

## Laboratory 8: Digital Signal Processing

Use the ADC0820 ADC, the TLC7524 DAC, and the DE2 Altera Cyclone II FPGA to construct the following DSP circuits:

1. Construct a DSP circuit with an ADC, the DE2 FPGA, and a DAC that delays an arbitrary signal by 80 microseconds. The sampling rate should be at least 100 kHz and the DAC should be operated in unipolar current mode. Compare the output using an LM741 and an OP27 op-amp.
  
2. Do *one* of the following two lab exercises:
  - 2a. Construct an FPGA-based DSP circuit which outputs the product of two arbitrary input signals. What is the maximum operating frequency (of the input signals) of the DSP circuit?
  
  - 2b. Construct an FPGA-based DSP circuit which produces two identical 100-sample sinewaves which differ by a phase. The phase difference should have an adjustment resolution of  $3.6^\circ$ . What is the maximum frequency at which you can produce sinewaves? What circuit element is responsible for this maximum frequency? How could you increase the output frequency?