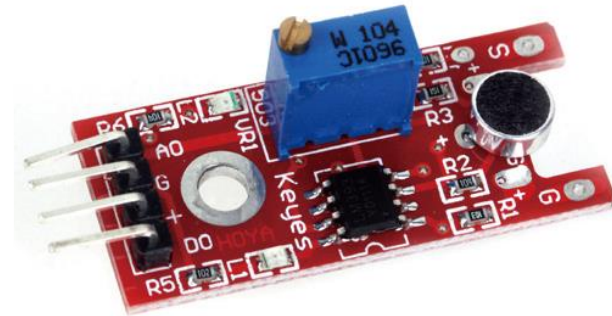
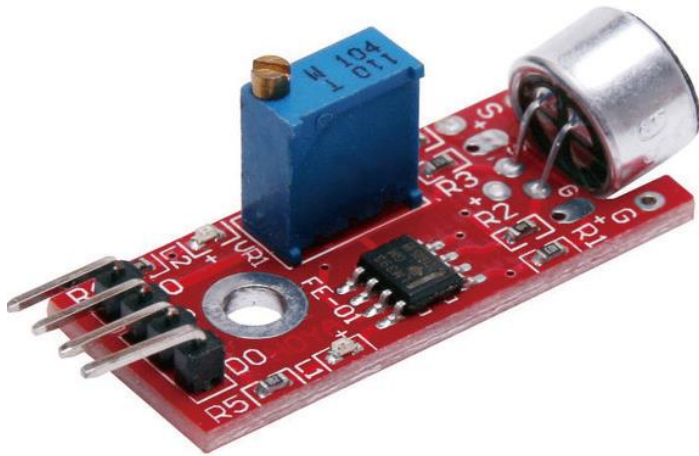


