Quick-Connect IoT DA16600 Provisioning Demo

This quick start guide explains the process of running the Quick-Connect IoT DA16600 (Wi-Fi BLE) Provisioning demo on an EK-RA6M4. The demo demonstrates provisioning the DA16600 module to a Wi-Fi network using the BLE interface and reading temperature and humidity data from the HS3001 sensor into the RA6M4 microcontroller.

A smartphone application is used to provision the DA16600 module to an existing Wi-Fi network using the BLE interface. A web browser is then used to display the temperature and humidity data read from the HS3001 sensor. Instructions for loading the example project are included at the end of the document as a next step after running the demo.

Target Devices

- RA6M4 MCU (R7FA6M4AF3CFB)
- HS3001 Temperature / Humidity Sensor (HS3001)
- DA16600 Wi-Fi BLE Module (DA16600MOD)

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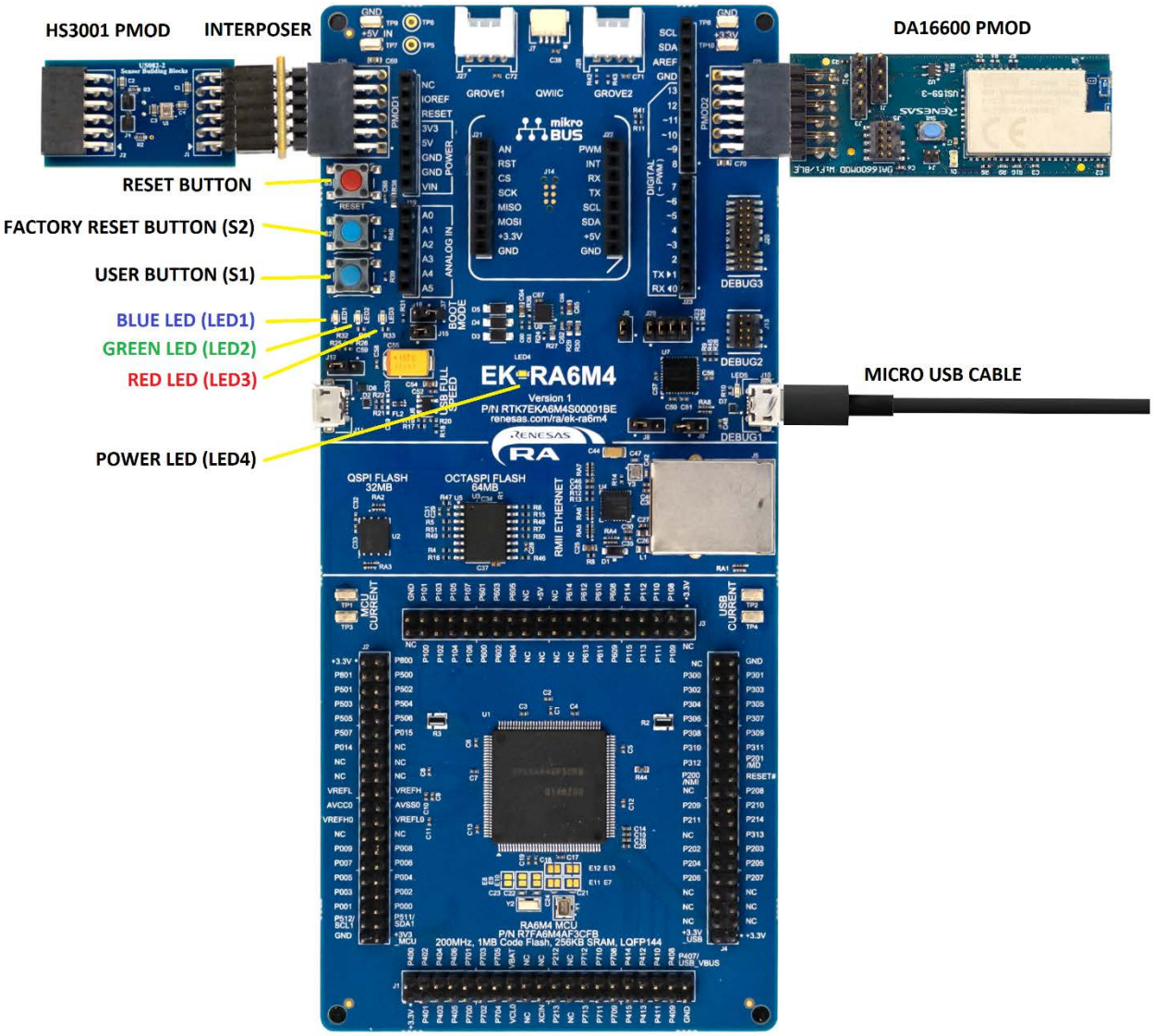
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1. Kit Contents

