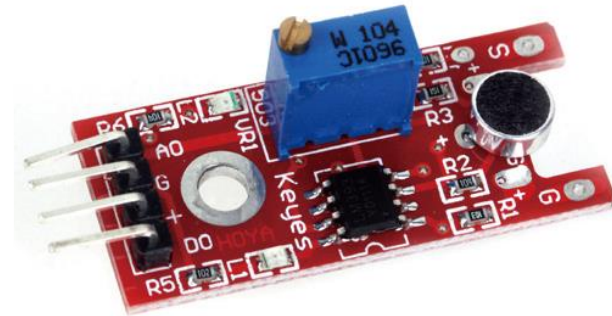
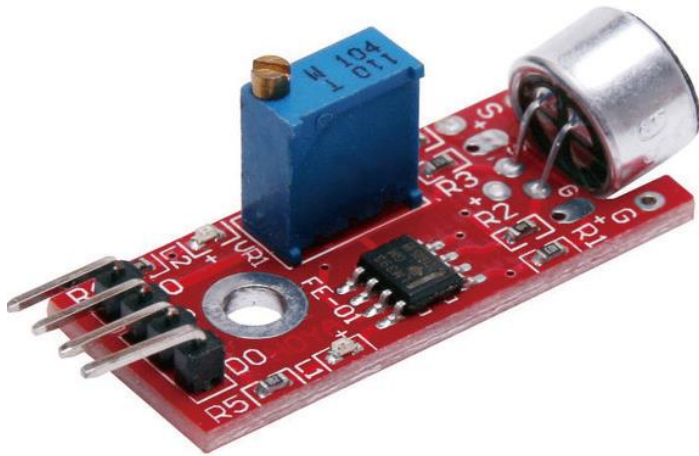


