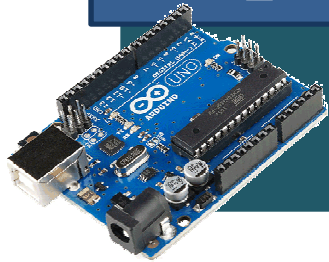


2022년 IoT기반 스마트 솔루션 개발자 양성과정



Firmware [펌웨어]

9-I2C LCD

담당 교수 : 유근택
010-5486-5376
rgt3340@naver.com



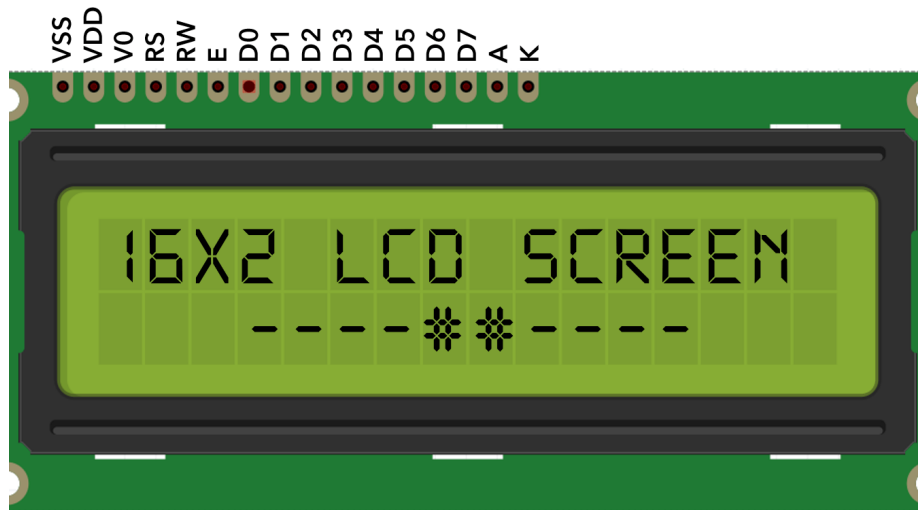
충북대학교 공동훈련센터

LCD(Liquid Crystal Display)

- LCD (Liquid Crystal Display) is an electronic display module.
- A 16x2 LCD is very commonly used in various device and circuits.
- A16x2 LCD means it has 16 columns and 2 rows for displaying information.
- A command is given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.
- The data sent to the LCD is in parallel combination i.e. by using D0 to D7 pins.

