

# Advantech AE Technical Share Document

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Category	<input checked="" type="checkbox"/> FAQ <input type="checkbox"/> SOP	Related OS	RTOS
Abstract	How to publish and subscribe the tags created by HMI to Azure IoT Hub?		
Keyword	Azure 、MQTT 、Cloud connector		
Related Product	HMINavi Designer 、WOP-200k Series		

## ● **Problem Description:**

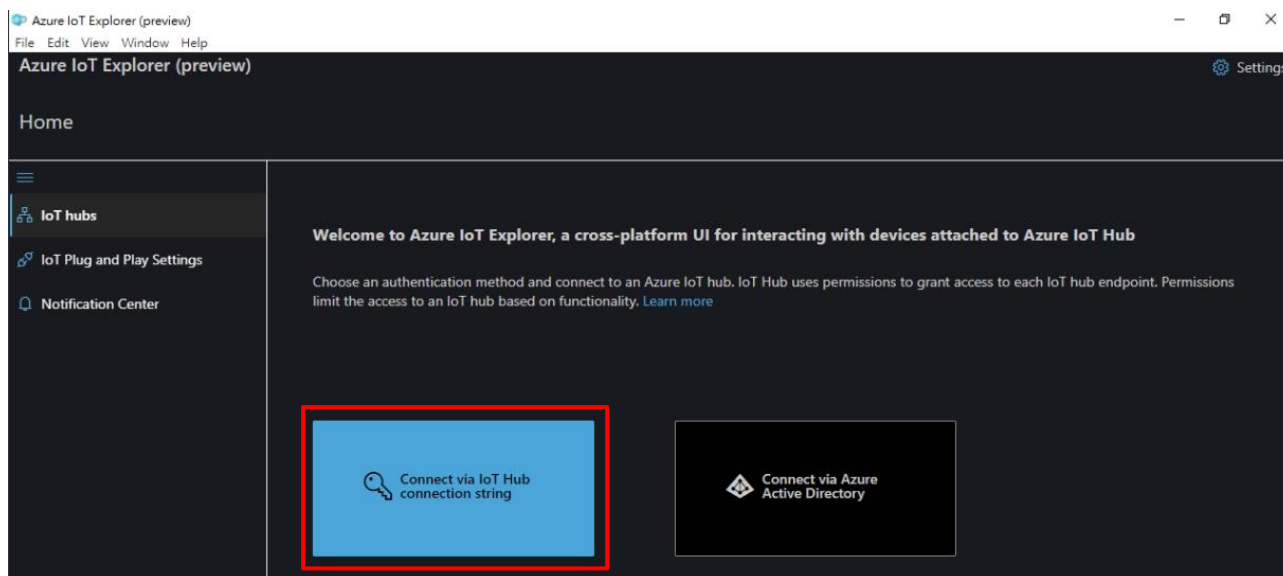
How to publish and subscribe the tags created by HMI to Azure IoT Hub?

如何將 HMI 所建立的測點，發佈及訂閱至 Azure IoT Hub?

## ● **Brief Solution - Step by Step:**

### ➤ **軟體安裝及連線測試**

- Go to the Internet to download the Azure IoT Explorer software,  
URL: <https://github.com/Azure/azure-iot-explorer/releases/tag/v0.15.8>.  
至網路上下載 Azure IoT Explorer 軟體，  
網址：<https://github.com/Azure/azure-iot-explorer/releases/tag/v0.15.8>。
- Open the Azure IoT Explorer software, click on IoT hubs → Connect via IoT Hub connection string, the following picture is an example of "connection string".  
開啟 Azure IoT Explorer 軟體，點選 IoT hubs → Connect via IoT Hub connection string，  
以下圖片是以“連接字串”為範例。

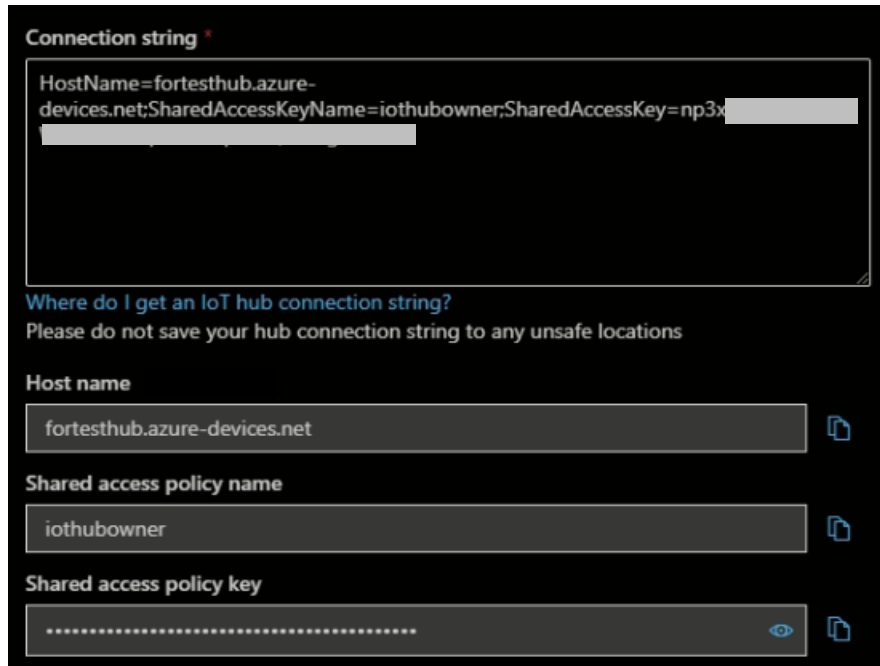


Picture 1: Click "Connect via IoT Hub connection string"

圖片 1：點選“Connect via IoT Hub connection string”

3. Then click "Add connection" and enter the correct connection string information, as shown in the example below.

接著點選"Add connection"，輸入正確的連接字串資訊，如下圖範例所示。



Picture 2: Enter connection string information

圖片 2：輸入連結字串資訊

4. Select the corresponding Device ID, you can see the information about Device identity, and then click the "Connection string with SAS token" option below. The meaning of each field is as follows:

- (1) Select "Primary key" for Symmetric key.
- (2) Expiration is the expiration time of the SAS token. The following example is that the SAS token will become invalid after 99999999 minutes.
- (3) After the above two items are set, click "Generate" to generate a set of SAS token.