# 마이크 센서 실험



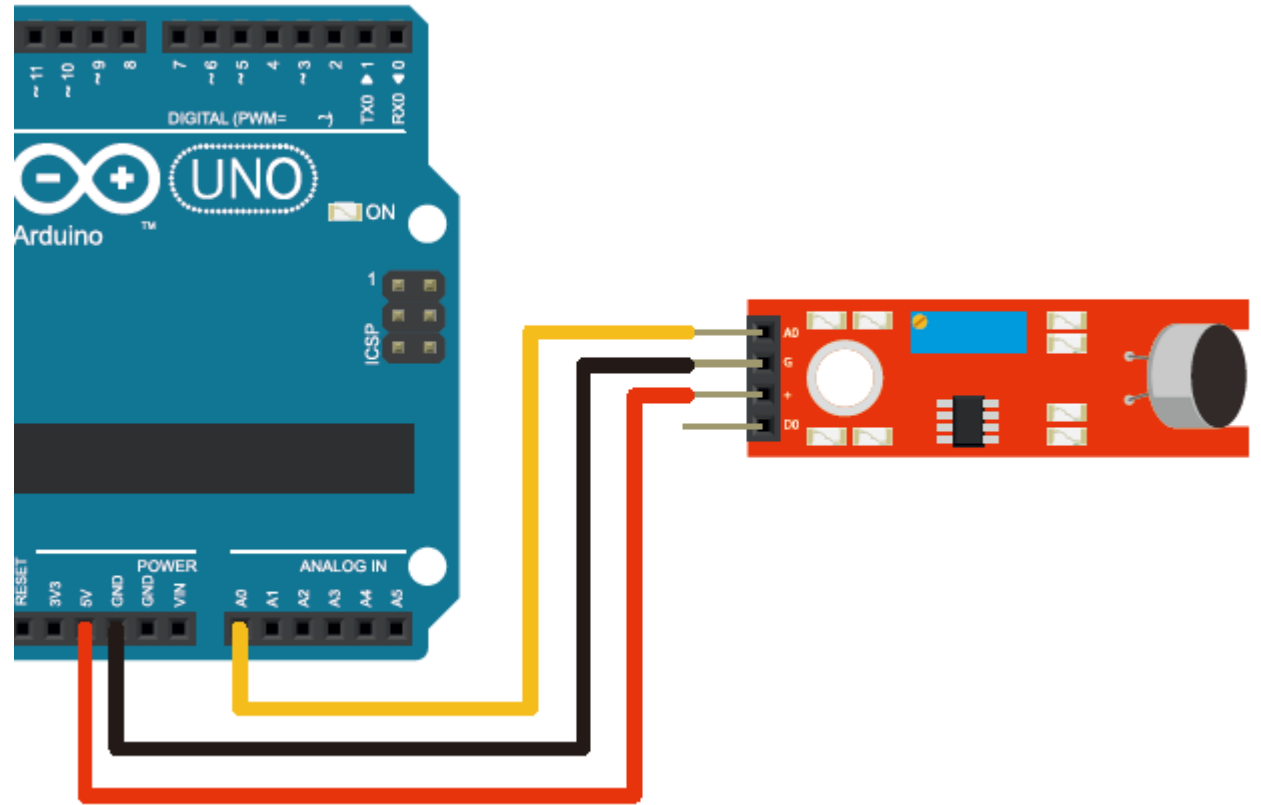
# MIC(마이크) 센서

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

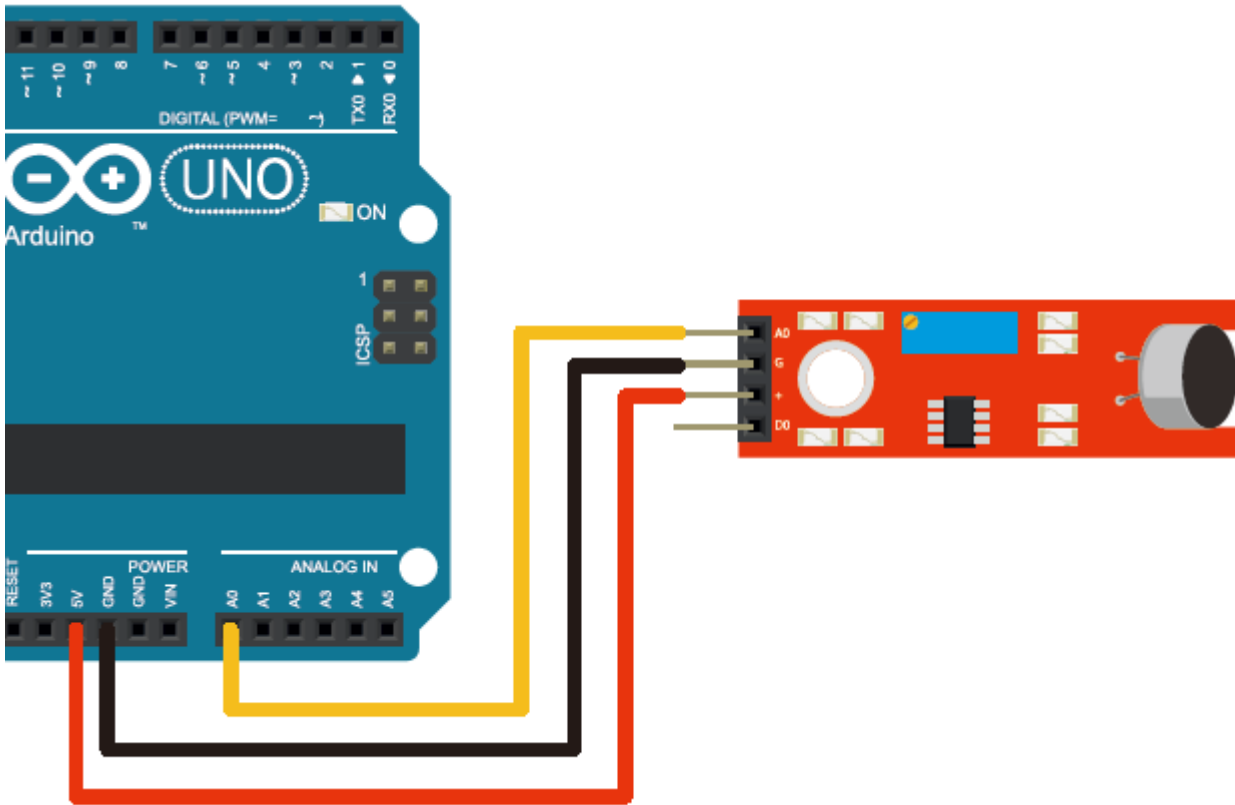


# 마이크 센서 실험

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



# 마이크 센서 실험

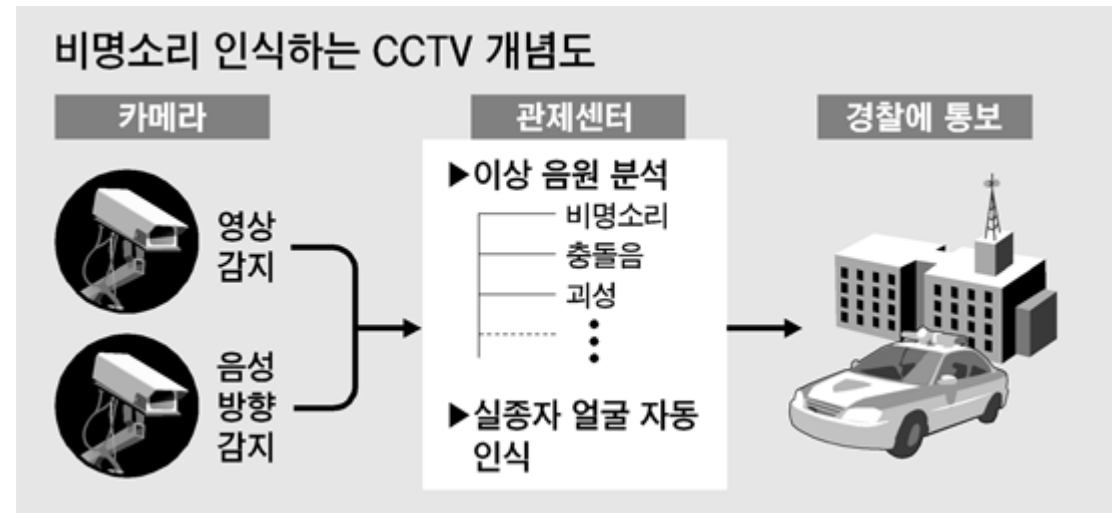


예제 : 7-0\_mic

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

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

# 마이크 센서 실험



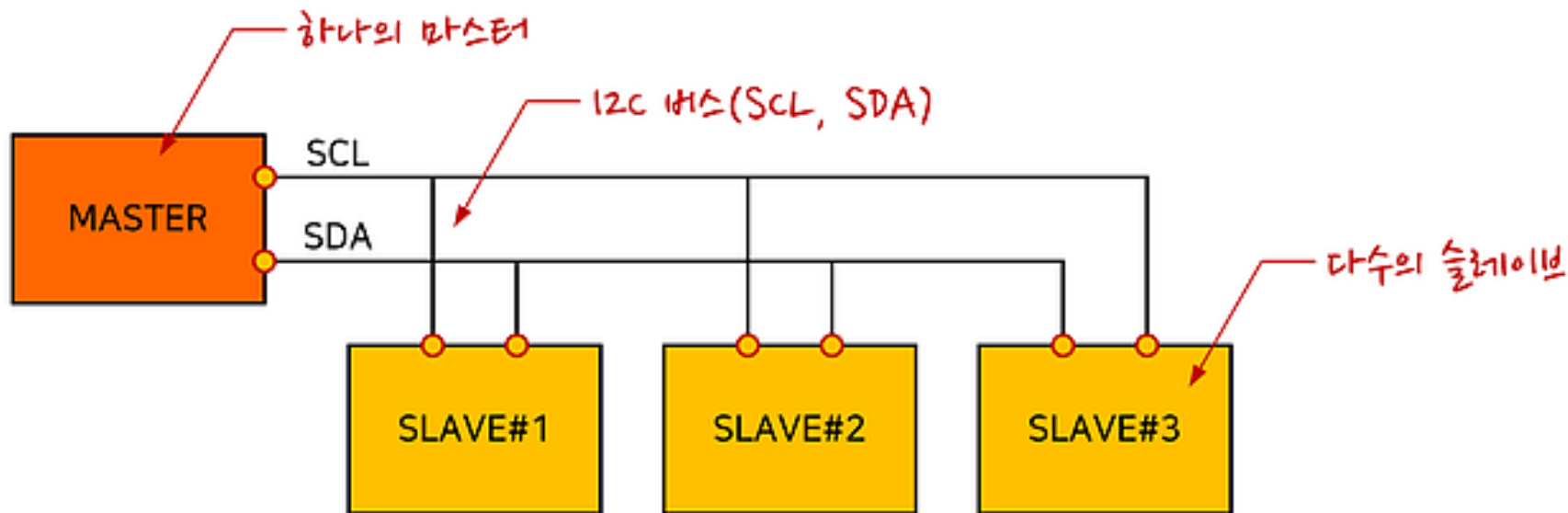
# 비접촉식 온도센서 실험

# MLX90614

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

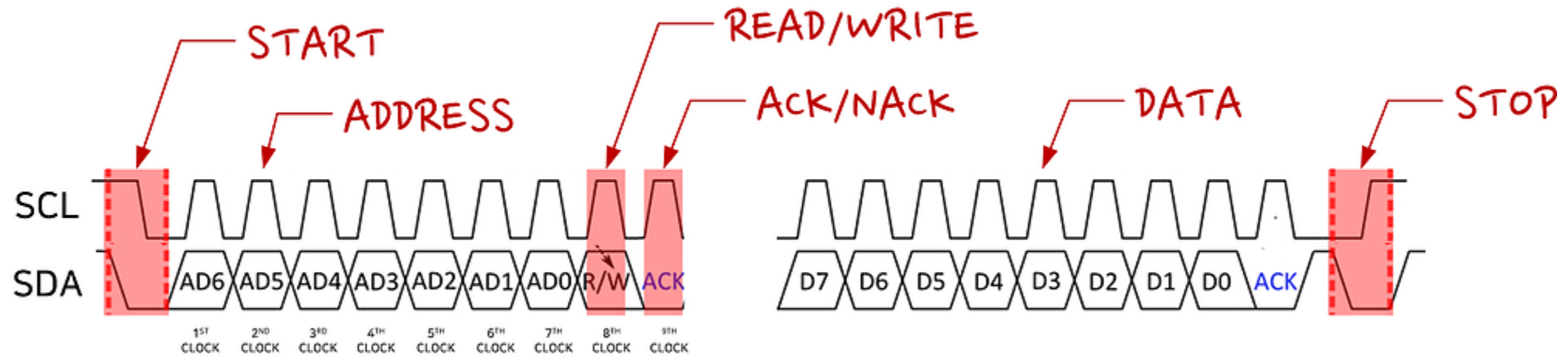


# I2C 통신

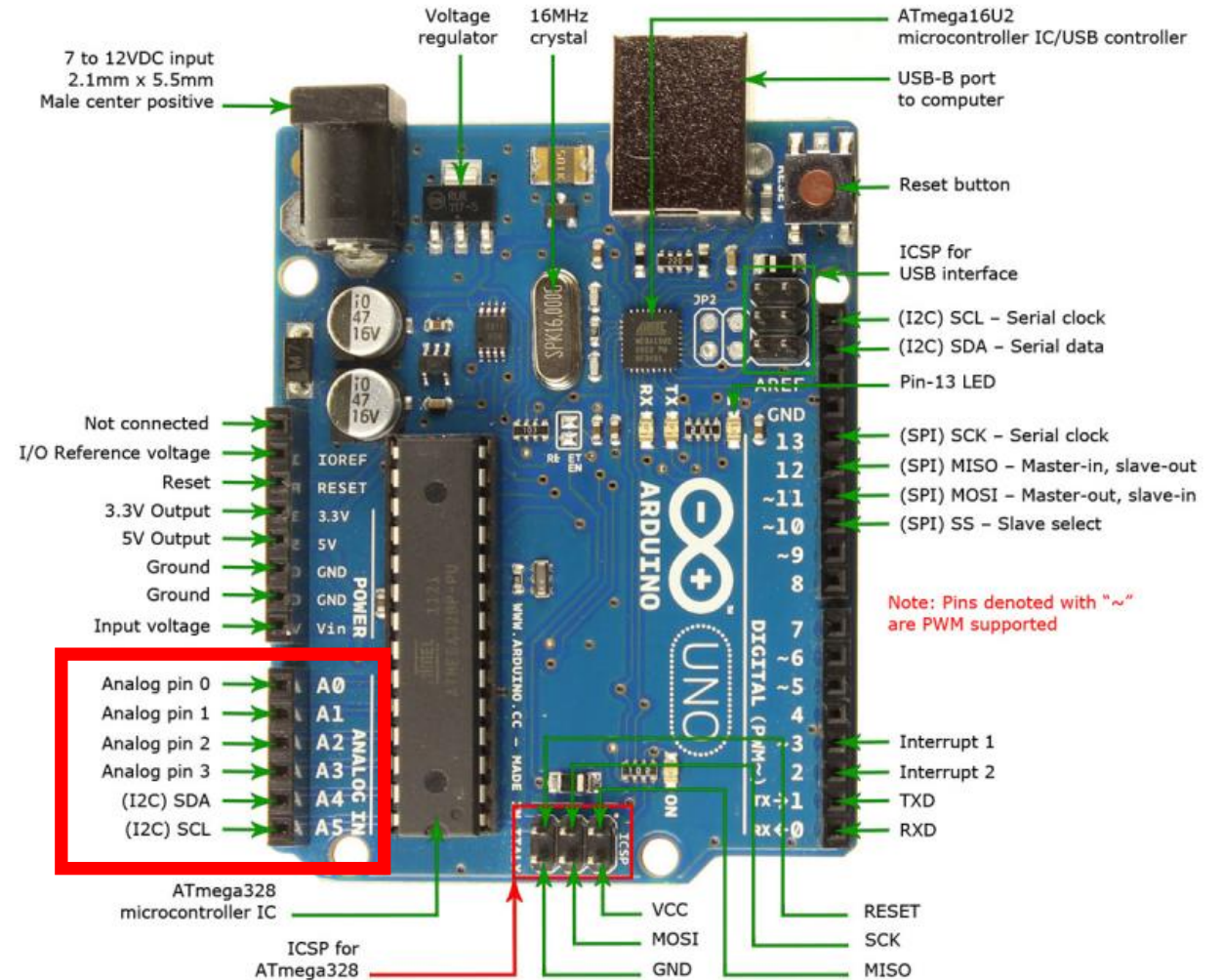
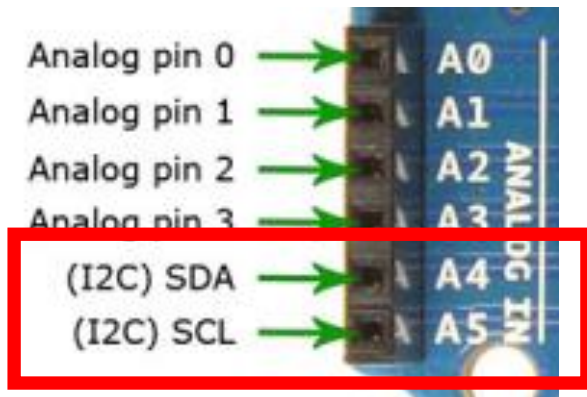




