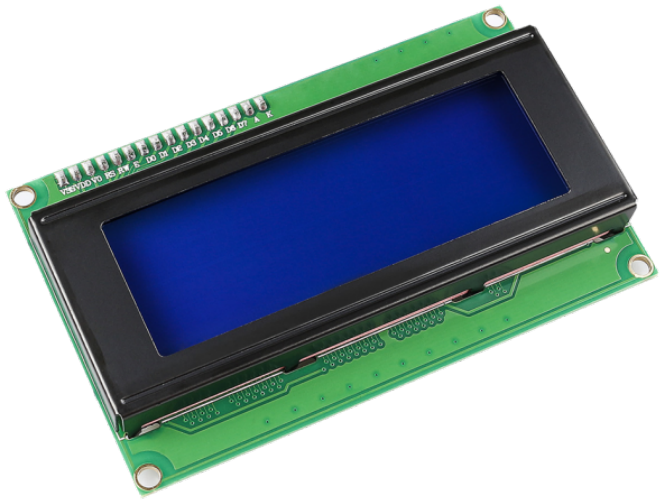
I2C LCD2004

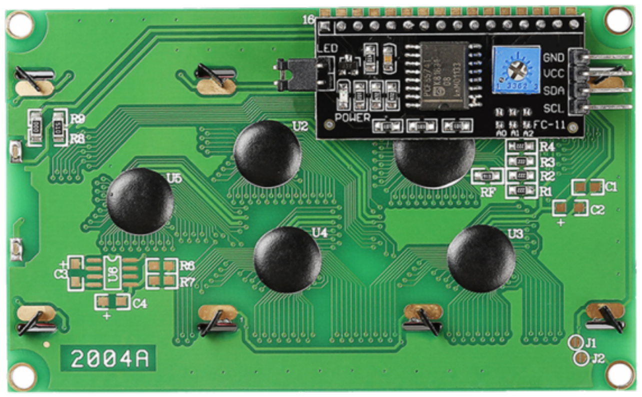
From Wiki

Contents

Introduction

As we all know, though LCD and some other displays greatly enrich the man-machine interaction, they share a common weakness. When they are connected to a controller, multiple IOs will be occupied of the controller which has no so many outer ports. Also it restricts other functions of the controller. Therefore, LCD2004 with an I2C bus is developed to solve the problem.
I2C bus is a type of serial bus invented by PHLIPS. It is a high performance serial bus which has bus ruling and high or low speed device synchronization function required by multiple host system. I2C bus has only two bidirectional signal lines, Serial Data Line (SDA) and Serial Clock Line (SCL). The blue potentiometer on the I2C LCD2004 is used to adjust backlight to make it easier to display on the I2C LCD2004.



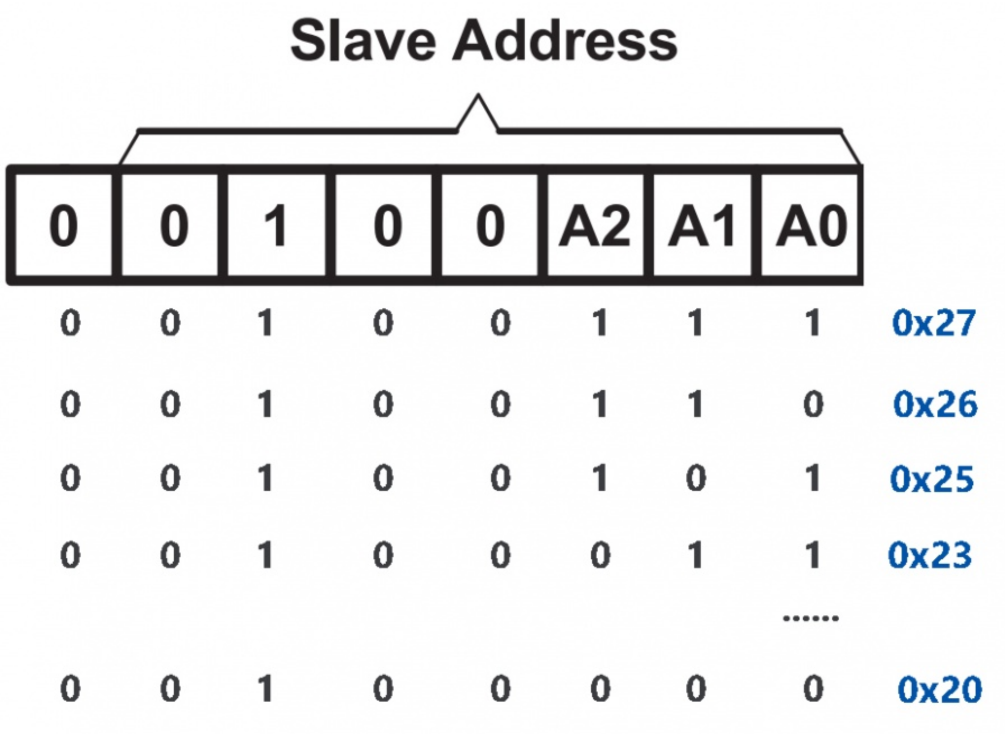


- **GND**: Ground
- **VCC**: Voltage supply, 5V.
- **SDA**: Serial data line. Connect to VCC through a pullup resistor.
- **SCL**: Serial clock line. Connect to VCC through a pullup resistor.