Note:

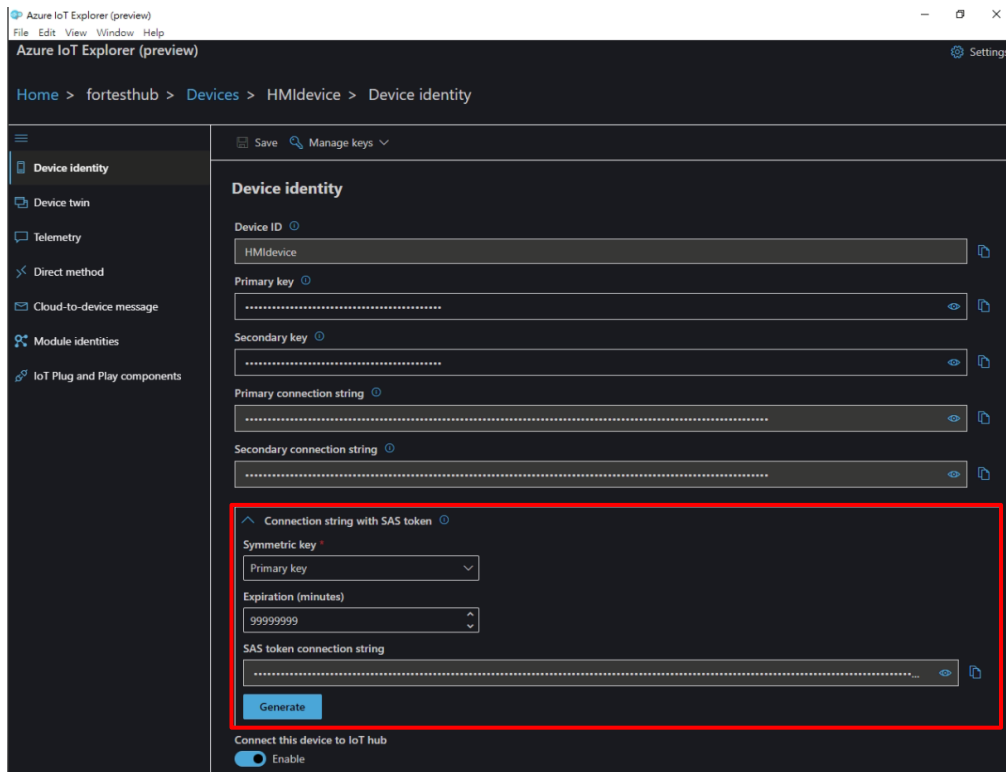
For the SAS token string required for the Password mentioned later, **you only need to copy the second half from "SharedAccessSignature sr=..." string is enough.**

選擇對應的 Device ID，即可看到 Device identity 相關資訊，接著點選下方"Connection string with SAS token"選項，各欄位涵義說明如下：

- (1) Symmetric key 選擇"Primary key"。
- (2) Expiration 為 SAS token 逾期時間，以下範例為過了 99999999 分鐘之後，此 SAS token 就會失效。
- (3) 以上兩項都設定完成之後，點選"Generate"，即可生成一組 SAS token。

備註：

後續所提到的 Password 所需帶入的 **SAS token 字串，只需要複製後半段從"SharedAccessSignature sr=..."即可。**



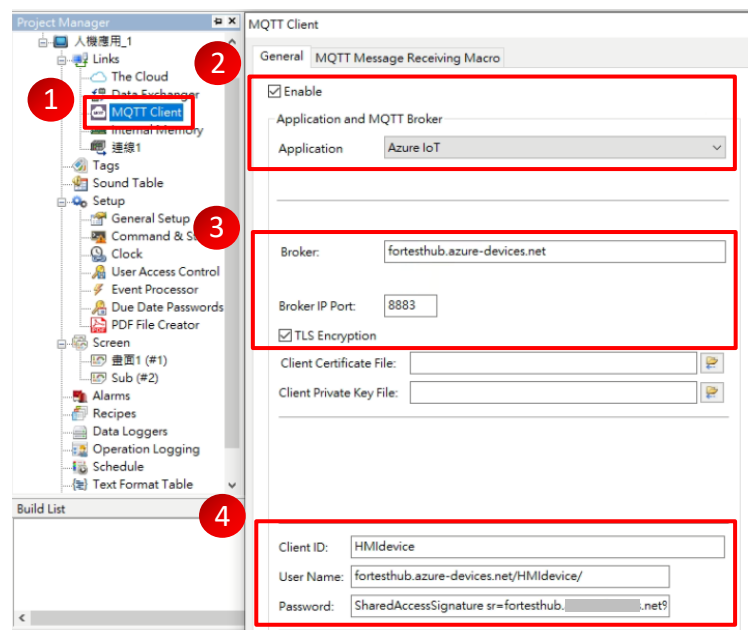
Picture 3: Generate SAS token

圖片 3：生成 SAS token

- Open the HMINavi Designer software → MQTT Client → General → Check to “Enable”, the parameter setting reference is as follows:

開啟 HMINavi Designer 軟體 → MQTT Client → General → 勾選 Enable，參數設定參考如下：

- Application：Azure IoT
- Broker：Host name
- Broker IP Port：8883
- Choose "TLS" Encryption
- Client ID：Device ID
- User Name：Host name/Device ID/
- Password：SAS Token  
(SharedAccessSignature sr=...)