To set up this demo, the following components are needed. Please ensure the Pmod™ boards are connected in the correct order, including on the correct Pmod ports. Connect the micro USB cable between the EK-RA6M4 MCU development board and the Windows PC.

1.1 Hardware Components

- EK-RA6M4 (RTK7EKA6M4S00001BE)
- HS3001 Pmod (US082-HS3001EVZ)
- Pmod Interposer Board (US082-INTERPEVZ)
- DA16600MOD Wi-Fi Bluetooth LE Combo Pmod (US159-DA16600MEVZ)
- Micro USB cable



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1.2 Software Components

The following software is required. The demo and application projects are both contained inside the Quick_Connect_IoT_DA16600_Provisioning_Demo.zip file that accompanies this document.

Category	Item	Note
e^2 studio project	Quick_Connect_IoT_DA16600_Provisioning_Demo.zip	Project can be directly imported to e^2 studio and the FSP (v4.5 and higher).
Mobile App	Renesas Wi-Fi Provisioning Tool for iOS	Apps available globally on Google Play and Apple App Store.
	Renesas Wi-Fi Provisioning Tool for Android	

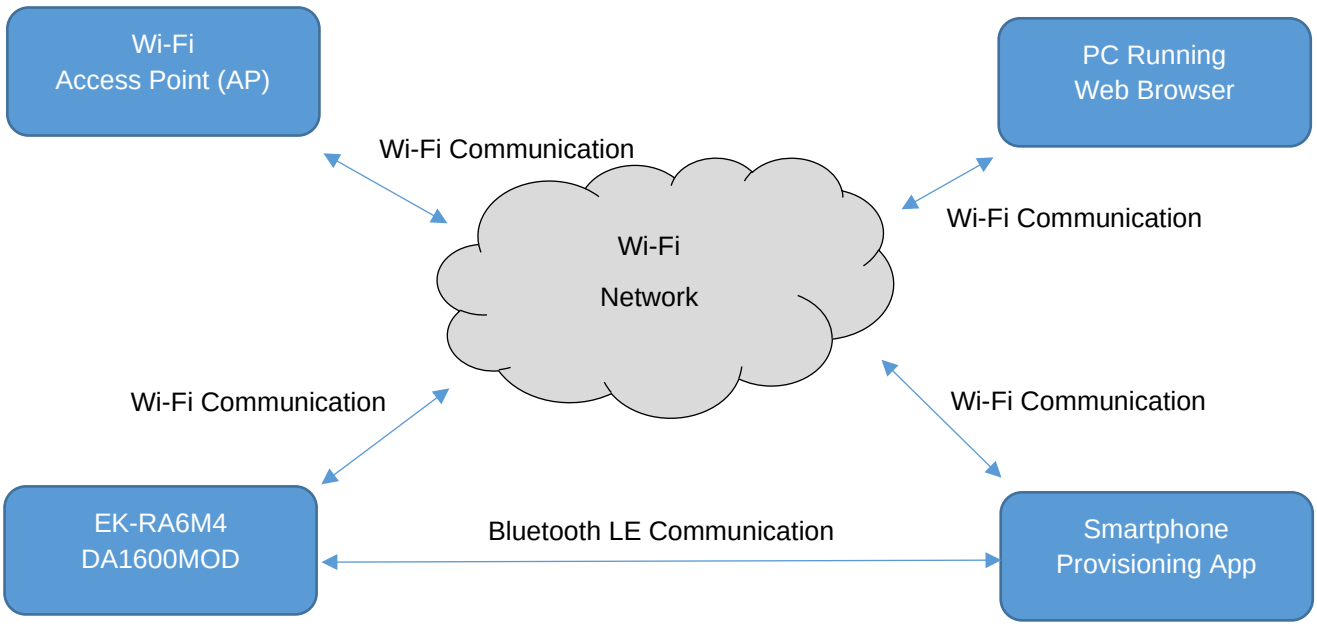
2. Features

- System power supplied by micro USB cable
- RA6M4 MCU reads measured data from HS3001 temperature and humidity sensor
- BLE connectivity provided by DA16600 allows easy provisioning to Wi-Fi networks
- Wi-Fi connectivity allows the web browser to display raw humidity and temperature values