I2C Address

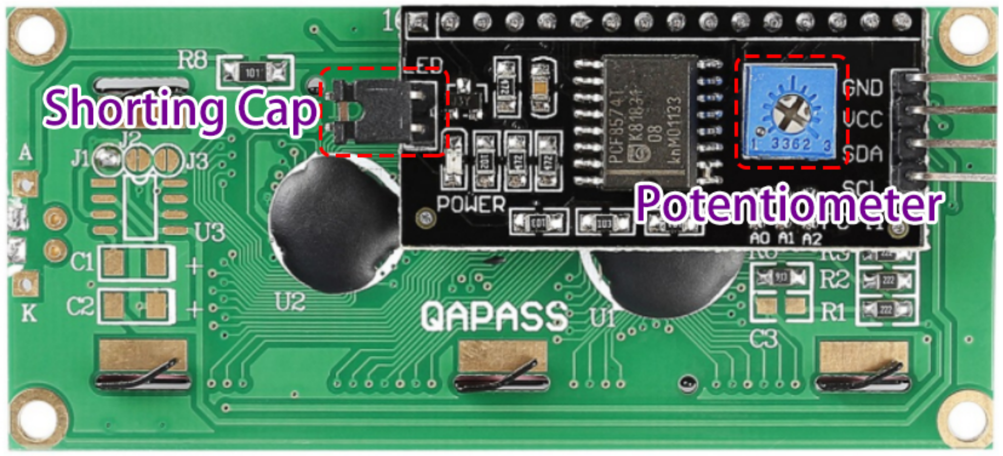
The default address is basically 0x27, in a few cases it may be 0x3F.

Taking the default address of 0x27 as an example, the device address can be modified by shorting the A0/A1/A2 pads; in the default state, A0/A1/A2 is 1, and if the pad is shorted, A0/A1/A2 is 0.



Backlight/Contrast

Backlight can be enabled by jumper cap, unplug the jumper cap to disable the backlight. The blue potentiometer on the back is used to adjust the contrast (the ratio of brightness between the brightest white and the darkest black).



- **Shorting Cap**: Backlight can be enabled by this cap， unplug this cap to disable the backlight.
- **Potentiometer**: It is used to adjust the contrast (the clarity of the displayed text), which is increased in the clockwise direction and decreased in the counterclockwise direction.

For Arduino User

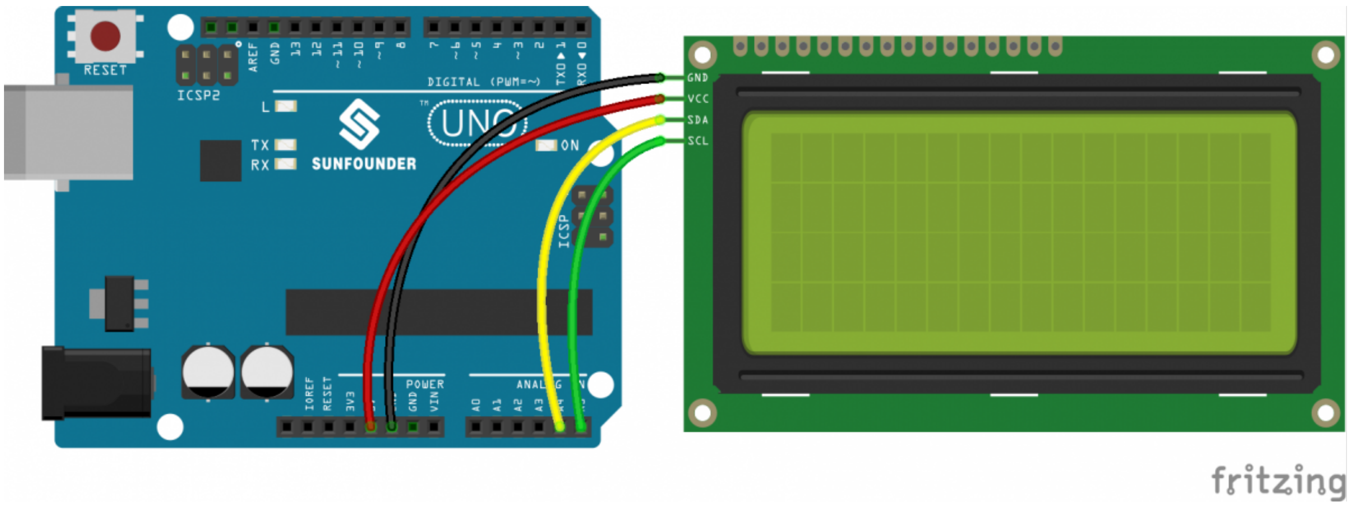
Components

- 1 *SunFounder Mars board
- 1 * I2C LCD2004 module
- 1 * USB cable
- Several jump wires

