LCD Menu for Microcontrollers

v001

Generated by Doxygen 1.8.15

Chapter 1

Data Structure Index

1.1 Data Structures

Here are the data structures with brief descriptions:

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

Chapter 3

Data Structure Documentation

3.1 MenuStructure Struct Reference

`#include <lcd_menu.h>`

Data Fields

- const char * text
- unsigned char num_menupoints
- unsigned char up
- unsigned char down
- unsigned char enter
- void(* fp)(void)

3.1.1 Field Documentation

3.1.1.1 down

`unsigned char MenuStructure::down`

3.1.1.2 enter

`unsigned char MenuStructure::enter`

3.1.1.3 fp

```
void( * MenuStructure::fp) (void)
```

3.1.1.4 num_menupoints

```
unsigned char MenuStructure::num_menupoints
```

3.1.1.5 text

```
const char* MenuStructure::text
```

3.1.1.6 up

```
unsigned char MenuStructure::up
```

The documentation for this struct was generated from the following file:

- D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/lcd_menu.h

Chapter 4

File Documentation

4.1 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/ADC_user_functions.h File Reference

```
#include <xc.h>
```

Functions

- void init_ADC (void)
- void init_dig_pot_SPI (void)
- void send_contrast_spi (void)
- void send_backlight_spi (void)
- void init_dac_SPI (void)
- void send_dac_u_spi (void)
- void send_dac_i_spi (void)

4.1.1 Function Documentation

4.1.1.1 init_ADC()

```
void init_ADC (
              void  )
```

4.1.1.2 init_dac_SPI()

```
void init_dac_SPI (
              void  )
```

4.1.1.3 init_dig_pot_SPI()

```
void init_dig_pot_SPI (
              void  )
```

4.1.1.4 send_backlight_spi()

```
void send_backlight_spi (
              void  )
```

4.1.1.5 send_contrast_spi()

```
void send_contrast_spi (
              void  )
```

4.1.1.6 send_dac_i_spi()

```
void send_dac_i_spi (
              void  )
```

4.1.1.7 send_dac_u_spi()

```
void send_dac_u_spi (
              void  )
```

4.2 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/busyxlcd.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- unsigned char BusyXLCD (void)

4.2.1 Function Documentation

4.2.1.1 BusyXLCD()

```
unsigned char BusyXLCD (
            void  )
```

BusyXLCD Returns the busy status of the LCD

4.3 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/lcd_menu.c File Reference

```
#include <xc.h>
#include <math.h>
#include <stdint.h>
#include <stdbool.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <plib/delays.h>
#include "lcd_menu.h"
#include "xlcd.h"
```

Functions

- void LCDWriteCmd (unsigned char command)
- void clear_display (void)
- void DelayFor18TCY (void)
- void DelayPORXLCD (void)
- void DelayXLCD (void)
- void Delay1Sec (void)
- void DelayHalfSec (void)
- void Delay200ms (void)
- void gotoxy (unsigned char x_pos, unsigned char y_pos)
- void LCDWriteStringROM (unsigned char x, unsigned char y, const char *lcd_menu_items, unsigned char add_line, char add_char)
- void show_menu (void)

Variables

- unsigned char selected = 1
- const char menu_000 [ ] = "-- Main Menu --"
- const char menu_001 [ ] = " Option1"
- const char menu_002 [ ] = " Option2"
- const char menu_003 [ ] = " Option3"
- const char menu_004 [ ] = " Option4"
- const char menu_005 [ ] = " Option5"
- const char menu_006 [ ] = " Option6"
- const char menu_007 [ ] = " Option7"
- const char menu_008 [ ] = " Option8"
- const char menu_009 [ ] = " START"
- const char menu_010 [ ] = " [Sub Menu]"
- const char menu_011 [ ] = " SubOption1"
- const char menu_012 [ ] = " SubOption2"
- const char menu_013 [ ] = " SubOption3"
- const char menu_014 [ ] = " SubOption4"
- const char menu_015 [ ] = " SubOption5"
- const char menu_016 [ ] = " RETURN"
- MenuEntry my_menu [ ]

