

Interfacing 16×2 LCD with STM32 (Sourya Board) using I²C – Documentation

Project Title

Interfacing 16×2 LCD Display with STM32H563 (Sourya Board) using I²C Protocol

Objective

To interface a **16×2 I²C LCD display** with the **STM32H563 (Sourya Board)** and display custom text using **STM32CubeIDE** and **HAL drivers**.

Components Used

Component	Quantity
STM32H563 (Sourya Board)	1
16×2 LCD with I ² C Module	1
ST-Link V2	1
5V SMPS Power Supply	1
Connecting Wires	As required

LCD Pin Connections

LCD Pin Connection

VCC	5V from SMPS
GND	GND of SMPS & GND of Sourya board
SDA	SDA1 of Sourya Board
SCL	SCL1 of Sourya Board

ST-Link V2 Connections (For Debugging)

ST-Link Pin Sourya Board

Pin 1	3.3V
Pin 7	SWDIO
Pin 9	SWCLK

ST-Link Pin Sourya Board

Pin 12 GND

Software Used

- **STM32CubeIDE**
- **STM32H563ZIT6 MCU**
- **HAL Drivers**

Project Creation Steps

Create New Project

1. Open **STM32CubeIDE**
2. Click **New STM32 Project**
3. Select MCU:
4. **STM32H563ZIT6**
5. Click **Next**
6. Name project as: **lcd_sensor**
7. Click **Finish**

Configure I2C Pins

Open **.ioc** file

Pin Configuration:

- **PB6 → I2C1_SCL**
- **PB7 → I2C1_SDA**

Enable I2C:

- Go to **Connectivity → I2C1**
- Select **I2C mode**

Save the file → Code will auto-generate.

LCD Driver Files

lcd_i2c.c

```
#include "lcd_i2c.h"
```

```
extern I2C_HandleTypeDef hi2c1;
```

```
#define SLAVE_ADDRESS_LCD 0x27 << 1
```

```
void lcd_send_cmd(char cmd)
```

```
{
```

```
    char data_u, data_l;
```

```
    uint8_t data_t[4];
```

```
    data_u = (cmd & 0xf0);
```

```
    data_l = ((cmd << 4) & 0xf0);
```

```
    data_t[0] = data_u | 0x0C;
```

```
    data_t[1] = data_u | 0x08;
```

```
    data_t[2] = data_l | 0x0C;
```

```
    data_t[3] = data_l | 0x08;
```

```
    HAL_I2C_Master_Transmit(&hi2c1, SLAVE_ADDRESS_LCD, data_t, 4, 100);
```

```
}
```

```
void lcd_send_data(char data)
```

```
{
```

```
    char data_u, data_l;
```

```
    uint8_t data_t[4];
```

```
    data_u = (data & 0xf0);
```

```
    data_l = ((data << 4) & 0xf0);
```

```
    data_t[0] = data_u | 0x0D;
```

```
    data_t[1] = data_u | 0x09;
```

```
    data_t[2] = data_l | 0x0D;
```

```
    data_t[3] = data_l | 0x09;
```

```
    HAL_I2C_Master_Transmit(&hi2c1, SLAVE_ADDRESS_LCD, data_t, 4, 100);
```

```
}
```

```

void lcd_init(void)
{
    HAL_Delay(50);

    lcd_send_cmd(0x30);
    HAL_Delay(5);
    lcd_send_cmd(0x30);
    HAL_Delay(1);
    lcd_send_cmd(0x30);
    HAL_Delay(10);

    lcd_send_cmd(0x20);
    lcd_send_cmd(0x28);
    lcd_send_cmd(0x08);
    lcd_send_cmd(0x01);
    HAL_Delay(2);
    lcd_send_cmd(0x06);
    lcd_send_cmd(0x0C);
}

void lcd_put_cur(int row, int col)
{
    if (row == 0)
        lcd_send_cmd(0x80 | col);
    else
        lcd_send_cmd(0xC0 | col);
}

void lcd_send_string(char *str)
{
    while (*str)
        lcd_send_data(*str++);
}

```

```
void lcd_clear(void)
{
    lcd_send_cmd(0x01);
    HAL_Delay(2);
}
```

lcd_i2c.h

```
#ifndef __LCD_I2C_H
#define __LCD_I2C_H

#include "stm32h5xx_hal.h"
```

```
void lcd_init(void);
void lcd_send_cmd(char cmd);
void lcd_send_data(char data);
void lcd_put_cur(int row, int col);
void lcd_send_string(char *str);
void lcd_clear(void);
```

```
#endif
```

Code in main.c

Inside main() **after initialization and before while loop:**

```
lcd_init();
```

```
lcd_put_cur(0, 0);
```

```
lcd_send_string("Hey People We are");
```

```
lcd_put_cur(1, 0);
```

```
lcd_send_string("From Mitralokam");
```

Flashing & Execution

1. **Connect ST-Link to Sourya board**

2. Click **Debug**
3. Code flashes successfully
4. Press **RESET button on Sourya board**
5. LCD displays:

Hey People We are

From Mitralokam

Output

LCD displays text correctly

I2C communication successful

STM32 working properly

Conclusion

This project demonstrates:

- I2C communication using STM32
- LCD interfacing with HAL
- STM32CubeIDE configuration
- Peripheral initialization and debugging