Connect the circuit

See the following table for connection between the I2C LCD2004 and the SunFounder Uno board:

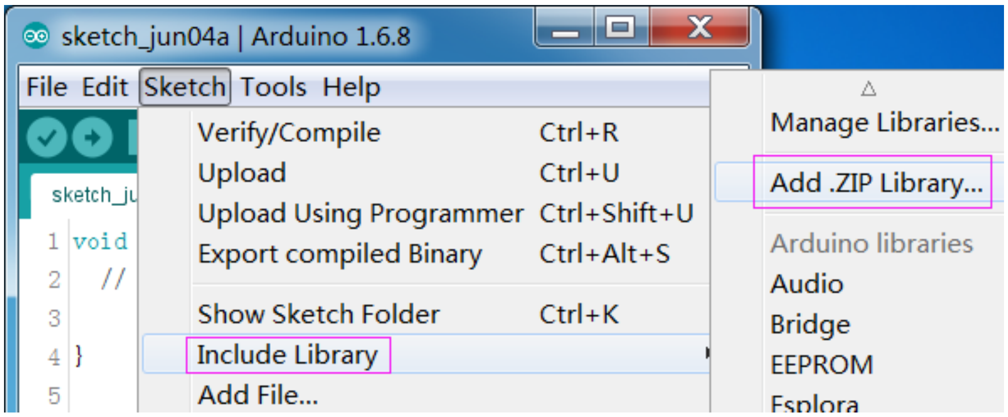
I2C LCD2004	Arduino Board
GND	GND
VCC	5V
SDA	A4 /pin 20 mega2560
SCL	A5 /pin 21 mega2560



Add library

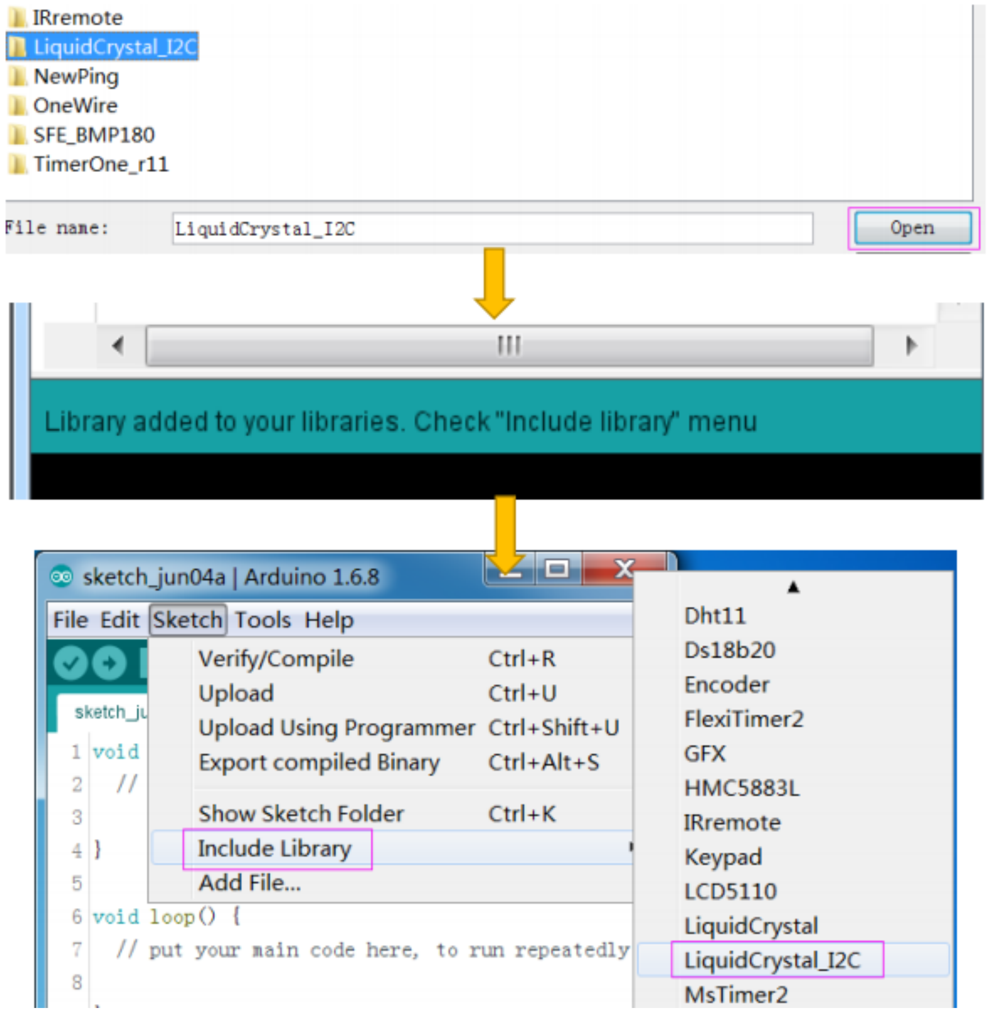
Before you upload the code to the control board,you neeed to add the LiquidCrystal_I2C library.
1) Download the **LiquidCrystal_I2C library** (http://wiki.sunfounder.cc/images/7/7e/LiquidCrystal_I2C.zip)