마이크 센서 실험



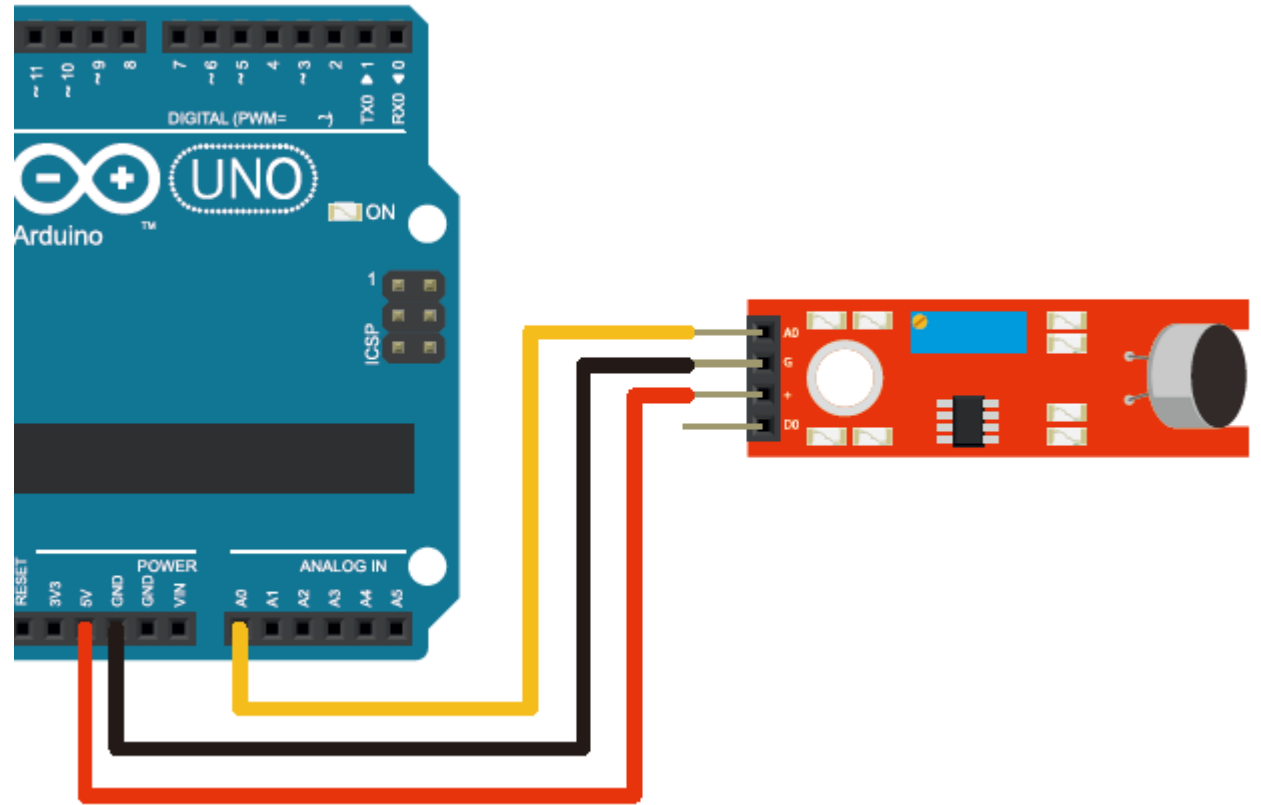
MIC(마이크) 센서

- 주변 소리의 크기를 감지할 수 있는 센서
- 소리의 크기에 따라 아날로그 전압을 출력

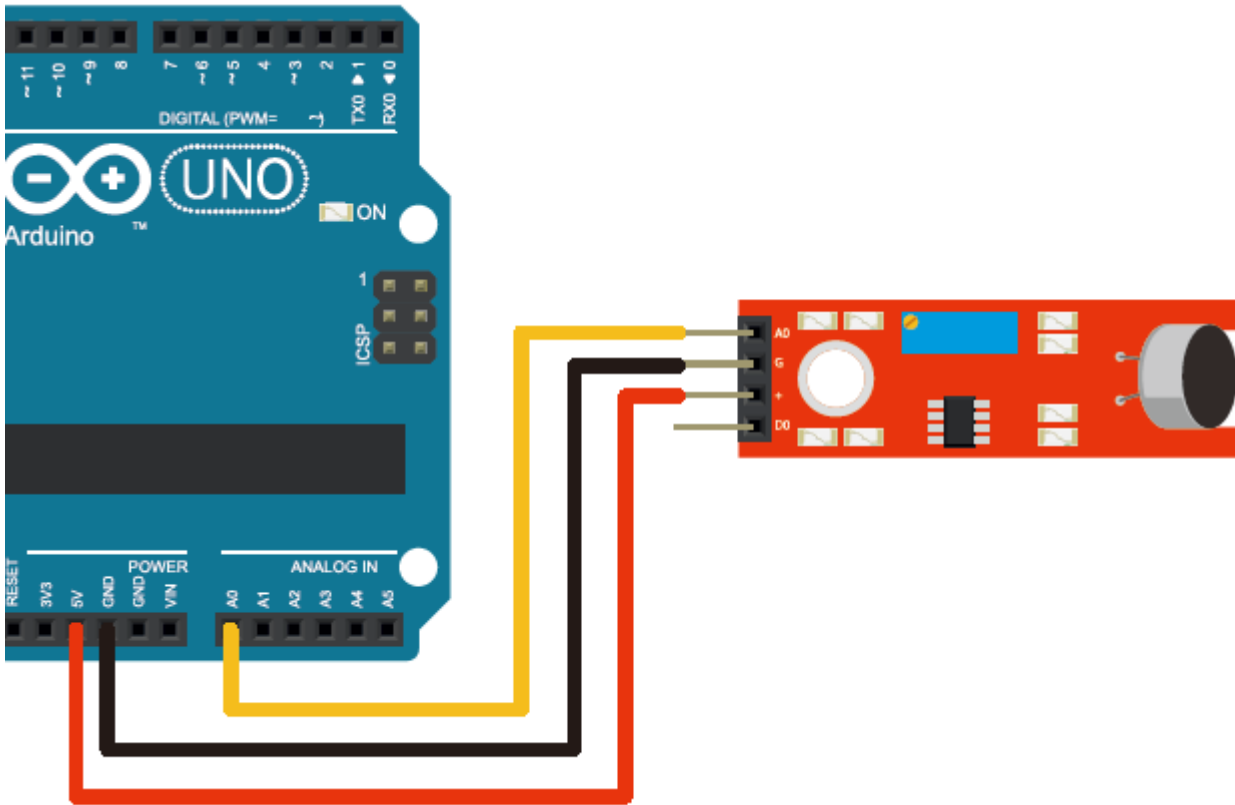


마이크 센서 실험

- G : GND(0V)
- + : VCC(5V)
- A0 : A0



마이크 센서 실험

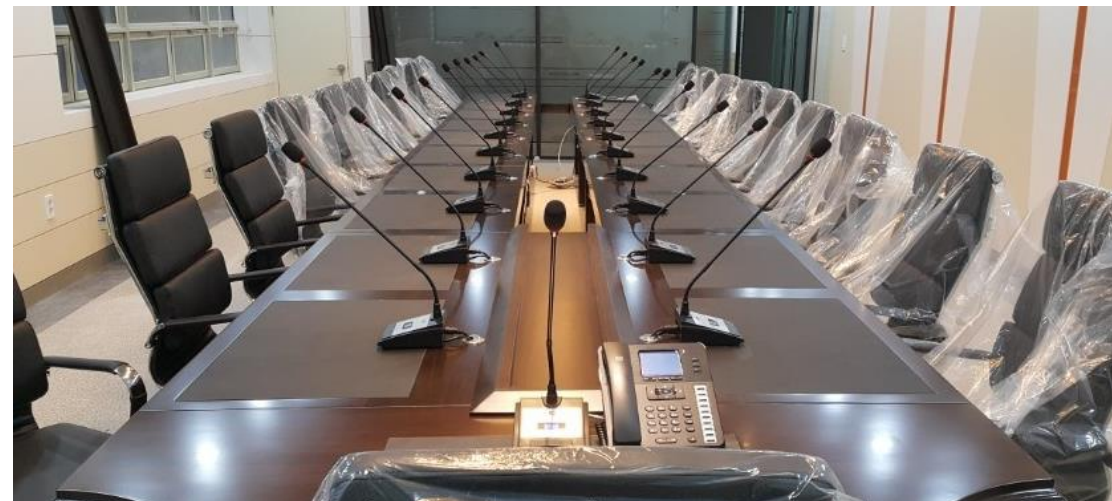
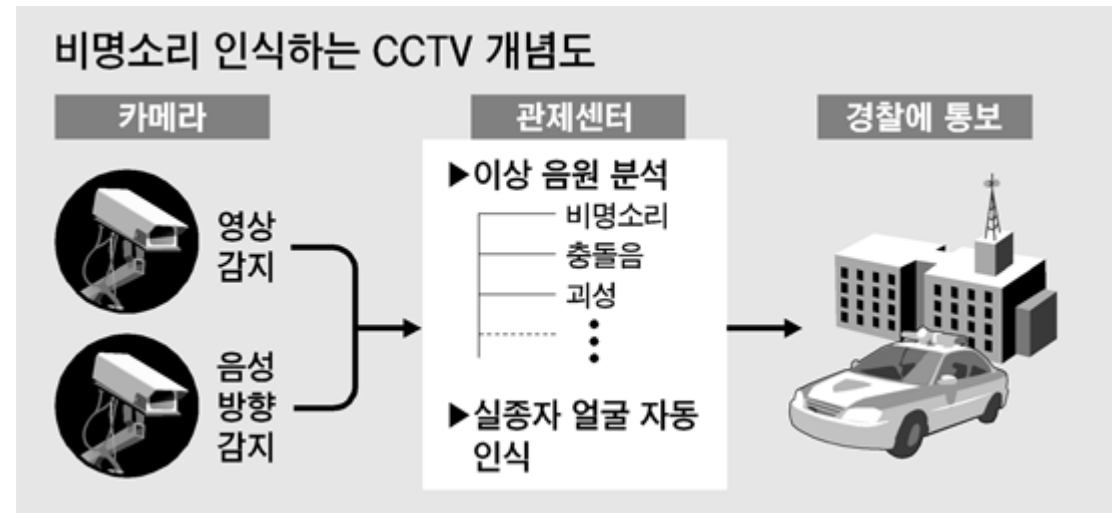


예제 : 7-0_mic

```
void setup()
{
  Serial.begin(9600) ;
}