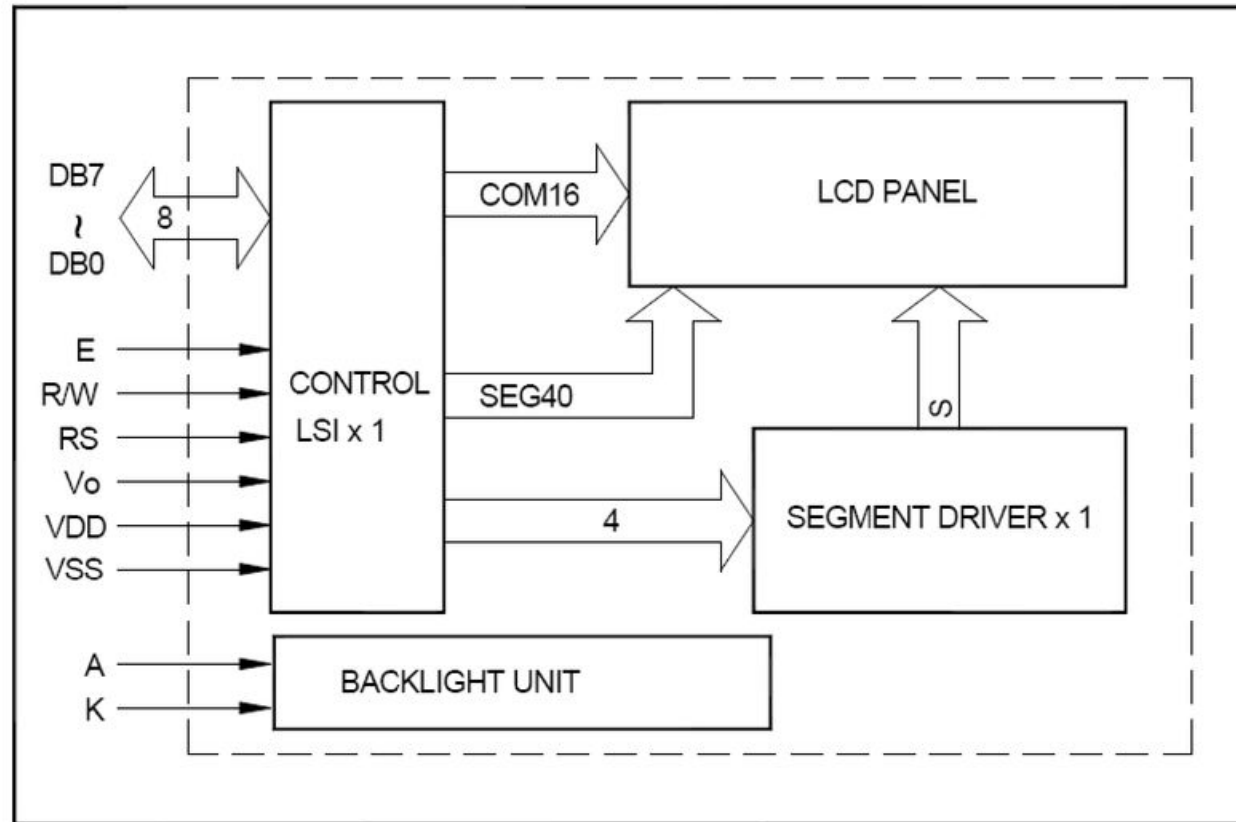


Parallel - LCD



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VSS	VDD	VO	RS	RW	E	D0	D1	D2	D3	D4	D5	D6	D7	A	K
Power		Bright	Control			Data								BackLight	





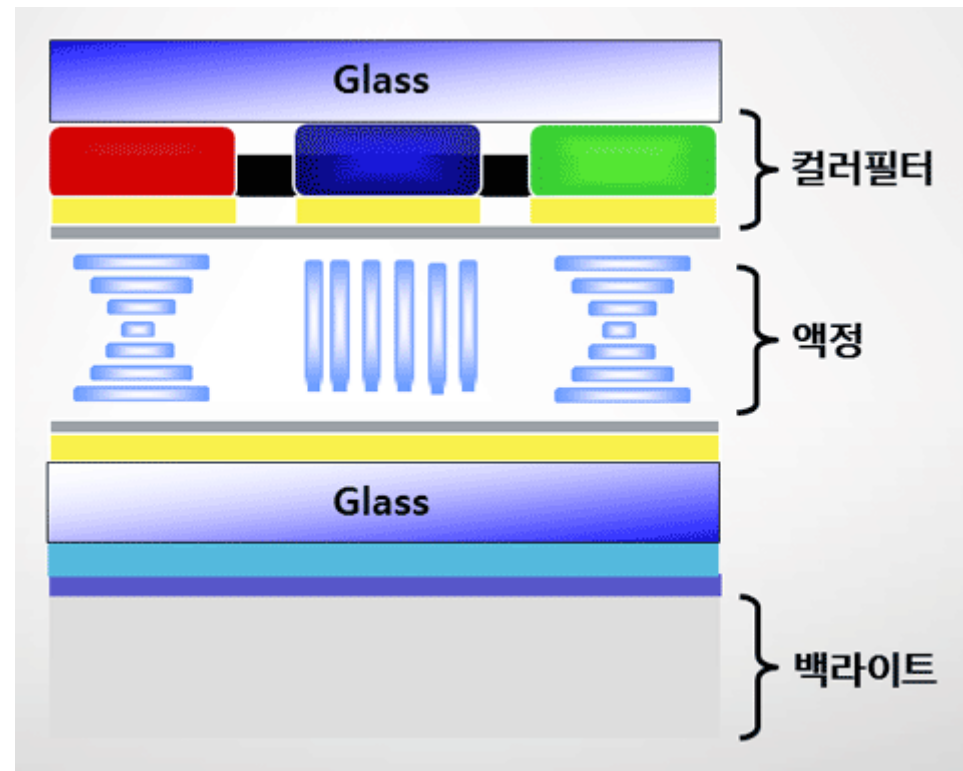
Parallel lcd display(4bit)