2) Open the Arduino IDE,Select Sketch -> Include Library -> Add ZIP Library


sketch_jun04a | Arduino 1.6.8
File Edit Sketch Tools Help
Verify/Compile Ctrl+R
Upload Ctrl+U
Upload Using Programmer Ctrl+Shift+U
Export compiled Binary Ctrl+Alt+S
Show Sketch Folder Ctrl+K
Include Library
Add File...
Manage Libraries...
Add .ZIP Library...
Arduino libraries
Audio
Bridge
EEPROM
Esplora

3) Find the file LiquidCrystal_I2C which you just download. Click it open and then you'll be prompted by "Library added to your

libraries. Check 'Import libraries"'. You also can see the libraries just imported have appeared on the list by Sketch->Include Library->LiquidCrystal_I2C.


IRremote
LiquidCrystal_I2C
NewPing
OneWire
SFE_BMP180
TimerOne_r11
File name: LiquidCrystal_I2C
Open
Library added to your libraries. Check "Include library" menu
sketch_jun04a | Arduino 1.6.8
File Edit Sketch Tools Help
Verify/Compile Ctrl+R
Upload Ctrl+U
Upload Using Programmer Ctrl+Shift+U
Export compiled Binary Ctrl+Alt+S
Show Sketch Folder Ctrl+K
Include Library
Add File...
Dht11
Ds18b20
Encoder
FlexiTimer2
GFX
HMC5883L
IRremote
Keypad
LCD5110
LiquidCrystal
LiquidCrystal_I2C
MsTimer2

Copy the code

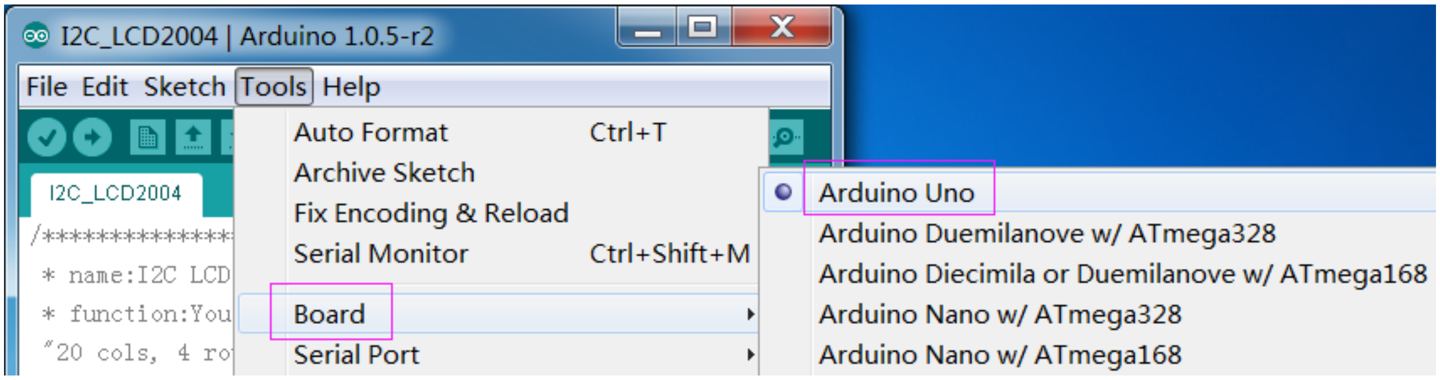
Copy the following code to the Arduino IDE

```
/*****************************************
 * name: I2C LCD2004
 * function: You should now see your I2C LCD2004 display "Hello,world!","IIC/I2C LCD2004"
 * "20 cols, 4 rows","www.sunfounder.com"
 ********************************/
//Email:service@sunfounder.com
//Website:www.sunfounder.com

/********************************/
// Include necessary libraries
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

// Initialize the LCD object, set the LCD I2C address to 0x27 for a 20x4 display
LiquidCrystal_I2C lcd(0x27, 20, 4);

/*********************************************************/
void setup()
{
  lcd.init();             // Initialize the LCD
  lcd.backlight();        // Turn on the backlight

  // Set cursor to the top left corner and print the string on the first row
  lcd.setCursor(0, 0);
  lcd.print("    Hello, world!    ");

  // Move to the second row and print the string
  lcd.setCursor(0, 1);
  lcd.print("   IIC/I2C LCD2004  ");
  // Move to the third row and print the string
  lcd.setCursor(0, 2);
  lcd.print("  20 cols, 4 rows   ");

  // Move to the fourth row and print the string
  lcd.setCursor(0, 3);
  lcd.print(" www.sunfounder.com ");
}
/*********************************************************/
void loop()
{
  // Empty loop
}
/************************************************************/
```