void loop()
{
  int val = analogRead(A0) ;
  Serial.println(val) ;
  delay(100) ;
}
```

마이크 센서 실험



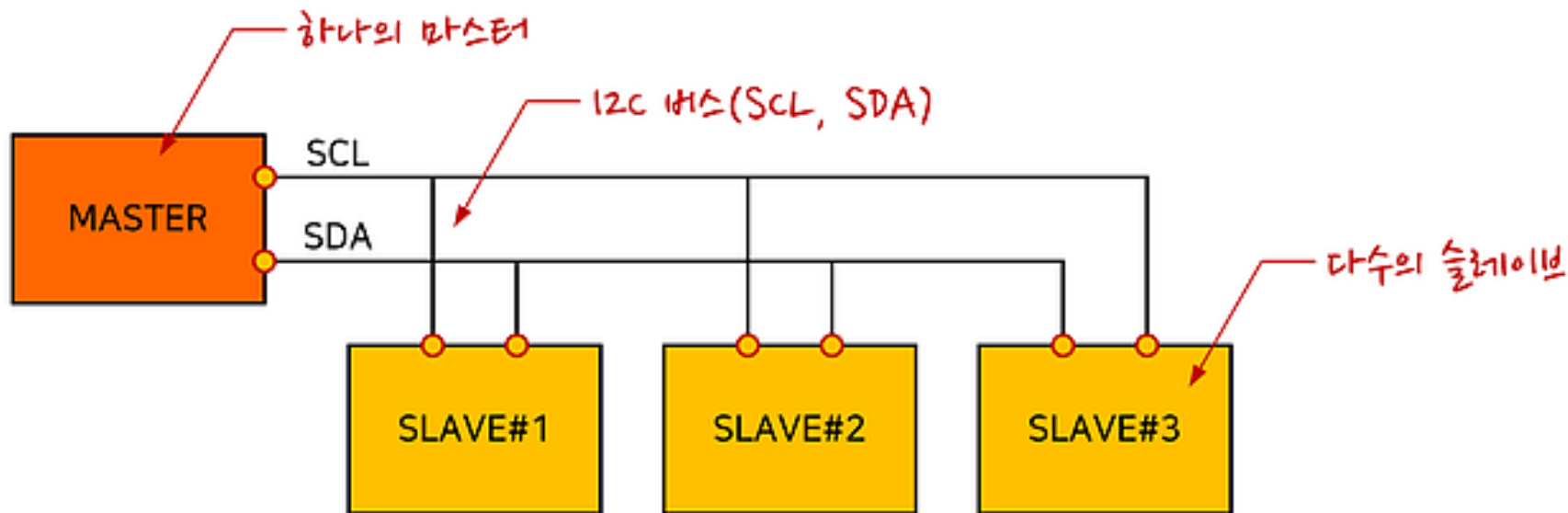
비접촉식 온도센서 실험

MLX90614

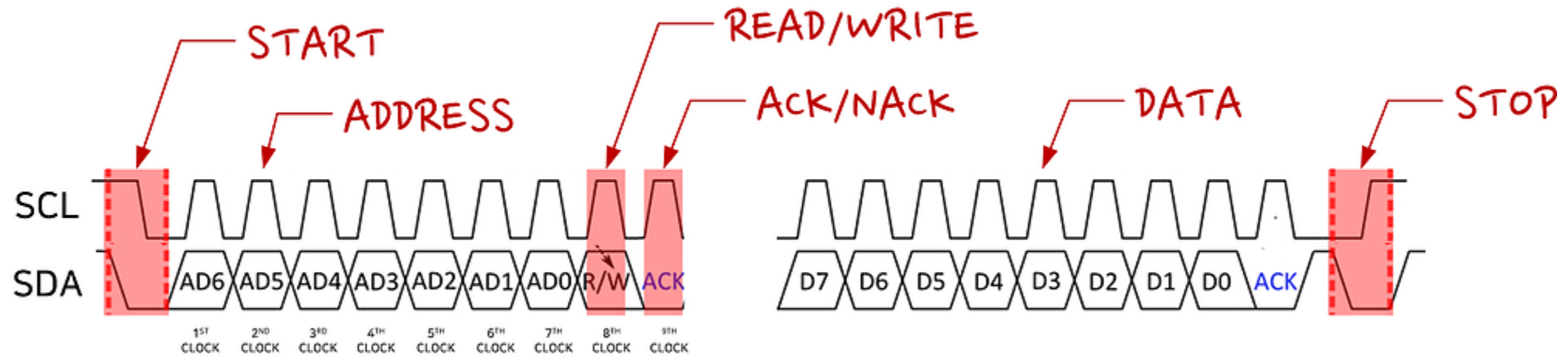
- 비접촉식 온도센서 모듈
- FOV 90°
- 측정범위 : -70°C ~ 380°C
- 인터페이스 : I2C



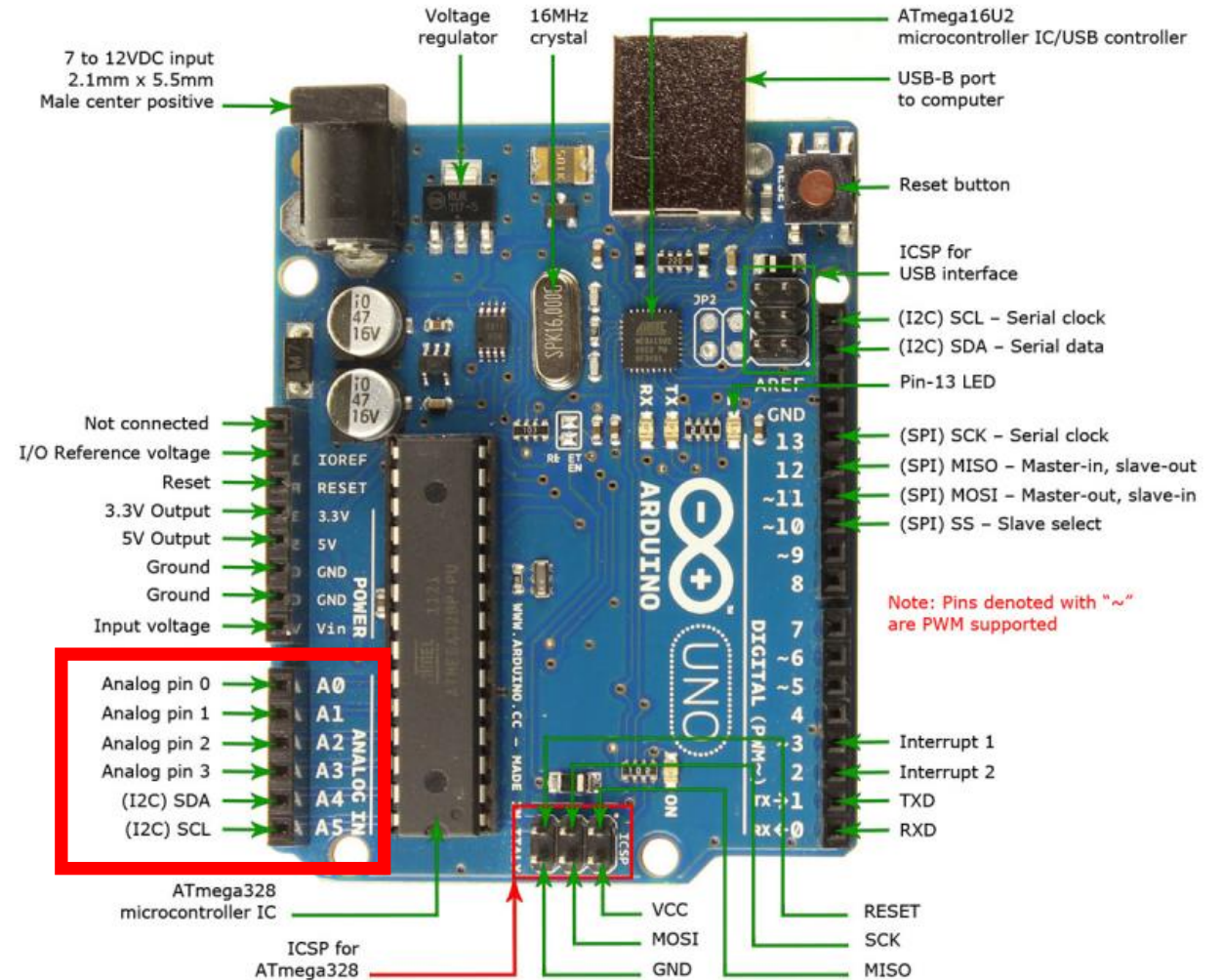
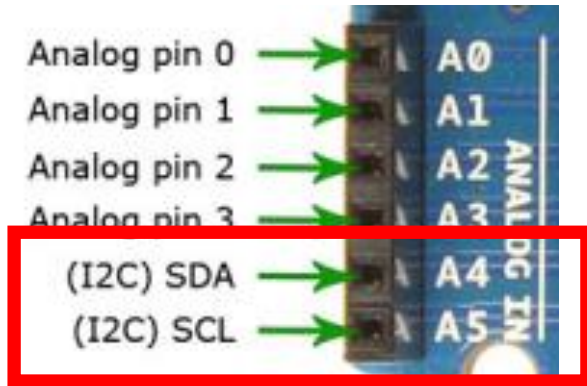
I2C 통신