3. Overview

The DA16600 Module contains both Wi-Fi and Bluetooth LE radios. A typical use case for such a module is to use the Bluetooth LE interface to quickly and easily join (provision) the Wi-Fi radio to an existing network. This demonstration uses an app running on a smartphone to provision the DA16600 module to an existing Wi-Fi network by using the Bluetooth LE interface to select the network and enter the password.

After the DA16600 is provisioned to the network, the RA6M4 Microcontroller reads temperature and humidity data via the HS3001 sensor and embeds this information into a simple webpage. This data can be displayed by connecting a PC to the same Wi-Fi network as the DA16600 and then using a web browser to view the webpages served by the RA6M4 Microcontroller.



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4. Build Environment

The example application was developed using the following environment.

Item	Description
IDE	e^2 Studio 2023-04
C Compiler	GCC ARM Embedded 10.3.1.20210824
FSP	4.5.0
RTOS	None
Emulator	On board (J-LINK)

If this environment is not already installed, see the Official Renesas RA Family Beginner's Guide for complete installation instructions.

5. Building and Downloading

When the build environment is installed, import the project contained within the zip file into e^2 Studio and build the Debug or Release targets. Then, load the application onto the EK-RA6M4 board using the debugger. If you are not familiar with the build/debug process, see sections 5, 7 and 8 in the Official Renesas RA Family Beginner's Guide.

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6. Preparing the Demo

6.1 Download the Smartphone Application

The DA16600 module is provisioned to a Wi-Fi network using a smartphone application that is available on the Apple App and Google Play stores. This app can be downloaded using the following QR code links:

Download on the App Store

GET IT ON Google Play

6.2 Obtain Wi-Fi Network Details

You will need to know the SSID and password of the Wi-Fi network to which you want to provision the DA16600 module. When you have this information, keep them at hand because they are required in the next section.

6.3 Status Indication

The red, green, and blue LEDs on the EK-RA6M4 evaluation kit board indicate the status of the demo software as follows:

LED State	Description
	Device is booting.
	Device is waiting to be provisioned to a Wi-Fi network.
	Device is provisioned and waiting to join a Wi-Fi network.
	Device is provisioned and connected to a Wi-Fi network.
	Device is provisioned, connected to a Wi-Fi network, and a TCP client is connected.
	An error has occurred; check boards are connected correctly and restart.

6.4 Start the Hardware

Apply power to the EK-RA6M4; the red, green, and blue LEDs should illuminate for a few seconds while the device boots. When completed, the red LED should begin to blink indicating the demo is ready to be provisioned to a Wi-Fi network.

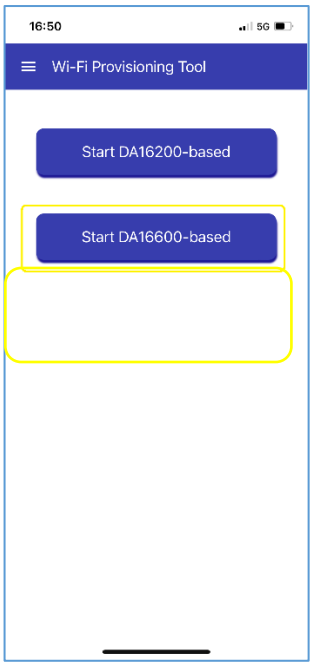
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7. Running the Demo

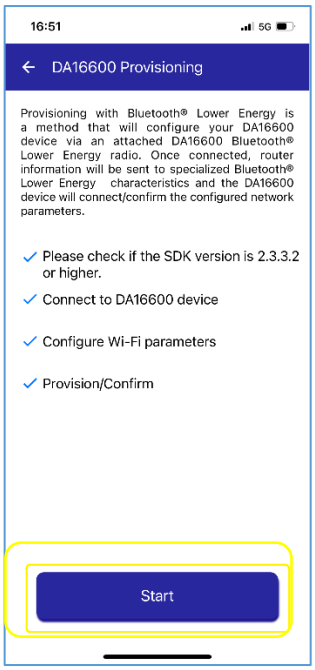
7.1 Provision Module to Wi-Fi Network

Open the Wi-Fi Provisioning Tool application on your smartphone and then perform the following steps.

