Exercise 2: ADC with Keyboard Interrupt

EG-252 Group Design Exercise – Microcontroller Laboratory

Dr K. S. (Joseph) Kim

Dr Chris P. Jobling

September 2020

## I. Overview

For this lab exercise you are provided a sample ADC assembly program given in the appendix. An electronic version of the program is available on the Blackboard site. The program uses interrupt generated by push buttons to trigger an ADC process on the MC9S08AW60 evaluation board. You are to carry out the following two tasks with this exercise:

* Use the sample program to practice on pushbutton with interrupt mechanism and ADC process with the evaluation board.
* Design an equivalent program in C language which can perform the same keyboard interrupt and ADC processing functions as provided by the example assembly program.

This exercise is worth 8 marks. For this exercise you need only convert the provided assembly language programme to C and submit it for assessment. The assessment asks some additional questions related to the set up of the ADC and its use in the micromouse project.

You can view this document as a web page [HTML](exercise2.html), [PDF](exercise2.pdf) or as a Word Document [.docx](exercise2.docx)

# Appendix

## Sample Program in Assembly

;\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
;\* kbi\_adc.asm \*  
;\* \*  
;\* MC9S08AW60 Evaluation board keyboard interrupt example \*  
;\* - Switch SW3 onboard connected to Port D pin 3, KBI pin6; \*  
;\* - Switch SW4 onboard connected to Port D pin 2, KBI pin5 \*  
;\* \*  
;\* Function: \*  
;\* On reset all LEDs will light on. If SW3 or SW4 pressed, \*  
;\* an interrupt is generated, which set LEDs 0:3 to light on. \*  
;\* More interrupts are genereated if SW3 or SW4 are pressed. \*  
;\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
  
 INCLUDE 'derivative.inc' ; Include derivative-specific definitions  
  
FLASH EQU $2000  
RAM EQU $0070  
WATCH EQU $1802  
  
 ORG RAM  
LED\_on DS.B 1 ; Define a variable VAR\_D with a size of 1 byte  
  
;Start program after reset  
 ORG FLASH  
START\_UP  
 LDA #$00  
 STA WATCH ; Turn off the watchdog timer  
   
;Init\_GPIO init code   
 LDA #$FF  
 STA PTFDD  
 MOV #$0F, LED\_on ; Initialize VAR\_D, used to control the LEDs  
 LDA #$FF  
 STA PTDPE ; Port D is enabled with pull-up  
 RSP ; Reset stack pointer  
   
;Enable interrupt for Keyboard input  
 LDA #$60  
 STA KBI1PE ; KBI1PE: enable KBI function for pins 5 and 6 only  
 BSET $02, KBI1SC ; KBI1SC: KBACK=1, to clear KBI flag   
 BSET $01, KBI1SC ; KBI1SC: KBIE=1, enable KBI   
   
 CLI ; Enable interrupt  
  
MAINLOOP  
 LDA LED\_on ; Simple loop  
 BRA MAINLOOP  
  
;Interrupt service routine for a keyboard interrupt generated upon the press of a pushbutton  
;with a falling edge (transition from high logic level "1" to low logic level "0")   
LED\_SWITCH  
 BSET $02, KBI1SC ; Clear KBI flag   
 LDA #8  
 STA ADC1SC1 ; ADC conversion will start after a number is written to ADC1SC1 register.  
ADCLOOP   
 TST ADC1SC1 ; Check the COCO bit (conversion complete flag).  
 BPL ADCLOOP ; if not complete, wait in the ADC loop.  
 LDA ADC1RL ; if complete, read the ADC outcome (digital value) from the register.  
 STA PTFD ; display over LED bar  
 RTI   
  
;INT\_VECTOR   
 ORG $FFD2  
 DC.W LED\_SWITCH  
   
 ORG $FFFE  
 DC.W START\_UP

View on [GitHub](https://github.com/cpjobling/EG-252-Resources/blob/master/Microcontroller-Interfacing/Exercises/Exercise2/kbi_adc.asm)