| แนวทางการใช้งานอินเทอร์เน็ตของสรรพสิ่งในระบบการผลิต<br>IoT Approaches to Manufacturing System | |
|---|---|
| ชื่อ-สกุล : นางสาวขวัญจิรา พันธุเกตุ | รหัสนักศึกษา : B6321451 |

**4/4. คำถามท้ายบทเพื่อทดสอบความเข้าใจ**

Quiz_201 – Web Control 2 LED

- อยากได้ปุ่มสำหรับคุมปิด-เปิด หลอดไฟ LED 2 ดวง
- https://www.colorhexa.com/008cba?fbclid=IwAR3dIZ_gRgDWmREmnzuknLbMxV3pOHy4YIPuLEz8-ZzTOX2VhWxcH2QjLGk

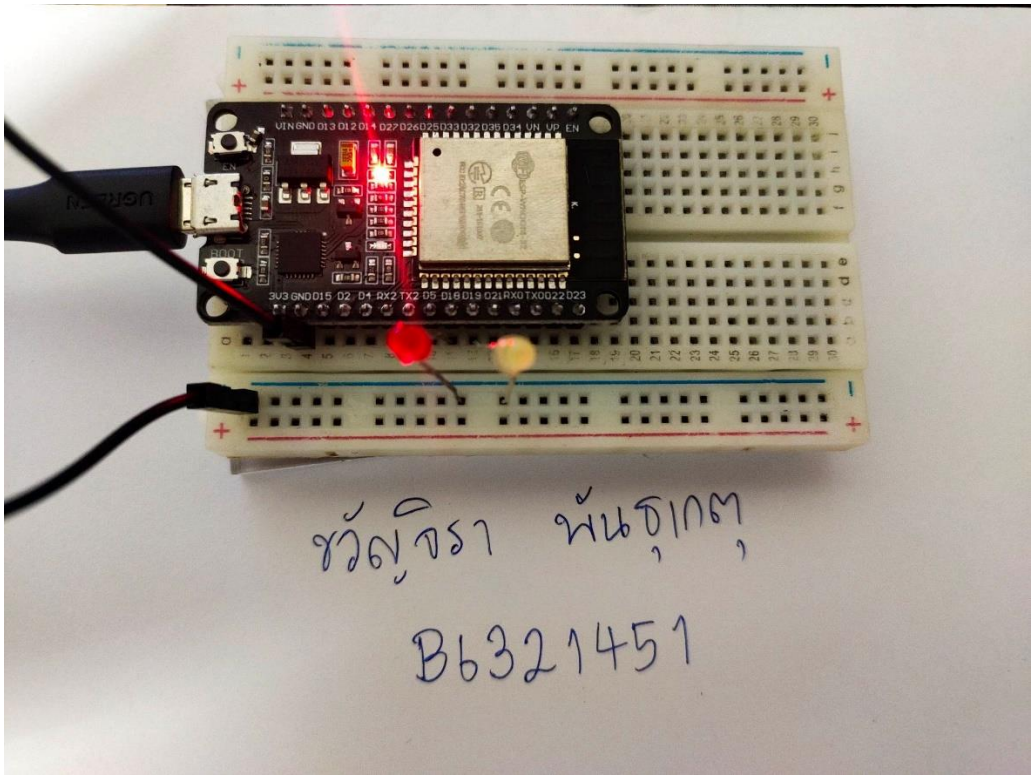

```
#include <WiFi.h>

const char* ssid = "105/766-2.4G";

const char* password = "0999128910";

int LED1 = 18;

int LED2 = 19;

WiFiServer server(80);

void setup() {

  Serial.begin(115200);

  pinMode(LED1, OUTPUT); // set the LED pin mode

  pinMode(LED2, OUTPUT); // set the LED2 pin mode

  delay(10);
```

```
  Serial.print("\n\nConnecting to "); Serial.println(ssid);
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(500); Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected."); Serial.println("IP address: ");
  Serial.println(WiFi.localIP()); server.begin();
}
int value = 0;
bool LED_Status = LOW;
bool LED_Status2 = LOW;
void loop() {
  digitalWrite(LED1, LED_Status);
  digitalWrite(LED2, LED_Status2);
  WiFiClient client = server.available(); // listen for incoming clients
  if (client) { // if you get a client,
    Serial.println("New Client."); // print a message out the serial port
    String currentLine = ""; // make a String to hold incoming data from the client
    while (client.connected()) { // loop while the client's connected
      if (client.available()) { // if there's bytes to read from the client,
        char c = client.read(); // read a byte, then
        Serial.write(c); // print it out the serial monitor
        if (c == '\n') { // if the byte is a newline character
```

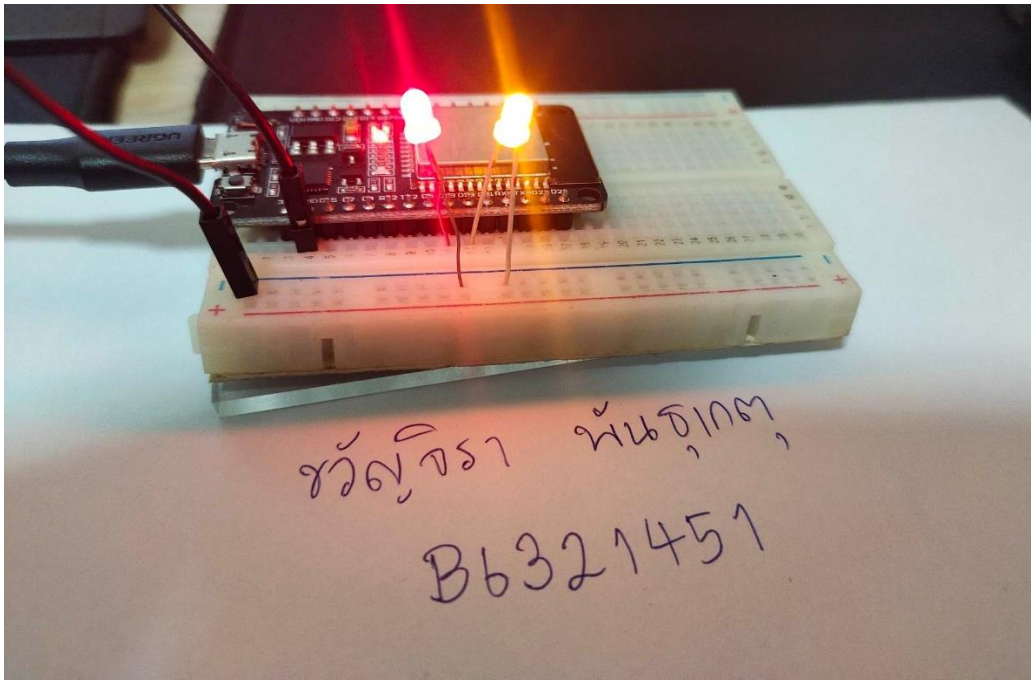
```
        if (currentLine.length() == 0) {
          client.println("HTTP/1.1 200 OK");
          client.println("Content-type:text/html");
          client.println();
          client.println("<html>");
          client.println("<body>");
          client.println("<h1>LED Status</h1>");
          client.println("<p>");
          if (LED_Status == HIGH)
            client.println("LED1-On ,");
          else
            client.println("LED1-Off ,");

          if (LED_Status2 == HIGH)
            client.println("LED2-On");
          else
            client.println("LED2-Off");
          client.println("<p>");
          client.println("<a href=\"/ledon\"><button style = \"background-color:
#f44336;\">LED1 On</button></a>");
          client.println("<a href=\"/led2on\"><button style = \"background-color:
#f44336;\">LED2 On</button></a>");
          client.println("</p>");
```

```
          client.println("<a href=\"/ledoff\"><button style = \"background-color:
#008CBA;\">LED1 Off</button></a>");

          client.println("<a href=\"/led2off\"><button style = \"background-color:
#008CBA;\">LED2 Off</button></a>");

          client.println("<body>");

          client.println("<html>");

          break;

        } else {

          currentLine = "";

        }

      } else if (c != '\r') {

        currentLine += c;

      }

      if (currentLine.endsWith("GET /ledon")) LED_Status = HIGH;

      if (currentLine.endsWith("GET /ledoff")) LED_Status = LOW;

      if (currentLine.endsWith("GET /led2on")) LED_Status2 = HIGH;

      if (currentLine.endsWith("GET /led2off")) LED_Status2 = LOW;



    }

  }

  client.stop(); // close the connection:

  Serial.println("Client Disconnected.");

 }

}
```