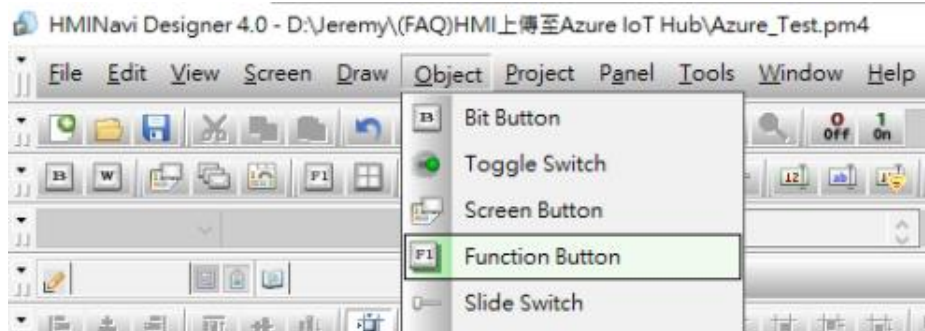


Picture 4: MQTT Client Settings

圖片 4：MQTT 用戶端設定

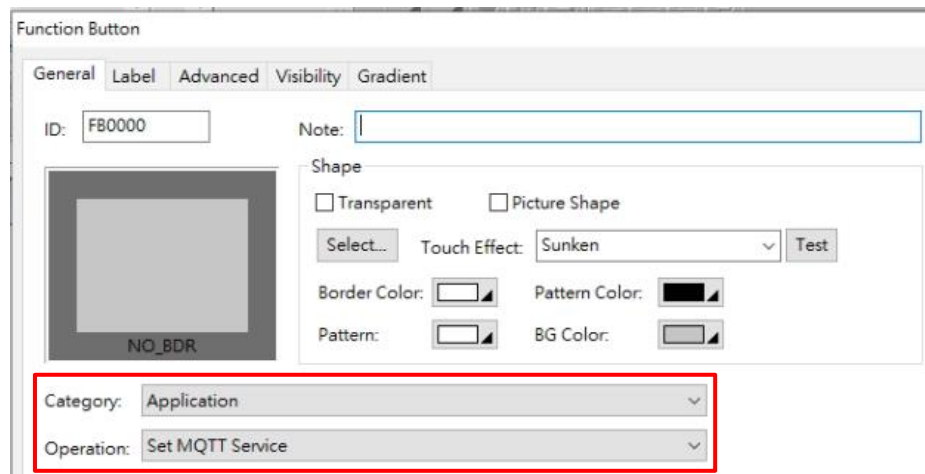
- After the parameter setting is completed, a function button is added in the HMI design page. The main function of the button is to confirm whether the HMI can successfully connect to the MQTT Broker.

參數設定完成後，於 HMI 設計畫面中，新增一個功能按鈕，其按鈕主要功能是為了確認 HMI 是否能夠成功連線到 MQTT Broker。



Picture 5: Add Function Button

圖片 5：新增功能按鈕



Picture 6: Add Function Button

圖片 6：功能按鈕參數設定

- In the HMInavi Designer software → Use offline simulation → Click the MQTT Broker communication test function button to confirm whether the "Test Success" page appears.  
在 HMInavi Designer 軟體 → 使用離線模擬 → 點選 MQTT Broker 通訊測試功能按鈕，確認是否有出現“測試成功”頁面。



Picture 7: Communication test

圖片 7：通訊測試

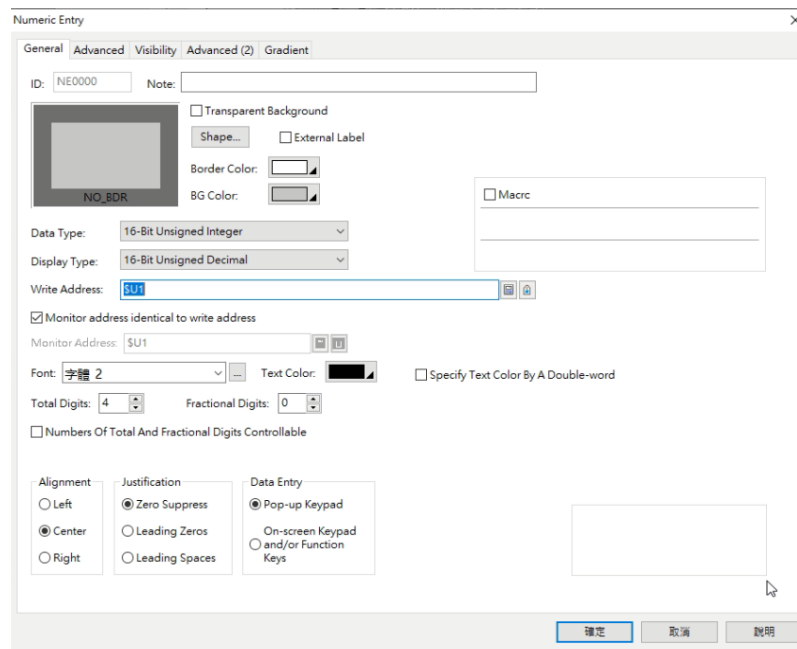
## ➤ 發佈功能設定及測試

- After confirming that you can successfully connect to the Broker, first perform a publish function test.

On the HMI design page, create a numerical input window for publishing tags. In the following example, there are 3 published tags.