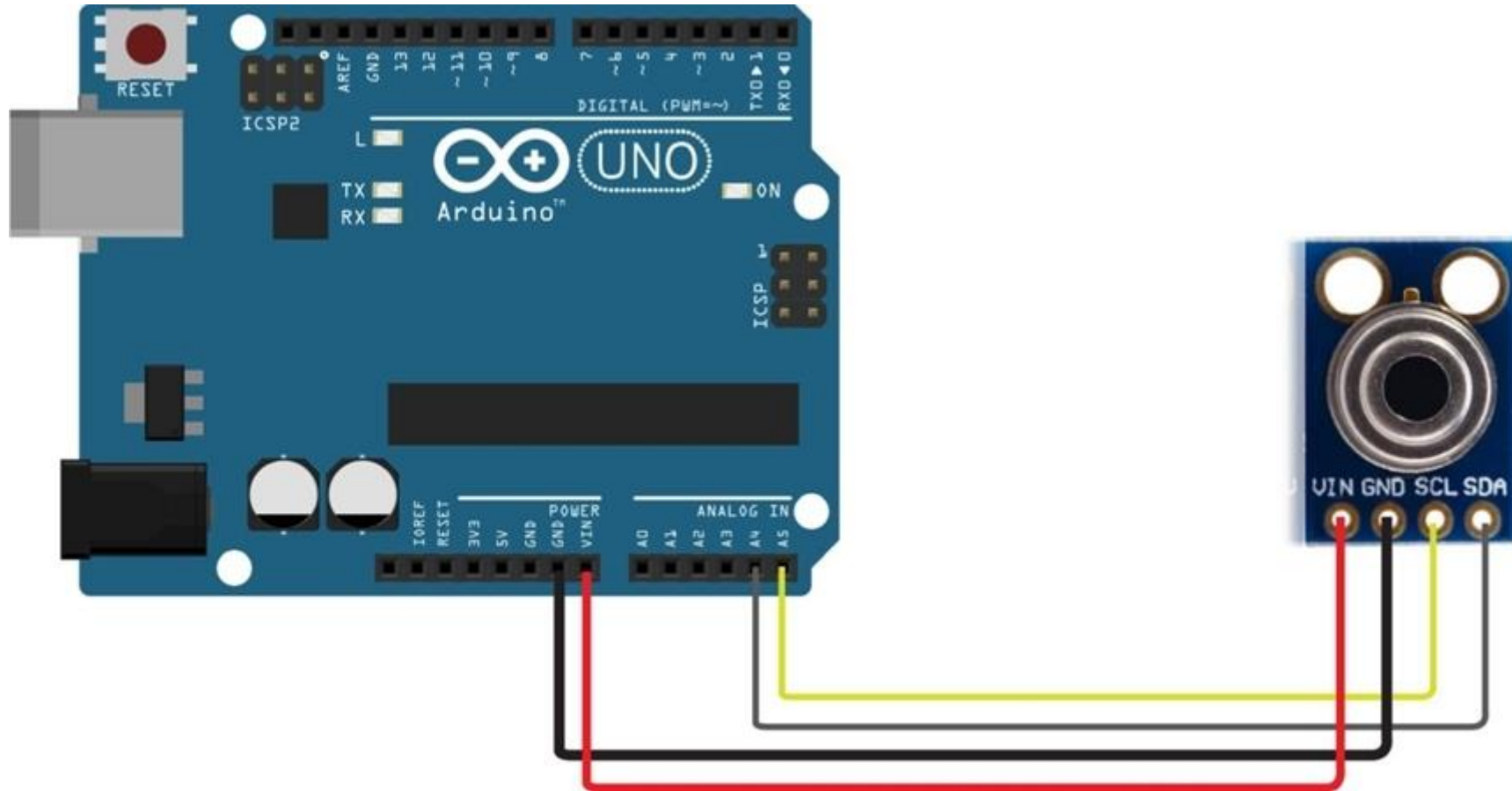
# I2C 통신



# 아두이노의 I2C통신

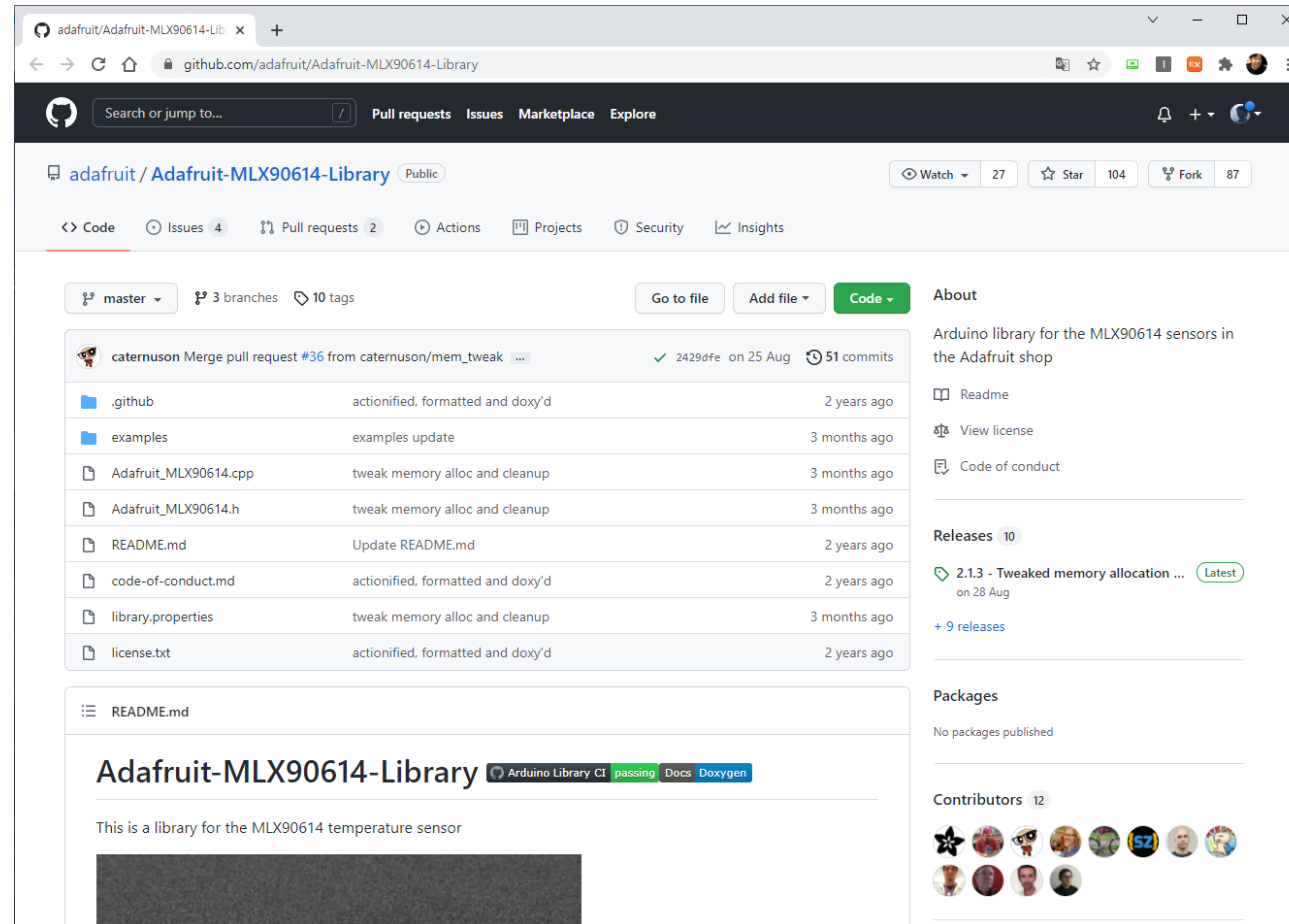


# MLX90614 테스트



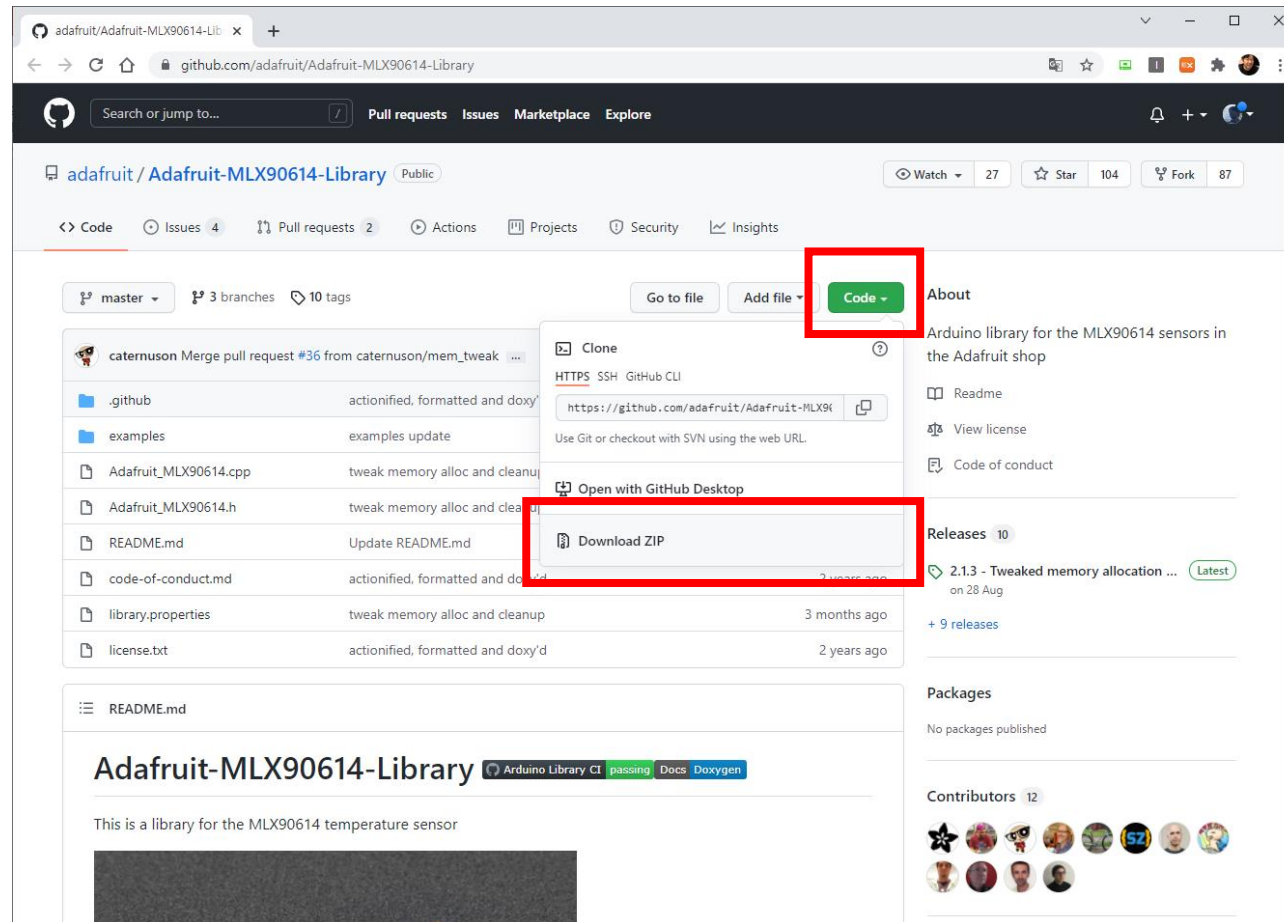
# MLX90614 라이브러리 사용