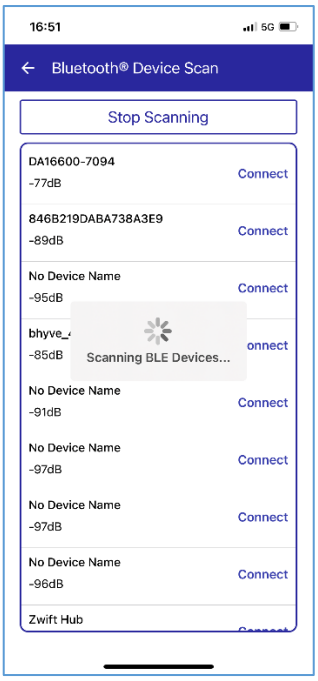
Note: The following instructions are based on the use of an iOS device. When using an Android device the interface may appear different.



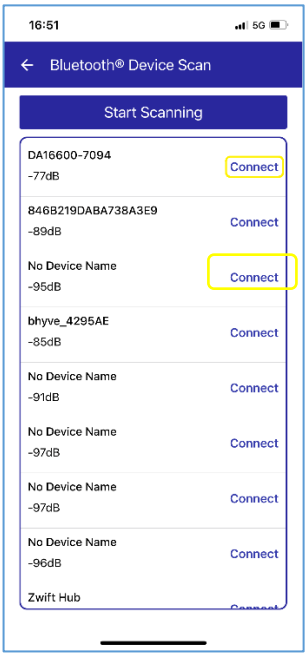
Step 1: Start the Wi-Fi Provisioning Tool and select the **Start DA1600-based** option.



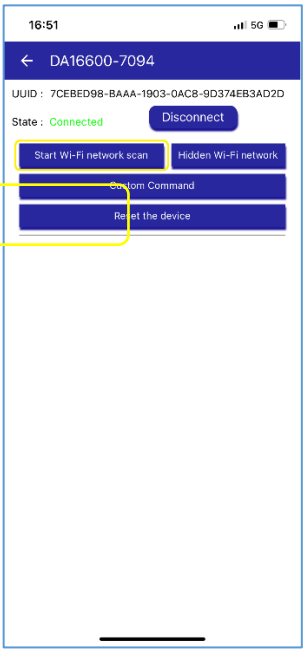
Step 2: Press the **Start** button to begin scanning the DA16600 device.



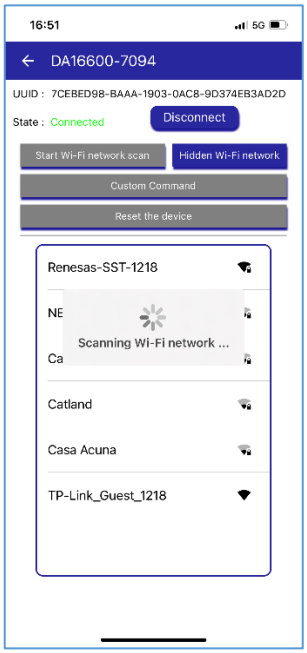
Step 3: Devices discovered during the scan are listed in the display.



Step 4: When the scan is complete press the **Connect** button next to the DA16600-xxxx device.

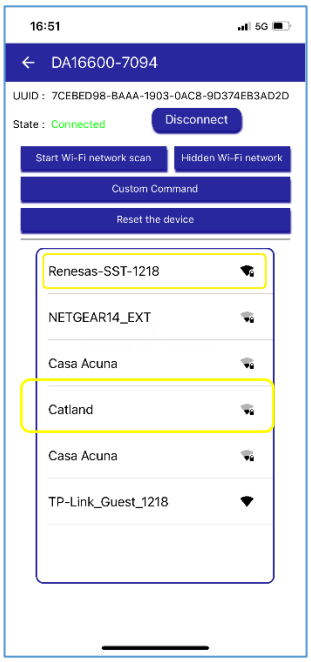


Step 5: When connected press the **Start Wi-Fi network scan** button to start searching for a Wi-Fi network to join.

