#include "L4\_123.h"

#define F\_CPU 16000000

#include <asf.h>

#include <stdio.h>

#include <avr/delay.h>

#include <avr/io.h>

#include <avr/interrupt.h>

#define \_CRT\_SECURE\_NO\_WARNINGS

//Parity 0

#define OFF\_PARITY 0

#define ODD\_PARITY 1

#define EVEN\_PARITY 2

#define BIT\_FORMAT\_8bit 1

//StopBit

#define STOP\_BIT\_1bit 1

#define STOP\_BIT\_2bit 2

char\* ReadString( unsigned port);

int WriteString(unsigned port, char \*szOutput);

//Task 2 Functions

//------------------------------------------------

void ADC\_DiffInit(char port1, char port2)

{

if ((port1 == 0)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC0 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 1)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC1 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 2)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX1)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC2 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 3)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX1)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC3 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 4)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX2)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC4 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 5)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX2)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC5 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 6)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX1)|(1<<MUX2)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC6 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 7)&&(port2 == 1))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX1)|(1<<MUX2)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC7 and ADC1 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 0)&&(port2 == 2))

{

ADMUX =(1 << REFS0)|(1<<MUX3)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC0 and ADC2 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 1)&&(port2 == 2))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX3)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC1 and ADC2 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 2)&&(port2 == 2))

{

ADMUX =(1 << REFS0)|(1<<MUX1)|(1<<MUX3)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC2 and ADC2 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 3)&&(port2 == 2))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX1)|(1<<MUX3)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC3 and ADC2 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 4)&&(port2 == 2))

{

ADMUX =(1 << REFS0)|(1<<MUX2)|(1<<MUX3)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC4 and ADC2 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

if ((port1 == 5)&&(port2 == 2))

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX2)|(1<<MUX3)|(1<<MUX4); // enable Vref=5 volts and MUX for difference between ADC4 and ADC2 with gain x1

ADCSRA |= (1 << ADEN); // ADC Enable

}

}

int ADC\_DiffRead(void)

{

ADCSRA|=(1<<ADSC);//start conversion

while(!(ADCSRA&(1<<ADSC))); //wait conversion

return ADCW;

}

//------------------------------------------------

int main (void)

{

int result;

//task 2

ADC\_DiffInit(2,1); // define which ports we measure

double voltage; // double type value to convert ADC value

char string[30]="ADC starts.. "; // print the string in the beginning

SetLineParameters( 0, 9600, EVEN\_PARITY, BIT\_FORMAT\_8bit, STOP\_BIT\_2bit ); // init board

WriteString((unsigned) 0, string); // write the started string in the terminal

//Task 2

while(1)

{

result=ADC\_DiffRead();// read integer difference value

voltage=(double)result; // convert to double

voltage=(voltage\*5)/511; // convert to decimal

sprintf(string,"\rResult = %.5f Volts", voltage); // set double value to string

WriteString((unsigned) 0, string); // write the voltage on the screen

\_delay\_ms(1000); // wait 1 second before clean the screen

WriteString((unsigned) 0, "\033[2J"); // clean a screen to measure again

}

}