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

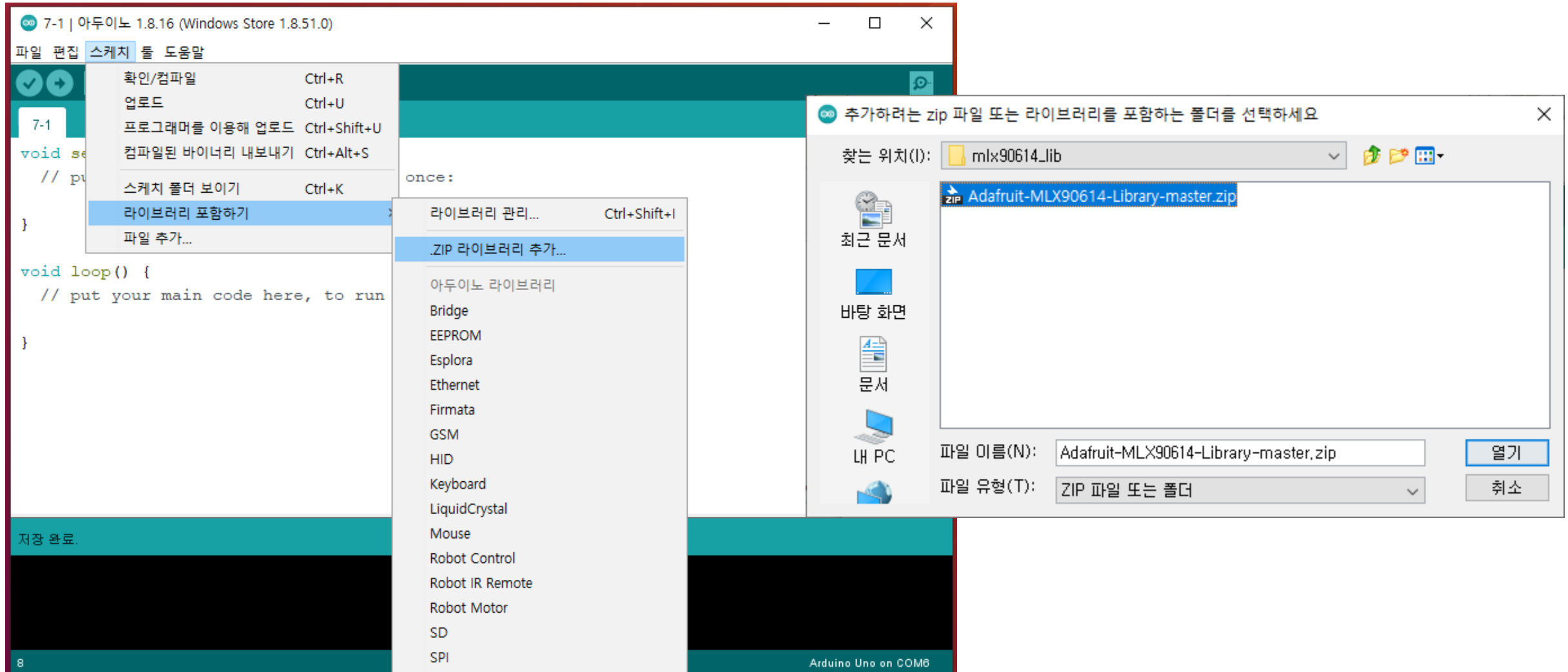


# MLX90614 라이브러리 사용

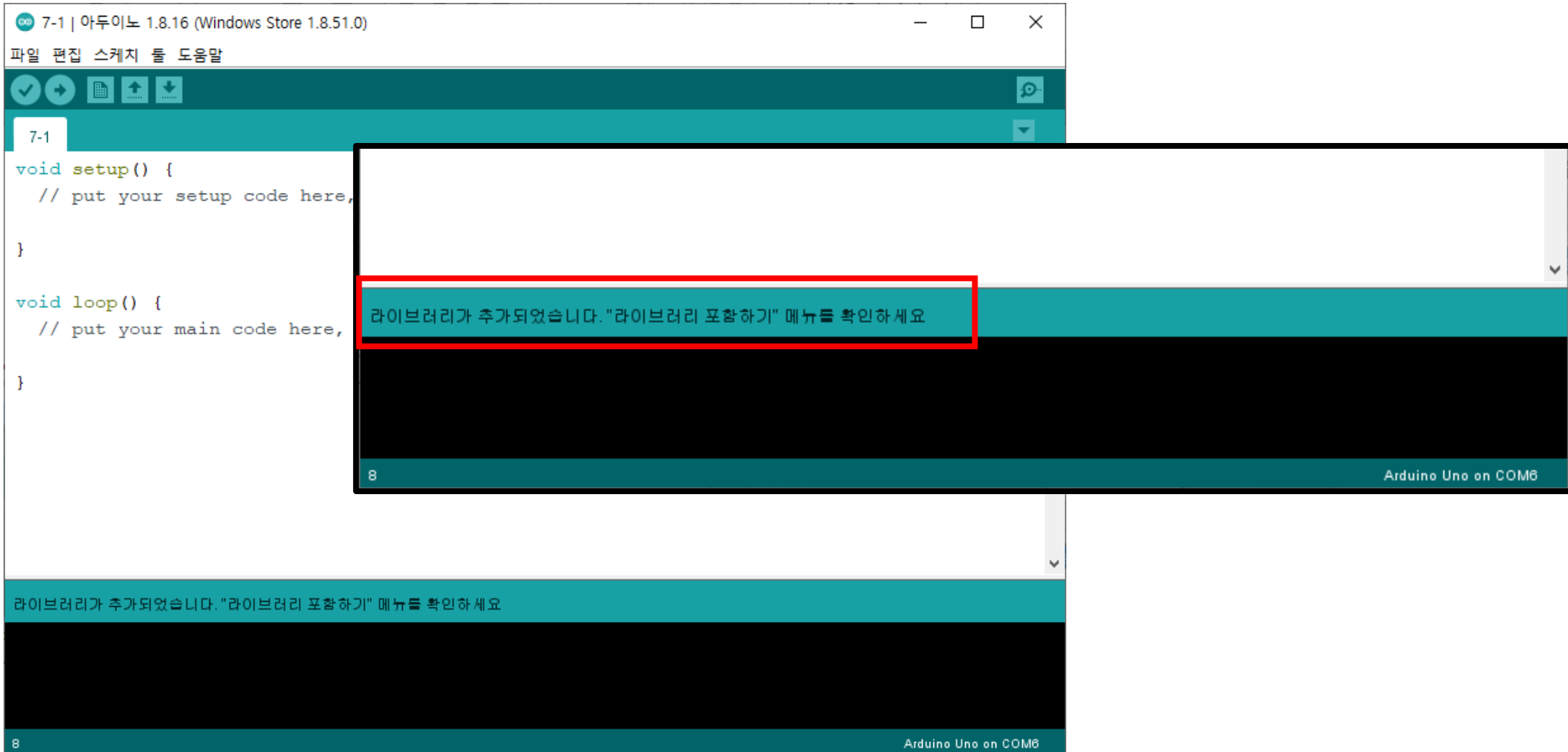
- <https://github.com/adafruit/Adafruit-MLX90614-Library>