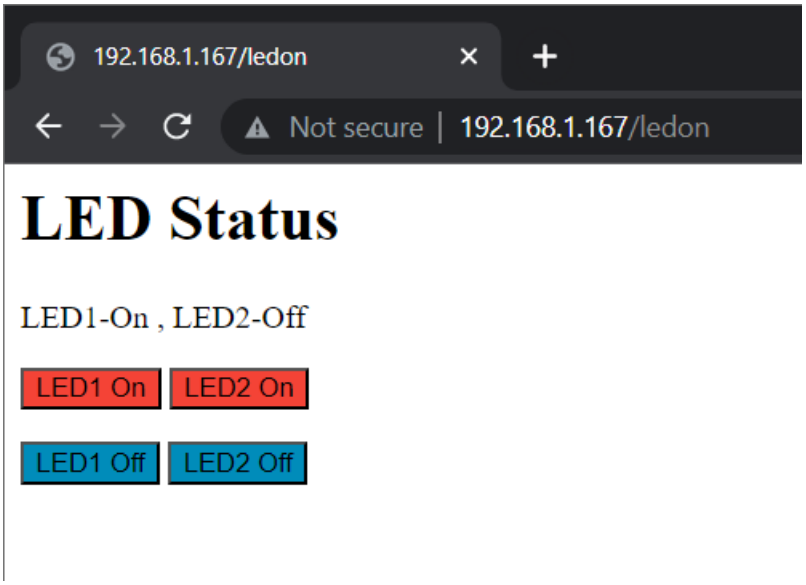
**รูปการต่อวงจร – 1**




**รูปการต่อวงจร – 2**



**หน้าจอ Web Control**

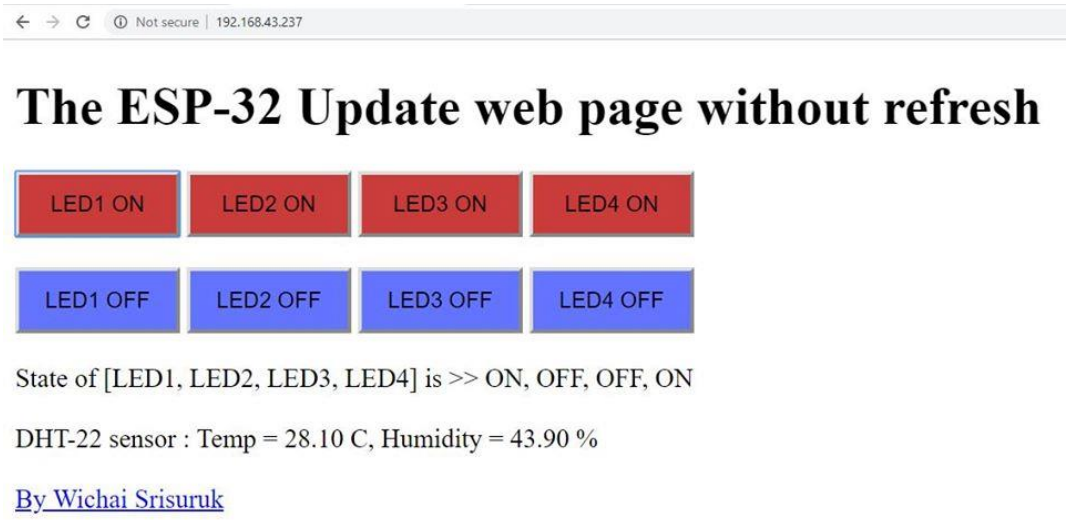



**Video**

https://www.youtube.com/shorts/q6w2j2Kop6U

## Quiz_202 – Web Control 4 LED and Monitor Humid/Temperature

- เพิ่มเติมจาก Q202 อยากได้ปุ่มสำหรับคุมปิด-เปิด หลอดไฟ LED 4 ดวง
- อยากมีกด Link ไปที่หน้า FB ของตัวเอง




```
//Quize.ino

#include <WiFi.h>

#include <WiFiClient.h>

#include <WebServer.h>

#include "DHTesp.h"

#include "index.h" //Our HTML webpage contents with javascripts

#define DHT_Pin 4

#define testLED1 18

#define testLED2 19

#define testLED3 22

#define testLED4 23

//SSID and Password of your WiFi router

const char* ssid = "105/766-2.4G";
```

```
const char* password = "0999128910";

WebServer server(80); //Server on port 80

DHTesp dht;

String ledState1 = "NA";

String ledState2 = "NA";

String ledState3 = "NA";

String ledState4 = "NA";

//================================================================

// This routine is executed when you open its IP in browser

//================================================================

void handleRoot() {

  String s = MAIN_page; //Read HTML contents

  server.send(200, "text/html", s); //Send web page

}

void handleADC() {

  float h = dht.getHumidity();

  float t = dht.getTemperature();

  String tmpValue = "Temp = ";

  tmpValue += String(t) + " C, Humidity = ";

  tmpValue += String(h) + " %";

  server.send(200, "text/plane", tmpValue); //Send value to client ajax request

}

void handleLED() {
```

```
 String t_state = server.arg("LEDstate"); //Refer xhttp.open("GET",
"setLED?LEDstate="+led, true);
 Serial.println(t_state);
 if (t_state == "11") {
  digitalWrite(testLED1, HIGH);  //Feedback parameter
  ledState1 = "ON";
 }
 if (t_state == "10") {
  digitalWrite(testLED1, LOW);  //Feedback parameter
  ledState1 = "OFF";
 }
 if (t_state == "21") {
  digitalWrite(testLED2, HIGH);  //Feedback parameter
  ledState2 = "ON";
 }
 if (t_state == "20") {
  digitalWrite(testLED2, LOW);  //Feedback parameter
  ledState2 = "OFF";
 }


 if (t_state == "31") {
  digitalWrite(testLED3, HIGH);  //Feedback parameter
  ledState3 = "ON";
 }
```

```
  if (t_state == "30") {
    digitalWrite(testLED3, LOW);  //Feedback parameter
    ledState3 = "OFF";
  }
  if (t_state == "41") {
    digitalWrite(testLED4, HIGH);  //Feedback parameter