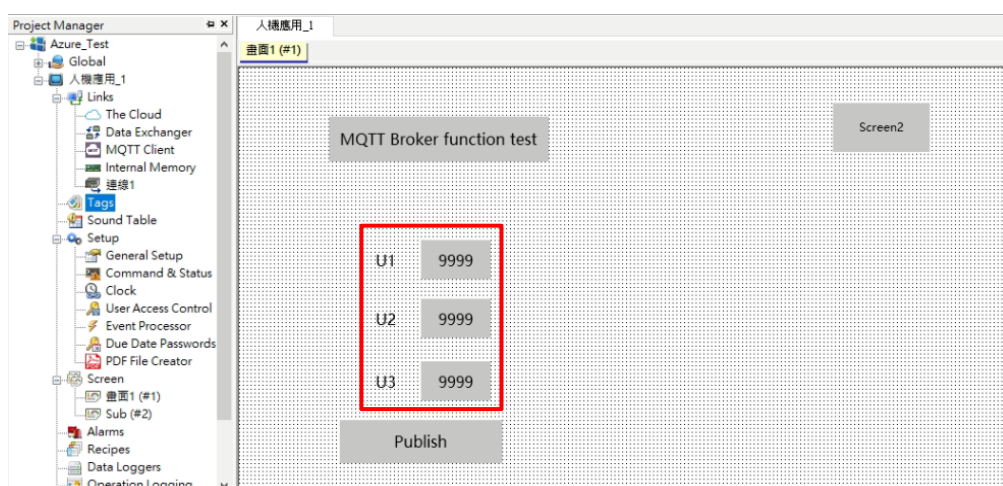
確認可以成功連到 **Broker** 之後，首先先進行發佈功能測試。

在 HMI 設計頁面中，建立發佈測點的數值輸入視窗，以下範例共有 3 個發佈的測點。



Picture 8: Numeric input window settings (U1 address as an example)

圖片 8：數值輸入視窗設定(以 U1 位址為例)



Picture 9: Establish 3 tags sequentially according to the above method

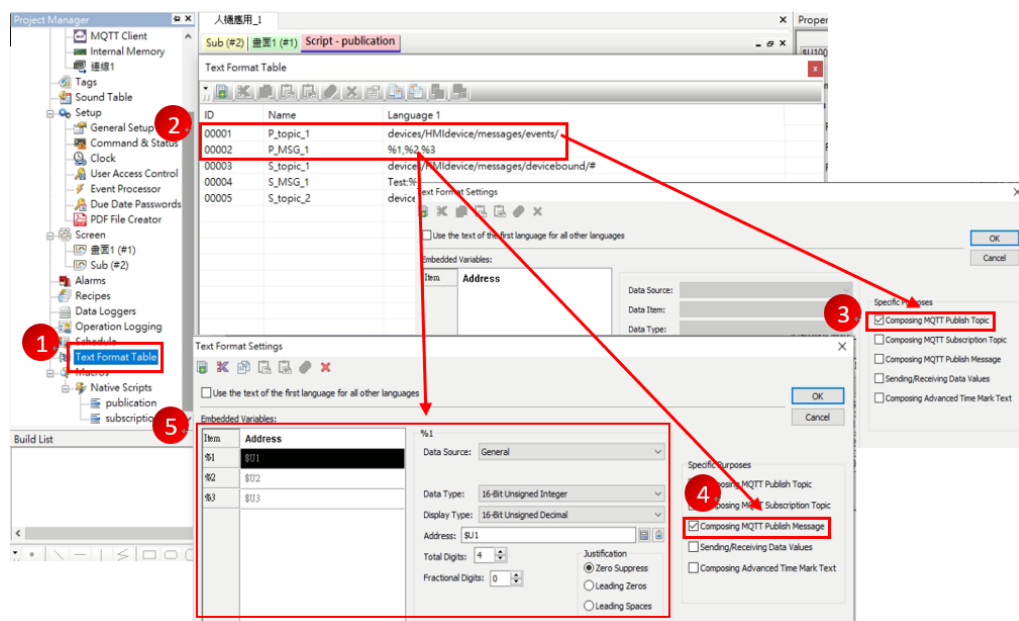
圖片 9：依上述方式依序建立 3 個測點

9. Create a list in text format.

- ID: 00001 is the topic to be published, Topic: devices/**Device ID(According to the actual setting)**/messages/events/, its property setting needs to check "Composing MQTT Publish Topic".
- ID: 00002 is the message to be published: %1, %2, %3, its property setting needs to check "Composing MQTT Publish Message", and create the tags that need to be published to Azure IoT Hub in sequence.

建立文本格式列表。

- ID：00001 為要發佈的主題，Topic：devices/**Device ID(According to the actual setting)**/messages/events/，其屬性設定需勾選“Composing MQTT Publish Topic”。
- ID：00002 為要發佈的訊息：%1、%2、%3，其屬性設定需勾選“Composing MQTT Publish Message”，並依序創建需要發佈至 Azure IoT Hub 的測點。



Picture 10: Text format list setting page

圖片 10：文本格式列表設定頁面

10. Write a macro program to execute the publishing function. The following figure uses the "MqttP\_IF" command. The parameters of the command are as follows:

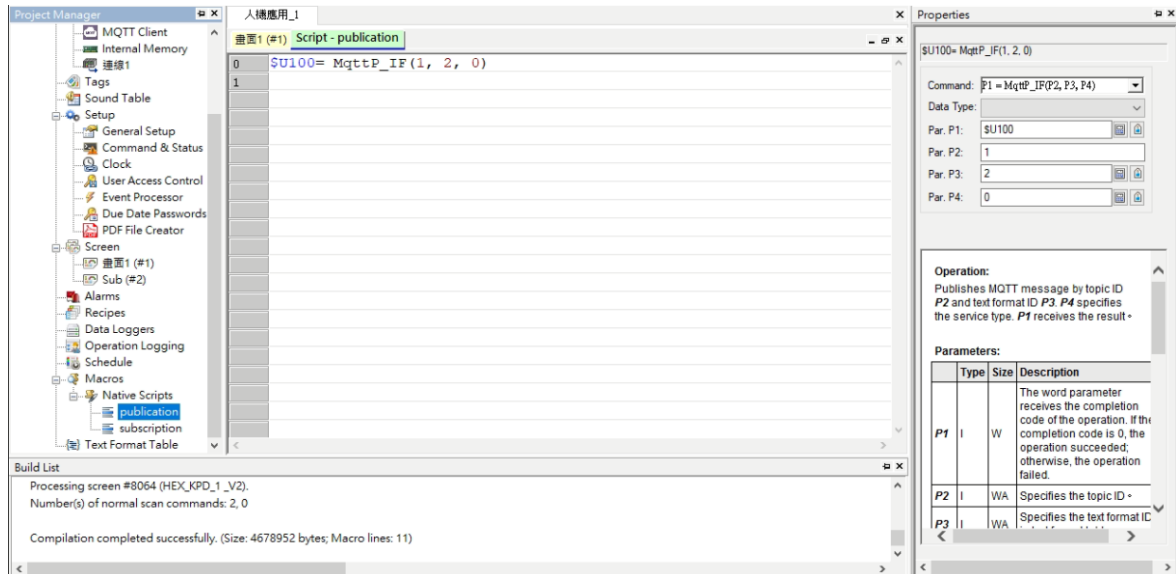
- P1(\$U100): The address of the internal scratchpad displays the final execution result. If it displays 0, it means that the execution is normal, otherwise, it means that it is abnormal.
- P2(1): The specified topic ID number.
- P3(2): In the text format table, the specified ID number.
- P4(0): If it is set to 0, it means that each message will only be sent once, and other setting methods can refer to the software instructions.

撰寫執行發佈功能巨集程式，下圖採用"MqttP\_IF"指令，該指令參數如下說明：

- P1(\$U100)：內部暫存器位址，顯示最終的執行結果，若顯示 0，代表執行正常，反之，則代表異常。
- P2(1)：指定的 Topic ID 編號。



- P3(2)：在文本格式表格中，指定的 ID 編號。
- P4(0)：若設定 0，代表每條訊息只會傳送一次，而其它設定方式可參考軟體指令說明。



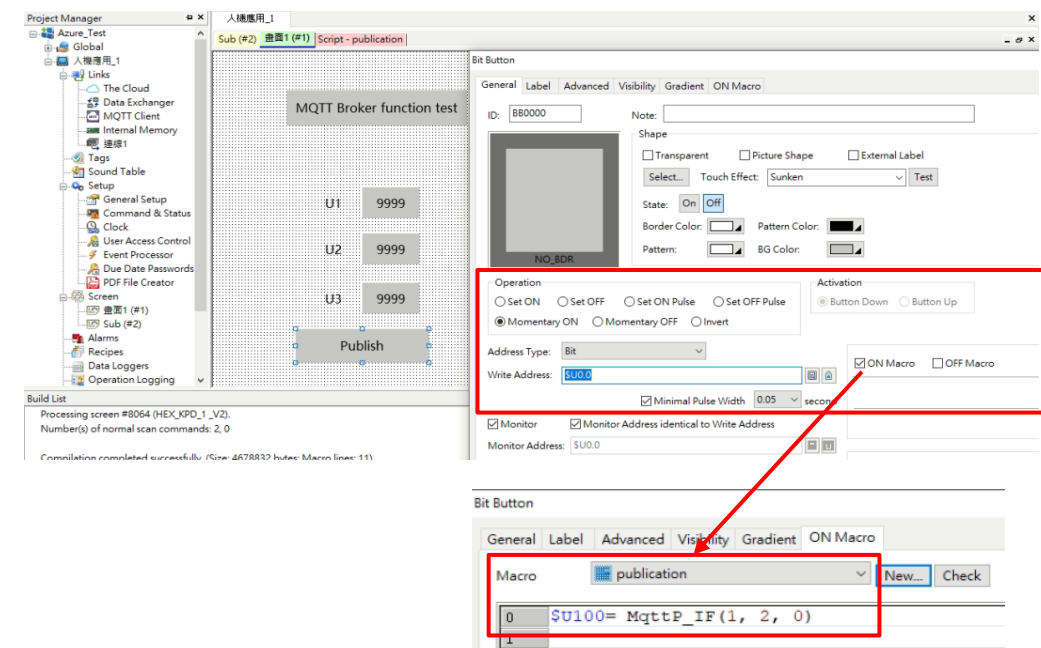
Picture 11: Publish function macro program

圖片 11：發佈功能巨集程式

11. In the HMI page, create a button that triggers the publish function macro program. For details, please refer to the picture below for setting.

於 HMI 頁面中，製作一個觸發發佈功能巨集程式之按鈕，詳細可以參考下方圖片設定。

- Select "Momentary ON" → Enter the specified address → Check "ON Macro"