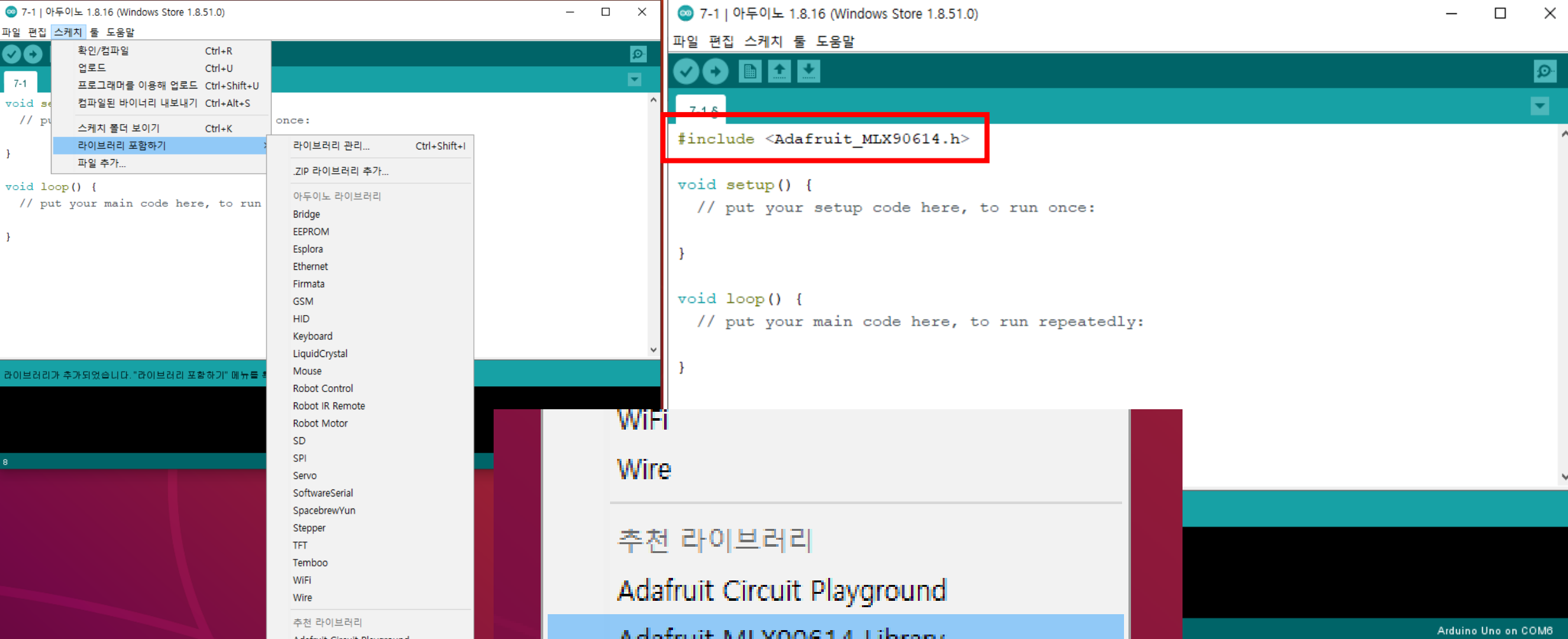
# MLX90614 라이브러리 사용



# MLX90614 라이브러리 사용



# MLX90614 라이브러리 사용



The image shows the Arduino IDE interface with the 'Sketch' menu open. The 'Include Library' option is selected, and a list of libraries is displayed. The 'Adafruit MLX90614 Library' is highlighted. The code editor shows the following code:

```
#include <Adafruit_MLX90614.h>

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

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

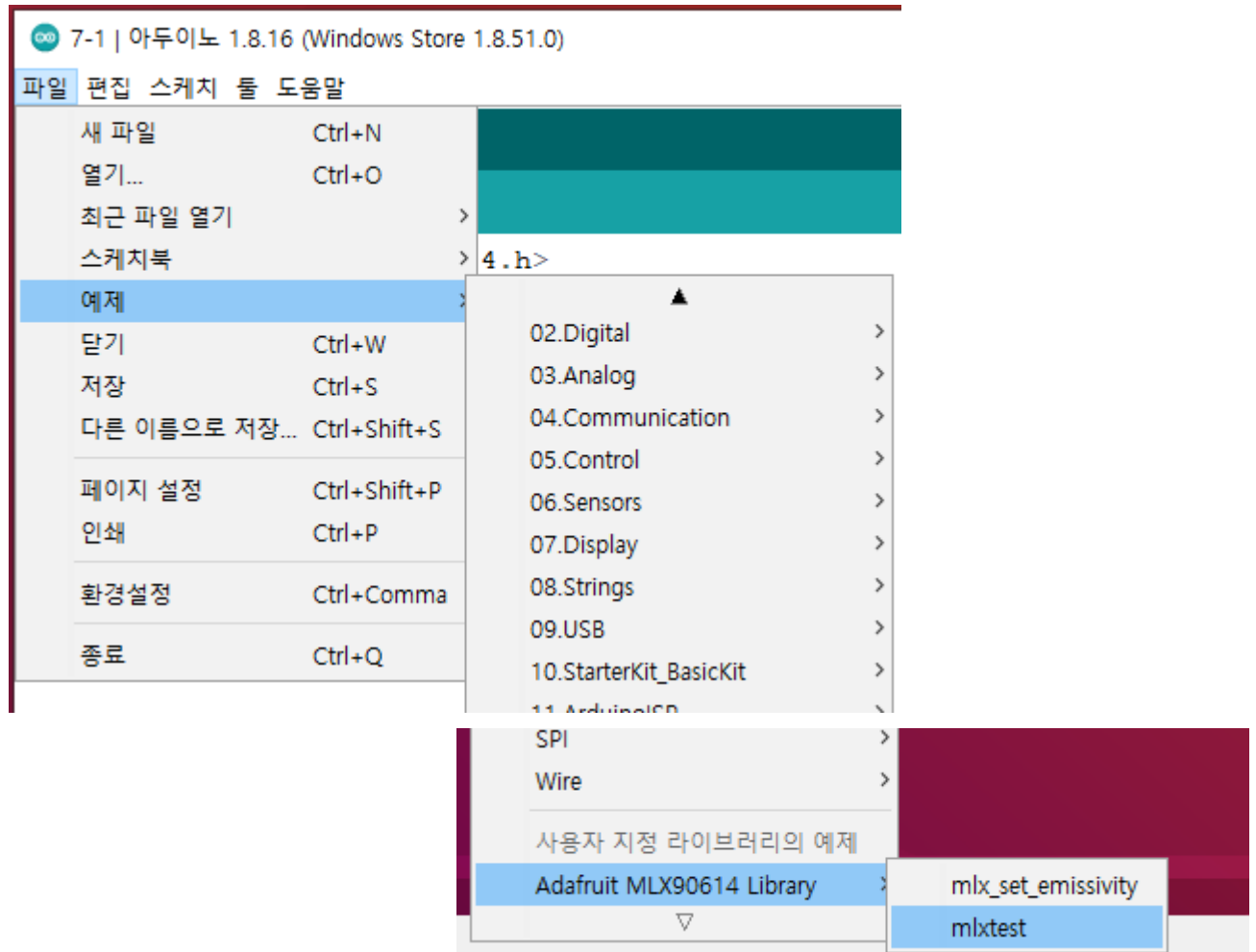