    ledState4 = "ON";
  }
  if (t_state == "40") {
    digitalWrite(testLED4, LOW);  //Feedback parameter
    ledState4 = "OFF";}
  server.send(200, "text/plane", ledState1 + ", " + ledState2 + ", " + ledState3 + ", " +
ledState4); //Send web page
}
void setup(void) {
  Serial.begin(115200);
  dht.setup(DHT_Pin, DHTesp::DHT22); // DHT_Pin D4, DHT22
  pinMode(testLED1, OUTPUT);
  pinMode(testLED2, OUTPUT);
  pinMode(testLED3, OUTPUT);
  pinMode(testLED4, OUTPUT);
  Serial.print("\n\nConnect to ");
  Serial.println(ssid);
  WiFi.begin(ssid, password);
```

```
  while (WiFi.status() != WL_CONNECTED) {
    delay(500); Serial.print(".");
  }
  Serial.print("\nConnected "); Serial.println(ssid);
  Serial.print("IP address: "); Serial.println(WiFi.localIP());
  server.on("/", handleRoot);
  server.on("/setLED", handleLED);
  server.on("/readADC", handleADC);
  server.begin();
  Serial.println("HTTP server started");
}
void loop(void) {
  server.handleClient(); //Handle client requests
}
```

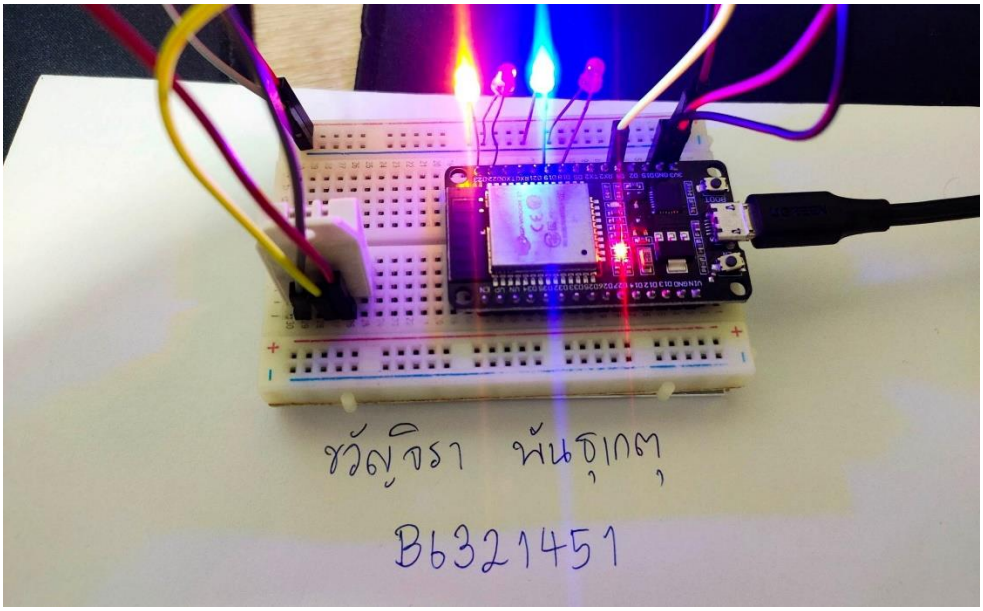
```
//index.h
const char MAIN_page[] PROGMEM = R"=====(
<!DOCTYPE html>
<html>
<body>
 <div id="demo">
 <h1>The ESP-32 Update web page without refresh</h1>
 <button type="button" onclick="sendData(11)" style="background: rgb(202, 60, 60);">LED1
ON_ </button>
```

```
<button type="button" onclick="sendData(21)" style="background: rgb(202, 60, 60);">LED2 ON_ </button>

<button type="button" onclick="sendData(31)" style="background: rgb(202, 60, 60);">LED3 ON_ </button>

<button type="button" onclick="sendData(41)" style="background: rgb(202, 60, 60);">LED4 ON_ </button><br><br>

<button type="button" onclick="sendData(10)" style="background: rgb(100,116,255);">LED1 OFF</button>

<button type="button" onclick="sendData(20)" style="background: rgb(100,116,255);">LED2 OFF</button>

<button type="button" onclick="sendData(30)" style="background: rgb(100,116,255);">LED3 OFF</button>

<button type="button" onclick="sendData(40)" style="background: rgb(100,116,255);">LED4 OFF</button><br><br>

State of [LED1, LED2, LED3, LED4] is >> <span id="LEDState">NA</span><br>

</div>

<div>

<br>DHT-22 sensor : <span id="ADCValue">0</span><br>

</div>

<script>

function sendData(led) {

var xhttp = new XMLHttpRequest();

xhttp.onreadystatechange = function() {

if (this.readyState == 4 && this.status == 200) {

document.getElementById("LEDState").innerHTML =
```

