#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 3 Functions

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

void ADC\_GainInit(char port1, char port2)

{

// set frequency 1MHz / 8 = 125kHz

ADCSRA = (1<<ADPS1) | (1<<ADPS0); //prescale

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

{

ADMUX =(1 << REFS0)|(1<<MUX3); // enable Vref=5 volts and MUX for difference between ADC0 and ADC1 with gain x10

}

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

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX3); // enable Vref=5 volts and MUX for difference between ADC1 and ADC1 with gain x10

}

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

{

ADMUX =(1 << REFS0)|(1<<MUX2)|(1<<MUX3); // enable Vref=5 volts and MUX for difference between ADC2 and ADC1 with gain x10

}

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

{

ADMUX =(1 << REFS0)|(1<<MUX0)|(1<<MUX2)|(1<<MUX3); // enable Vref=5 volts and MUX for difference between ADC3 and ADC1 with gain x10

}

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

}

int ADC\_Read(void)

{

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

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

return ADCW;

}

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

int Voltage(unsigned gain)

{

if (gain==10) // if gain 10, all MUX1 sets to zero for both ports

ADMUX|=(0<<MUX1);

else

ADMUX|=(1<<MUX1); // if gain 200, all MUX1 sets to 1 for both ports

return ADC\_Read();// and we go to reading ADC values

}

int main (void)

{

ADC\_GainInit(1,0); // initialize two ports to measure difference between them with gain

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 3

while(1)

{

voltage=(double)Voltage(10); // read integer ADC with gain x10 or x200, convert to double

voltage=(voltage\*5)/1023; // transform to decimal

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

WriteString((unsigned) 0, string); // print the voltage

\_delay\_ms(1000); // wait a second before cleaning a screen

WriteString((unsigned)0, "\033[2J"); // clear the terminal to measure again

}

}