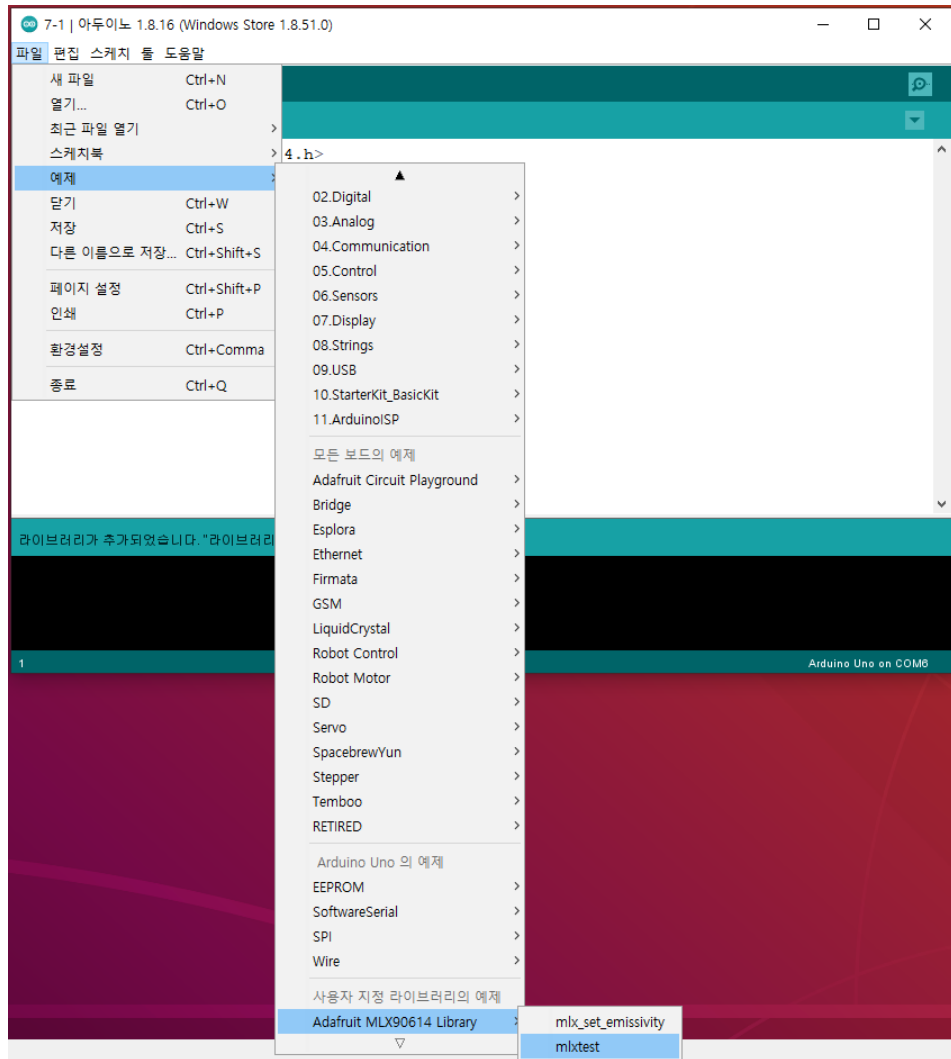
Below the code editor, a list of recommended libraries is shown:

- WIFI
- Wire
- 추천 라이브러리
- Adafruit Circuit Playground
- Adafruit MLX90614 Library

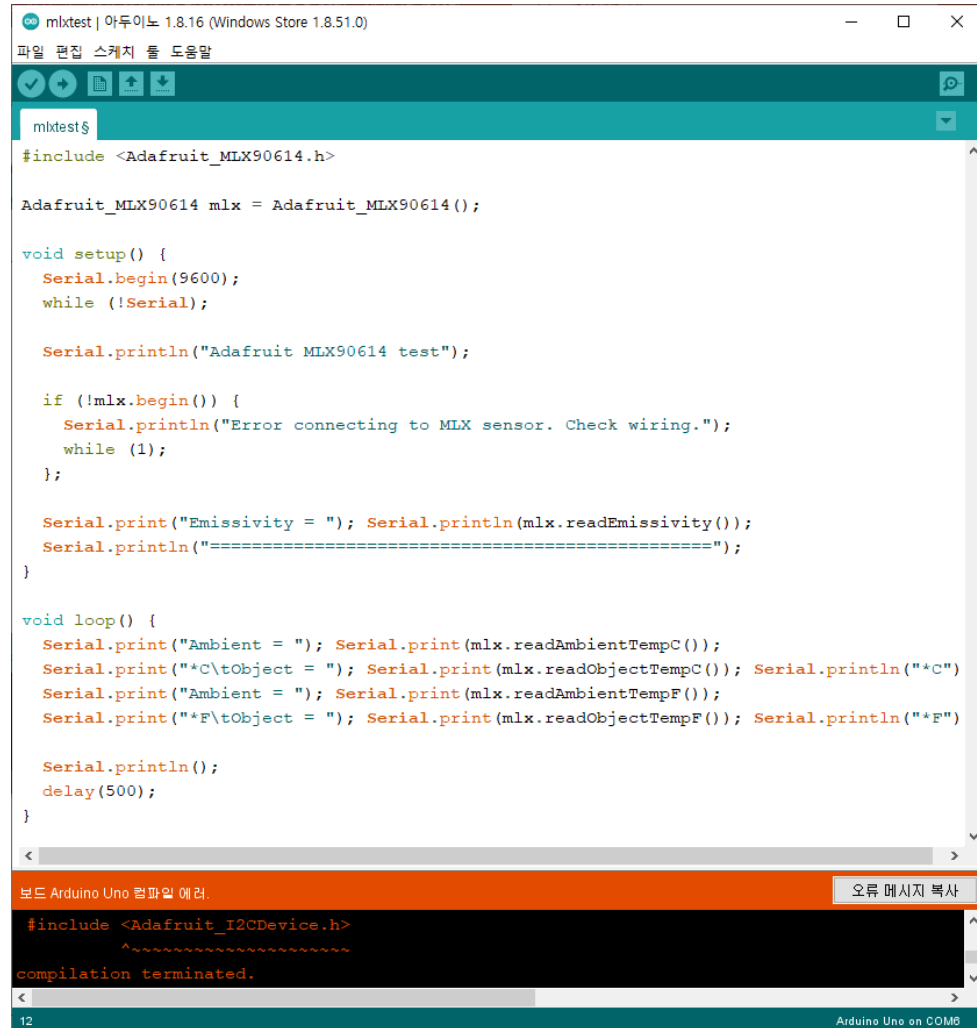
The status bar at the bottom right indicates 'Arduino Uno on COM8'.



# 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);
}

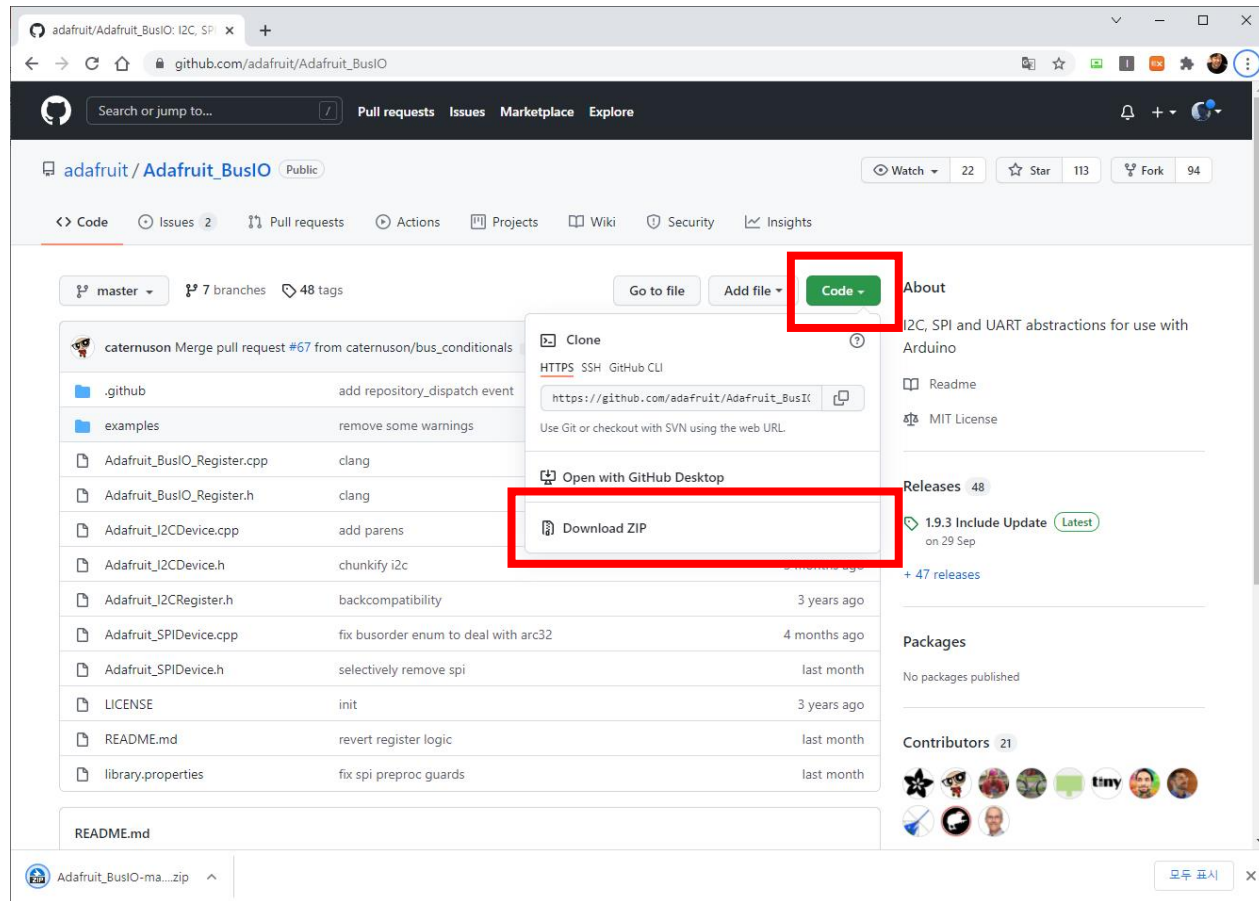
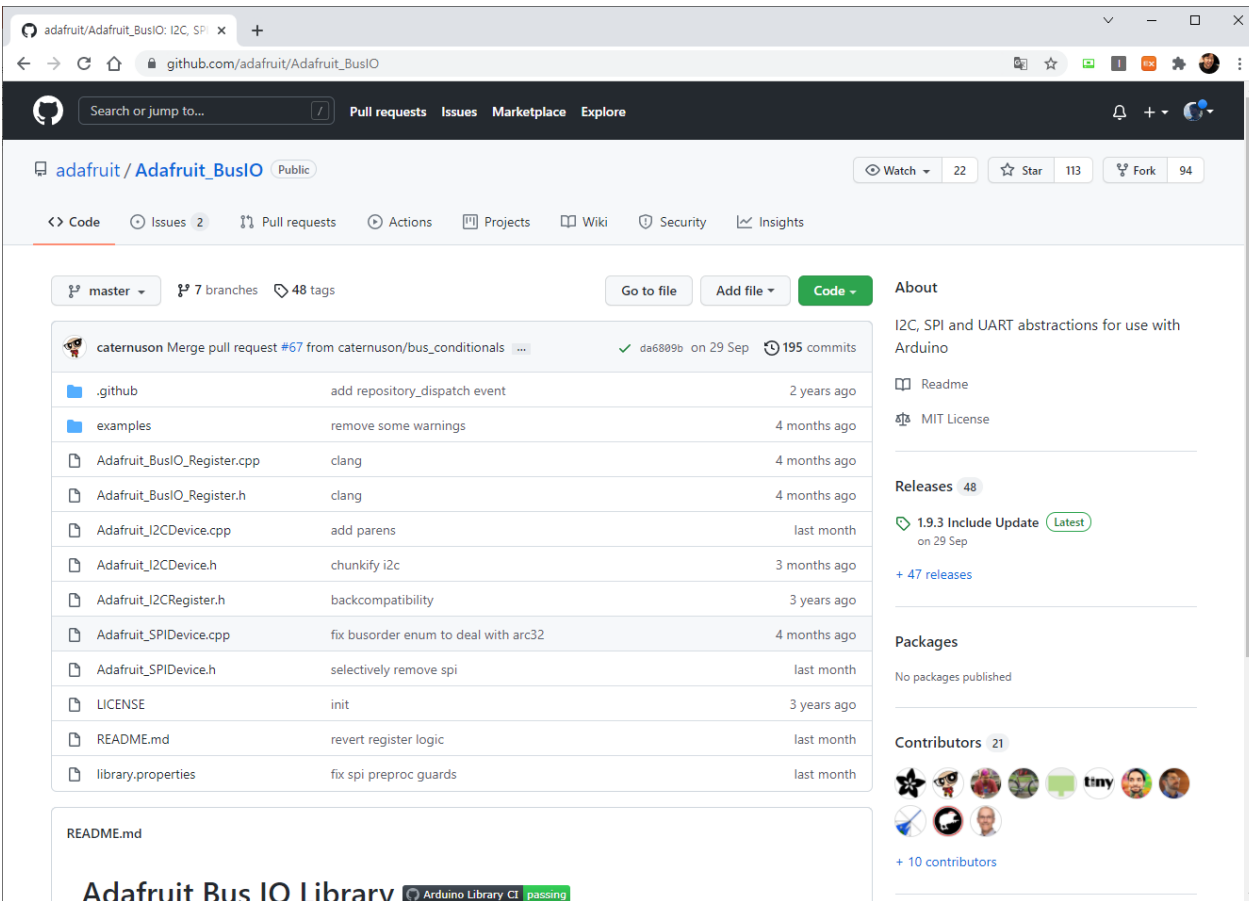
보드 Arduino Uno 컴파일 에러. 오류 메시지 복사
#include <Adafruit_I2CDevice.h>
^~~~~~
compilation terminated.
```