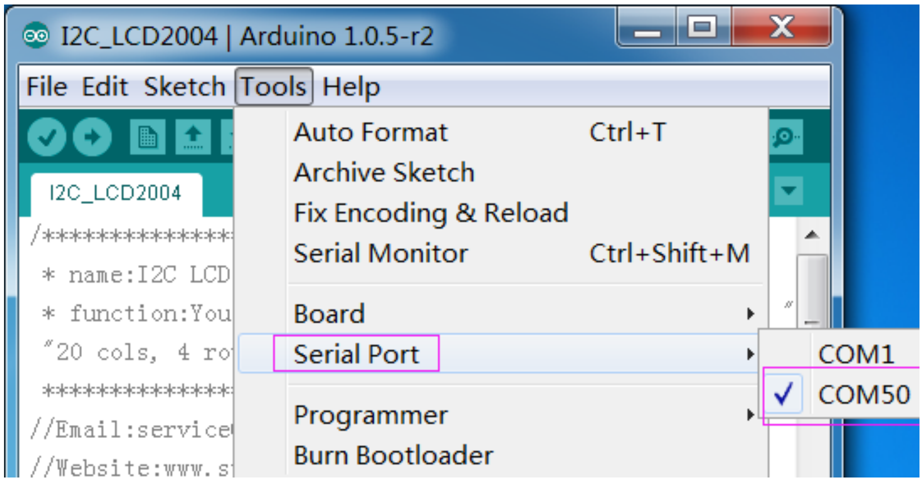
Upload the code

Before upload the code ,you need to select correct Board and Port,please follow the steps:

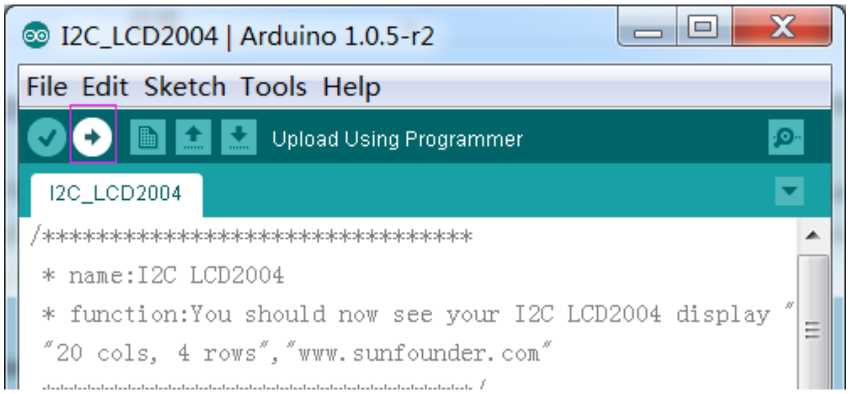
1) Click Tools ->Board and select Arduino/Genuino Uno.


I2C_LCD2004 | Arduino 1.0.5-r2
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Serial Monitor Ctrl+Shift+M
Board
Serial Port
Arduino Uno
Arduino Duemilanove w/ ATmega328
Arduino Diecimila or Duemilanove w/ ATmega168
Arduino Nano w/ ATmega328
Arduino Nano w/ ATmega168

2) Then select Tools ->Port.



3) Click to the upload icon to upload the code to the control board



```
/********************************
 * name:I2C LCD2004
 * function:You should now see your I2C LCD2004 display "
 "20 cols, 4 rows","www.sunfounder.com"
```

If "Done uploading" appears at the bottom of the window, it means the sketch has been successfully uploaded.