4.3.1 Function Documentation

4.3.1.1 clear_display()

```
void clear_display (
             void  )
```

4.3.1.2 Delay1Sec()

```
void Delay1Sec (
             void  )
```

4.3.1.3 Delay200ms()

```
void Delay200ms (
             void  )
```

4.3.1.4 DelayFor18TCY()

```
void DelayFor18TCY (
             void  )
```

User defines these routines according to the oscillator frequency

4.3.1.5 DelayHalfSec()

```
void DelayHalfSec (
             void  )
```

4.3.1.6 DelayPORXLCD()

```
void DelayPORXLCD (
             void  )
```

4.3.1.7 DelayXLCD()

```
void DelayXLCD (
             void  )
```

4.3.1.8 gotoxy()

```
void gotoxy (
             unsigned char x_pos,
             unsigned char y_pos )
```

4.3.1.9 LCDWriteCmd()

```
void LCDWriteCmd (
             unsigned char command )
```

4.3.1.10 LCDWriteStringROM()

```
void LCDWriteStringROM (
             unsigned char x,
             unsigned char y,
             const char * lcd_menu_items,
             unsigned char add_line,
             char add_char )
```

4.3.1.11 show_menu()

```
void show_menu (
             void  )
```

< from which row of menu points

< till which row of menu points

4.3.2 Variable Documentation

4.3.2.1 menu_000

```
const char menu_000[] = "-- Main Menu --"
```

4.3.2.2 menu_001

```
const char menu_001[] = " Option1"
```

4.3.2.3 menu_002

```
const char menu_002[] = " Option2"
```

4.3.2.4 menu_003

```
const char menu_003[] = " Option3"
```

4.3.2.5 menu_004

```
const char menu_004[] = " Option4"
```

4.3.2.6 menu_005

```
const char menu_005[] = " Option5"
```

4.3.2.7 menu_006

```
const char menu_006[] = " Option6"
```

4.3.2.8 menu_007

```
const char menu_007[] = " Option7"
```

4.3.2.9 menu_008

```
const char menu_008[] = " Option8"
```

4.3.2.10 menu_009

```
const char menu_009[] = " START"
```

4.3.2.11 menu_010

```
const char menu_010[] = " [Sub Menu]"
```

4.3.2.12 menu_011

```
const char menu_011[] = " SubOption1"
```

4.3.2.13 menu_012

```
const char menu_012[] = " SubOption2"
```

4.3.2.14 menu_013

```
const char menu_013[] = " SubOption3"
```

4.3.2.15 menu_014

```
const char menu_014[] = " SubOption4"
```

4.3.2.16 menu_015

```
const char menu_015[] = " SubOption5"
```

4.3.2.17 menu_016

```
const char menu_016[] = " RETURN"
```

4.3.2.18 my_menu

```
MenuEntry my_menu[]
```

Initial value:

```
=
{
    {menu_000, 10, 0, 0, 0,  0},
    {menu_001, 10, 1, 2, 1,  0},
    {menu_002, 10, 1, 3, 11, 0},
    {menu_003, 10, 2, 4, 3,  0},
    {menu_004, 10, 3, 5, 4,  0},
    {menu_005, 10, 4, 6, 5,  0},
    {menu_006, 10, 5, 7, 6,  0},
    {menu_007, 10, 6, 8, 7,  0},
    {menu_008, 10, 7, 9, 8,  0},
    {menu_009, 10, 8, 9, 9,  start},

    {menu_010, 7, 0,  0,  0,  0},
    {menu_011, 7, 1,  12, 11, 0},
    {menu_012, 7, 11, 13, 12, 0},
    {menu_013, 7, 12, 14, 13, 0},
    {menu_014, 7, 13, 15, 14, 0},
    {menu_015, 7, 14, 16, 15, 0},
    {menu_016, 7, 15, 16, 1,  0},
}
```

