```
// nlcd.h
//-------



//Data port definitions
//----------------------
#define PORTX     PORTD   //Port used for signals
#define DDRX      DDRD    //Data direction for this port
#define PORTX_E   PORTD6  //Port's operation enable signal pin
#define PORTX_RS  PORTD7  //Port's register select pin

#define DATA_PORTX  PORTB   //Port used for data
#define DATA_DDRX   DDRB    //Data direction for this port
#define DATA_PORTX0 PORTB2  //Lowest bit pin (used for shifting data)



//Commands to LCD
//---------------

//Clears entire display. Sets DDRAM Address 0 in Address Counter.
#define CLR_DISPLAY 0x01

//Sets DDRAM Address 0 in Address Counter. Display returns to original position. Contents of DDRAM do not change.
#define RETURN_HOME 0x02
```

```
//Wake up the LCD screen for initialization
#define WAKE_UP 0x30

//4-bit data length, 2-line display, 5x8dot font
#define FUNCTION_SET 0x28

//Shifting off, moving right
#define INIT_CURSOR 0x10

//Turn on the display, cursor, and blinking of cursor
#define INIT_DISPLAY 0x0F

//Have cursor increment on data entry
#define ENTRY_MODE 0x06

//Move the cursor to the left
//  This is the same command value as INIT_CURSOR, which has an initialization-only purpose.
#define MV_CURSOR_LEFT 0x10


//Display on/off commands (used for flashing the screen)
#define DISP_ON  0x0C
#define DISP_OFF 0x08
```

```
//Move to a specific point of DDRAM      Position
#define DDRAM_PRIOR_HALF_ADDRESS 0x87  //   7
#define DDRAM_HALF_ADDRESS       0xA8  //   8



//Other useful macros
//------------

//Special characters
#define EOL       '\0'  //End-of-line character
#define BACKSPACE '\b'  //Backspace character
#define BLANK     0x20  //Blank character

//Position tracking for next_pos and db_next_pos variables
#define FIRST_POS 0  //First display position
#define HALF_POS  8  //Halfway display position -- positions are in two pieces in DDRAM
#define LAST_POS 15  //Last display position

//Frames per second (used for flashing the screen)
#define FPS 2                     //Desired FPS
#define FPS_DELAY (1000 / (2 * FPS))   //Number of ms to delay for desired FPS

//For scrolling
#define DISP_BUFFER_SIZE 16
```

```
//Driver API
//----------
int nlcd_init (void);  //Initialize LCD screen for usage

void nlcd_char (unsigned char);      //LCD prints a single character
void nlcd_string (const char*);      //LCD prints a (constant) string
void nlcd_vstring (unsigned char*);  //LCD prints a (variable) string

void nlcd_flash (int);  //Flash the LCD screen for x secs @ FPS
void nlcd_wipe (void);  //Clear the LCD screen

void nlcd_enable_scrolling  (void);  //Enable pseudo-scrolling feature
void nlcd_disable_scrolling (void);  //Disable pseudo-scrolling feature
```