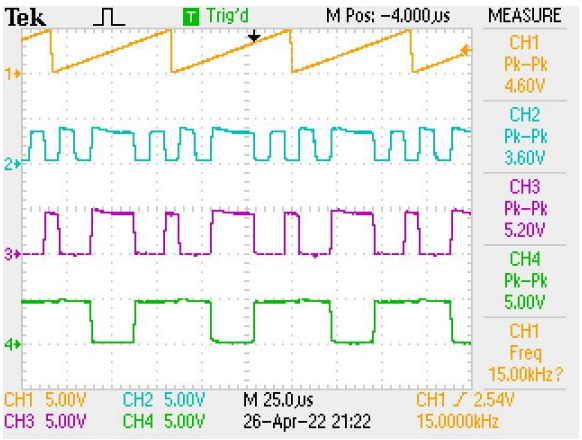


Figure 9.4 Case 4 Waveform 7V Ramp with a freq @ 5kHz ADC Circuit



Case 4 Experimental

Alternate Author 1 Case 1 and 3 Results:

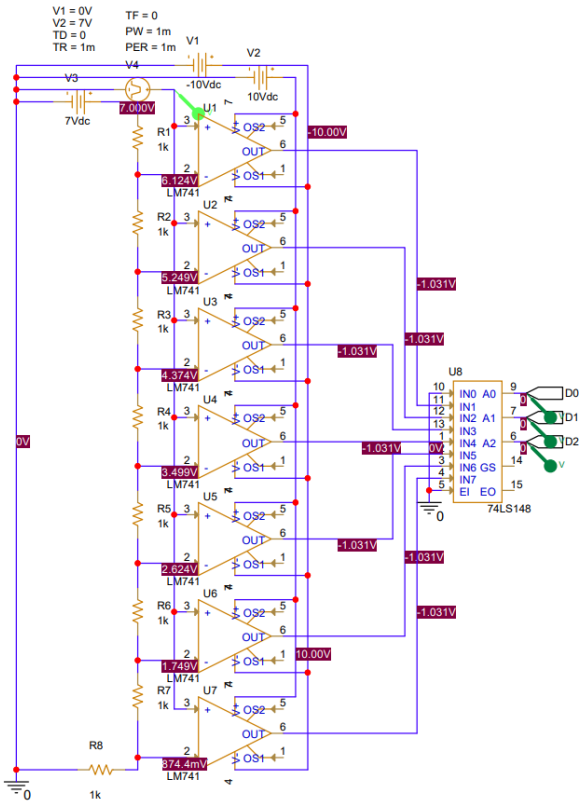


Fig. 9.1 Analog to Digital Converter Schematic, Vin = 1kHz, Vref = 7V

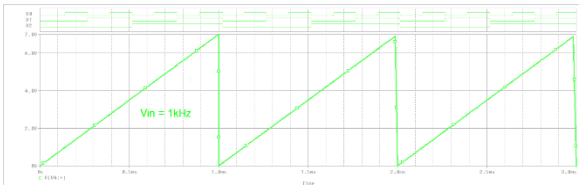


Fig. 9.1 Analog to Digital Converter Simulation Results, Vin = 1kHz, Vref = 7V

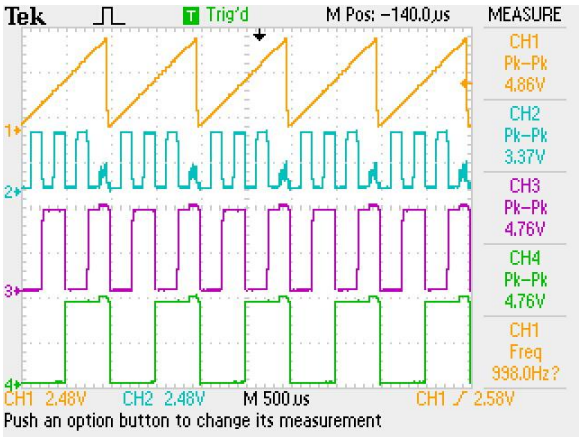


Fig. 9.3 Analog to Digital Converter Experimental Results, Vin = 1kHz, Vref = 7V

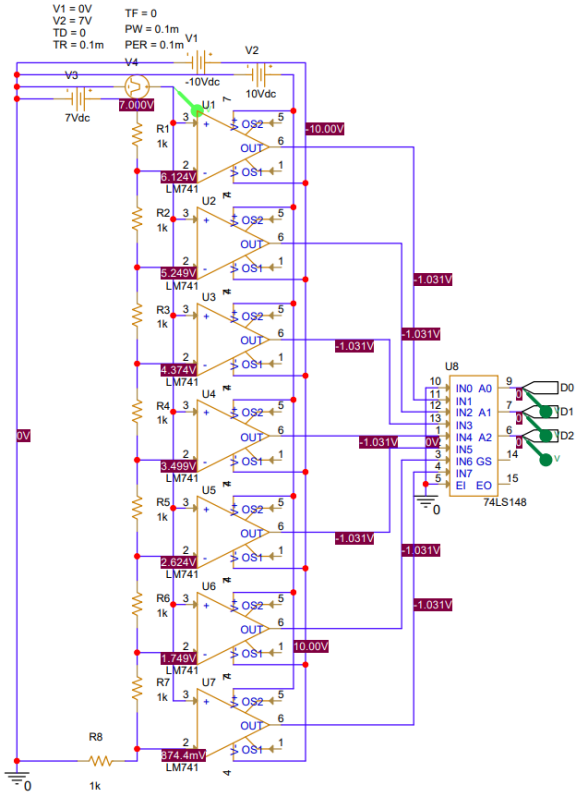


Fig. 9.4 Analog to Digital Converter Schematic, Vin = 8kHz, Vref = 7V

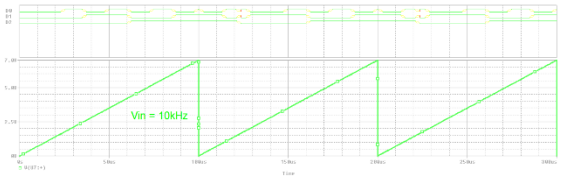


Fig. 9.5 Analog to Digital Converter Simulation Results, Vin = 8kHz, Vref = 7V

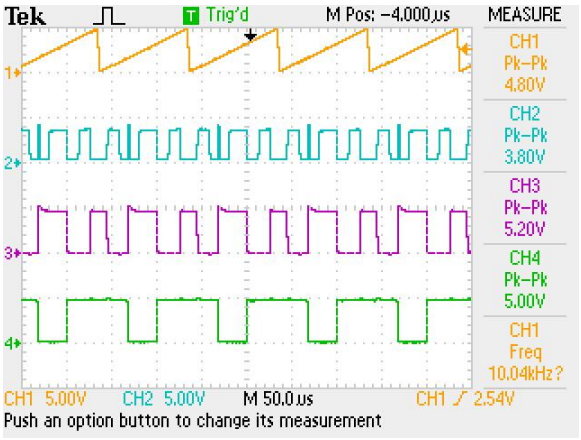


Fig. 9.6 Analog to Digital Converter Experimental Results, Vin = 8kHz, Vref = 7V

Conclusion:

In this experiment students were exposed to the set up and application of Analog to digital converter circuits. This is used in everyday life ranging from music to smart phones to satellites up in space.