4.3.2.19 selected

```
unsigned char selected = 1
```

4.4 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/lcd_menu.h File Reference

Data Structures

- struct MenuStructure

Macros

- #define TRUE 1
- #define FALSE 0
- #define _XTAL_FREQ 8000000
- #define DISPLAY_16x4

  Display type definitions. These are character LCD display type definitions.
- #define VISIBLE_MENU_HEADER TRUE

  Define whether menu header is always visible.
- #define SELECTION_CHAR '>'
- #define SELECTION_CHAR_END '<'
- #define DISPLAY_ROWS 4
- #define UPPER_SPACE 2
- #define LOWER_SPACE 1
- #define INITIAL_MAXX 16
- #define INITIAL_MAXY 4
- #define START_ROW3 0x10
- #define START_ROW4 0x50

Typedefs

- typedef const struct MenuStructure MenuEntry

Functions

- void DelayFor18TCY (void)
- void DelayPORXLCD (void)
- void DelayXLCD (void)
- void Delay1Sec (void)
- void DelayHalfSec (void)
- void Delay200ms (void)
- void start (void)
- void show_menu (void)
- void LCDWriteStringROM (unsigned char x, unsigned char y, const char *lcd_menu_items, unsigned char add_line, char add_char)
- void LCDWriteCmd (unsigned char command)
- void gotoxy (unsigned char x_pos, unsigned char y_pos)
- void clear_display (void)

Variables

- MenuEntry my_menu [ ]
- unsigned char selected

4.4.1 Macro Definition Documentation

4.4.1.1 _XTAL_FREQ

```
#define _XTAL_FREQ 8000000
```

4.4.1.2 DISPLAY_16x4

```
#define DISPLAY_16x4
```

Display type definitions. These are character LCD display type definitions.

LCD menu library support four types of character LCD display:

- LCD 16 columns on 2 rows
- LCD 16 columns on 4 rows
- LCD 20 columns on 4 rows
- LCD 20 columns on 2 rowsDefine display type 16x4.

4.4.1.3 DISPLAY_ROWS

```
#define DISPLAY_ROWS 4
```

4.4.1.4 FALSE

```
#define FALSE 0
```

4.4.1.5 INITIAL_MAXX

```
#define INITIAL_MAXX 16
```

4.4.1.6 INITIAL_MAXY

```
#define INITIAL_MAXY 4
```

4.4.1.7 LOWER_SPACE

```
#define LOWER_SPACE 1
```

4.4.1.8 SELECTION_CHAR

```
#define SELECTION_CHAR '>'
```

Define selection symbols

4.4.1.9 SELECTION_CHAR_END

```
#define SELECTION_CHAR_END '<'
```

4.4.1.10 START_ROW3

```
#define START_ROW3 0x10
```

4.4.1.11 START_ROW4

```
#define START_ROW4 0x50
```

4.4.1.12 TRUE

```
#define TRUE 1
```

4.4.1.13 UPPER_SPACE

```
#define UPPER_SPACE 2
```

4.4.1.14 VISIBLE_MENU_HEADER

```
#define VISIBLE_MENU_HEADER TRUE
```

Define whether menu header is always visible.

First row of the menu could be reserved for menu header.

Use flag TRUE to keep menu header always visible. If flag FALSE is used, then menu header will shift accordingly depending of the selected menu item.