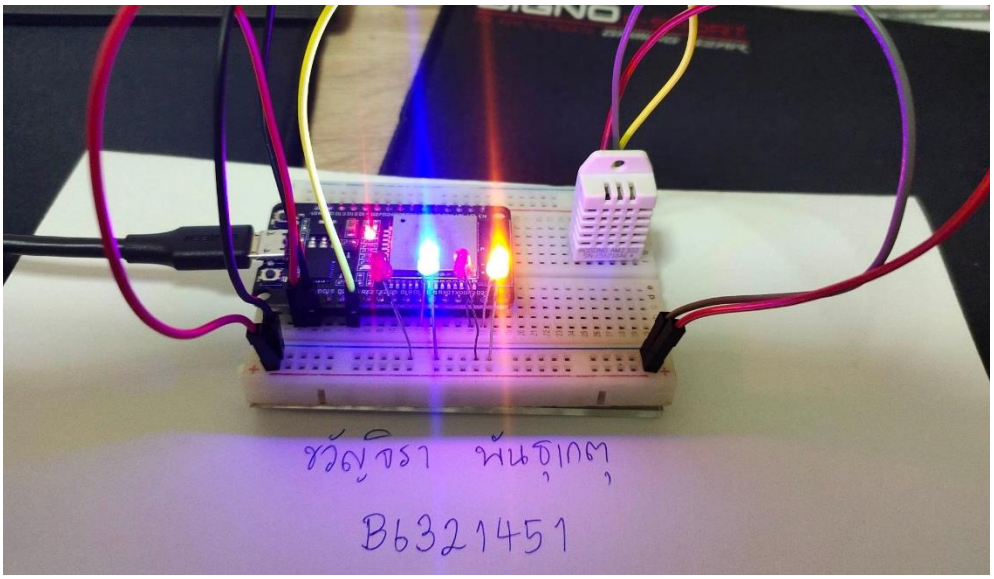
```
this.responseText;

}

};

xhttp.open("GET", "setLED?LEDstate="+led, true);

xhttp.send();

}

setInterval(function() {

// Call a function repetatively with 2 Second interval

getData();

}, 2000); //2000mSeconds update rate

function getData() {

var xhttp = new XMLHttpRequest();

xhttp.onreadystatechange = function() {

if (this.readyState == 4 && this.status == 200) {

document.getElementById("ADCValue").innerHTML =

this.responseText;

}

};

xhttp.open("GET", "readADC", true);

xhttp.send();

}

</script>
```

```
<br><a href="https://www.facebook.com/profile.php?id=100007842571414">By Khunjira
Pantuket</a>

</body>

</html>

)=====";
```

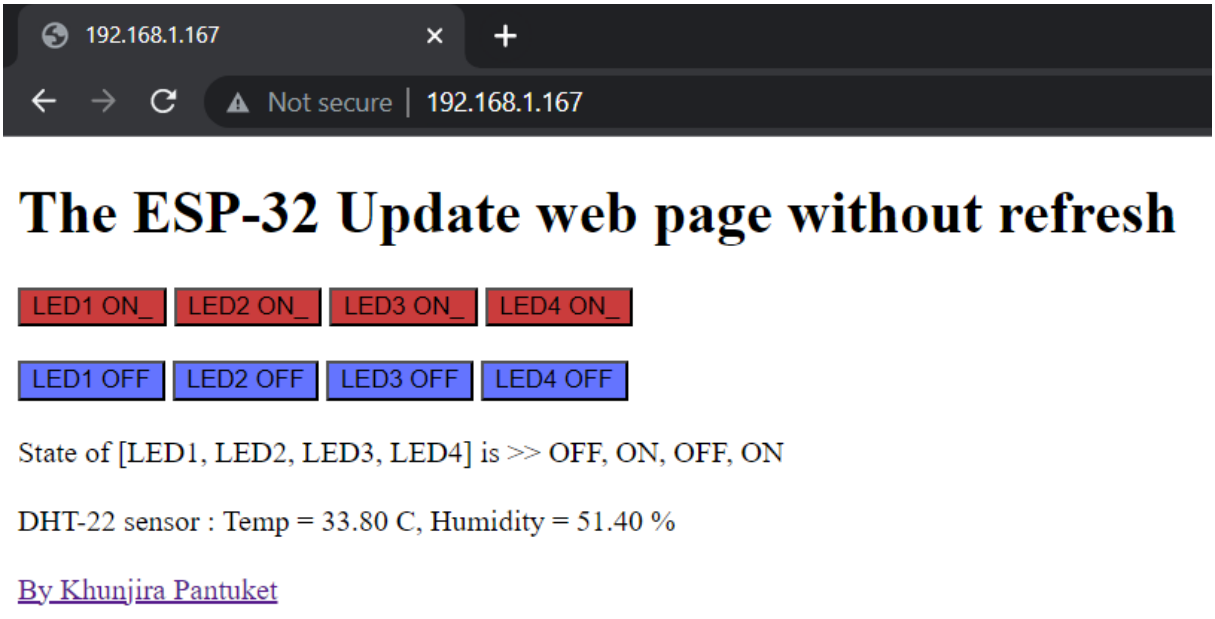
**รูปการต่อวงจร – 1**




**รูปการต่อวงจร – 2**



**หน้าจอ Web Control**



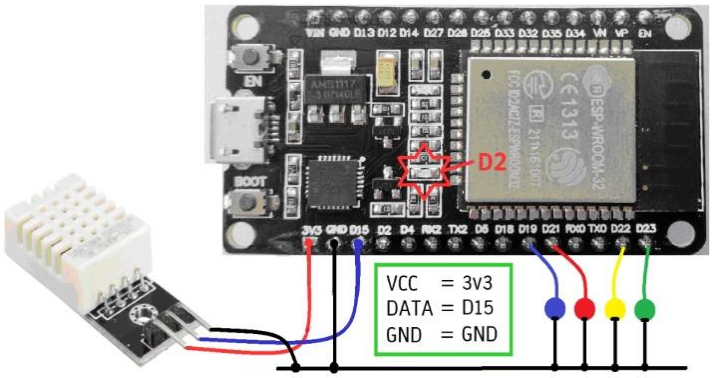

**Video**

**https://www.youtube.com/shorts/ZFWOKx0syrw**

## Quiz_203 – Publish

- อ่านค่า DHT-22 แล้วส่งไปยัง MQTT Broker ทุกๆ 5 วินาที
- ควบคุมการแสดงผลให้ 4 LED แสดงผลตามข้อกำหนดดังนี้