* 4-bit LCD 구동하기 핀맵

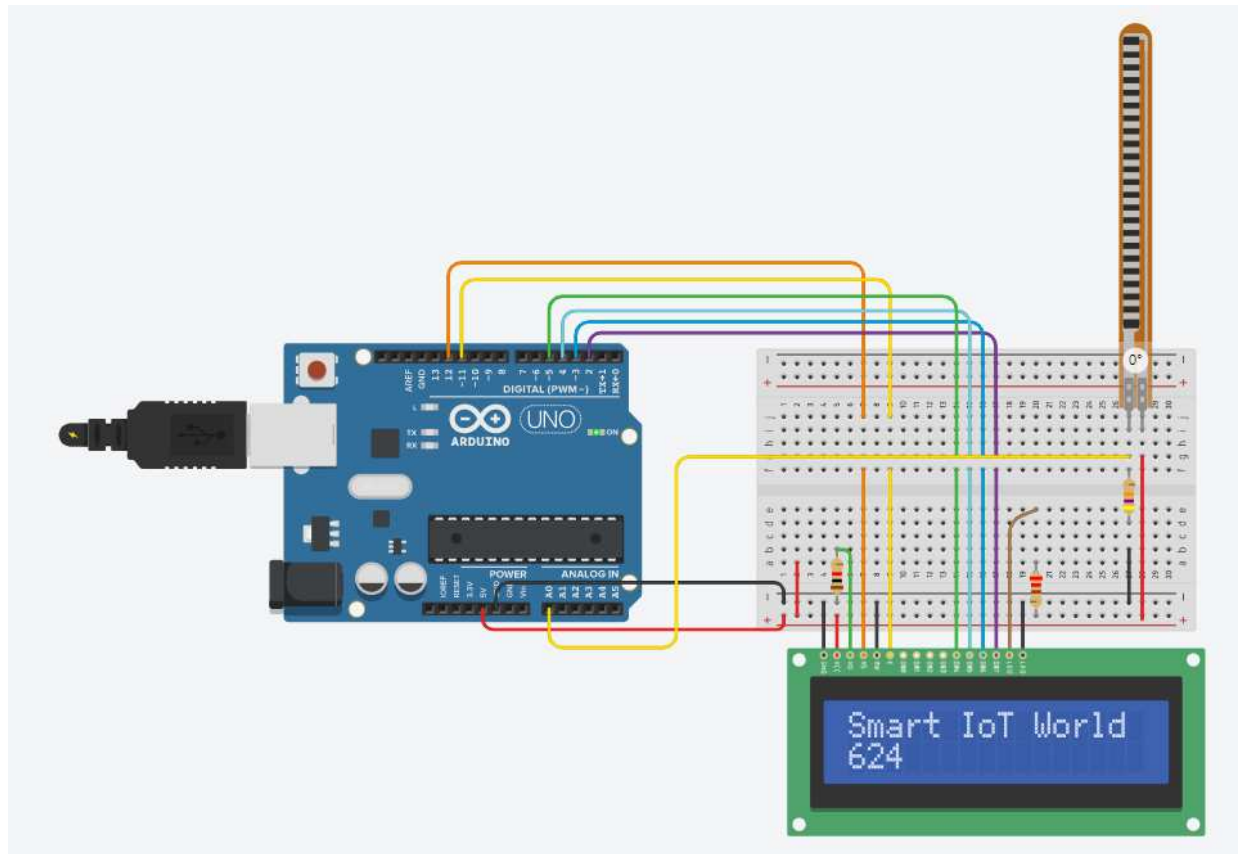
LCD Pin NO	Arduino Pin	LCD Pin
1	GND	Vss
2	5V	VCC
3	Contrast(가변 저항에 연결)	V0
4	D12	RS(Register Select)
5	GND	R / W(Read / Write)
6	D11	Enable
7	NC(연결 없음)	Data Bit 0
8	NC(연결 없음)	Data Bit 1
9	NC(연결 없음)	Data Bit 2
10	NC(연결 없음)	Data Bit 3
11	D5	Data Bit 4
12	D4	Data Bit 5
13	D3	Data Bit 6
14	D2	Data Bit 7