4.4.2 Typedef Documentation

4.4.2.1 MenuEntry

```
typedef const struct MenuStructure MenuEntry
```

4.4.3 Function Documentation

4.4.3.1 clear_display()

```
void clear_display (
            void  )
```

4.4.3.2 Delay1Sec()

```
void Delay1Sec (
            void  )
```

4.4.3.3 Delay200ms()

```
void Delay200ms (
            void  )
```

4.4.3.4 DelayFor18TCY()

```
void DelayFor18TCY (
            void  )
```

4.4.3.5 DelayHalfSec()

```
void DelayHalfSec (
            void  )
```

4.4.3.6 DelayPORXLCD()

```
void DelayPORXLCD (
            void  )
```

4.4.3.7 DelayXLCD()

```
void DelayXLCD (
            void  )
```

4.4.3.8 gotoxy()

```
void gotoxy (
            unsigned char x_pos,
            unsigned char y_pos )
```

4.4.3.9 LCDWriteCmd()

```
void LCDWriteCmd (
            unsigned char command )
```

4.4.3.10 LCDWriteStringROM()

```
void LCDWriteStringROM (
            unsigned char x,
            unsigned char y,
            const char * lcd_menu_items,
            unsigned char add_line,
            char add_char )
```

4.4.3.11 show_menu()

```
void show_menu (
            void  )
```

< from which row of menu points

< till which row of menu points

4.4.3.12 start()

```
void start (
            void  )
```

4.4.4 Variable Documentation

4.4.4.1 my_menu

```
MenuEntry my_menu[]
```

4.4.4.2 selected

```
unsigned char selected
```

4.5 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/lcd_trials_4bits.c File Reference

```
#include <xc.h>
#include <math.h>
#include <stdint.h>
#include <stdbool.h>
#include <stdio.h>
#include <stdlib.h>
#include "lcd_trials_4bits.h"
#include <plib/delays.h>
#include "xlcd.h"
#include "lcd_menu.h"
#include <string.h>
```

Macros

- #define DISPLAY_SET_MODE_SELECT RE3
- #define DISPLAY_SET_UP RA5
- #define DISPLAY_SET_DOWN RA6

Functions

- void start (void)
- void init_GPIO_DIR (void)
- void init_XLCD (void)
- void main (void)

Variables

- unsigned int button_delay_counter = 0
- unsigned int return_default_display_counter = 0
- bool button_enable = 1
- bool button_delay_counter_enable = 0
- bool return_default_display_counter_enable = 0

4.5.1 Macro Definition Documentation

4.5.1.1 DISPLAY_SET_DOWN

```
#define DISPLAY_SET_DOWN RA6
```

4.5.1.2 DISPLAY_SET_MODE_SELECT

```
#define DISPLAY_SET_MODE_SELECT RE3
```

4.5.1.3 DISPLAY_SET_UP

```
#define DISPLAY_SET_UP RA5
```

4.5.2 Function Documentation

4.5.2.1 init_GPIO_DIR()

```
void init_GPIO_DIR (
             void  )
```

4.5.2.2 init_XLCD()

```
void init_XLCD (
             void  )
```

4.5.2.3 main()

```
void main (
             void  )
```

4.5.2.4 start()

```
void start (
             void  )
```

4.5.3 Variable Documentation

4.5.3.1 button_delay_counter

```
unsigned int button_delay_counter = 0
```

4.5.3.2 button_delay_counter_enable

```
bool button_delay_counter_enable = 0
```

4.5.3.3 button_enable

```
bool button_enable = 1
```

4.5.3.4 return_default_display_counter

```
unsigned int return_default_display_counter = 0
```

4.5.3.5 return_default_display_counter_enable

```
bool return_default_display_counter_enable = 0
```

4.6 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/lcd_trials_4bits.h File Reference

4.7 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/LCD_user_functions.h File Reference

Functions

- void init_XLCD (void)
- void clear_display (void)
- void DelayFor18TCY (void)
- void DelayPORXLCD (void)
- void DelayXLCD (void)
- void Delay1Sec (void)
- void DelayHalfSec (void)
- void Delay200ms (void)
- void init_GPIO_DIR (void)

