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//Expt.2: LCD Interfacing
//Includes
#include <p18f4550.h>
#include "vector_relocate.h"

//Declarations
#define LCD_DATA    PORTD                       //LCD data port to PORTD
#define ctrl        PORTE                       //LCD control port to PORTE
#define rs          PORTEbits.RE0       //register select signal to RE0
#define rw          PORTEbits.RE1       //read/write signal to RE1
#define en          PORTEbits.RE2       //enable signal to RE2

//Function Prototypes
void init_LCD(void);                                    //Function to initialise
the LCD
void LCD_command(unsigned char cmd);    //Function to pass command to the LCD
void LCD_data(unsigned char data);              //Function to write character to
the LCD
void LCD_write_string(static char *str);//Function to write string to the LCD
void msdelay (unsigned int time);               //Function to generate delay

//Start of Main Program
void main(void)
{
     char var1[] = "aaaaa";//Declare message to be displayed
     char var2[] = "aaaaaa";

     ADCON1 = 0x0F;                     //Configuring the PORTE pins as digital I/O

     TRISD = 0x00;              //Configuring PORTD as output
     TRISE = 0x00;                      //Configuring PORTE as output

     init_LCD();                // call function to initialise of LCD
     msdelay(50);               // delay of 50 mili seconds

     LCD_write_string(var1);//Display message on first line
     msdelay(15);

     LCD_command(0xC0);         // initiate cursor to second line
     LCD_write_string(var2);//Display message on second line

     while (1);                         //Loop here
}                                                       //End of Main

//Function Definitions
void msdelay (unsigned int time) //Function to generate delay
{
unsigned int i, j;
  for (i = 0; i < time; i++)
        for (j = 0; j < 710; j++);//Calibrated for a 1 ms delay in MPLAB
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}


void init_LCD(void)             // Function to initialise the LCD
{
    LCD_command(0x38);      // initialization of 16X2 LCD in 8bit mode
    msdelay(15);
    LCD_command(0x01);      // clear LCD
    msdelay(15);
    LCD_command(0x0C);      // cursor off
    msdelay(15);
    LCD_command(0x80);      // go to first line and 0th position
    msdelay(15);
}

void LCD_command(unsigned char cmd) //Function to pass command to the LCD
{
    LCD_DATA = cmd;             //Send data on LCD data bus
    rs = 0;                             //RS = 0 since command to LCD
    rw = 0;                             //RW = 0 since writing to LCD
    en = 1;                             //Generate High to low pulse on EN
    msdelay(15);
    en = 0;
}

void LCD_data(unsigned char data)//Function to write data to the LCD
{
    LCD_DATA = data;    //Send data on LCD data bus
    rs = 1;                             //RS = 1 since data to LCD
    rw = 0;                             //RW = 0 since writing to LCD
    en = 1;                             //Generate High to low pulse on EN
        msdelay(15);
    en = 0;
}
//Function to write string to LCD
void LCD_write_string(static char *str)
{
    int i = 0;
    while (str[i] != 0)
    {
        LCD_data(str[i]);      // sending data on LCD byte by byte
        msdelay(15);
        i++;
    }
}
```