LCD Structure



Flex_Sensor



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A9-0 : Flex Sensor

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

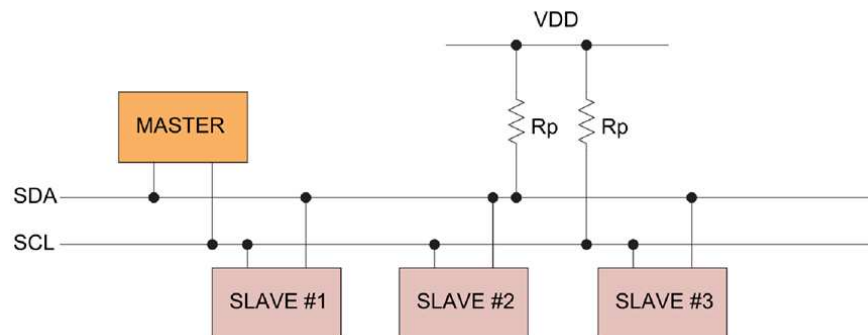
void setup() {
  lcd.begin(16, 2);
  lcd.print("Smart IoT World!");
}

void loop() {
  lcd.setCursor(0, 1);
  lcd.print(analogRead(A0));
  delay(50);
}
```

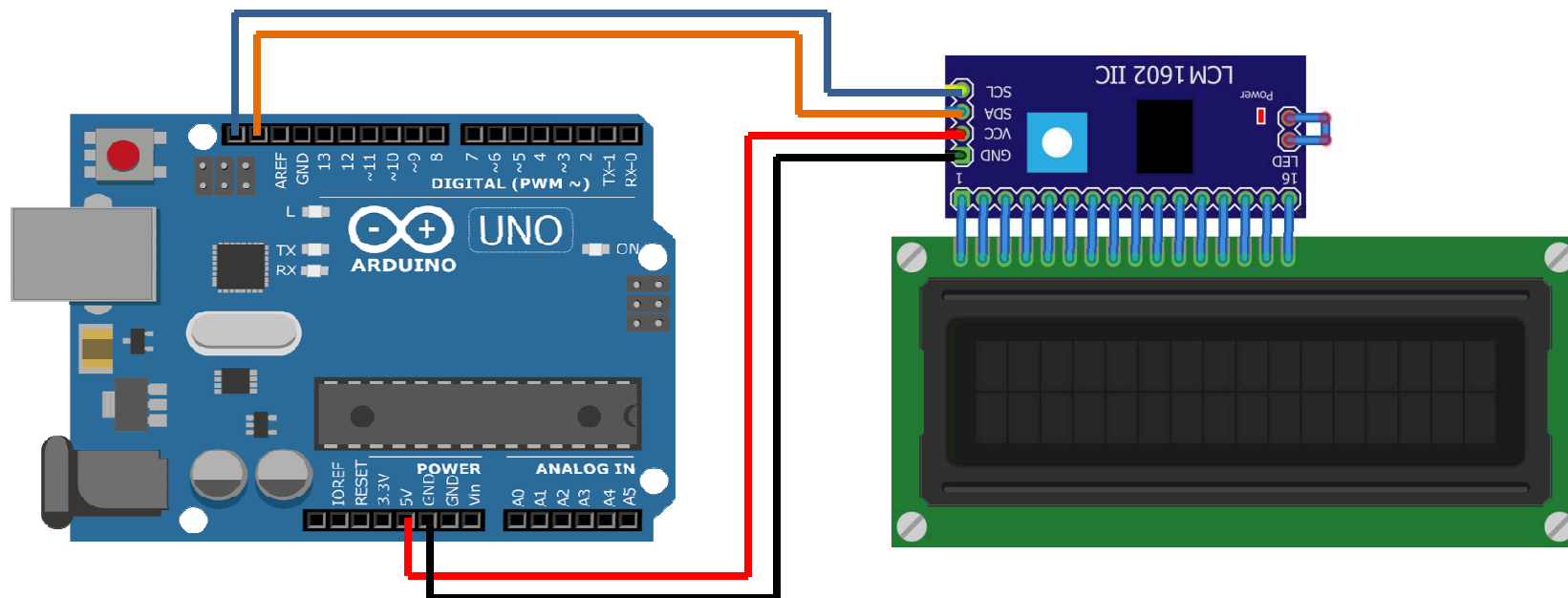


I2C LCD

- I2C (IIC) : Inter-Integrated Circuit
 - 저속의 주변기기들과 연결을 위한 직렬 통신 방식
 - SCL (Serial Clock)
 - SDA (Serial Data)
- I2C Address : 0x20, 0x27, 0x3F

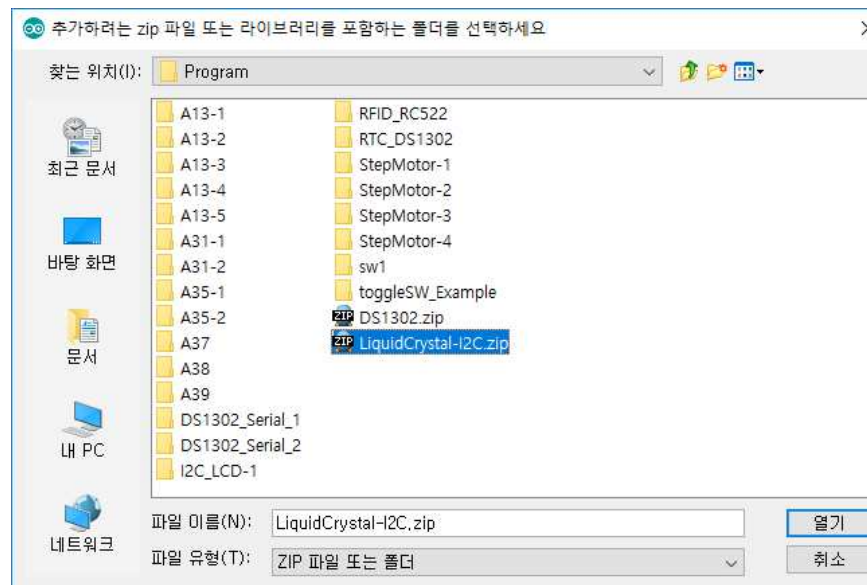


Wiring



Library 추가하기

- 메뉴 [스케치][라이브러리 포함하기][.ZIP 라이브러리 추가]



Search LiquidCrystal

라이브러리 매니저

타입: All 토픽: All liquidcrystal

LiquidCrystal
Built-In by Arduino, Adafruit 버전 1.0.7 **INSTALLED**
Allows communication with alphanumerical liquid crystal displays (LCDs). This library allows an Arduino/Genuino board to control LiquidCrystal displays (LCDs) based on the Hitachi HD44780 (or a compatible) chipset, which is found on most text-based LCDs. The library works with in either 4 or 8 bit mode (i.e. using 4 or 8 data lines in addition to the rs, enable, and, optionally, the rw control lines).
[More info](#)

Adafruit LiquidCrystal
by Adafruit
Fork of LiquidCrystal HD44780-compatible LCD driver library, now with support for ATtiny85. Fork of LiquidCrystal HD44780-compatible LCD driver library, now with support for ATtiny85.
[More info](#) 버전 1.0.1 설치

AGirs
by Bengt Martensson