4.7.1 Function Documentation

4.7.1.1 clear_display()

```
void clear_display (
             void  )
```

4.7.1.2 Delay1Sec()

```
void Delay1Sec (
             void  )
```

4.7.1.3 Delay200ms()

```
void Delay200ms (
             void  )
```

4.7.1.4 DelayFor18TCY()

```
void DelayFor18TCY (
             void  )
```

4.7.1.5 DelayHalfSec()

```
void DelayHalfSec (
             void  )
```

4.7.1.6 DelayPORXLCD()

```
void DelayPORXLCD (
             void  )
```

4.7.1.7 DelayXLCD()

```
void DelayXLCD (
             void  )
```

4.7.1.8 init_GPIO_DIR()

```
void init_GPIO_DIR (
             void  )
```

4.7.1.9 init_XLCD()

```
void init_XLCD (
             void  )
```

4.8 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/openxlcd.c File Reference

```
#include <p18cxxx.h>
#include <plib/delays.h>
#include "xlcd.h"
```

Functions

- void OpenXLCD (unsigned char lcdtype)

4.8.1 Function Documentation

4.8.1.1 OpenXLCD()

```
void OpenXLCD (
             unsigned char lcdtype )
```

4.9 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/putrxlcd.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- void putrsXLCD (const char *buffer)

4.9.1 Function Documentation

4.9.1.1 putrsXLCD()

```
void putrsXLCD (
            const char *  )
```

putrsXLCD Writes a string of characters in ROM to the LCD

4.10 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/putsxlcd.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- void putsXLCD (char *buffer)

4.10.1 Function Documentation

4.10.1.1 putsXLCD()

```
void putsXLCD (
            char * buffer )
```

4.11 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/readaddr.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- unsigned char ReadAddrXLCD (void)

4.11.1 Function Documentation

4.11.1.1 ReadAddrXLCD()

```
unsigned char ReadAddrXLCD (
            void  )
```

ReadAddrXLCD Reads the current address

4.12 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/readdata.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- char ReadDataXLCD (void)

4.12.1 Function Documentation

4.12.1.1 ReadDataXLCD()

```
char ReadDataXLCD (
            void  )
```

ReadDataXLCD Reads a byte of data

4.13 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/setcgram.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- void SetCGRamAddr (unsigned char CGaddr)

4.13.1 Function Documentation

4.13.1.1 SetCGRamAddr()

```
void SetCGRamAddr (
            unsigned char CGaddr )
```

4.14 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/setddram.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- void SetDDRamAddr (unsigned char DDaddr)

4.14.1 Function Documentation

4.14.1.1 SetDDRamAddr()

```
void SetDDRamAddr (
            unsigned char DDaddr )
```

4.15 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/wcmdxlcd.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- void WriteCmdXLCD (unsigned char cmd)

4.15.1 Function Documentation

4.15.1.1 WriteCmdXLCD()

```
void WriteCmdXLCD (
            unsigned char cmd )
```

4.16 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/writdata.c File Reference

```
#include <p18cxxx.h>
#include "xlcd.h"
```

Functions

- void WriteDataXLCD (char data)

4.16.1 Function Documentation

4.16.1.1 WriteDataXLCD()

```
void WriteDataXLCD (
            char data )
```

4.17 D:/Projects/pic18f2525/LCD_trials/lcd_mcu_menu.X/xlcd.h File Reference

```
#include "p18cxxx.h"
```

Macros

- #define DATA_PORT PORTB

  PIC18 XLCD peripheral routines.
- #define TRIS_DATA_PORT TRISB
- #define RW_PIN LATCbits.LATC2
- #define TRIS_RW TRISCbits.RC2
- #define RS_PIN LATCbits.LATC0
- #define TRIS_RS TRISCbits.RC0
- #define E_PIN LATCbits.LATC1
- #define TRIS_E TRISCbits.RC1
- #define DON 0b00001111
- #define DOFF 0b00001011
- #define CURSOR_ON 0b00001111
- #define CURSOR_OFF 0b00001101
- #define BLINK_ON 0b00001111

