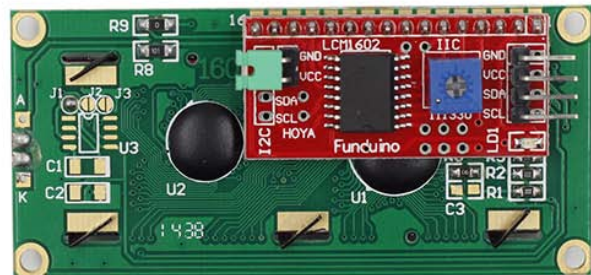# I2C LCD1602

Introduction

LCD1602 is a character type liquid crystal display, which can display 32 (16*2) characters at the same time. It has 16 pins, of which at least 7 would be used each time. You can use a PCF8574 I2C chip to expand I/O ports so only two GPIO ports would be occupied.

Front   Back

Components

- 1 *SunFounder Uno board
- 1 * I2C LCD1602 module
- 1 * USB cable
- Several jump wires

Experimental Principle

In this experiment, we will let I2C LCD1602 display "SUNFOUNDER" and "hello, world" by programming.

I²C (Inter-Integrated Circuit), pronounced I-squared-C, is a multi-master, multi-slave, single-ended, serial computer bus invented by Philips Semiconductor (now NXP Semiconductors). It is typically used for attaching lower-speed peripheral ICs to processors and microcontrollers. Alternatively I²C is spelled I2C (pronounced I-two-C) or IIC (pronounced I-I-C).

I²C uses only two bidirectional open-drain lines, Serial Data Line (SDA) and Serial Clock Line (SCL),pulled up with resistors. Typical voltages used are +5 V or +3.3 V although systems with other voltages are permitted. For more information,please refer to https://en.wikipedia.org/wiki/I²C

Experimental Procedures

Step 1: Connect the circuit

See the following table for connection between the I2C LCD1602 and the SunFounder Uno board:

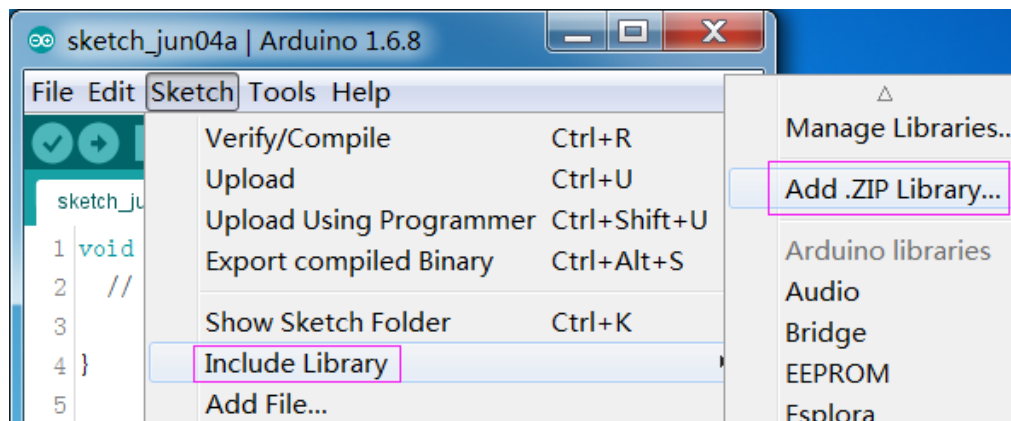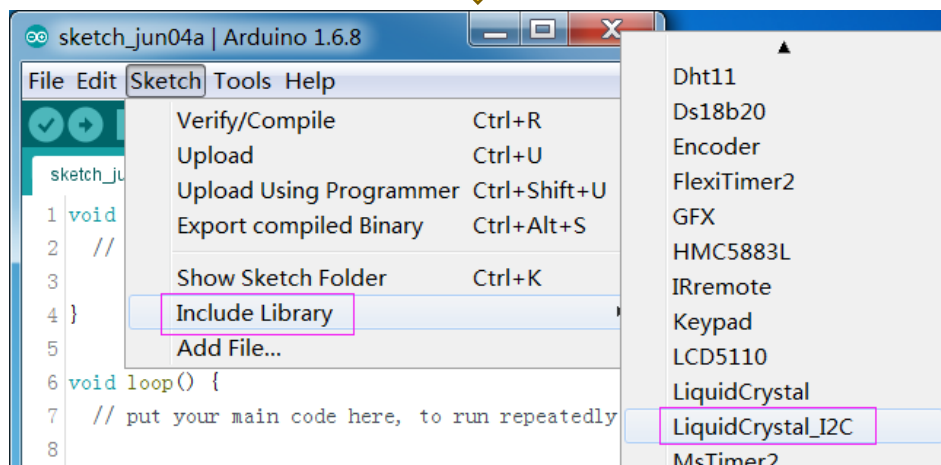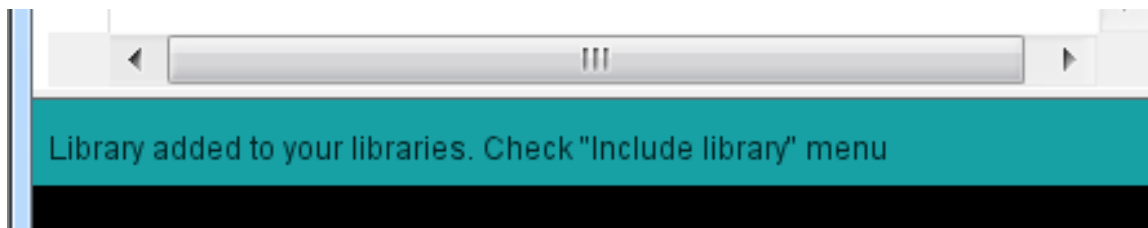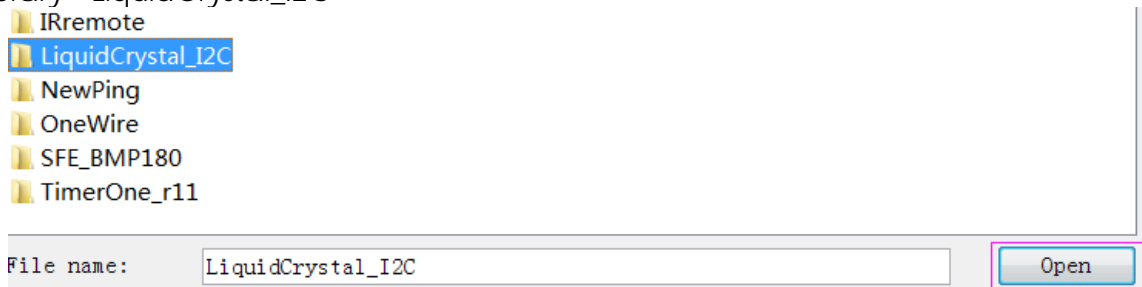| I2C LCD1602	SunFounder Uno board
GND	GND
VCC	5V
SDA	A4 /pin 20 mega2560
SCL	A5 /pin 21 mega2560
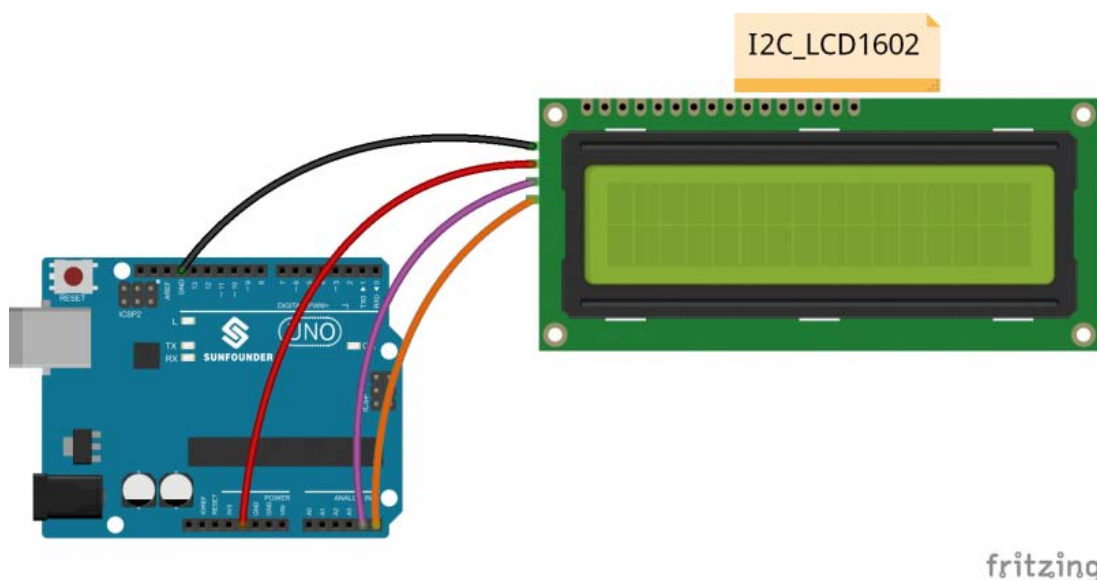
Step 2:Add library