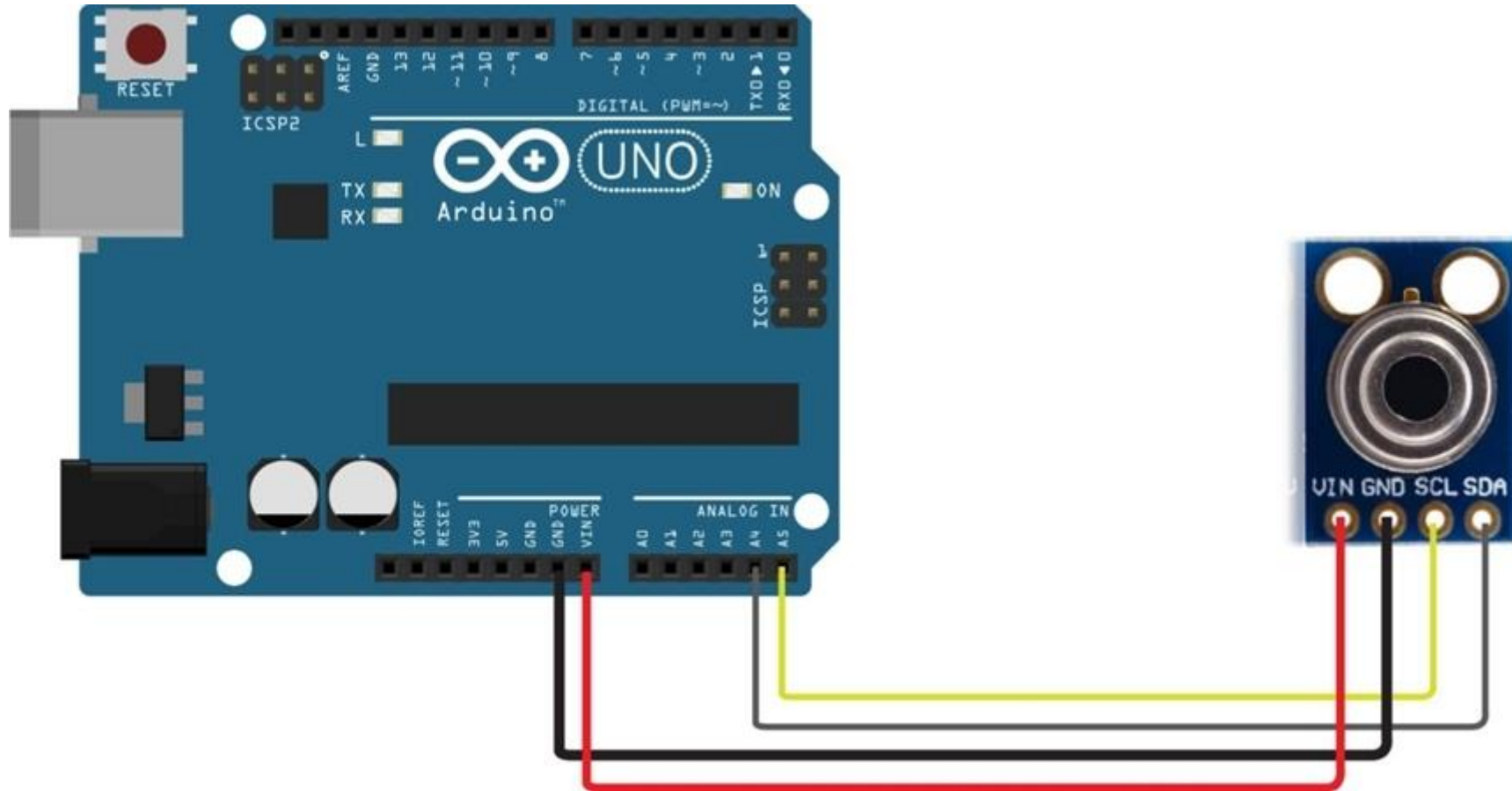
I2C 통신



아두이노의 I2C통신

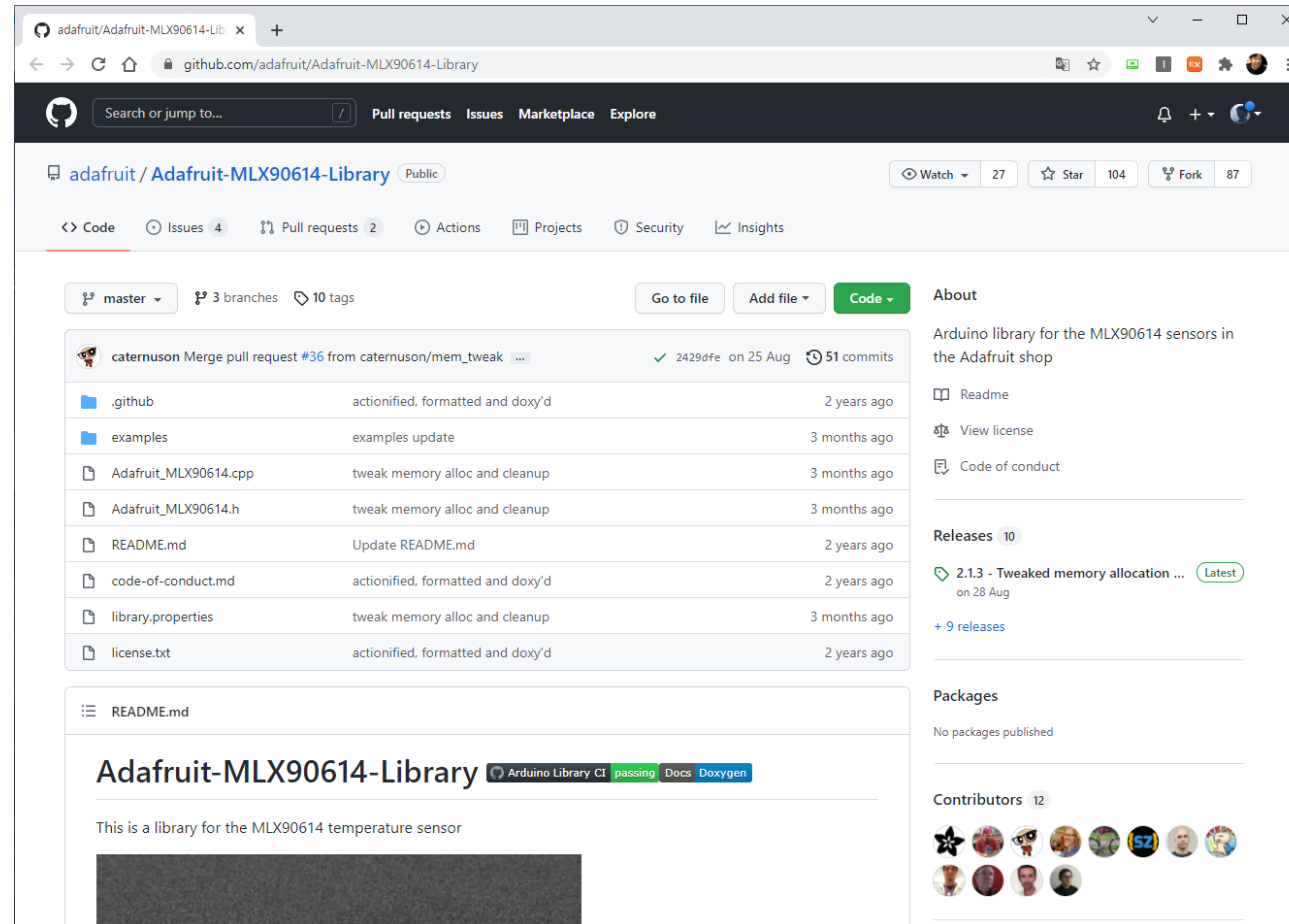


MLX90614 테스트



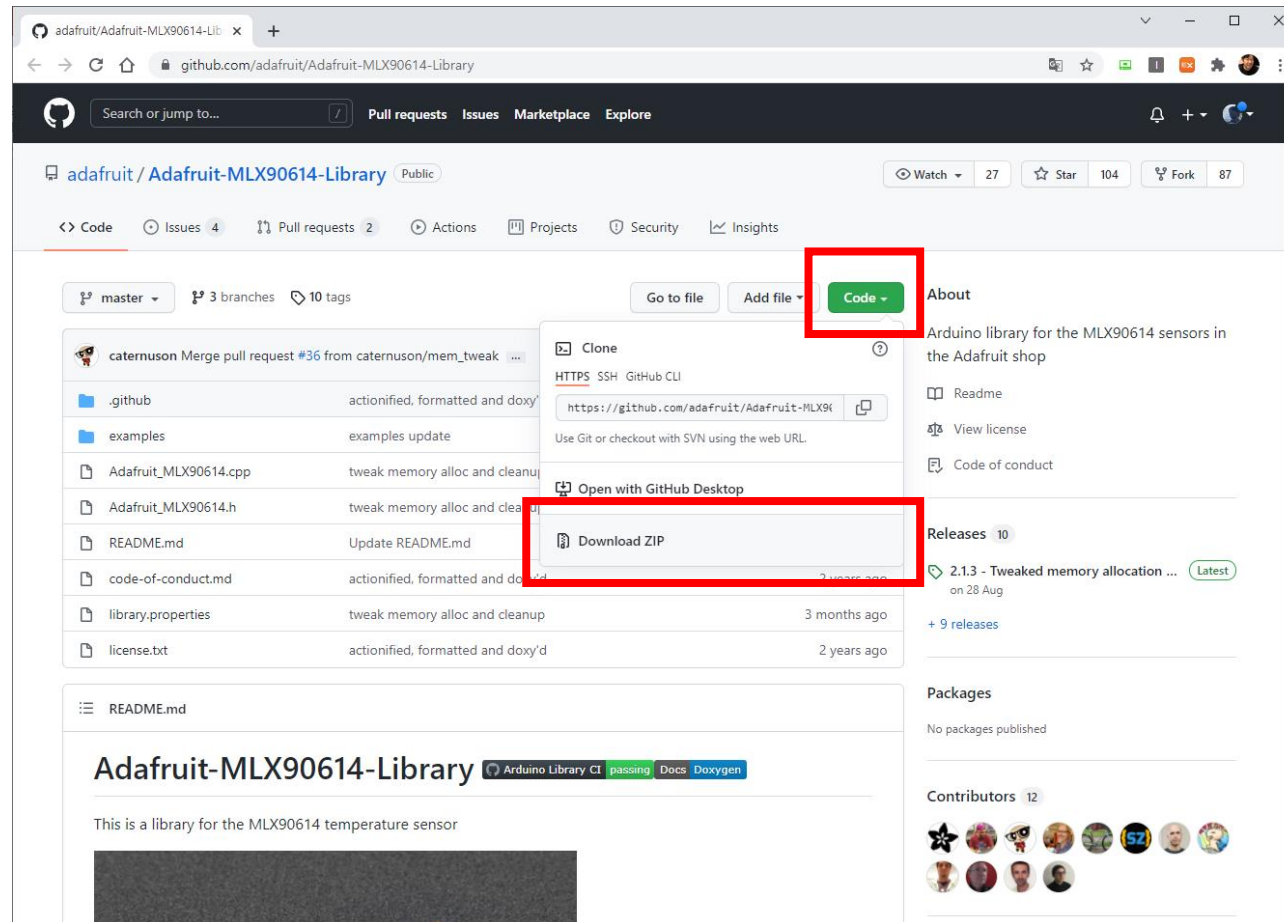
MLX90614 라이브러리 사용

- <https://github.com/adafruit/Adafruit-MLX90614-Library>

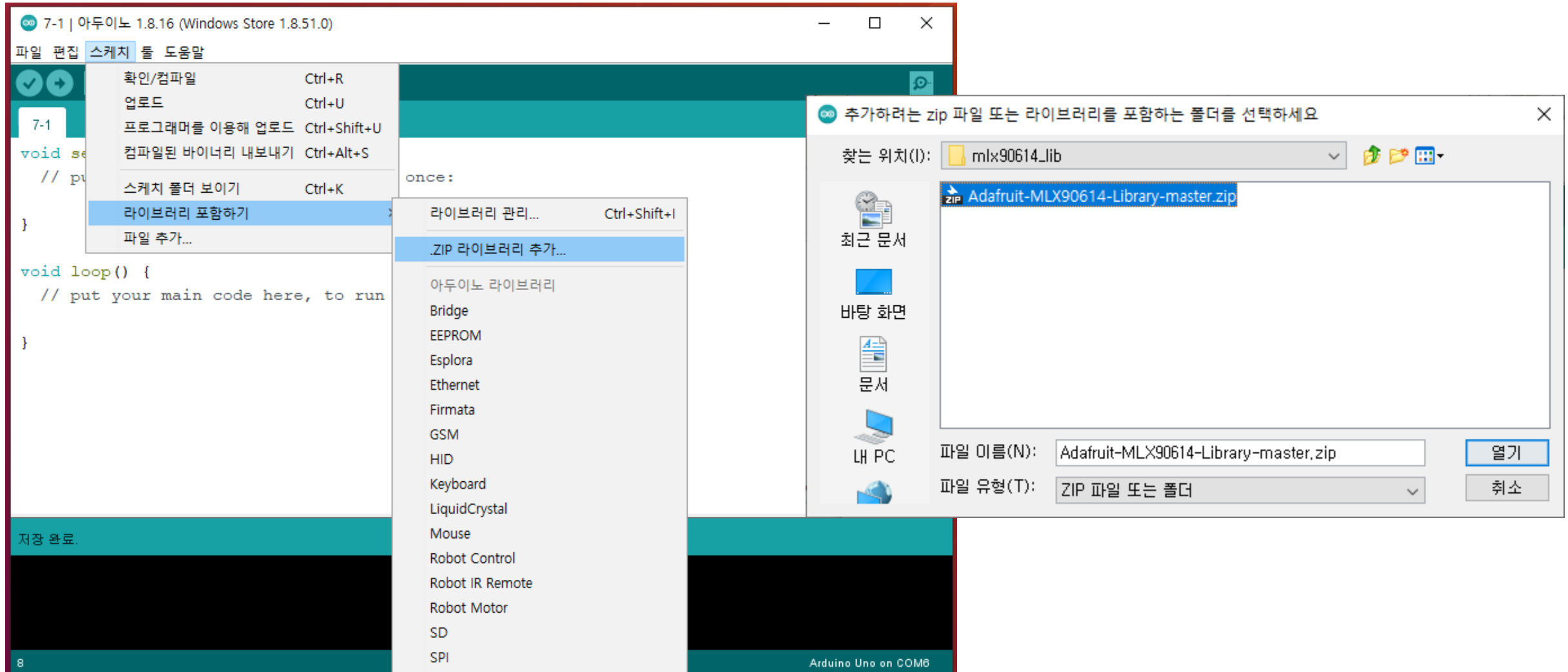


MLX90614 라이브러리 사용

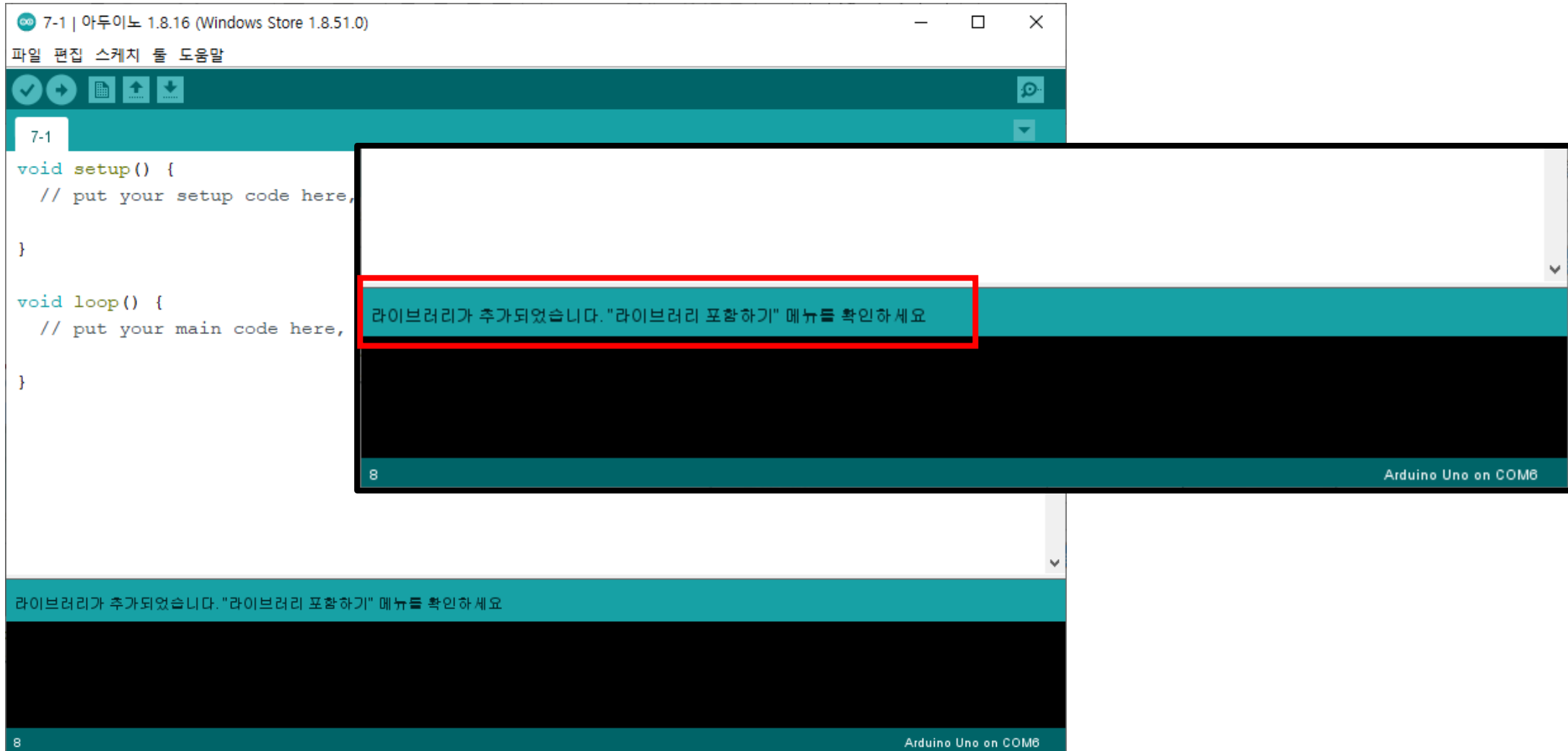
- <https://github.com/adafruit/Adafruit-MLX90614-Library>