- #define BLINK_OFF 0b00001110
- #define SHIFT_CUR_LEFT 0b00000100
- #define SHIFT_CUR_RIGHT 0b00000101
- #define SHIFT_DISP_LEFT 0b00000110
- #define SHIFT_DISP_RIGHT 0b00000111
- #define FOUR_BIT 0b00101100
- #define EIGHT_BIT 0b00111100
- #define LINE_5X7 0b00110000
- #define LINE_5X10 0b00110100
- #define LINES_5X7 0b00111000
- #define PARAM_SCLASS auto
- #define MEM_MODEL far /∗ Change this to near for small memory model ∗/
- #define putcXLCD WriteDataXLCD

Functions

- void OpenXLCD (PARAM_SCLASS unsigned char)
- void SetCGRamAddr (PARAM_SCLASS unsigned char)
- void SetDDRamAddr (PARAM_SCLASS unsigned char)
- unsigned char BusyXLCD (void)
- unsigned char ReadAddrXLCD (void)
- char ReadDataXLCD (void)
- void WriteCmdXLCD (PARAM_SCLASS unsigned char)
- void WriteDataXLCD (PARAM_SCLASS char)
- void putsXLCD (PARAM_SCLASS char ∗)
- void putrsXLCD (const char ∗)
- void DelayFor18TCY (void)
- void DelayPORXLCD (void)
- void DelayXLCD (void)

4.17.1 Macro Definition Documentation

4.17.1.1 BLINK_OFF

```
#define BLINK_OFF 0b00001110
```

Cursor No Blink

4.17.1.2 BLINK_ON

```
#define BLINK_ON 0b00001111
```

Cursor Blink

4.17.1.3 CURSOR_OFF

```
#define CURSOR_OFF 0b00001101
```

Cursor off

4.17.1.4 CURSOR_ON

```
#define CURSOR_ON 0b00001111
```

Cursor on

4.17.1.5 DATA_PORT

```
#define DATA_PORT PORTB
```

PIC18 XLCD peripheral routines.

Notes:

- These libraries routines are written to support the Hitachi HD44780 LCD controller.
- The user must define the following items:
  - The LCD interface type (4- or 8-bits)
  - If 4-bit mode
    - whether using the upper or lower nibble
  - The data port
    - The tris register for data port
    - The control signal ports and pins
    - The control signal port tris and pins
  - The user must provide three delay routines:
    - DelayFor18TCY() provides a 18 Tcy delay
    - DelayPORXLCD() provides at least 15ms delay
    - DelayXLCD() provides at least 5ms delayInterface type 8-bit or 4-bit For 8-bit operation uncomment the #define BIT8When in 4-bit interface define if the data is in the upper or lower nibble of MCU's data port. For lower nibble, comment the #define UPPERDATA_PORT defines the port to which the LCD data lines are connected