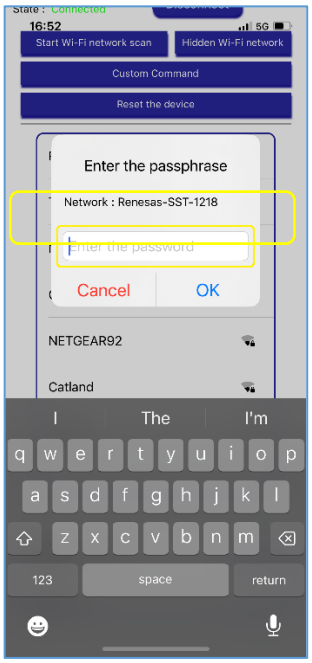


Step 6: The DA16600 starts searching for available Wi-Fi networks.

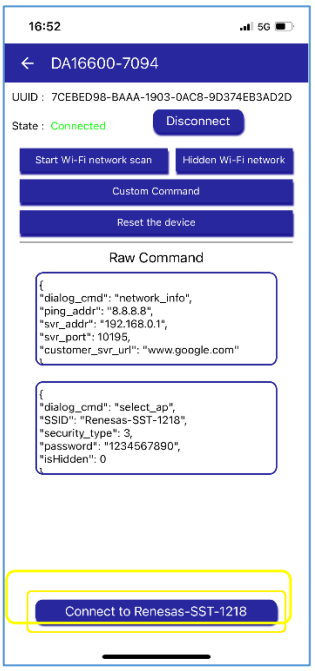
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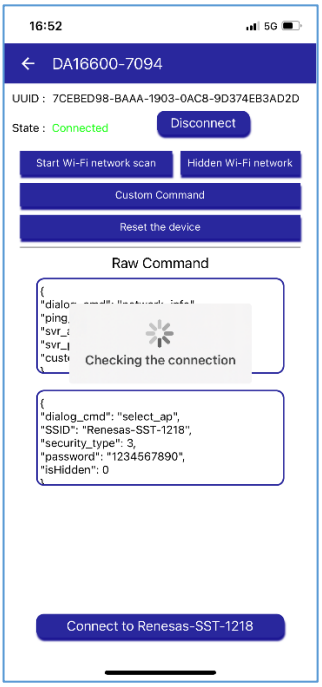
Step 7: Select the Wi-Fi network you want the DA16600 to join.



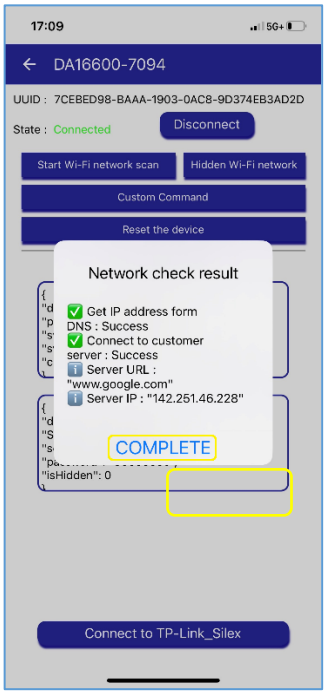
Step 8: Enter the password for the Wi-Fi network then press **OK**.



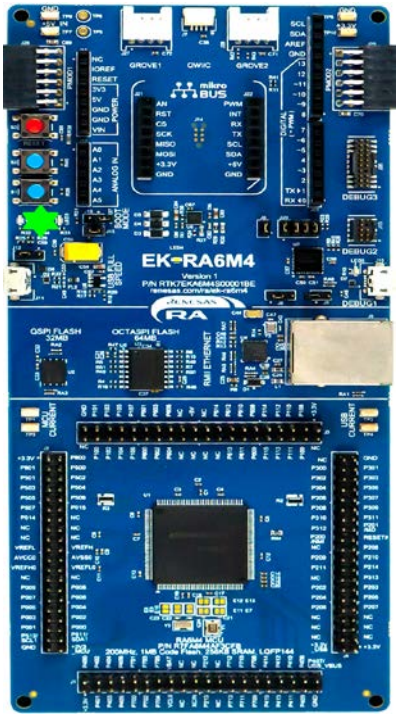
Step 9: Connect the DA16600 device to the select Wi-Fi network by pressing the **Connect to xxx** button.