| | |
|---|---|
| ✱○○○(Blink) | หากการอ่านค่าแล้วเป็น null, หรือไม่มีเซ็นเซอร์ |
| ●○○○ | ช่วงของอุณหภูมิ (-∞, 24) |
| ●●○○ | ช่วงของอุณหภูมิ [24,26) |
| ●●●○ | ช่วงของอุณหภูมิ [26,28) |
| ●●●● | ช่วงของอุณหภูมิ [28,30) |
| ✱✱✱✱(Blink) | ช่วงของอุณหภูมิ [30,∞) |




```
#include <WiFi.h>

#include <Wire.h>

#include <PubSubClient.h>

#include "DHTesp.h"

DHTesp dht;

#define PinLED0 18

#define PinLED1 19

#define PinLED2 22

#define PinLED3 23

#define DHT22_Pin 15

float h, t;
```

```
int blinkStatus = 1;

int LED_PinArray[] = {PinLED0, PinLED1, PinLED2, PinLED3};

int LED_StsArray[] = {0, 0, 0, 0};

//Wifi

const char* ssid = "105/766-2.4G";

const char* password = "0999128910";

const char* mqtt_server = "test.mosquitto.org";  //MQTT

const char* topic1 = "QUIZ203";

String ledState1 = "NA";

WiFiClient espClient;

PubSubClient client(espClient);

long lastMsg = 0;

char msg[50];


int value = 0;

void setup_wifi() {

  delay(10);

  Serial.println();

  Serial.print("Connecting to ");

  Serial.println(ssid);

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {

    delay(500); Serial.print(".");

  }
```

```
  randomSeed(micros());
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void reconnect()
{ while (!client.connected()) // Loop until we're reconnected
  { Serial.print("Attempting MQTT connection...");
    String clientId = "ESP32Client-";
    clientId += String(random(0xffff), HEX); // Create a random client ID
    if (client.connect(clientId.c_str())) // Attempt to connect
    { Serial.println("connected"); // Once connected, publish an announcement...
      client.publish(topic1, "Hello World Pk007"); // ... and resubscribe
      client.subscribe(topic1);
    } else
    { Serial.print("failed, rc=");
      Serial.print(client.state());
      Serial.println(" try again in 5 seconds");
      delay(5000);
    }
  }
}
```

```
void LEDShowStatus(void) {
 if (isnan(t)) {
  blinkStatus = 1 - blinkStatus;
  LED_StsArray[0] = 1;
  LED_StsArray[1] = 0;
  LED_StsArray[2] = 0;
  LED_StsArray[3] = 0;
 }
 if (t < 24) {
  blinkStatus = 1;
  LED_StsArray[0] = 1;
  LED_StsArray[1] = 0;
  LED_StsArray[2] = 0;
  LED_StsArray[3] = 0;
 }
 if (t >= 24) {
  LED_StsArray[0] = 1;
  LED_StsArray[1] = 1;
  LED_StsArray[2] = 0;
  LED_StsArray[3] = 0;
 }
 if (t < 26) {
  blinkStatus = 1;
```

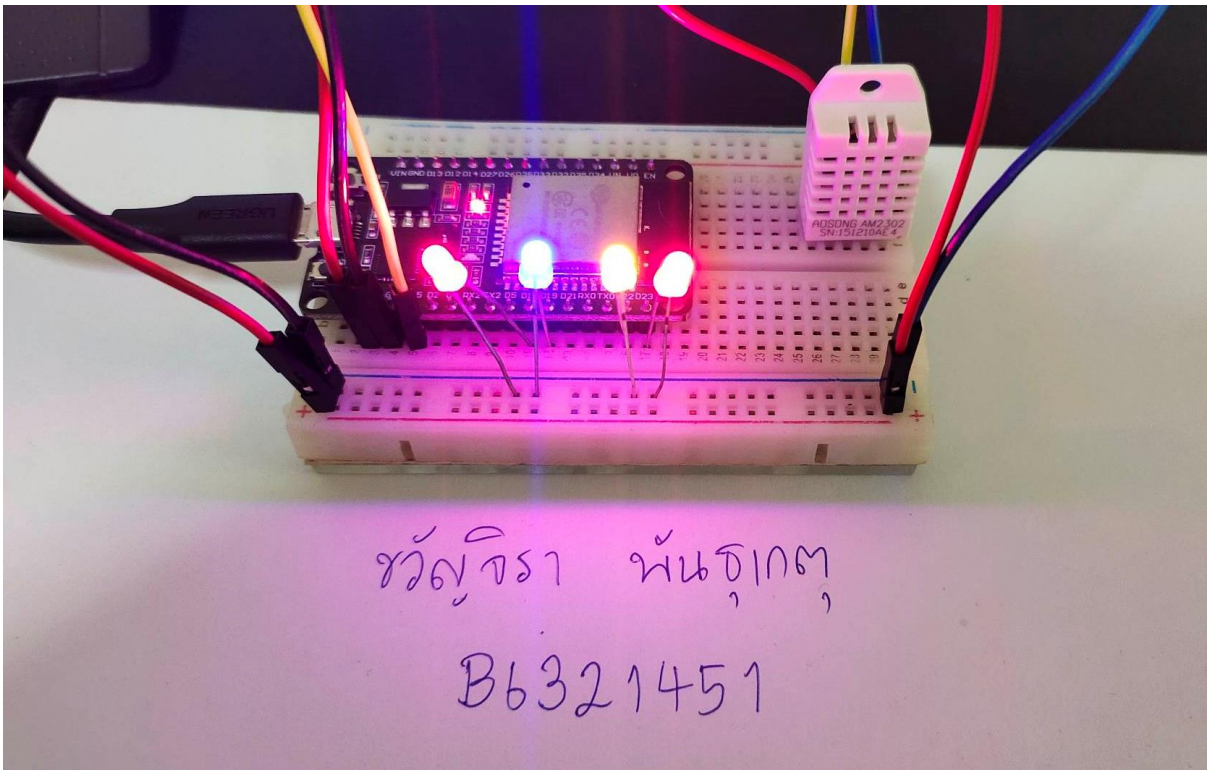
```
  LED_StsArray[0] = 1;

  LED_StsArray[1] = 1;

  LED_StsArray[2] = 0;

  LED_StsArray[3] = 0;

}

if (t >= 26) {

  LED_StsArray[0] = 1;

  LED_StsArray[1] = 1;

  LED_StsArray[2] = 1;

  LED_StsArray[3] = 0;

}

if (t < 28) {

  blinkStatus = 1;

  LED_StsArray[0] = 1;

  LED_StsArray[1] = 1;

  LED_StsArray[2] = 1;

  LED_StsArray[3] = 0;

}

if (t >= 28) {

  LED_StsArray[0] = 1;

  LED_StsArray[1] = 1;

  LED_StsArray[2] = 1;

  LED_StsArray[3] = 1;

}
```

```
  if (t < 30) {
    blinkStatus = 1;
    LED_StsArray[0] = 1;
    LED_StsArray[1] = 1;
    LED_StsArray[2] = 1;
    LED_StsArray[3] = 1;
  }
  if (t >= 30) {
    blinkStatus = 1 - blinkStatus;
    LED_StsArray[0] = 1;
    LED_StsArray[1] = 1;
    LED_StsArray[2] = 1;
    LED_StsArray[3] = 1;
  }
  for (int i = 0; i < 4; i++)
    digitalWrite(LED_PinArray[i], LED_StsArray[i] & blinkStatus);
}
void setup()
{ Serial.begin(115200);
  setup_wifi();
  //Wire.begin(22, 23);
  client.setServer(mqtt_server, 1883);
  dht.setup(DHT22_Pin, DHTesp::DHT22);
  for (int i = 0; i < 4; i++) {
```