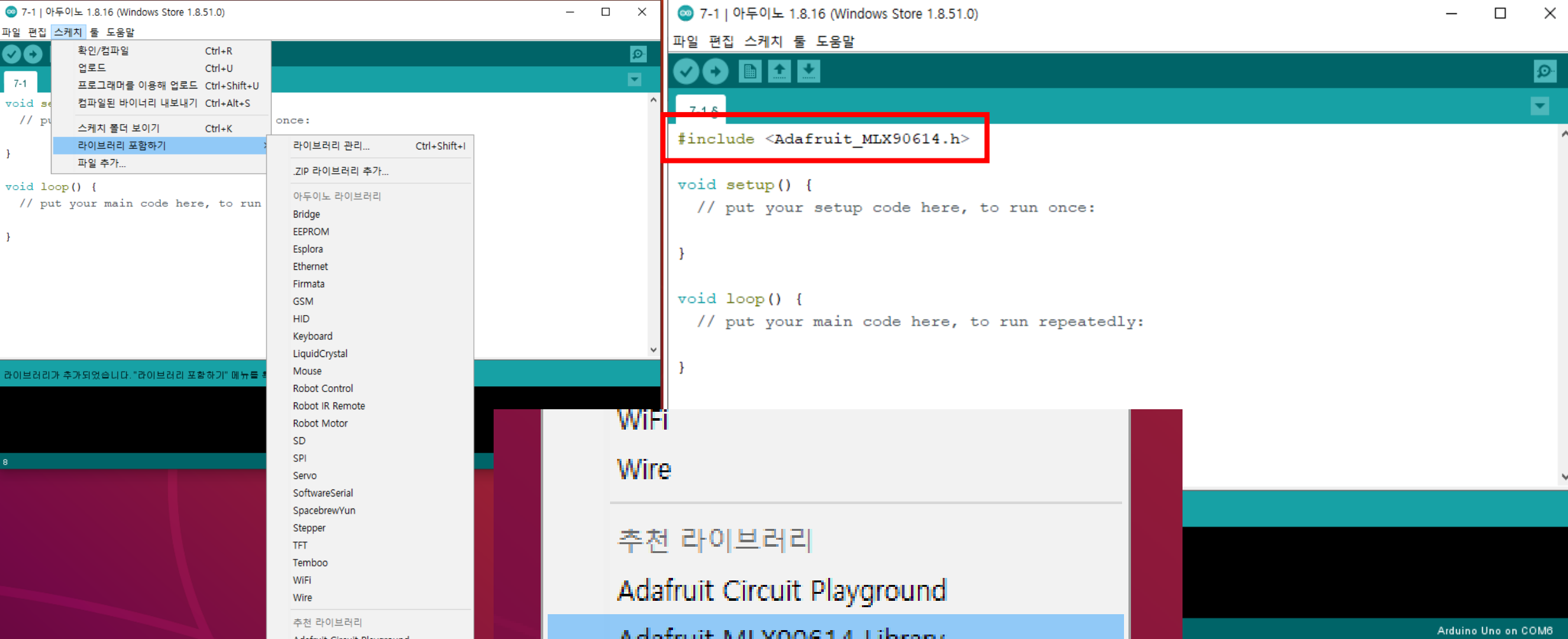
MLX90614 라이브러리 사용



MLX90614 라이브러리 사용



MLX90614 라이브러리 사용



The screenshot shows the Arduino IDE interface with the 'Tools' menu open. The 'Library Manager' is displayed, showing a list of libraries. The 'Adafruit MLX90614 Library' is highlighted in the 'Recommended Libraries' section.

라이브러리가 추가되었습니다. "라이브러리 포함하기" 메뉴를 클릭하여 라이브러리를 포함하십시오.

라이브러리 관리... Ctrl+Shift+I

.ZIP 라이브러리 추가...

아두이노 라이브러리

- Bridge
- EEPROM
- Esplora
- Ethernet
- Firmata
- GSM
- HID
- Keyboard
- LiquidCrystal
- Mouse
- Robot Control
- Robot IR Remote
- Robot Motor
- SD
- SPI
- Servo
- SoftwareSerial
- SpacebrewYun
- Stepper
- TFT
- Temboo
- WiFi
- Wire

추천 라이브러리

- Adafruit Circuit Playground
- Adafruit MLX90614 Library

7-1 | 아두이노 1.8.16 (Windows Store 1.8.51.0)

파일 편집 스케치 툴 도움말

확인/컴파일 Ctrl+R

업로드 Ctrl+U

프로그래머를 이용해 업로드 Ctrl+Shift+U

컴파일된 바이너리 내보내기 Ctrl+Alt+S

스케치 폴더 보기 Ctrl+K

라이브러리 포함하기

파일 추가...

once:

```
void setup() {  
  // put your setup code here, to run once:  
}  
  
void loop() {  
  // put your main code here, to run repeatedly:  
}
```

7-1 | 아두이노 1.8.16 (Windows Store 1.8.51.0)

파일 편집 스케치 툴 도움말

```
#include <Adafruit_MLX90614.h>  
  
void setup() {  
  // put your setup code here, to run once:  
}  
  
void loop() {  
  // put your main code here, to run repeatedly:  
}
```

WiFi

Wire

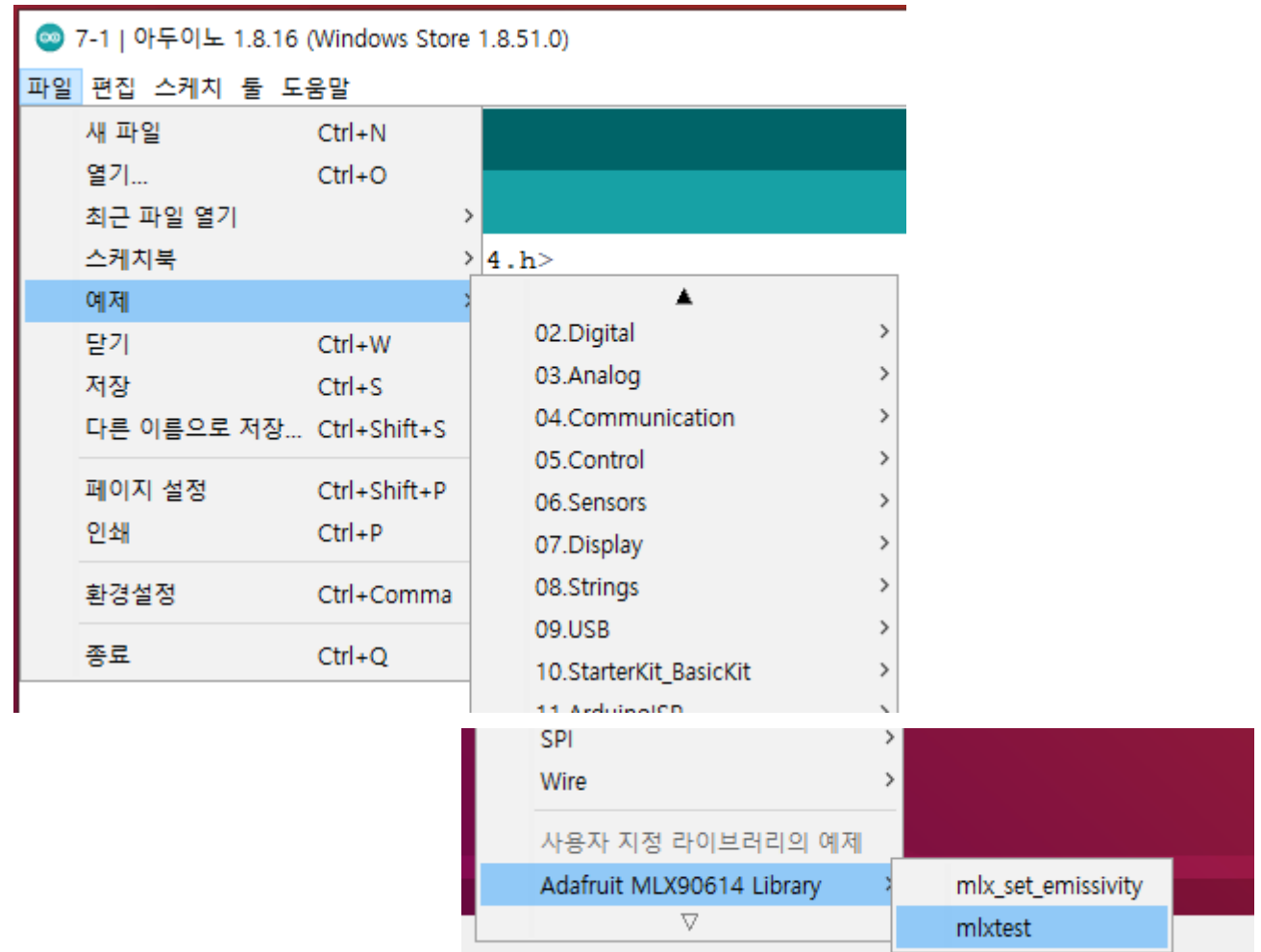
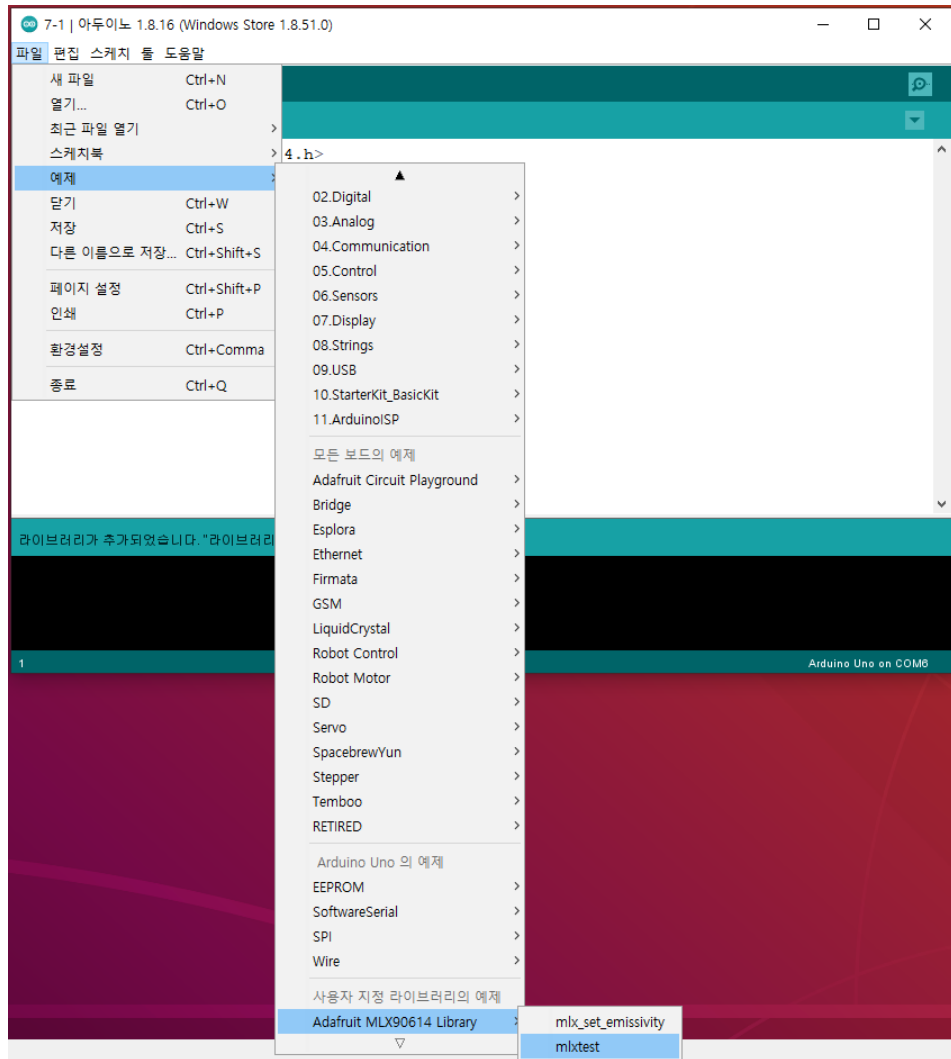
추천 라이브러리