Read I2C Address

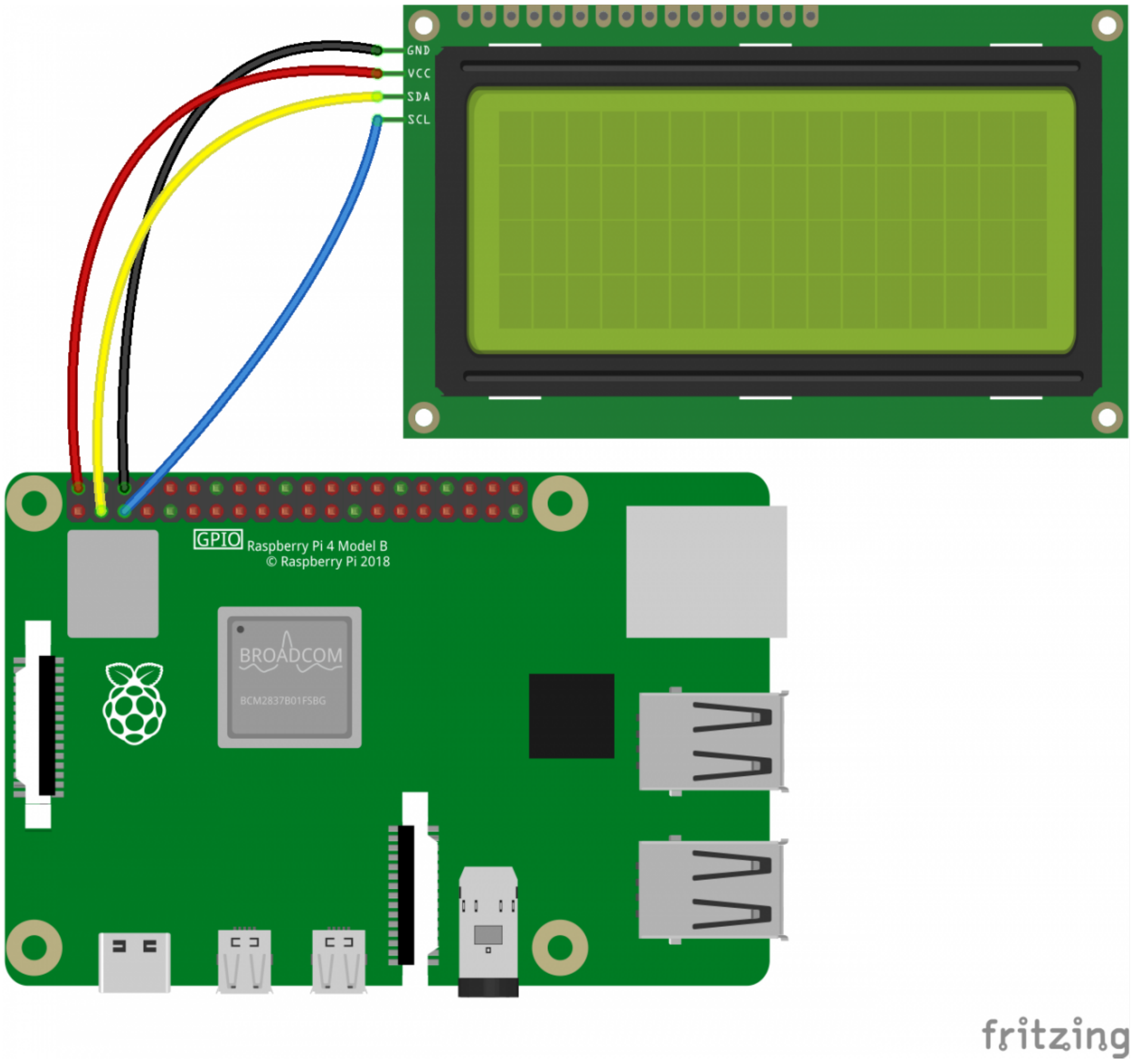
If everything is correct, but the display just shows 16 black rectangles on Line 1.it may be the address of i2c is not 0x27,therfore you need to run the following code to read the address,then modify the 0x27 to which you read.

```
LiquidCrystal_I2C lcd(0x27,16,2);
```

```
/*****************************************************
 * Name: I2C_Address
 * Function: Read the address of the I2C LCD1602
 * Connection:
 * I2C                  Arduino UNO
 * GND                  GND
 * VCC                  5V
 * SDA                  A4 (pin 20 in Mega2560)
 * SCL                  A5 (pin 21 in Mega2560)
 ********************************************************/

#include <Wire.h>  // Include Wire library for I2C communication

void setup() {
  Wire.begin();                     // Initialize I2C communication
  Serial.begin(9600);               // Start serial communication at 9600 baud rate
  Serial.println("\nI2C Scanner");  // Print a message to the serial monitor
}

void loop() {
  byte error, address;  // Declare variables for storing error status and I2C address
  int nDevices;         // Variable to keep track of number of devices found

  Serial.println("Scanning...");  // Print scanning message
  nDevices = 0;                   // Initialize the device count to 0

  // Loop through all possible I2C addresses (1 to 126)
  for (address = 1; address < 127; address++) {
    Wire.beginTransmission(address);  // Start a transmission to the I2C address
    error = Wire.endTransmission();   // End the transmission and get the status

    // Check if device responded without error (acknowledged)
    if (error == 0) {
      Serial.print("I2C device found at address 0x");  // Notify device found
      if (address < 16) Serial.print("0");             // Print leading zero for addresses less than 16
      Serial.print(address, HEX);                      // Print the address in hexadecimal
      Serial.println(" !");
      nDevices++;                                   // Increment the device count
    } else if (error == 4) {                        // If there was an unknown error
      Serial.print("Unknown error at address 0x");  // Notify about the error
      if (address < 16) Serial.print("0");          // Print leading zero for addresses less than 16
      Serial.println(address, HEX);                 // Print the address in hexadecimal
    }
  }

  // After scanning, print the results
  if (nDevices == 0)
    Serial.println("No I2C devices found\n");  // No devices found
  else
    Serial.println("done\n");  // Scanning done

  delay(5000);  // Wait 5 seconds before the next scan
}
```