Before you upload the code to the control board,you neeed to add the **LiquidCrystal_I2C** library.
1) Download the '''LiquidCrystal_I2C library.zip'''

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

2) 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

Step 3: Copy the code

Copy the follwing code to the Arduino IDE ,click to the upload icon to upload the code to the control board

```
/********************************************************
   name:I2C LCD1602
   function:You should now see your I2C LCD1602 display the flowing characters: "SunFounder"
and "hello, world".
  //Email:support@sunfounder.com
  //Website:www.sunfounder.com
*********************************************************/

// include the library code
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 16, 2); // set the LCD address to 0x27 for a 16 chars and 2 line display

void setup()
{
  lcd.init();   //initialize the lcd
  lcd.backlight();   //open the backlight
}
void loop()
{
  lcd.setCursor(3, 0); // set the cursor to column 3, line 0
  lcd.print("SunFounder");   // Print a message to the LCD
  lcd.setCursor(2, 1); // set the cursor to column 2, line 1
  lcd.print("Hello, World!");   // Print a message to the LCD.
}
```

experimental phenomenon

You should now see your I2C LCD1602 display the flowing characters "SunFounder" and "hello, world".

Note

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                  UNO
GND                   GND
VCC                   5V
SDA                   A4(pin20 in mega2560)
SCL                   A5(pin21 in mega2560)
*****************************************************/

#include <Wire.h>
```

```
void setup()
{
  Wire.begin();
  Serial.begin(9600);
  Serial.println("\nI2C Scanner");
}
void loop()
{
  byte error, address;
  int nDevices;
  Serial.println("Scanning...");
  nDevices = 0;
  for (address = 1; address < 127; address++ )
  {
    // The i2c_scanner uses the return value of
    // the Write.endTransmisstion to see if
    // a device did acknowledge to the address.
    Wire.beginTransmission(address);
    error = Wire.endTransmission();
    if (error == 0)
    {
      Serial.print("I2C device found at address 0x");
      if (address < 16)
        Serial.print("0");
      Serial.print(address, HEX);
      Serial.println(" !");
      nDevices++;
    }
    else if (error == 4)
    {
      Serial.print("Unknow error at address 0x");
      if (address < 16)
        Serial.print("0");
      Serial.println(address, HEX);
    }
  }
  if (nDevices == 0)
    Serial.println("No I2C devices found\n");
  else
    Serial.println("done\n");
  delay(5000); // wait 5 seconds for next scan
}
```

Resources

PCF8574T_datasheet:
http://www.sunfounder.com/wiki/index.php/File:PCF8574T_datasheet.pdf

Test_Experiment_for_Raspberry_Pi:

https://www.sunfounder.com/learn/sensor-kit-v2-0-for-raspberry-pi-b-plus/lesson-30-i2c-lcd1602-sensor-kit-v2-0-for-b-plus.html

LiquidCrystal_I2C library:
http://www.sunfounder.com/wiki/index.php?title=File:LiquidCrystal_I2C.zip