Adafruit Circuit Playground

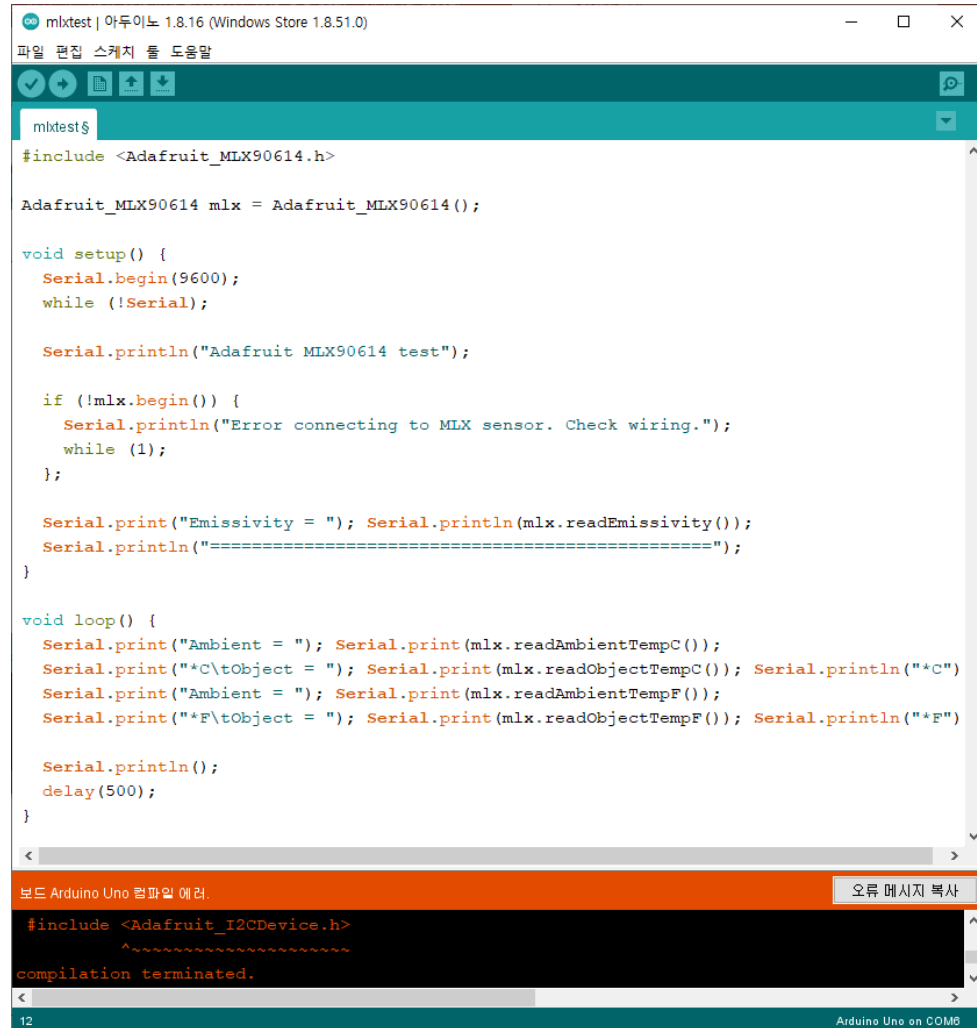
Adafruit MLX90614 Library

Arduino Uno on COM8

MLX90614 라이브러리 예제 테스트



MLX90614 라이브러리 예제 테스트



```
mlxtest | 아두이노 1.8.16 (Windows Store 1.8.51.0)
파일 편집 스케치 툴 도움말
mlxtest$
#include <Adafruit_MLX90614.h>

Adafruit_MLX90614 mlx = Adafruit_MLX90614();

void setup() {
  Serial.begin(9600);
  while (!Serial);

  Serial.println("Adafruit MLX90614 test");

  if (!mlx.begin()) {
    Serial.println("Error connecting to MLX sensor. Check wiring.");
    while (1);
  };

  Serial.print("Emissivity = "); Serial.println(mlx.readEmissivity());
  Serial.println("=====");
}

void loop() {
  Serial.print("Ambient = "); Serial.print(mlx.readAmbientTempC());
  Serial.print("C\tObject = "); Serial.print(mlx.readObjectTempC()); Serial.println("C");
  Serial.print("Ambient = "); Serial.print(mlx.readAmbientTempF());
  Serial.print("F\tObject = "); Serial.print(mlx.readObjectTempF()); Serial.println("F");

  Serial.println();
  delay(500);
}
```

보드 Arduino Uno 컴파일 에러. 오류 메시지 복사

```
#include <Adafruit_I2CDevice.h>
^~~~~~
compilation terminated.
```