보드 Arduino Uno 컴파일 에러.

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

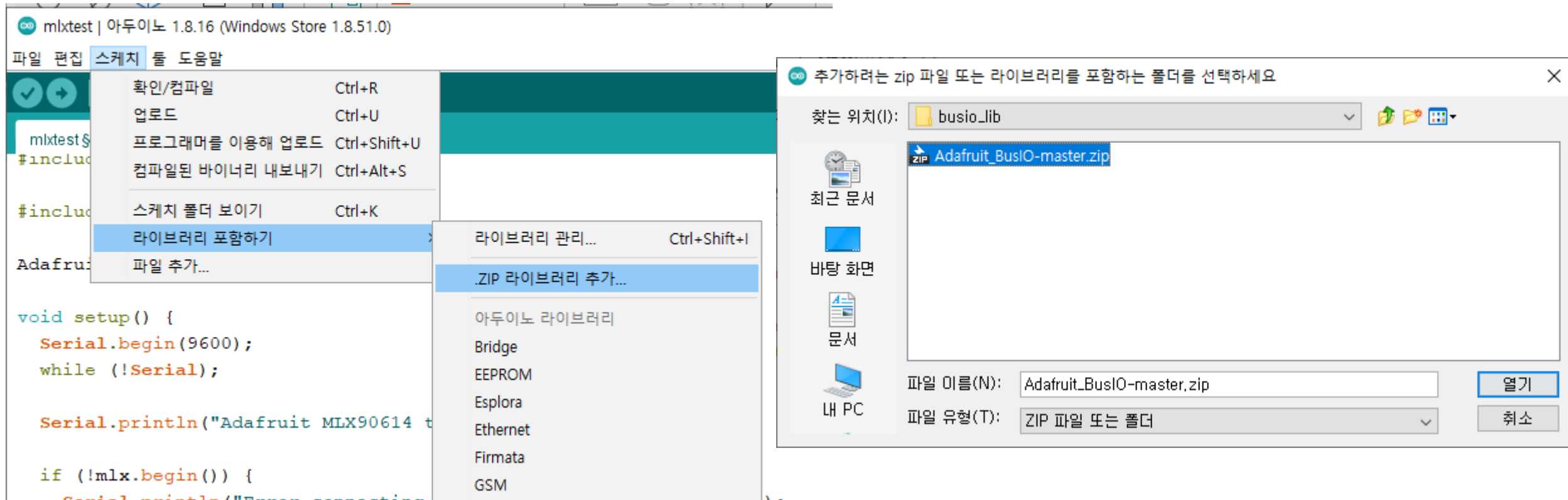
# MLX90614 라이브러리 예제 테스트

- [https://github.com/adafruit/Adafruit\\_BusIO](https://github.com/adafruit/Adafruit_BusIO) 라이브러리 다운로드



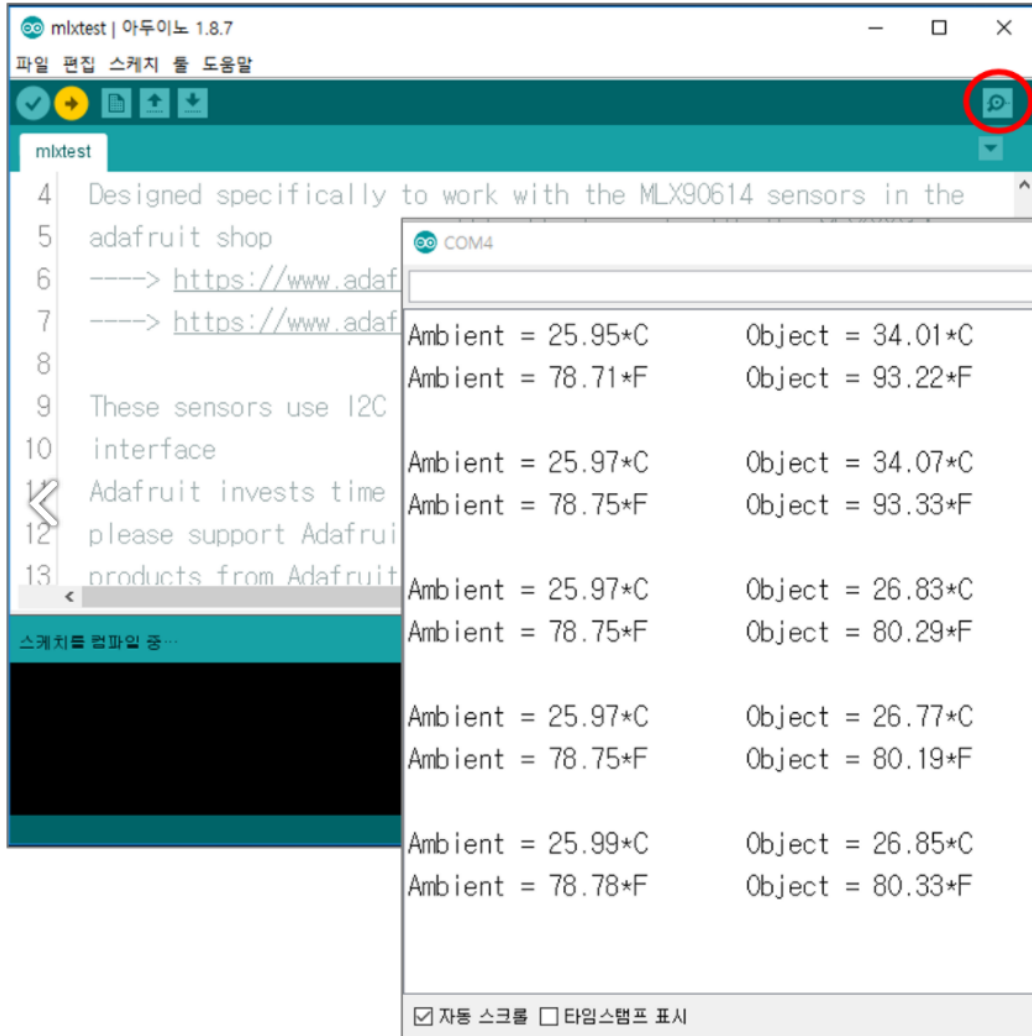
# MLX90614 라이브러리 예제 테스트

- [https://github.com/adafruit/Adafruit\\_BusIO](https://github.com/adafruit/Adafruit_BusIO) 라이브러리 추가