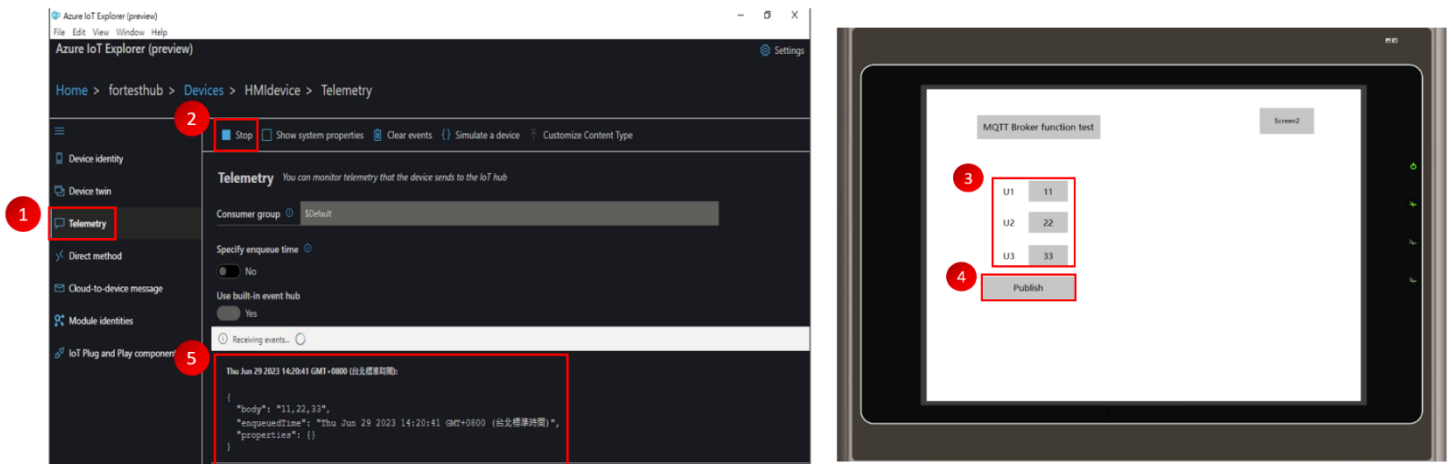


Picture 12: Publish function button settings

圖片 12：發佈功能按鈕設定

12. Save the file → Compile → Open the offline simulation tool → Open the Azure IoT Explorer Preview software → Enter the "Telemetry" page(No.1) → Press Start(No.2) → Change the values of the three tags on the HMI simulation page arbitrarily(No.3) → Click the "Publish" button(No.4) → In the Azure IoT Explorer Preview software, receive the tag value(No.5).

儲存檔案 → 進行編譯 → 開啟離線模擬工具 → 開啟 Azure IoT Explorer Preview 軟體 → 進入"Telemetry"頁面(No.1) → 按下 Start(No.2) → 於 HMI 模擬頁面任意更改三個測點數值(No.3) → 點選"Publish"按鈕(No.4) → 即可於 Azure IoT Explorer Preview 軟體中，收到測點數值(No.5)。



Picture 13: Azure IoT Explorer Preview software (left) and HMI (right) monitoring page

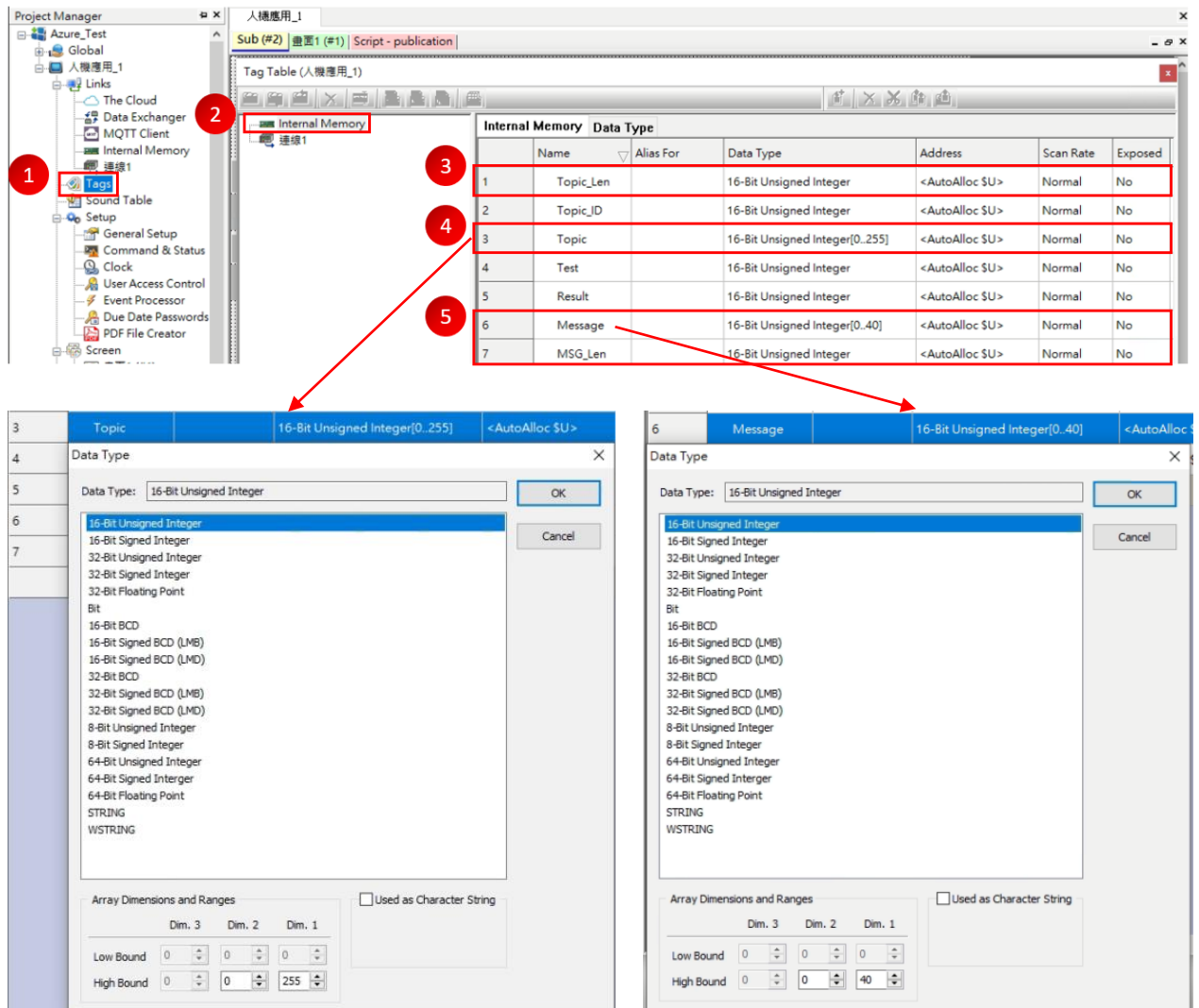
圖片 13：Azure IoT Explorer Preview 軟體(左圖)與 HMI(右圖)監視頁面



