#include <avr/io.h>

#include <string.h>

#include <stdio.h>

#define E PD7

#define RS PB0

void display(char string[16], char LineNo);

void displaybyte(char D);

void dispinit(void);

void epulse(void);

void delay\_ms(unsigned int M);

int main(void)

{

char lcd[6];

int T,level1,level2;

level1=30; // the point of Middle temperature

level2=40; // the point of High temperature

DDRB = 0xE1; // Direction of LCD Port

DDRD = 0xE0;

PORTB = 0x06;

dispinit();

delay\_ms(200);

while(1)

{

// Heat level system

ADMUX=0xE5;

ADCSRA=0xC7;

while (!(ADCSRA & (1<<ADIF)));

T=ADCH;

ADCSRA |= 1<<4;

sprintf(lcd, "%03d",T);

display("Temperature:",1);

displaybyte(lcd[1]);

displaybyte(lcd[2]);

displaybyte(0xDF);

if(T<level1)

{

PORTB &= ~(1<<5);

display("Heat level:LOW",2);

displaybyte(0xDF);

}

else if(T<level2)

{

PORTB &= ~(1>>5);

display("Heat level:MIDDLE",2);

displaybyte(0xDF);

}

else

{

PORTB |= (1<<5);

display("Heat level:HIGH",2);

displaybyte(0xDF);

}

}

}

void dispinit(void)

{

int i;

char init[]={0x43,0x03,0x03,0x02,0x28,0x01,0x0C,0x06,0x02,0x02};

PORTB &= ~(1<<RS); // (RS=0)

for (i = 0; i <= 9; i++)

{

displaybyte(init[i]);

}

PORTB |= 1<<RS; //(RS=1)

}

void epulse(void)

{

PORTD |= 1<<E;

delay\_ms(10);

PORTD &= ~(1<<E);

delay\_ms(10);

}

void displaybyte(char D)

{

//D4=PD6, D5=PD5, D6=PB7, D7=PB6

char K;

K=D;

K=K & 0xF0;

K=K >> 4;

PORTD &= 0x9F;

PORTB &= 0x3F;

if((K & 0x01)==0x01){PORTD |= (1<<PD6);}

if((K & 0x02)==0x02){PORTD |= (1<<PD5);}

if((K & 0x04)==0x04){PORTB |= (1<<PB7);}

if((K & 0x08)==0x08){PORTB |= (1<<PB6);}

epulse();

K=D;

K=K & 0x0F;

PORTD &= 0x9F;

PORTB &= 0x3F;

if((K & 0x01)==0x01){PORTD |= (1<<PD6);}

if((K & 0x02)==0x02){PORTD |= (1<<PD5);}

if((K & 0x04)==0x04){PORTB |= (1<<PB7);}

if((K & 0x08)==0x08){PORTB |= (1<<PB6);}

epulse();

}

void display(char string[16], char LineNo)

{

int ln,c;

PORTB &= ~(1<<RS); // (RS=0)

if(LineNo==1)

{

displaybyte(0x80);

}

else

{

displaybyte(0xC0);

}

PORTB |= (1<<RS); // (RS=1)

ln = strlen(string);

for (c=0;c<ln;c++)

{

displaybyte(string[c]);

}

}

void delay\_ms(unsigned int M)

{

unsigned int r,r1;

for (r=0;r<M;r++)

{

for(r1=0;r1<30;r1++)

{

asm("nop");

}

}

}