For Raspberry Pi User

Build the circuit



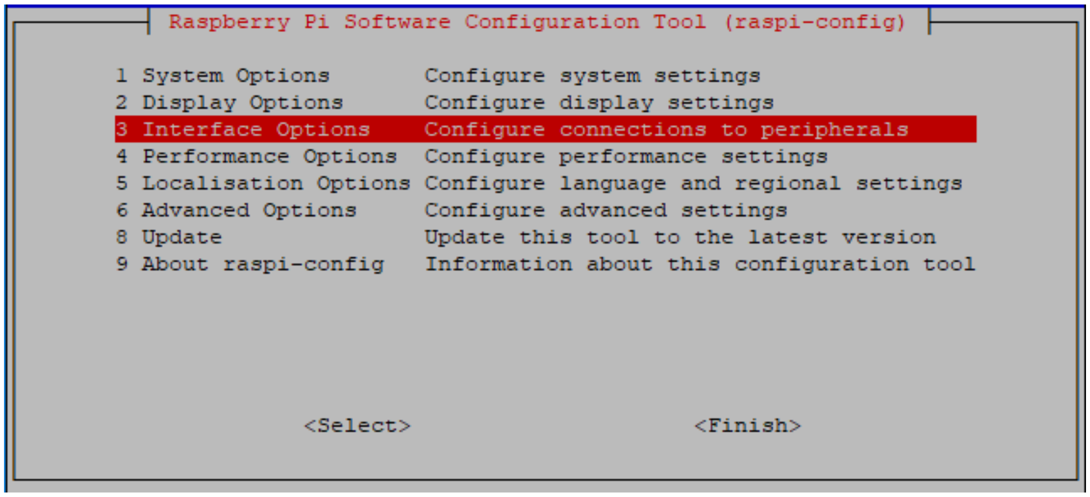
Setup I2C

Enable the I2C port of your Raspberry Pi (If you have enabled it, skip this; if you do not know whether you have done that or not, please continue).

Step 1: Run the following command.

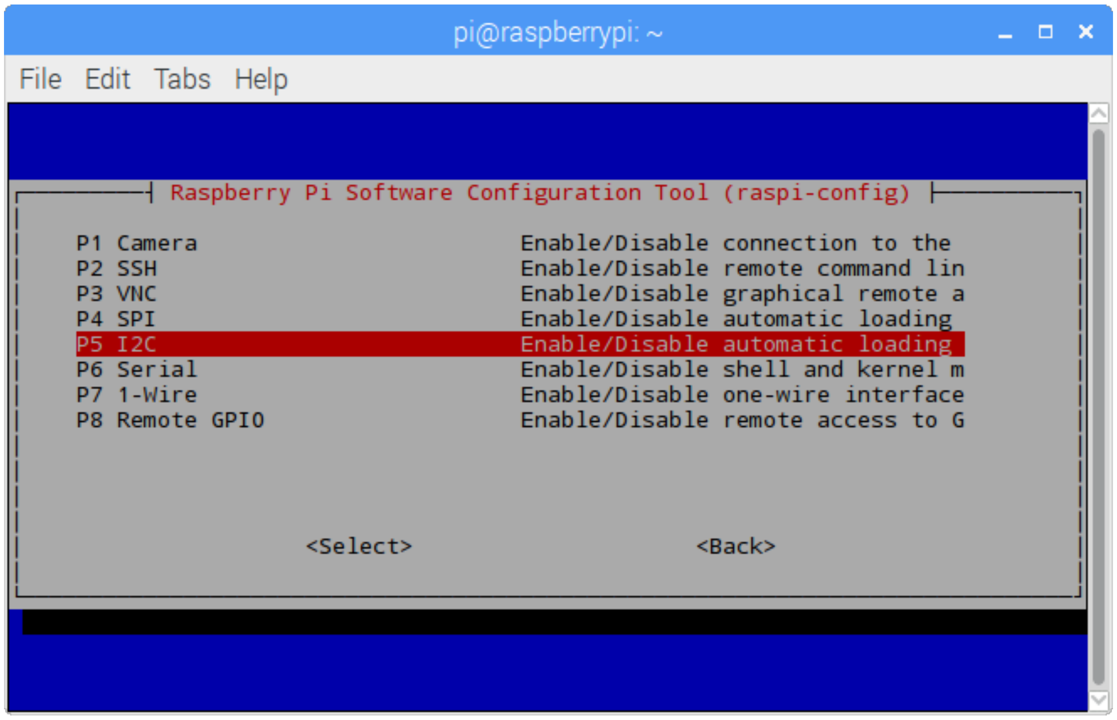
```
sudo raspi-config
```

Step 2: 3 Interfacing options.