# MLX90614 라이브러리 예제 테스트

예제 7-1



The screenshot shows the Arduino IDE interface. The top window displays the 'mlxtest' sketch, which is a test program for the MLX90614 non-contact temperature sensor. The code includes comments in Korean and C++ code that initializes the sensor and prints temperature readings. A red circle highlights the 'Verify' button in the top toolbar. Below the code editor, the 'Serial Monitor' window is open, showing the output of the program. The output displays ambient and object temperatures in both Celsius and Fahrenheit. The status bar at the bottom indicates '자동 스크롤' (Auto Scroll) is checked, '타임스탬프 표시' (Show Timestamps) is unchecked, 'line ending 없음' (No line ending) is selected, '9600 보드레이트' (9600 baud rate) is set, and '출력 지우기' (Clear output) is available.

```
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 and
12 please support Adafruit hardware by purchasing our
13 products from Adafruit!

스케치를 컴파일 중...
```

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



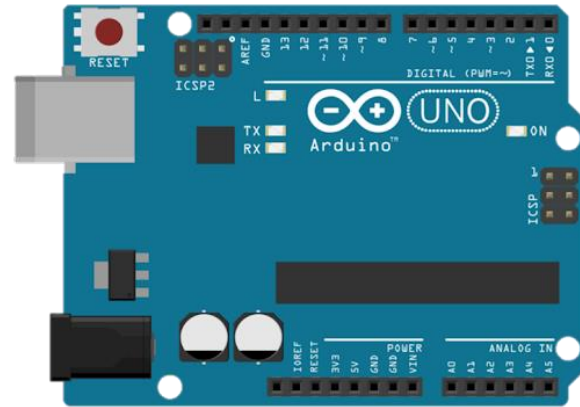
응용 : 체온 측정 출입 관리

# 전체 구성

손(물체) 유무 감지  
(예제 6-1)



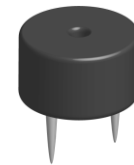
온도 측정  
(예제 7-1)



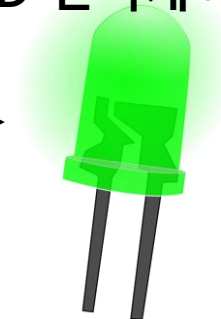
정보 출력(시리얼통신)



측정 완료 경고음 발생



LED 인디케이터



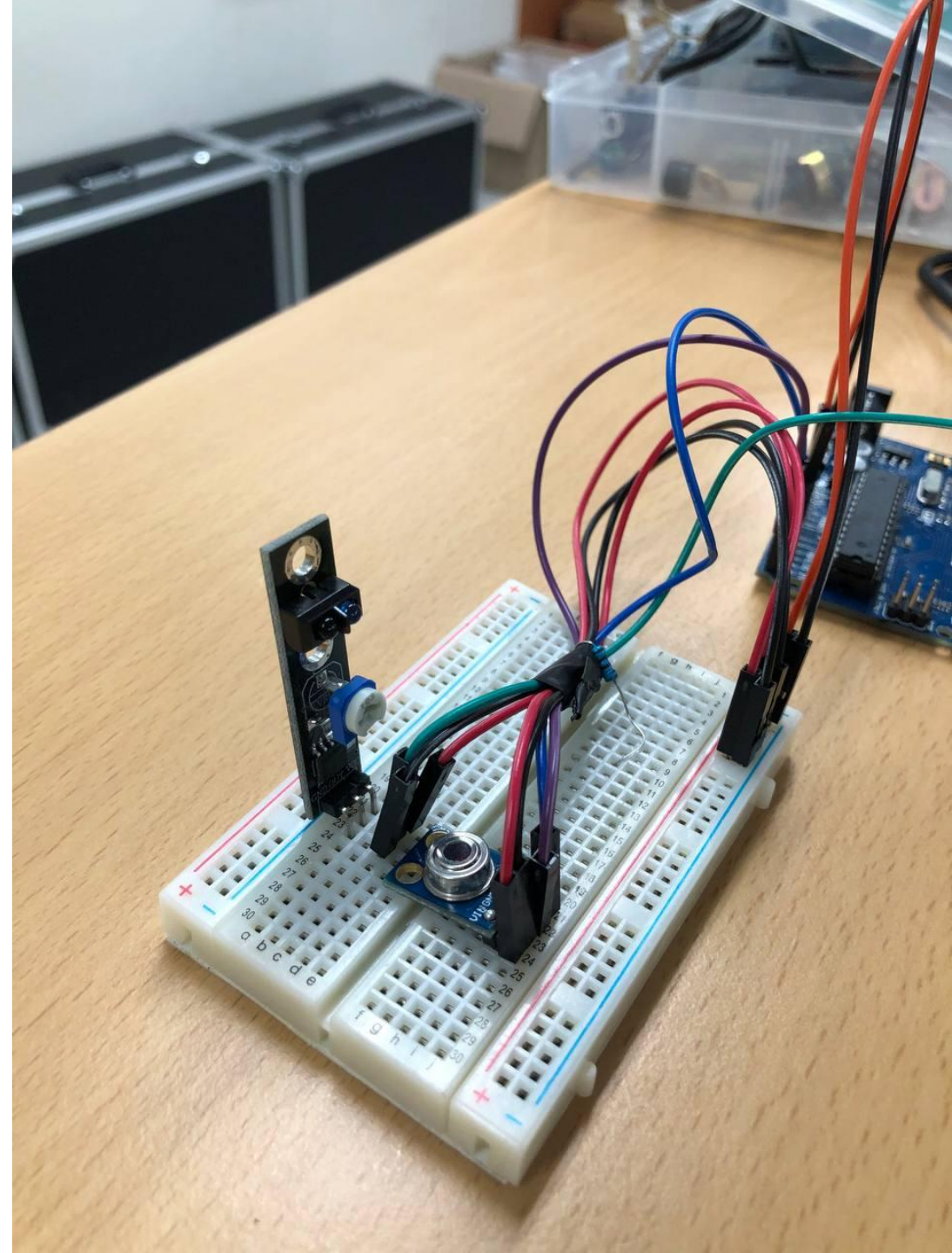


# 물체감지 + 온도체크

- 물체감지 체크 : 아두이노 5번핀

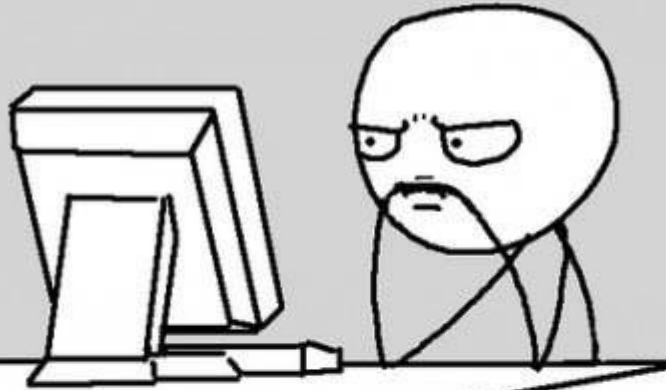


- 온도체크

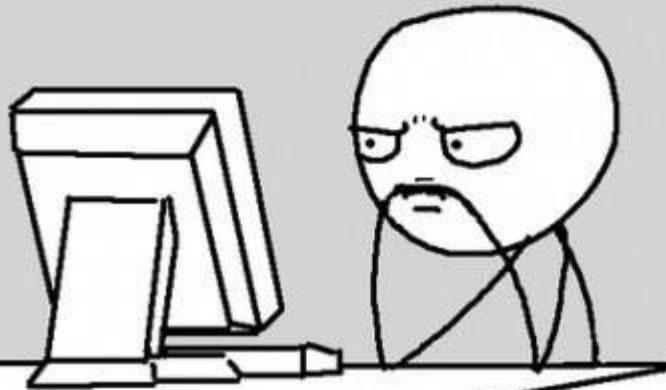




It doesn't work..... why?



It works..... why?



# 순서도