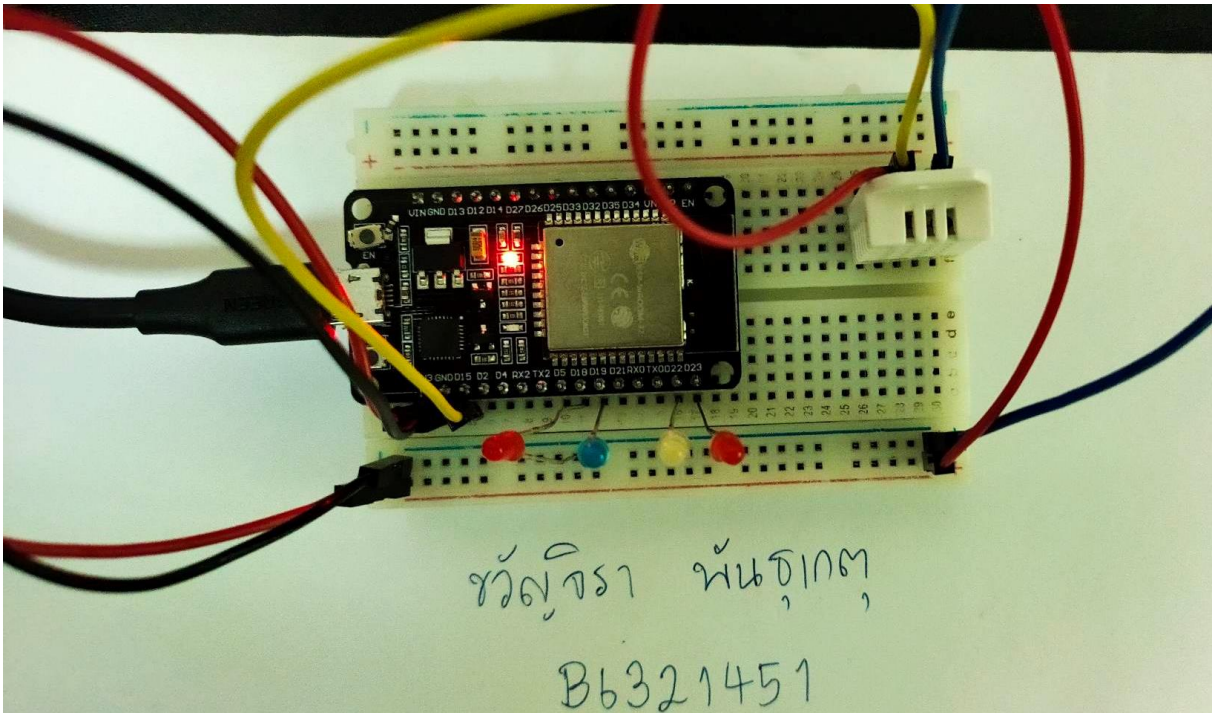
```
    pinMode(LED_PinArray[i], OUTPUT);
  }
}
void loop()
{
  if (!client.connected()) reconnect();
  client.loop();
  long now = millis();
  if (now - lastMsg > 5000)
  { lastMsg = now;
    ++value;
    //float t = s.readTempC();
    //float h = s.readHumidity();
    delay(dht.getMinimumSamplingPeriod());
    h = dht.getHumidity();
    t = dht.getTemperature();

    sprintf (msg, "TempC: %.2f C, Humidity: %.2f %%", t, h);
    Serial.print("Publish message: ");
    Serial.println(msg);
    client.publish(topic1, msg);

  }
  LEDShowStatus(); delay(250);
```

```
  LEDShowStatus(); delay(250);

  LEDShowStatus(); delay(250);

  LEDShowStatus(); delay(250);

  LEDShowStatus(); delay(250);

  LEDShowStatus(); delay(250);

}
```

