

# Exercise 2: ADC with Keyboard Interrupt

EG-252 Group Design Exercise – Microcontroller Laboratory

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## 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.

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## Appendix

### Sample Program in Assembly

```
1 ;*****
2 ;*      kbi_adc.asm                                *
3 ;*                                           *
4 ;*      MC9S08AW60 Evaluation board keyboard interrupt example      *
5 ;*      - Switch SW3 onboard connected to Port D bit 3, KBI pin6;    *
6 ;*      - Switch SW4 onboard connected to Port D bit 2, KBI pin5    *
7 ;*                                           *
8 ;*      Function:                                *
```

```

9  ;*          On reset, all LEDs are off. When either SW3 or SW4 are pressed,  *
10 ;*          then the ADC channel 8 is read and sent to the LEDs.          *
11 ;*****
12
13          INCLUDE          'derivative.inc' ; Include derivative-specific definitions
14
15  FLASH          EQU          $2000
16  RAM            EQU          $0070
17  WATCH          EQU          $1802
18
19  ConvComp        EQU          %10000000 ;Mask for Conversion Complete flag
20
21          ORG          RAM
22  LED_on          DS.B          1 ; Define a variable VAR_D with a
23
24  ;Start program after reset
25
26          ORG          FLASH
27  START_UP
28          LDA          #$00
29          STA          WATCH ; Turn off the watchdog timer
30
31  ;Init_GPIO init code
32          LDA          #$FF
33          STA          PTFDD
34          MOV          #$0F, LED_on ; Initialize VAR_D, used to control
35          LDA          #$FF
36          STA          PTDPE ; Port D is enabled with pull-up
37          RSP ; Reset stack pointer to $0080
38
39  ;Enable interrupt for Keyboard input
40          LDA          #$60
41          STA          KBI1PE ; KBI1PE: enable KBI function for pins 5 and 6
42          BSET          $02, KBI1SC ; KBI1SC: KBACK=1, to clear KBI flag
43          BSET          $01, KBI1SC ; KBI1SC: KBIE=1, enable KBI
44
45          CLI ; Enable interrupt
46
47  MAINLOOP
48          LDA          LED_on ; Simple loop with "dummy" operation
49          BRA          MAINLOOP
50
51  ;Interrupt service routine for a keyboard interrupt generated upon the press of a pushbutton
52  ;with a falling edge (transition from high logic level "1" to low logic level "0")
53  LED_SWITCH
54          BSET          $02, KBI1SC ; Clear KBI flag

```

```

55          LDA          #8          ; Select analogue input 8 (the blue potentiometer)
56          STA          ADC1SC1     ; ADC conversion will start after a number of samples
57  ADCLOOP
58          LDA          ADC1SC1     ;
59          AND          #ConvComp    ; Check the COCO bit (conversion complete)
60          BEQ          ADCLOOP      ; if not complete, wait in the ADC loop.
61          LDA          ADC1RL       ; if complete, read the ADC outcome (digital value)
62          STA          PTFD         ; display over LED bar
63          RTI
64
65  ;INT_VECTOR
66          ORG          $FFD2
67          DC.W         LED_SWITCH
68
69          ORG          $FFFE
70          DC.W         START_UP
71
72
73
74
75

```

[View on GitHub](#)