➤ 訂閱功能設定及測試

13. First, create 4 internal tags, which are "Topic\_Len", "Topic", "Message", and "MSG\_Len". However, it is necessary to pay special attention to the data type of "Topic" and "Message". The array type should be selected, and the array size It depends on the actual situation. (tag names can be customized)

首先建立 4 個內部測點，分別為"Topic\_Len"、"Topic"、"Message"、"MSG\_Len"，不過需特別留意"Topic"及"Message"兩者的資料類型要選擇陣列，而陣列大小則依照實際狀況而定。(測點名稱皆可自定義)



Picture 14: Internal tag setting page

圖片 14：內部測點設定頁面

14. Add an additional subscription function test page. The component settings in it are as follows. It mainly displays the relevant topic, message text, and length information, and how to parse the message word by word. In addition, the U200~U210 addresses store the received messages as The result of converting the Unicode format to the ASC II format, and the U1~U3 addresses store the result of converting the ASC II format to the Uint format. The intermediate conversions are all processed by the macro program.

額外新增一個訂閱功能測試頁面，裡面的元件設定參考如下，主要是顯示有關主題及訊息文字及長度資訊，以及如何將訊息逐字解析，另外 U200~U210 位址是存放將收到的訊息為 Unicode 格式轉換成 ASC II 格式的結果，而 U1~U3 位址則是存放 ASC II 格式轉換成 Uint 格式的結果，中間的轉換皆透過巨集程式來做處理。

**Show message text length**  
顯示訊息文字長度

**Show Topic text length**  
顯示主題文字長度

**Show Topic text**  
顯示主題文字

**parse the message verbatim**  
將訊息逐字解析

**ASCII text display (Unicode to ASCII)**  
ASCII 文字顯示(Unicode 轉 ASCII)

**Show message text**  
顯示訊息文字

Picture 15: Page Object Settings

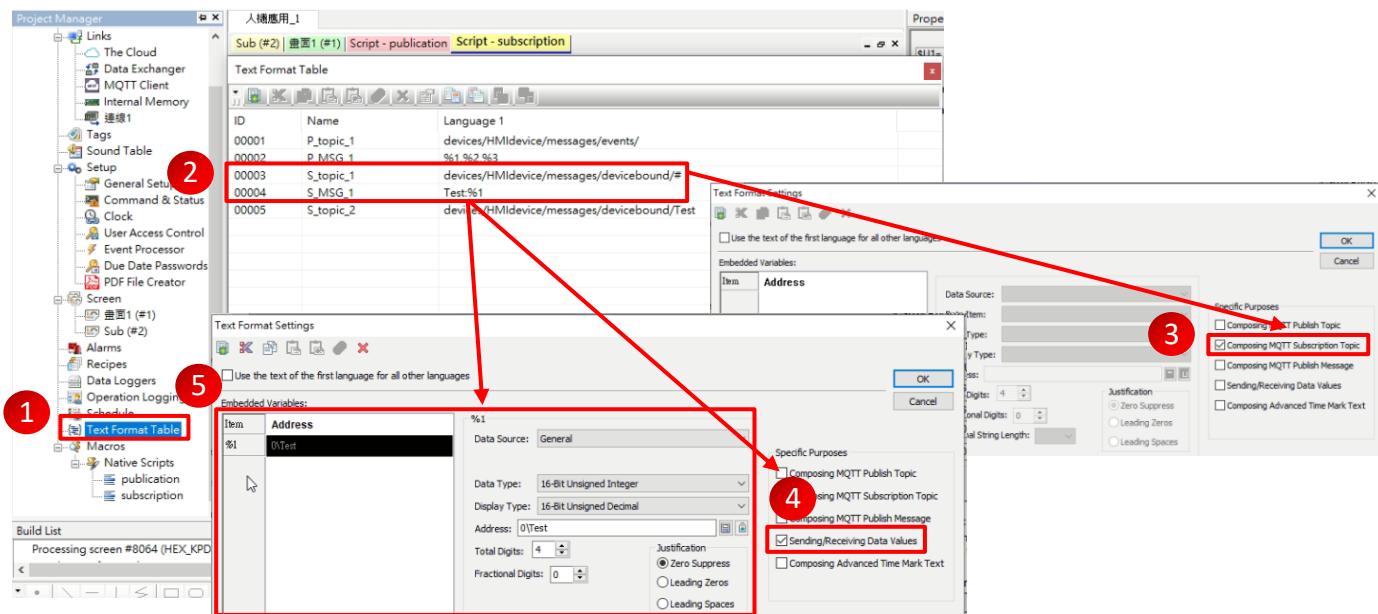
圖片 15：頁面物件設定

# 15. Create a list in text format.

- ID: 00003 is the topic to be subscribed to, Topic: devices/**Device ID(According to the actual setting)**/messages/devicebound/#, and its property setting needs to check "Composing MQTT Subscription Topic".
- ID: 00004 is the subscribed message tag: 0\TEST, its property setting needs to check "Sending/Receiving Data Values".