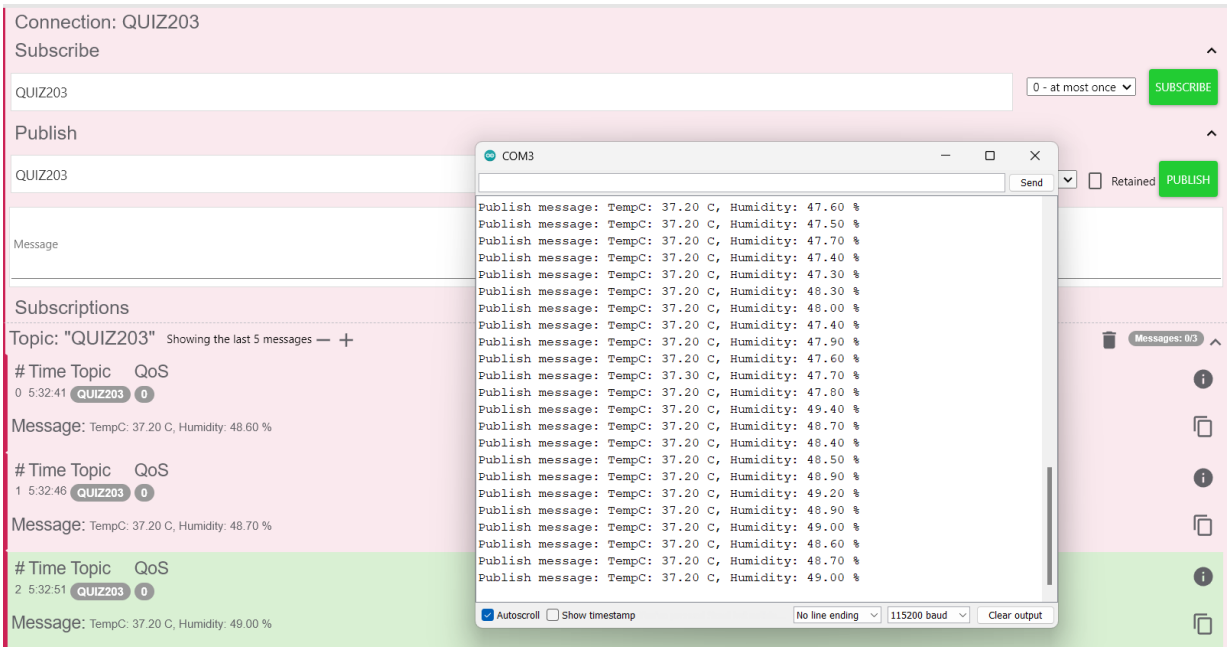
**รูปการต่อวงจร – 1**



## รูปการต่อวงจร – 2




## หน้าจอ MQTT Lens

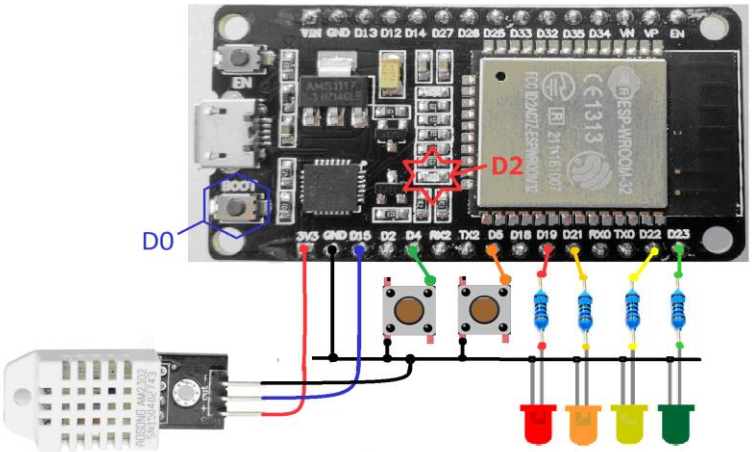



## Video

https://www.youtube.com/watch?v=t3AKr26F7vg

## Quiz_204 – Publish and Subscribe

- อ่านค่า DHT-22 แล้วส่งไปยัง MQTT Broker ทุกๆ 5 วินาที
- ควบคุมการปิดเปิด 4 LED
- รับค่าสวิตซ์กำหนด SW1 แจ้ง Overheat Alarm, SW2 แจ้ง Intruders Alarm




```
#include <WiFi.h>

#include <Wire.h>

#include <PubSubClient.h>

#include "DHTesp.h"

DHTesp dht;

#define LED1 2

#define LED2 4

#define LED3 18

#define LED4 19

#define DHT22_Pin 15

int pushButton1 = 22;

int pushButton2 = 23;

const char* ssid = "105/766-2.4G";
```

```
const char* password = "0999128910";

const char* mqtt_server = "test.mosquitto.org";

const char* topic1 = "QUIZ204";

String ledState1 = "NA";

WiFiClient espClient;

PubSubClient client(espClient);

long lastMsg = 0;

char msg[50];

int value = 0;

void setup_wifi() {

  delay(10);

  Serial.println();

  Serial.print("Connecting to ");

  Serial.println(ssid);

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {

    delay(500); Serial.print(".");

  }

  randomSeed(micros());

  Serial.println("");

  Serial.println("WiFi connected");

  Serial.println("IP address: ");

  Serial.println(WiFi.localIP());

  pinMode(LED1, OUTPUT);
```

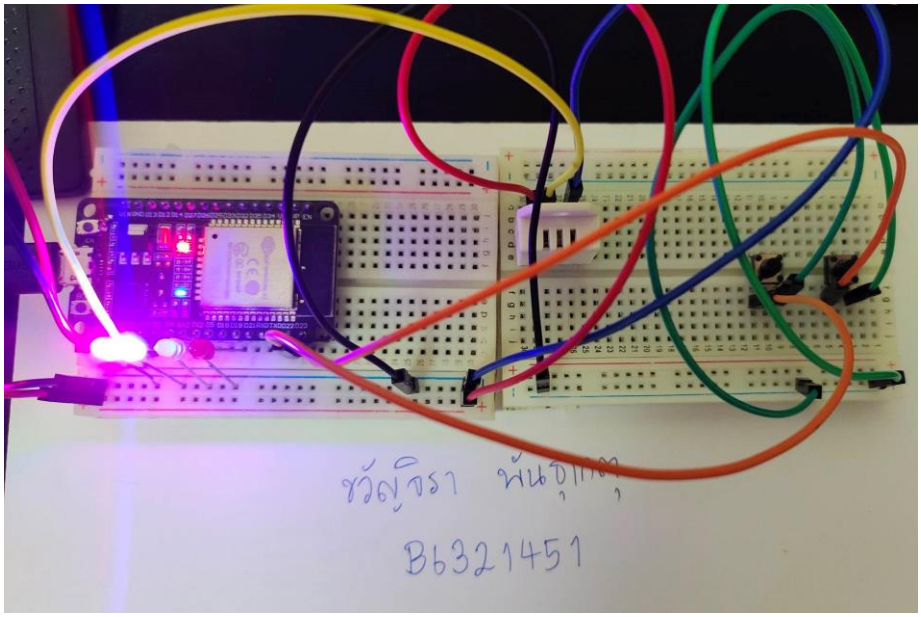
```
  pinMode(LED2, OUTPUT);
  pinMode(LED3, OUTPUT);
  pinMode(LED4, OUTPUT);
}
void callback(char* topic, byte* payload, unsigned int length)
{ char myPayLoad[50];
  Serial.print("Message arrived [");
  Serial.print(topic1);
  Serial.print("] ");
  for (int i = 0; i < length; i++)
  { Serial.print((char)payload[i]);
    myPayLoad[i] = payload[i];
    myPayLoad[i + 1] = '\0'; // End of String
  }
  Serial.print("\n"); Serial.println(myPayLoad);
  myPayLoad[4] = '\0'; // String lessthan 4 Charector
  if ((String)myPayLoad == "ON1") digitalWrite(LED1, HIGH);
  if ((String)myPayLoad == "OFF1") digitalWrite(LED1, LOW);
  if ((String)myPayLoad == "ON2") digitalWrite(LED2, HIGH);
  if ((String)myPayLoad == "OFF2") digitalWrite(LED2, LOW);
  if ((String)myPayLoad == "ON3") digitalWrite(LED3, HIGH);
  if ((String)myPayLoad == "OFF3") digitalWrite(LED3, LOW);
  if ((String)myPayLoad == "ON4") digitalWrite(LED4, HIGH);
  if ((String)myPayLoad == "OFF4") digitalWrite(LED4, LOW);
```

```
}
void reconnect()
{ while (!client.connected()) // Loop until we're reconnected
  { Serial.print("Attempting MQTT connection...");
    String clientId = "ESP32Client-";
    clientId += String(random(0xffff), HEX); // Create a random client ID
    if (client.connect(clientId.c_str())) // Attempt to connect
    { Serial.println("connected"); // Once connected, publish an announcement...
      client.publish(topic1, "Hello World "); // ... and resubscribe
      client.subscribe(topic1);
    } else
    { Serial.print("failed, rc=");
      Serial.print(client.state());
      Serial.println(" try again in 5 seconds");
      delay(5000);
    }
  }
}
void setup()
{ Serial.begin(115200);
  setup_wifi();
  dht.setup(DHT22_Pin, DHTesp::DHT22);
  pinMode(pushButton1, INPUT_PULLUP);
  pinMode(pushButton2, INPUT_PULLUP);
```