A Girs infrared server for the Arduino platform. Requires Infrared4Arduino. Also uses LiquidCrystal_I2C version 1.1.2 or later.
[More info](#)

Akafugu TWILiquidCrystal Library
by Akafugu
Akafugu TWILiquidCrystal Library Akafugu TWILiquidCrystal Library

닫기



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LiquidCrystal_I2C

LiquidCrystal I2C

by **Frank de Brabander**

A library for I2C LCD displays. The library allows to control I2C displays with I2C. THIS LIBRARY MIGHT NOT BE COMPATIBLE WITH EXISTING SKETCHES.
[More info](#)

LiquidCrystal I2C

by **Frank de Brabander** 버전 1.1.2 **INSTALLED**

A library for I2C LCD displays. The library allows to control I2C displays with I2C. THIS LIBRARY MIGHT NOT BE COMPATIBLE WITH EXISTING SKETCHES.
[More info](#)

버전 선택 ▾

설치

johnrickman / LiquidCrystal_I2C

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LiquidCrystal Arduino library for the DFRobot I2C LCD displays

31 commits 1 branch 0 packages 4 releases 9 contributors

Branch: master New pull request Find file Clone or download

John Rickman Update README.md 1 Latest commit c976ad2 on 10 Apr 2019

examples	Removed Wire.h import	2 years ago
LiquidCrystal_I2C.cpp	Merge pull request #19 from Pigeo/patch-1	2 years ago
LiquidCrystal_I2C.h	workaround for WEH001602 (WS0010 based) display	2 years ago
README.md	Update README.md	13 months ago
keywords.txt	initial commit	5 years ago
library.json	Add platform espressif8266	3 years ago
library.properties	version bump, again	2 years ago



충북대학교 공동훈련센터

A9-1 : Hello