Step 10: The DA16600 attempts to connect to the select network. This might take up to 1 minute.



Step 11: When connected to the Wi-Fi network, press **Complete** to finish the process.



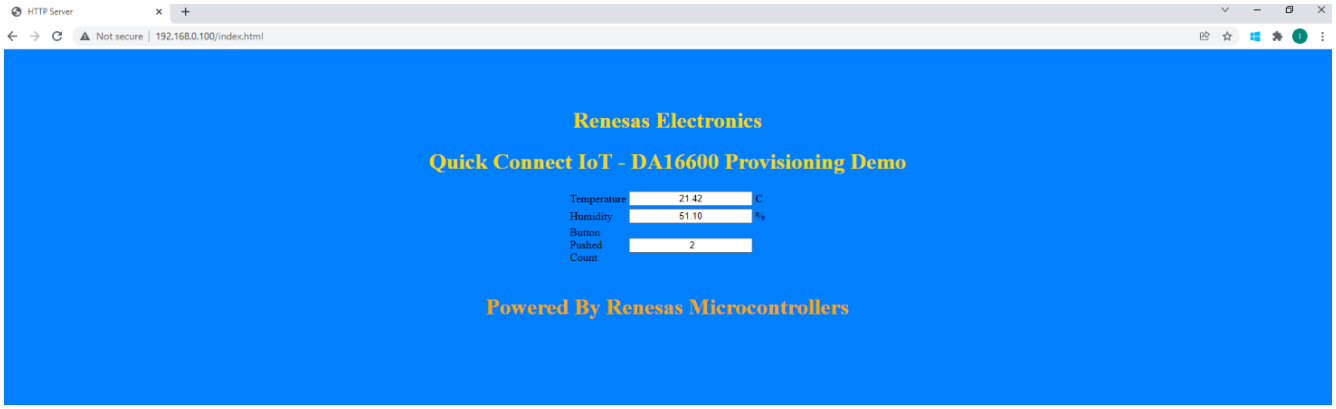
Step 12: When provisioning is completed, the red LED on the EK-RA6M4 EK turns on. It turns green when the DA16600 has connected to the Wi-Fi network.

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7.1 View Sensor Data

Now that the DA16600 Module has been provisioned to a Wi-Fi network, the sensor data can be read using a web browser as follows:

1. Discover the IP Address of the DA16600. To do this, log in to the Wi-Fi AP that the DA16600 joined and determine what IP address it has been assigned. The assigned IP address is also output using the serial debug interface and can be viewed using the Segger J-Link RTT Viewer.
2. Use a web browser to access the sensor data. When the browser has connected to the DA16600, the blue LED on the EK-RA6M4 turns on.
3. Press the S1 button on the EK-RA6M4 and the value displayed in the **Button Push Count** field increments.



7.2 Resetting the Demo

When provisioned, the DA16600 stores information about the Wi-Fi network it has joined in non-volatile memory, allowing it to re-join the network if it is reset or the power is turned off and on. If you want to provision the DA16600 to a different Wi-Fi network, this information must be erased. This can be achieved using the following procedure:

1. Press and hold button S2 on the EK-RA6M4 board.
2. Press and release the reset button (S3) on the EK-RA6M4 board.
3. Release button S2 on the EK-RA6M4 board. The RED led on the EK-RA6M4 should now be flashing, indicating the DA16600 is not provisioned.

8. Starting Development with the Application Project

The source code used to create the demo project is also included in the zip bundle. This project can be imported into the RA Flexible Software Package (FSP), version 4.5 or higher. The FSP must be downloaded and installed on a Windows or Linux machine. The e2 studio IDE is included as part of the FSP install. For more information on the FSP and how it can be downloaded and installed to your local machine, see the resource links in the following section.

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9. Reference Documents

- Renesas Quick-Connect
- Renesas RA6M4 MCU
- EK-RA6M4
- Renesas RA Flexible Software Package (FSP)
- Renesas DA16600MOD
- Renesas HS3001
- Technical Updates / News - The latest information can be downloaded from the Renesas Electronics Website.

Website and Support:

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- Inquiries

10. Revision History

Revision	Date	Description
2.00	Sep 6, 2023	Updated to be compatible with FSP 4.5.0 and latest version of Wi-Fi Provisioning Tool.
1.00	Jul 5, 2022	Initial release.

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