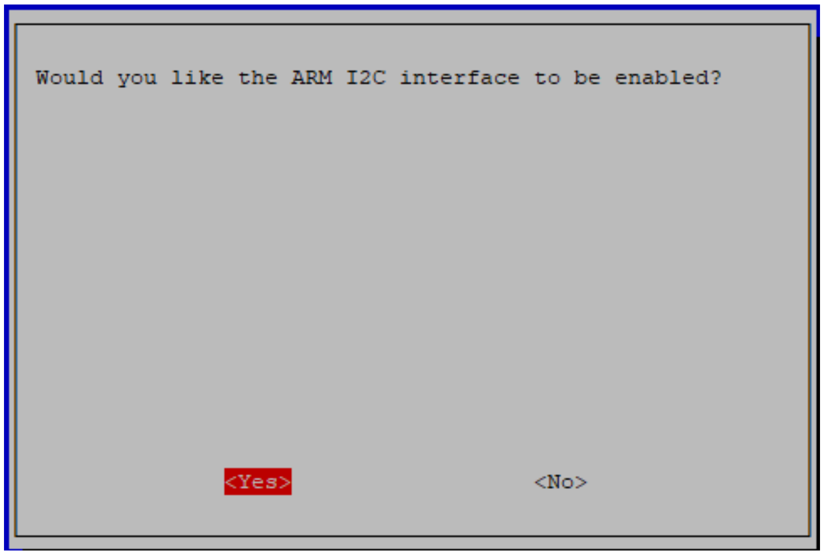
```
Raspberry Pi Software Configuration Tool (raspi-config)

1 System Options       Configure system settings
2 Display Options      Configure display settings
3 Interface Options    Configure connections to peripherals
4 Performance Options  Configure performance settings
5 Localisation Options Configure language and regional settings
6 Advanced Options     Configure advanced settings
8 Update               Update this tool to the latest version
9 About raspi-config   Information about this configuration tool

           <Select>                     <Finish>
```

Step 3: P5 I2C.



```
pi@raspberrypi: ~
File  Edit  Tabs  Help

Raspberry Pi Software Configuration Tool (raspi-config)

P1 Camera                         Enable/Disable connection to the
P2 SSH                            Enable/Disable remote command lin
P3 VNC                            Enable/Disable graphical remote a
P4 SPI                            Enable/Disable automatic loading
P5 I2C                            Enable/Disable automatic loading
P6 Serial                         Enable/Disable shell and kernel m
P7 1-Wire                         Enable/Disable one-wire interface
P8 Remote GPIO                    Enable/Disable remote access to G

           <Select>                     <Back>
```

Step 4: <Yes>, then <Ok> -> <Finish>.



```
Would you like the ARM I2C interface to be enabled?

               <Yes>                    <No>
```

Step 5: Check whether the i2c modules are loaded and active.

```
lsmod | grep i2c
```

Step 6: Then the following codes will appear (the number may be different).

```
i2c_dev                     6276    0
i2c_bcm2708                 4121    0
```

Step 7: Install i2c-tools.

```
sudo apt-get install i2c-tools
```

Step 8: Check the address of the I2C device.

```
i2cdetect -y 1      # For Raspberry Pi 2 and higher version
```

```
i2cdetect -y 0      # For Raspberry Pi 1
```

```
    pi@raspberrypi ~ $ i2cdetect -y 1
        0  1  2  3   4  5  6  7  8  9   a  b  c  d  e  f
    00:           -- -- -- -- -- -- -- -- -- -- -- -- --
    10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
    20: -- -- -- -- -- -- -- 27 -- -- -- -- -- -- -- --
    30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
    40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
    50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
    60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
    70: -- -- -- -- -- -- -- --
```

If there is an I2C device connected, the address of the device will be displayed.

Step 9: Install libi2c-dev or smbus.

For C language users

```
sudo apt-get install libi2c-dev
```

For Python users

```
sudo pip3 install smbus2
```

Download and run the code

Step 1: Download the code (http://wiki.sunfounder.cc/images/3/36/I2c_lcd2004_for_raspberry_pi.zip) package.

```
wget http://wiki.sunfounder.cc/images/3/36/I2c_lcd2004_for_raspberry_pi.zip
```

Step 2: Extract the package

```
unzip I2c_lcd2004_for_raspberry_pi.zip
```

(For C Language Users)

Step 3: If you have not installed wiringPi, then you will need to install it first.

```
sudo apt-get update
git clone https://github.com/WiringPi/WiringPi
cd WiringPi
./build
```

Step 4: You can test whether the wiringPi library is installed successfully or not by the following instruction.

```
gpio -v
```

Step 5: Get into the folder of code.

```
cd ~/I2c_lcd2004_for_raspberry_pi/c
```

Step 6: Compile.

```
gcc lcd2004.c -o lcd2004 -lwiringPiDev -lwiringPi
```

Step 7: Run.

```
sudo ./lcd2004
```

(For Python Users)
Step 3: Get into the folder of code.

```
cd ~/I2c_lcd2004_for_raspberry_pi/python
```

Step 4: Run.

```
sudo python lcd2004_show.py
```

Resources

Arduino I2C LCD2004 Code (http://wiki.sunfounder.cc/images/5/56/I2C_LCD2004.zip)

LiquidCrystal_I2C library (http://wiki.sunfounder.cc/images/7/7e/LiquidCrystal_I2C.zip)

Raspberry Pi I2C LCD2004 Code (http://wiki.sunfounder.cc/images/3/36/I2c_lcd2004_for_raspberry_pi.zip)

PCF8574T_datasheet (http://wiki.sunfounder.cc/images/1/18/PCF8574T_datasheet.pdf)

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