```
#include <LiquidCrystal_I2C.h>

// Set the LCD address to (0x20, 0x27, 0x3F) for 16 x 2 display
LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup( ){
  lcd.init( );
  lcd.backlight( );    //backlight On
  lcd.print("Hello");
}

void loop( ){
  // Do nothing here...
}
```



A9-2 : SetCursor

```
#include <LiquidCrystal_I2C.h>

// Set the LCD address to (0x20, 0x27, 0x3F) for 16 x 2 display
LiquidCrystal_I2C lcd(0x27, 16, 2);

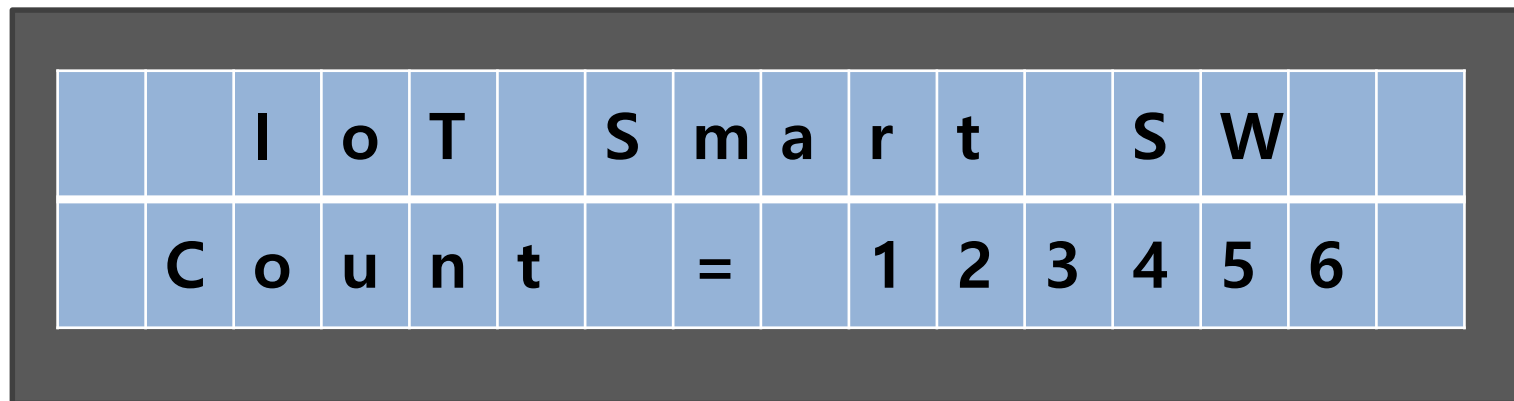
void setup( ){
    lcd.init( );
    lcd.backlight( );           //backlight On
    lcd.setCursor(2,0);         //3 Column 0 Row
    lcd.print("IoT Smart SW");
    lcd.setCursor(2,1);         //2 Column 1 Row
    lcd.print("Geun-Taek Ryu");
}

void loop( ){
    // Do nothing here...
}
```



A9-3 : Count Display

- Text LCD 에 다음과 같이 표시하여 보자
- Count 값은 0~999999



A9-3 : I2C_LCD

