

EET364 Microcontroller Systems

OIT Portland West, Winter 2010

Homework Assignment #7 Due February 22

The ADC in 10 bit integer mode produces a measured value of \$0000 for an input voltage of 0 and a measured value of \$03FF for an input value of 5 volts. In other words, the reference voltages are 0 and 5 volts. The scale factor in units of volts is the value you need to multiply the measured value by to get the voltage in units of volts. This means the scale factor would be 5/1023 volts. If we multiply the measured value \$03FF by 5/1023 volts we get 5 volts. If we multiply the measured value \$0000 by 5/1023 volts we get 0 volts. Note how we carry the units through the calculation (the measured values are "unitless", they just represent counts.)

You may do this assignment in either assembler or C.

1. The ADC value is stored in a memory word named *measure*. Show the code sequence that will convert the value to have a scale factor of 1 millivolt (so that one count equals a millivolt) and store the value with the new scale factor in memory word named *scaled*. Example — if *measure* is 1023, then *scaled* should end up being 5000.
2. Now suppose the ADC is configured to have left-justified values, what is called a binary fraction. Values range from \$0000 to \$FFC0. The value is again stored in memory word named *measure*. Show the code sequence that will convert the value to have a scale factor of 1 millivolt (so that one count equals a millivolt) and store the value with the new scale factor in memory word *scaled*. Example — if *measure* is 65472 (\$FFC0) then *scaled* should end up being 5000.
3. A 12-bit DAC produces an output voltage of 6 volts for code \$fff and an output voltage of 0 volts for code \$00. The DAC output is set by writing to the word location *DAC*. Show the code sequence that will take a voltage in millivolts stored in memory word *scaled*, as produced by either question 1 or 2, and produce an output on the DAC with the same voltage.
4. A 12-bit DAC produces an output voltage of 6 volts for code \$fff and an output voltage of 0 volts for code \$00. The DAC output is set by writing to the word location *DAC*. Show the code sequence that will take the 10 bit right justified ADC value from problem 1, which is stored in *measure*, and produce an output on the DAC with the same voltage. Do this with the minimum amount of calculation — one multiply and one divide.