建立文本格式列表。

- ID：00003 為要訂閱的主題，Topic：devices/**Device ID(According to the actual setting)**/messages/devicebound/#，其屬性設定需勾選“Composing MQTT Subscription Topic”。
- ID：00004 為訂閱的訊息點位：0\TEST，其屬性設定需勾選“Sending/Receiving Data Values”。



Picture 16: Text format list setting page

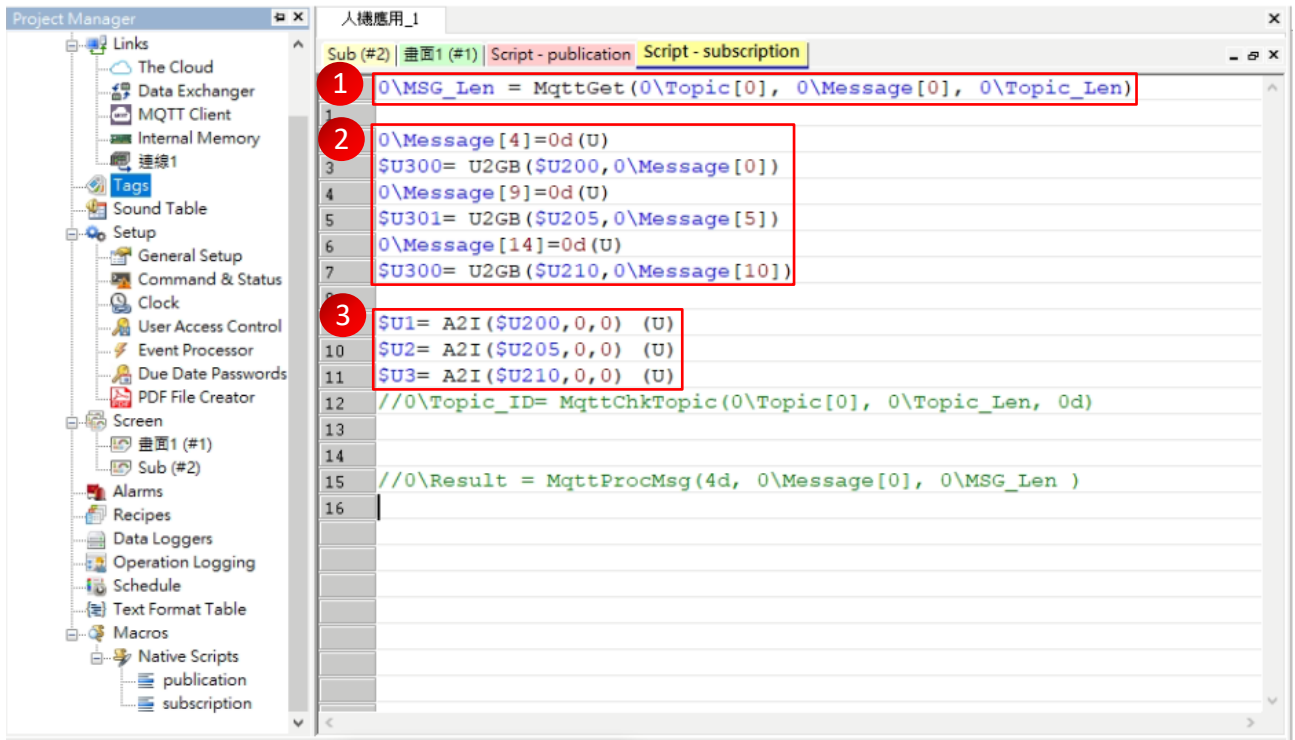
圖片 16：文本格式列表設定頁面

# 16. Write a subscription function macro program, the function description of the program is as follows:

- (1) Use the "MqttGet" command to read Topic and Message information.
- (2) Convert Unicode format to ASC II format.
- (3) Convert ASC II format to Uint format.

撰寫訂閱功能巨集程式，程式功能說明如下：

- (1) 利用“MqttGet”指令，讀取 Topic 及 Message 資訊(No.1)。
- (2) 將 Unicode 格式轉換成 ASC II 格式(No.2)。
- (3) 將 ASC II 格式轉換成 Uint 格式(No.3)。

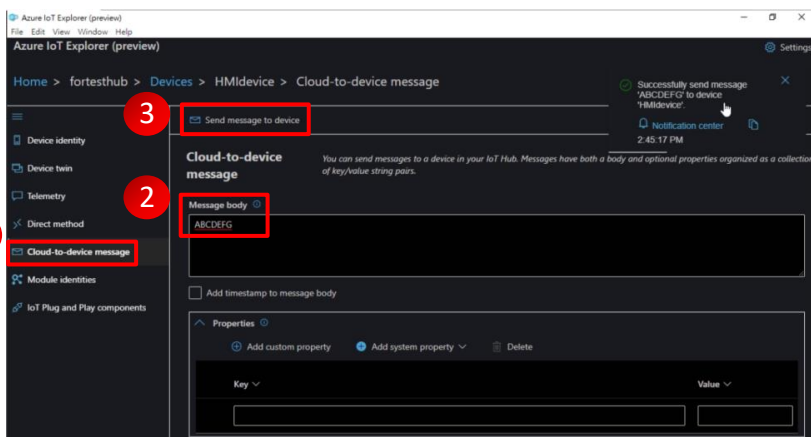


Picture 17: Subscription function macro program

圖片 17：訂閱功能巨集程式

17. Save the file → Compile → Open the offline simulation tool → Open the Azure IoT Explorer Preview software → Enter the "Cloud-to-device message" page(No.1) → Enter any English characters and numbers in the "Message body"(No.2) → Press "Send message to device"(No.3) → HMI simulation The page can display Topic and Message related information(No.4).

儲存檔案 → 進行編譯 → 開啟離線模擬工具 → 開啟 Azure IoT Explorer Preview 軟體 → 進入"Cloud-to-device message"頁面(No.1) → 於"Message body"任意輸入英數字(No.2) → 按下"Send message to device" (No.3) → HMI 模擬頁面即可顯示 Topic 及 Message 相關資訊(No.4)。



Picture 18: Azure IoT Explorer Preview software (left) and HMI (right) monitoring page

圖片 18：Azure IoT Explorer Preview 軟體(左圖)與 HMI(右圖)監視頁面