



Study Notes of Iteaduino Part VI

- Temperature Sensor

In the last study note, I introduced how to utilize 1602 LCD screen to display the characters, now I will continue to make use of 1602 LCD screen. This is to receive the information transmitted from temperature sensor DS18B20 electronic brick with the use of Iteaduino pin input and to display the temperature value detected by DS18B20 on 1602 LCD screen.

DS18B20 is an improved smart temperature sensor adapted to microprocessor. Compared to the conventional thermistor, it can directly read out the temperature measured and 9-12 bit digital value by simple programming based on actual requirements. DS18B20 measuring temperature ranges from -55°C $+125^{\circ}\text{C}$, and accuracy is $\pm 0.5^{\circ}\text{C}$ in the range of -10°C to $+85^{\circ}\text{C}$. Digitized single-bus device DS18B20 is applicable for measurement of temperature in site of harsh environments, such as use in consumer electronics products of environment control, equipment or process control, and temperature measurement, etc, and the accuracy, conversion time, transmission distance and resolution of which has been greatly improved, giving users more convenient and satisfactory results. It can be widely used in devices, systems and large-scale equipments for temperature measurement and control in industrial, civil and military fields, etc.

To do this test, we will need:

- Iteaduino board x 1
- Arduino 1602LCD shield x 1



- DS18B20 electronic brick x 1

Construction of hardware circuit

First, insert Arduino 1602 LCD shield directly into Iteaduino, pin connection of which is the same with condition in last note. Then connect DS18B20 electronic brick module to A4 pin on 1602 LCD shield via connection cable, thus cathode of DS18B20 is linked to GND terminal of 1602 LCD shield, anode is linked to +5 V of 1602 LCD shield and data terminal is connected to A4 on 1602 LCD shield via S pin.

The actual circuit is shown in Figure 1:

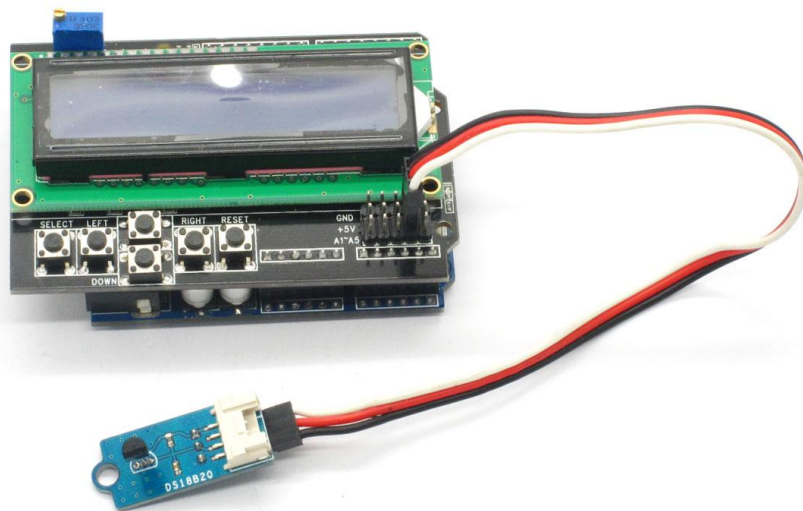


Figure 1

Writing of control program

First, we need to download library function of DS18B20 from the following link:

<http://imall.iteadstudio.com/prototyping/electronic-brick/sensor-brick/im120710012.html>

After entering the above website, you can see "DOWNLOAD" on the page and " Demo Code" under "DOWNLOAD" as shown in figure 2, click "DC_IM120710012.zip" and download it into the computer.



Figure 2

After downloading, unzip file DC_IM120710012.zip into folder **arduino-1.0.1/libraries**, then open text editor, open files DallasTemperature.cpp and OneWire.cpp, and change #include "WConstants.h" to #include "Arduino.h" in the files.

Next, I'd like to briefly introduce Arduino library functions used in the test:

LiquidCrystal(rs, enable, d4, d5, d6, d7)



Function : to set the interfaces, 4-bit connection method is used for 1602LCD in the test, only the 4 data interfaces D4-d7 are used, no need to configure RW as it is connected to GND.

Parameters :

- rs: Pin number on Iteaduino which connects to RS terminal of LCD
- enable: Pin number on Iteaduino which connects to enable terminal of LCD
- d4: Pin number on Iteaduino which connects to d4 pin of LCD
- d5: Pin number on Iteaduino which connects to d5 pin of LCD
- d6 : Pin number on Iteaduino which connects to d6 pin of LCD
- d7 : Pin number on Iteaduino which connects to d7 pin of LCD

sensors.begin()

Function : to initialize bus

lcd.begin(cols, rows)

Function : to initialize LCD and to specify size (width and height) of the screen

Parameters :

- cols: the number of columns displayed
- rows: the number of rows displayed

lcd.print(data)



Function : to display characters on LCD screen

Parameter :

- data: contents which need to be displayed on the screen, data types could be char, byte, int, long, or string.

sensors.requestTemperatures()

Function : to send temperature conversion command to all the devices across the bus

lcd.clear()

Function : to clear the characters on the screen and locate the cursor onto upper left corner

lcd.setCursor(col, row)

Function : to locate cursor and to set the position of characters to be displayed later

Parameters :

- cols: the number of column where the cursor locates
- rows: the number of row where the cursor locates

sensors.getTempCByIndex(0)

Function : to obtain temperature value

The complete program used in the test is as below:

```
#include <DallasTemperature.h>
```

```
#include <OneWire.h>
```



```
#include <LiquidCrystal.h>
#define ONE_WIRE_BUS 18
LiquidCrystal lcd(8, 9, 4, 5, 6, 7);
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);

void setup()
{
  sensors.begin();
  lcd.begin(16, 2);
  delay(1000);
}

void loop ()
{
  sensors.requestTemperatures();
  lcd.clear();
  lcd.print("Temperature is");
  lcd.setCursor(0, 1) ;
  lcd.print(sensors.getTempCByIndex(0));
  lcd.print((char)223);
  lcd.print("C");
  delay(2000); }
```

Compiling and downloading of program

Then compile and download the above program into Iteaduino, the operation of which is the same with that in last test.



After the program is downloaded, you can see "Temperature is" displayed in the first row on 1602 LCD screen and the temperature value of the test environment in the second row such as 28.31°C.

The temperature value will change when the temperature changes.