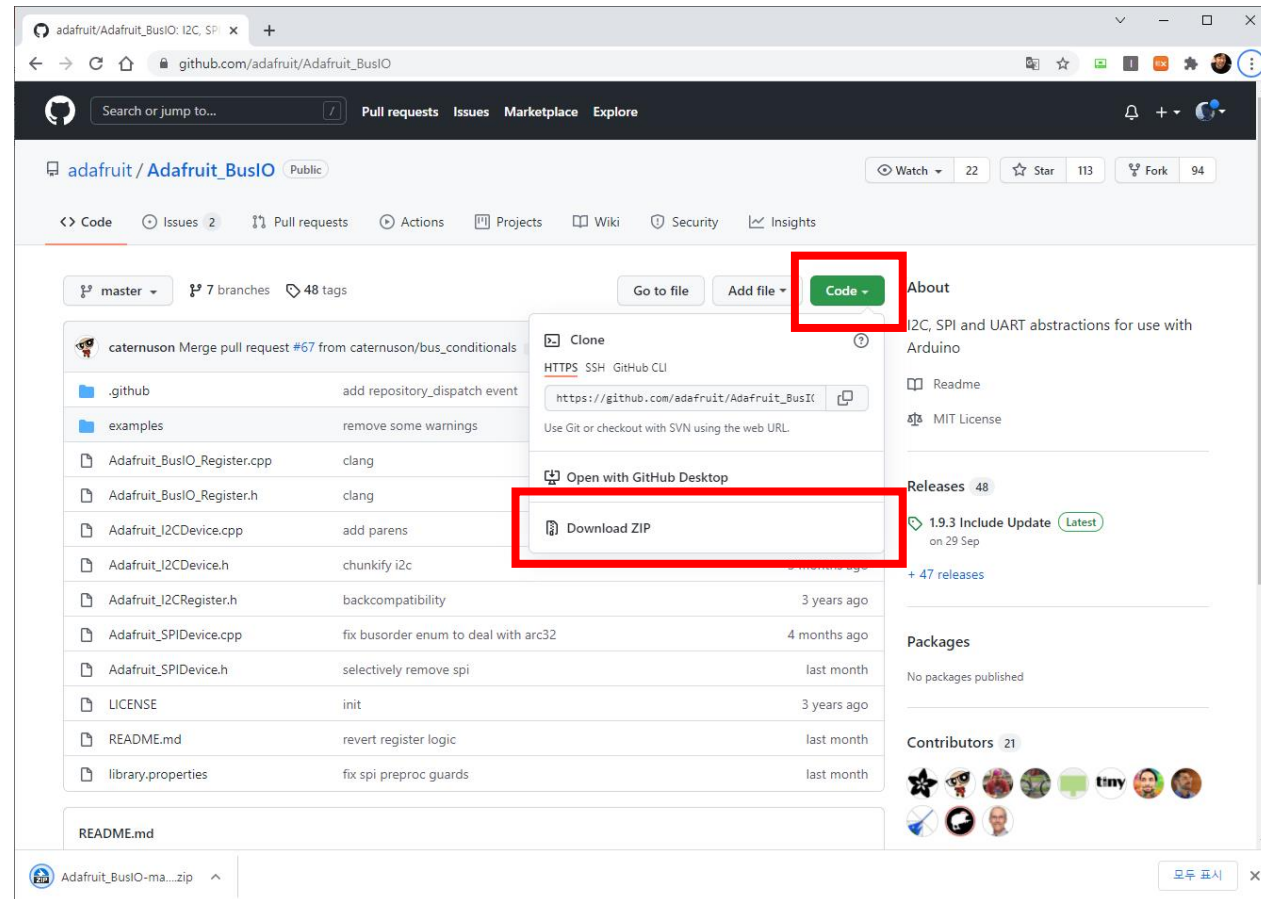
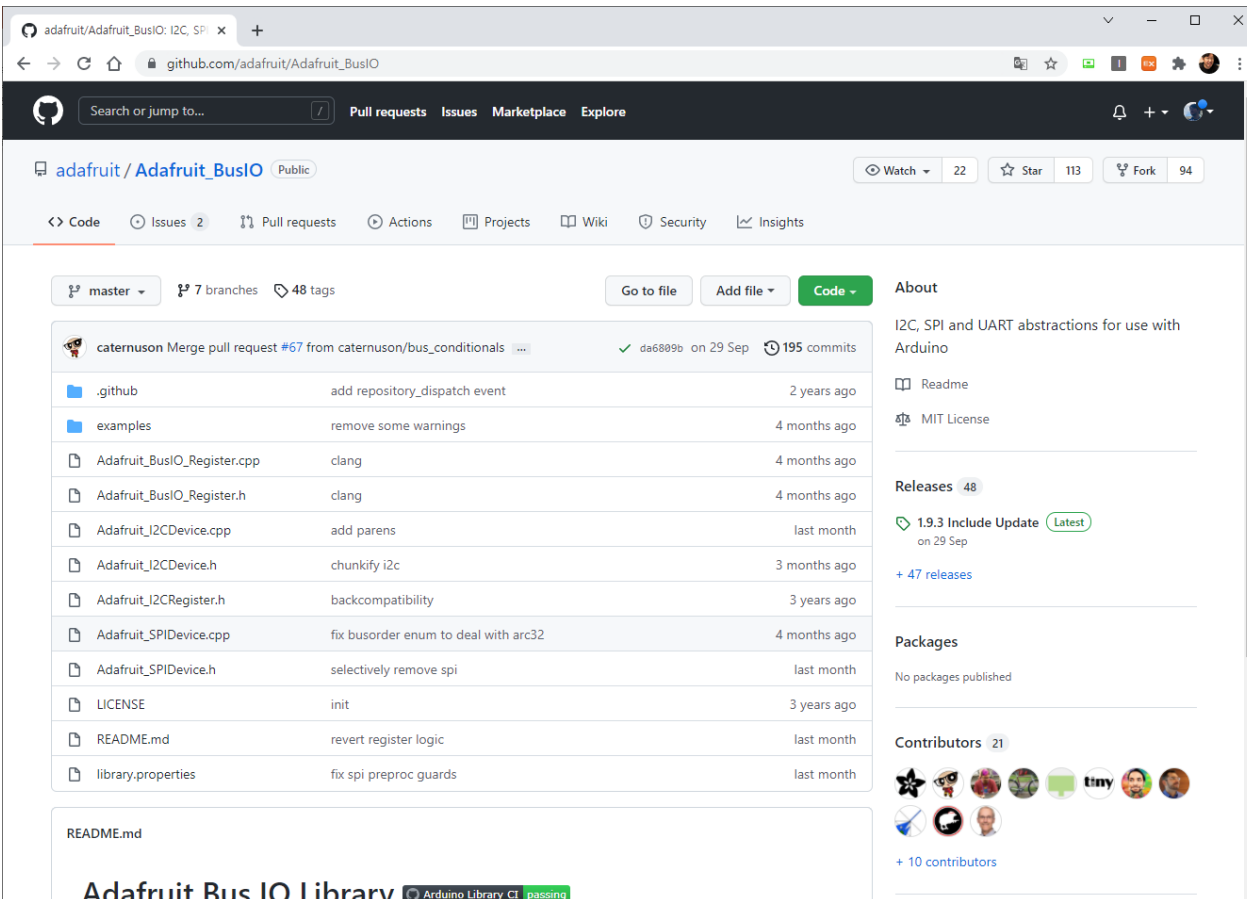
12 Arduino Uno on COM8

보드 Arduino Uno 컴파일 에러.

```
#include <Adafruit_I2CDevice.h>
^~~~~~
compilation terminated.
```