4.17.1.6 DOFF

```
#define DOFF 0b00001011
```

Display off

4.17.1.7 DON

```
#define DON 0b00001111
```

Display ON/OFF Control defines Display on

4.17.1.8 E_PIN

```
#define E_PIN LATCbits.LATC1
```

PORT for D

4.17.1.9 EIGHT_BIT

```
#define EIGHT_BIT 0b00111100
```

8-bit Interface

4.17.1.10 FOUR_BIT

```
#define FOUR_BIT 0b00101100
```

Function Set defines 4-bit Interface

4.17.1.11 LINE_5X10

```
#define LINE_5X10 0b00110100
```

5x10 characters

4.17.1.12 LINE_5X7

```
#define LINE_5X7 0b00110000
```

5x7 characters, single line

4.17.1.13 LINES_5X7

```
#define LINES_5X7 0b00111000
```

5x7 characters, multiple line

4.17.1.14 MEM_MODEL

```
#define MEM_MODEL far /* Change this to near for small memory model */
```

4.17.1.15 PARAM_SCLASS

```
#define PARAM_SCLASS auto
```

4.17.1.16 putcXLCD

```
#define putcXLCD WriteDataXLCD
```

putcXLCD A putc is a write

4.17.1.17 RS_PIN

```
#define RS_PIN LATCbits.LATC0
```

PORT for RS

4.17.1.18 RW_PIN

```
#define RW_PIN LATCbits.LATC2
```

CTRL_PORT defines the port where the control lines are connected. These are just samples, change to match your application. In case changes are introduce to match application's specifics then source files should be explicitly included in your project so they are re-compiled as a part of the project. One could also decide (or explicitly need) to redirect this header file in another, project specific locationPORT for RW

4.17.1.19 SHIFT_CUR_LEFT

```
#define SHIFT_CUR_LEFT 0b00000100
```

Cursor or Display Shift defines Cursor shifts to the left

4.17.1.20 SHIFT_CUR_RIGHT

```
#define SHIFT_CUR_RIGHT 0b00000101
```

Cursor shifts to the right

4.17.1.21 SHIFT_DISP_LEFT

```
#define SHIFT_DISP_LEFT 0b00000110
```

Display shifts to the left

4.17.1.22 SHIFT_DISP_RIGHT

```
#define SHIFT_DISP_RIGHT 0b00000111
```

Display shifts to the right

4.17.1.23 TRIS_DATA_PORT

```
#define TRIS_DATA_PORT TRISB
```

4.17.1.24 TRIS_E

```
#define TRIS_E TRISCbits.RC1
```

TRIS for E

4.17.1.25 TRIS_RS

```
#define TRIS_RS TRISCbits.RC0
```

TRIS for RS

4.17.1.26 TRIS_RW

```
#define TRIS_RW TRISCbits.RC2
```

TRIS for RW

4.17.2 Function Documentation

4.17.2.1 BusyXLCD()

```
unsigned char BusyXLCD (
            void  )
```

BusyXLCD Returns the busy status of the LCD

4.17.2.2 DelayFor18TCY()

```
void DelayFor18TCY (
            void  )
```

User defines these routines according to the oscillator frequency

4.17.2.3 DelayPORXLCD()

```
void DelayPORXLCD (
            void  )
```

4.17.2.4 DelayXLCD()

```
void DelayXLCD (
            void  )
```

4.17.2.5 OpenXLCD()

```
void OpenXLCD (
            PARAM_SCLASS unsigned char  )
```

OpenXLCD Configures I/O pins for external LCD

4.17.2.6 putrsXLCD()

```
void putrsXLCD (
            const char *  )
```

putrsXLCD Writes a string of characters in ROM to the LCD

4.17.2.7 putsXLCD()

```
void putsXLCD (
            PARAM_SCLASS char *  )
```

putsXLCD Writes a string of characters to the LCD

4.17.2.8 ReadAddrXLCD()

```
unsigned char ReadAddrXLCD (
            void  )
```

ReadAddrXLCD Reads the current address

4.17.2.9 ReadDataXLCD()

```
char ReadDataXLCD (
            void  )
```

ReadDataXLCD Reads a byte of data

4.17.2.10 SetCGRamAddr()

```
void SetCGRamAddr (
             PARAM_SCLASS unsigned char  )
```

SetCGRamAddr Sets the character generator address

4.17.2.11 SetDDRamAddr()

```
void SetDDRamAddr (
             PARAM_SCLASS unsigned char  )
```

SetDDRamAddr Sets the display data address

4.17.2.12 WriteCmdXLCD()

```
void WriteCmdXLCD (
             PARAM_SCLASS unsigned char  )
```

WriteCmdXLCD Writes a command to the LCD

4.17.2.13 WriteDataXLCD()

```
void WriteDataXLCD (
             PARAM_SCLASS char  )
```

WriteDataXLCD Writes a data byte to the LCD

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