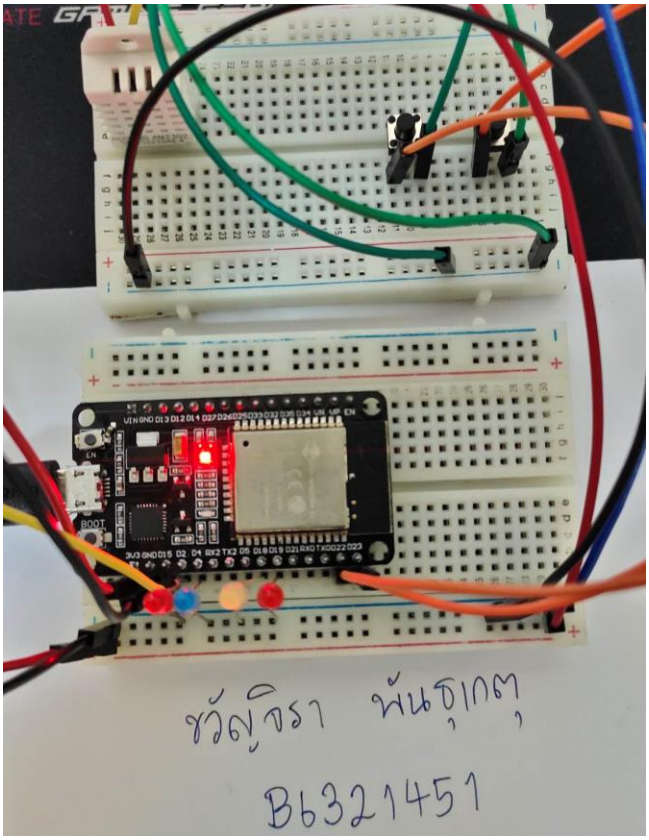
```
  client.setServer(mqtt_server, 1883);
  client.setCallback(callback);
  pinMode(LED1, OUTPUT);
  pinMode(LED2, OUTPUT);
  pinMode(LED3, OUTPUT);
  pinMode(LED4, OUTPUT);
}
void loop()
{
  if (!client.connected()) reconnect();
  client.loop();
  long now = millis();
  if (now - lastMsg > 5000)
  { lastMsg = now;
    ++value;
    float h = dht.getHumidity();
    float t = dht.getTemperature();
    sprintf (msg, "TempC: %.2f C, Humidity: %.2f %%", t, h);
    Serial.print("Publish message: ");
    Serial.println(msg);
    client.publish(topic1, msg);
  }
  if (digitalRead(pushButton1) == 0) {
    sprintf (msg, "Overheat Alarm");
```

```
    Serial.println(msg);
    client.publish(topic1, msg);
    delay(500);
  }
  if (digitalRead(pushButton2) == 0) {
    sprintf (msg, "Intruders Alarm");
    Serial.println(msg);
    client.publish(topic1, msg);
    delay(500);
  }
}
```

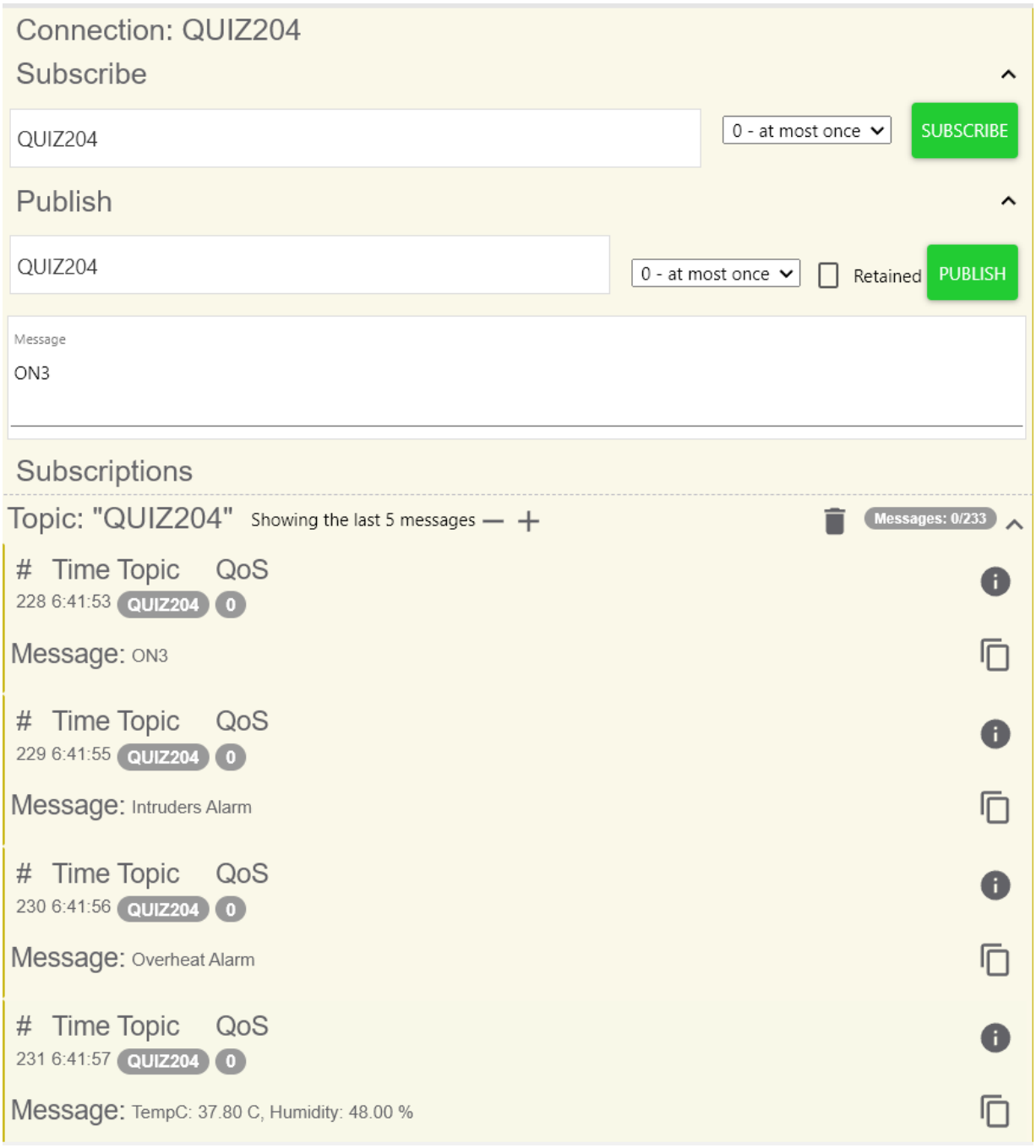
**รูปการต่อวงจร – 1**




**รูปการต่อวงจร – 2**



**หน้าจอ MQTT Lens**




https://www.youtube.com/shorts/JKYyXiWatZM