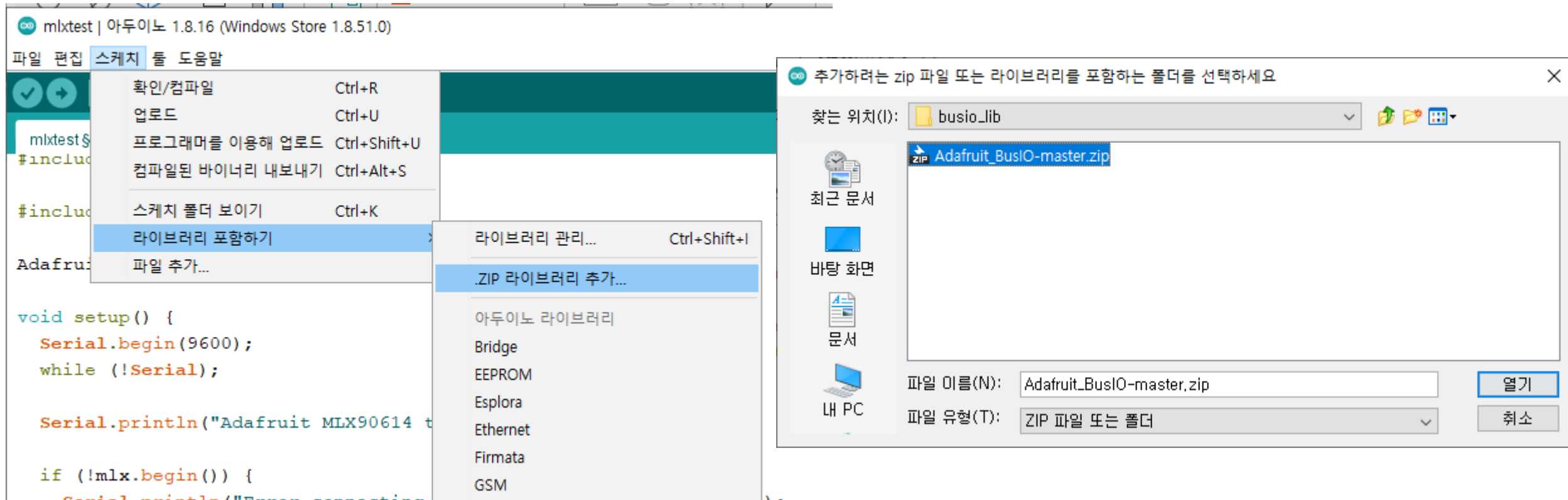
MLX90614 라이브러리 예제 테스트

- https://github.com/adafruit/Adafruit_BusIO 라이브러리 다운로드



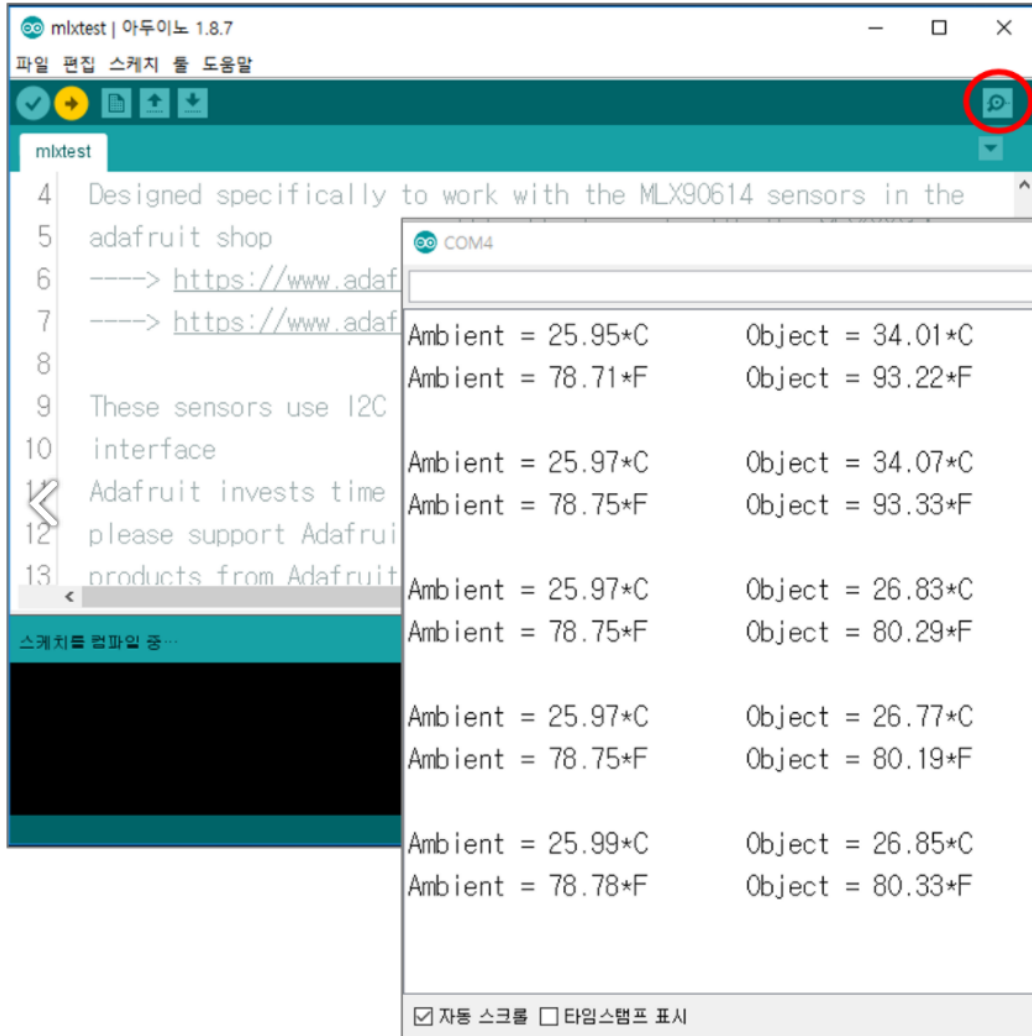
MLX90614 라이브러리 예제 테스트

- https://github.com/adafruit/Adafruit_BusIO 라이브러리 추가



MLX90614 라이브러리 예제 테스트

예제 7-1



The screenshot shows the Arduino IDE interface. The main window displays the 'mlxtest' sketch, which is a library example for the MLX90614 sensor. The code includes comments and a serial monitor setup. A red circle highlights the 'Serial Monitor' icon in the top right corner of the IDE. Below the code editor, the 'Serial Monitor' window is open, showing the output of the sketch. The output displays temperature readings in both Celsius and Fahrenheit for both the ambient and object sensors.

```
4 Designed specifically to work with the MLX90614 sensors in the
5 adafruit shop
6 ----> https://www.adafruit.com/products/3916
7 ----> https://www.adafruit.com/products/3916
8
9 These sensors use I2C
10 interface
11 Adafruit invests time and resources into developing open source
12 please support Adafruit and open-source hardware by purchasing
13 products from Adafruit!
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90
91
92
93
94
95
96
97
98
99
100
```

COM4

Ambient = 25.95°C	Object = 34.01°C
Ambient = 78.71°F	Object = 93.22°F
Ambient = 25.97°C	Object = 34.07°C
Ambient = 78.75°F	Object = 93.33°F
Ambient = 25.97°C	Object = 26.83°C
Ambient = 78.75°F	Object = 80.29°F
Ambient = 25.97°C	Object = 26.77°C
Ambient = 78.75°F	Object = 80.19°F
Ambient = 25.99°C	Object = 26.85°C
Ambient = 78.78°F	Object = 80.33°F

☒ 자동 스크롤 ☐ 타임스탬프 표시 line ending 없음 9600 보드레이트 출력 지우기



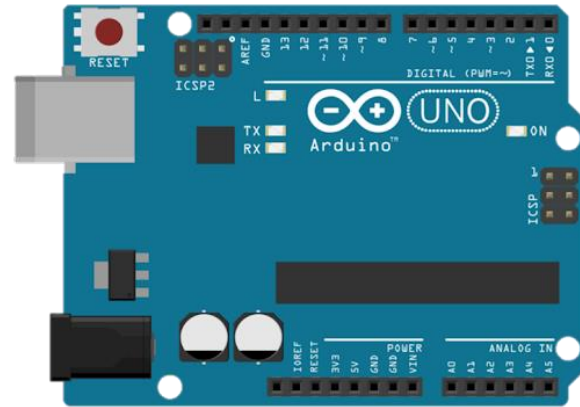
응용 : 체온 측정 출입 관리

전체 구성

손(물체) 유무 감지
(예제 6-1)



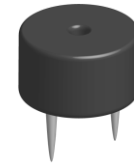
온도 측정
(예제 7-1)



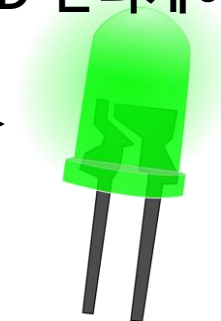
정보 출력(시리얼통신)



측정 완료 경고음 발생



LED 인디케이터

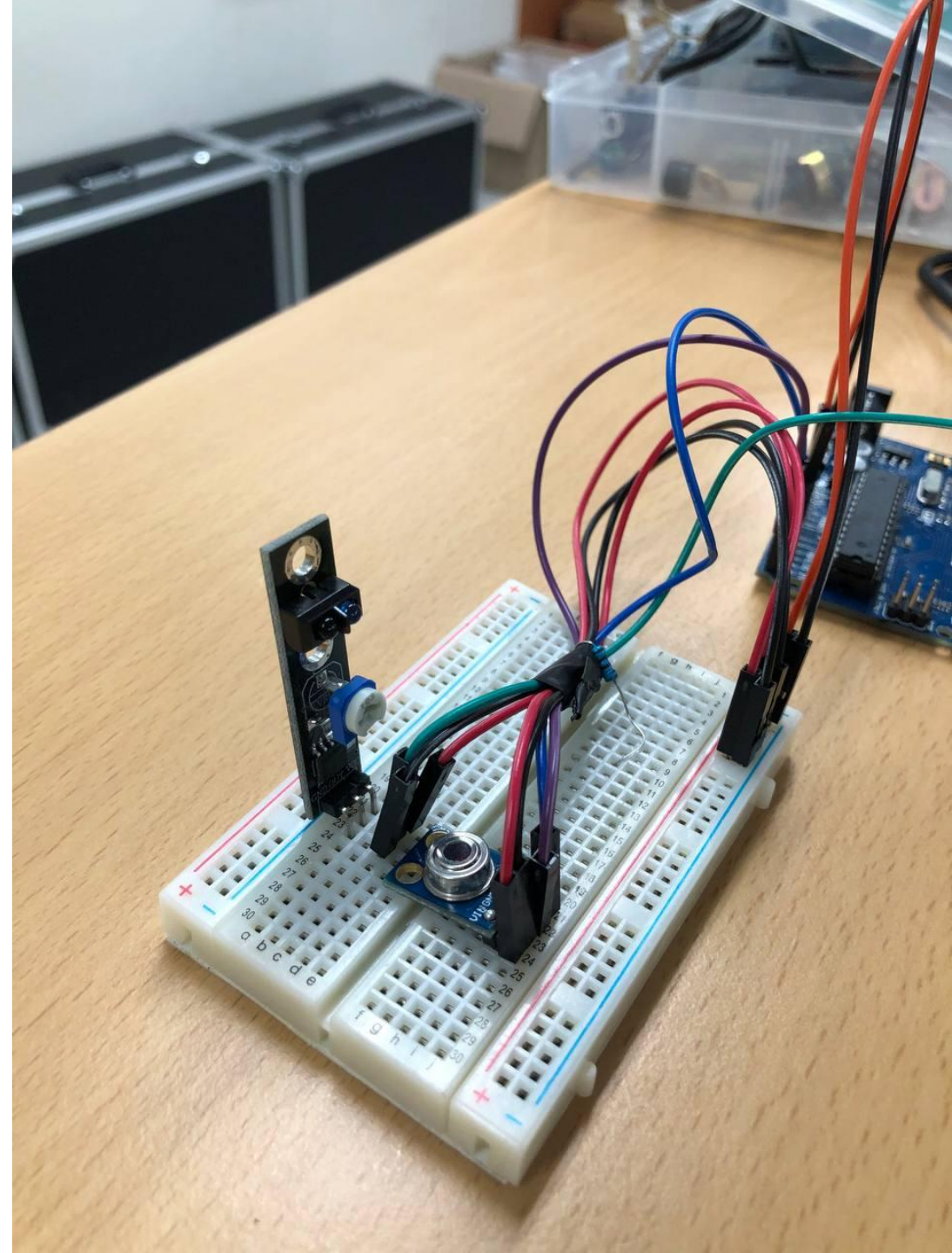


물체감지 + 온도체크

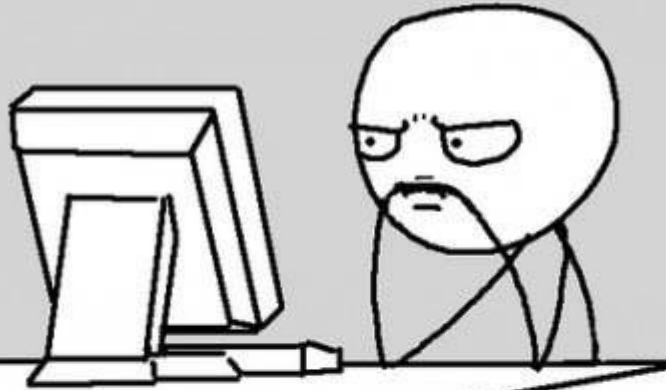
- 물체감지 체크 : 아두이노 5번핀



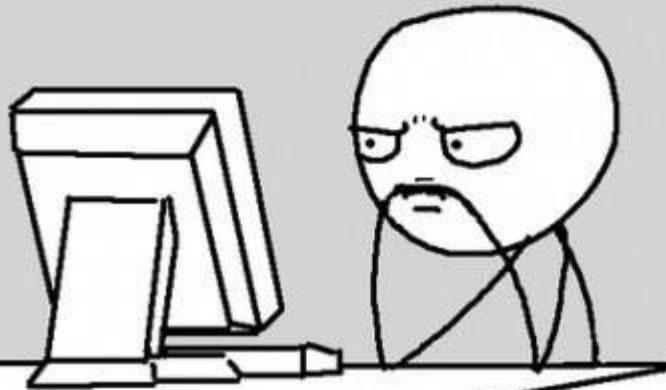
- 온도체크



It doesn't work..... why?



It works..... why?



순서도