```
#include <LiquidCrystal_I2C.h>
// LCD address : (0x20, 0x27, 0x3F) for 16 x 2
LiquidCrystal_I2C lcd(0x27, 16, 2);

long Count=0;

void setup( ) {
  lcd.init( );
  lcd.backlight( );
  lcd.setCursor(0, 0);
  lcd.print(" IoT Smart SW ");
  lcd.setCursor(0, 1);
  lcd.print(" Count = ");
  Serial.begin(9600);
}
```

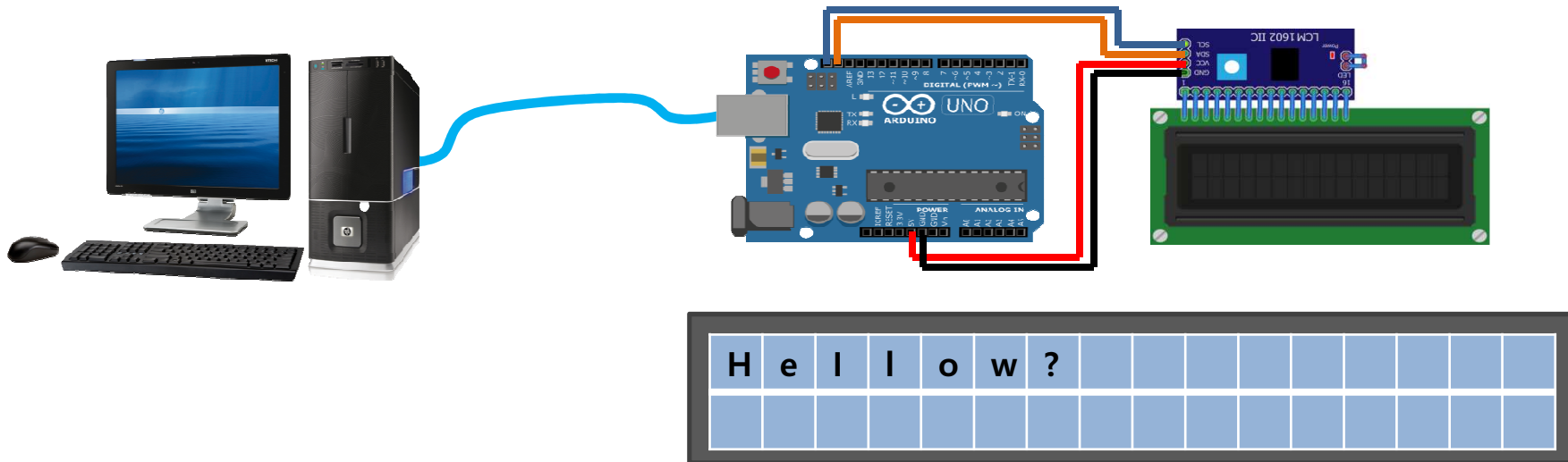
```
void loop( ) {
  lcd.setCursor(9, 1);
  lcd.print(Count);

  delay(500);
  if (++Count>999999) Count=0;
}
```



A9-4 : Serial Display

- Text LCD 에 Serial로 수신받은 문자를 표시하여 보자



A9-4 : Serial Receive Data

```
#include <LiquidCrystal_I2C.h>

// LCD address : (0x20, 0x27, 0x3F) for 16 x 2
LiquidCrystal_I2C lcd(0x27, 16, 2);

void setup( ){
    lcd.init( );
    lcd.backlight( );

    Serial.begin(9600);
}
```

```
void loop( ){
    if (Serial.available( )) {
        delay(100);
        lcd.clear( );    // Clear the screen

        while (Serial.available( ) > 0) {
            lcd.print((char)Serial.read( ));
        }
    }
}
```

