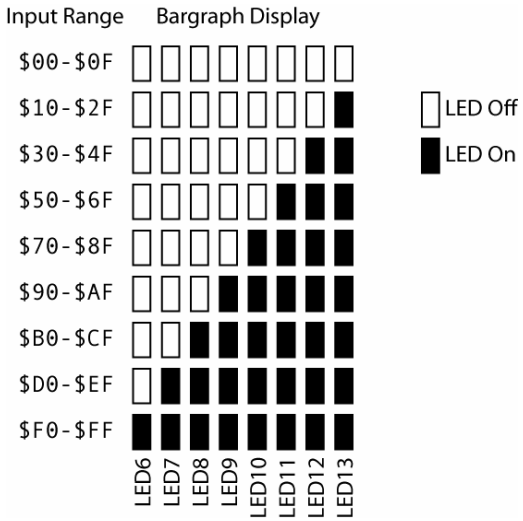
1 Introduction

In this lab you will create a program that displays the average of two A-to-D converter(ADC) samples and displays the result as a bar graph. The ADC channels you will use are the two connected to the potentiometers on the 9S12UB board, POT1 and POT2. The bar graph will use the 8 on-board LEDs connected to PORTA. This lab covers basic flow diagrams, simple conditional branches, subroutines, basic ADC usage, and simple fixed-point math.

References: ATD_10B8C Block User Guide (S12ATD10B8CV2.pdf), MC9S12DT128 Device User Guide (9S12DT128DGV2.pdf)

2 Requirements

1. The program MUST follow the flow diagram shown in Figure 1.
2. The ADC must be set up to take 2 samples per sequence – one for ATD1 channel 0 (AN08) and one for ATD1 channel 1 (AN09).
3. The average value of the samples must be accurate to ±0.5
4. The barcode converter code must be implemented as a subroutine that takes the value passed in ACCB and returns the bar graph code in ACCB. The bar graph conversion must be set up as follows:



3 Program Design

The following is a written description of the sequence that the program must follow. Also, see the flow diagram shown in Figure 1.

1) Initialize ADC – The A-to-D converter must be initialized first so it has time to power-up. To do this set the following registers:

   ATD1CTL2 = %10000000 -Power-up ADC

   ATD1CTL3 = %00010000 - Set-up to sample two channels

2) Initialize PORTA for the LEDs.

3) Start ADC Conversion – To start an A-to-D conversion, you must write to ATD1CTL5. A write to this register starts a new conversion. The value written controls the type of conversion. Write the following:

   ATD1CTL5 = %00010000 -Left justified, unsigned, single sequence, channels 0 and 1

4) Conversion Complete? – In order to know if the conversion is complete, you must check the SCF flag on the ATD1STAT0 register. If the flag bit is ‘0’, the conversion is not complete, if the flag bit is ‘1’, it is complete.

5) Average Samples – Take the average value of the two samples. Make sure to keep resolution within the specified ±0.5. After a conversion is complete the samples are located in ATD1DR0H and ATD1DR1H. For this lab, it is ok to just read the upper 8-bits of the samples, which are in these two registers.

6) Convert average value to bar graph display code – This must be done in a subroutine as described in the requirements. Here's a case where a lookup table isn't practical because you'd need 256 entries in the table. In this case use conditional branching to implement a *case* construct.

4 Deliverables

1. Source programs must be emailed before midnight on the lab due date.
2. The write-up is due before 5:00pm on the Write-up due date. The write-up includes:

   Introduction

   Program Description. Including block diagram(s) that shows more detail of the bar graph code converter subroutine.

   Listing. The assembled program listing.

   Comments/Conclusions

Due Dates: Program Source – Thursday, Jan 25, 2008. Write-up – Monday, Jan. 28, 2008

Figure 1 Program Block Diagram