Using Matter Door Lock with RAFW Connectivity Devices

This application note provides guidance on importing, compiling, flashing, and testing the Matter Door Lock reference application on RAFW connectivity devices.

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Terms and Definitions

DPM	Dynamic Power Management
EVB	Evaluation Board
FSP	Flexible Software Package
IDE	Integrated Development Environment

1. Introduction

Matter is a unified, open-source application-layer connectivity standard designed to enable developers and device manufacturers to connect and build reliable, secure ecosystems and increase compatibility among connected home devices.
This document provides an overview of the Matter Door Lock application developed on the RA6W1 platform using Easy Setup for initial provisioning, followed by the implementation on the RA6W2 platform with device provisioning over Bluetooth® Low Energy (LE). It also covers the complete process of importing, compiling, flashing, and testing the reference Door Lock application within the Matter environment.

2. Hardware Setup

Figure 1 shows the basic element of Matter network (Hub, Device, and Controller) and how the network is linked together remotely. Matter accessory applications (lights and door locks) can be tested and developed on the device, RA6W1, and RA6W2 Evaluation Board (EVB).



Figure 1. Basic elements of Matter network

- Hub: Matter smart hubs such as Apple HomePod mini, Google Nest Hub, and Amazon Echo Dot
- Controller: Mobile apps such as Apple Home, Google Home, and Amazon Alexa
- Device: RA6W1 EVB or RA6W2 EVB.

3. Software Setup

To develop Matter applications on the RA6W1 and RA6W2 using the Matter module, install and set up the Renesas Electronics e^2 studio IDE.
To set up the development environments:

1. Install and configure the e^2 studio IDE version 2026-04.3.
2. Use GCC Arm Embedded Toolchain: Version 13.3.1 arm-13-24.
3. Download the RAFW FSP version 2.2.0 or later from the Renesas Electronics website.
4. Load the Matter Application project template in e^2 studio.
5. Change the Matter Application in the reference project. Build the application project.
6. Program firmware image.
7. Debug with J-Link.

3.1 Install e^2 studio IDE

To install e^2 studio, download and run the e^2 studio platform installer for your operating system (Windows, Linux, or macOS). For detailed installation instructions, see the Install e^2 studio IDE for Windows, Linux, and macOS sections in *RA6W1/RRQ61001 Application Development Guide*.

- **Platform Installer**
  - File: `setup_rafwfsp_v2_1_0_e2s_v2026-04.2.exe`
  - Download from the RAFW FSP GitHub Releases page - Releases·renesas/rafw-fsp.
- **GNU Arm Embedded Toolchain**
  - File: `gnu-toolchain-13.3.rel1-mingw-w64-i686-arm-none-eabi.zip`
  - Download from the official Arm GNU Toolchain website.

3.2 Download Reference Door Lock Template

Download the example templates and FSP pack files from the Renesas Electronics website (https://www.renesas.com/en/products/ra6w1).

- The RAFW FSP Examples (2.2.0 or later) package can be downloaded from the Renesas website using the following path:

Renesas Website > Software & Tools > Software Downloads > RAFW FSP Examples (2.2.0 or later)
Access the RAFW FSP Examples from the RA6W1 Software & Tools page.

- The `RAFW_FSP_Packs_ (v2.2.0 or later)` pack can be downloaded from the Renesas website using the following path:

Renesas Website > Software & Tools > Software Downloads > RAFW Flexible Software Package
Clicking the RAFW Flexible Software Package navigates to the download page for `RAFW_FSP_Packs_(v2.2.0.` or later)
Matter Door lock reference application for RA6W1 and RA6W2:

- A sample project template for RA6W1– `matter_wifi_lock_ek_ra6w1` is available in `application_projects/r19an0438/Matter_Wifi_Lock_Application/` in the downloaded `RAFW FSP Examples (2.2.0 or later).zip`
- A sample project template for RA6W2 – `matter_wifi_lock_ek_ra6w2` is available in `application_projects/r19an0438/Matter_Wifi_Lock_Application/` in the downloaded `RAFW FSP Examples (2.2.0 or later).zip`

3.3 Load Matter Application Project Template in e^2 studio

1. Extract the project template `matter_wifi_lock_ek_ra6w1` for RA6W1 and launch e^2 studio. Choose `matter_wifi_lock_ek_ra6w2` Door Lock application on RA6W2.
2. To import project template, go to **File** > **Import**.
3. Under the **General** folder, select **Rename and Import Existing C/C++ Project into Workspace**.

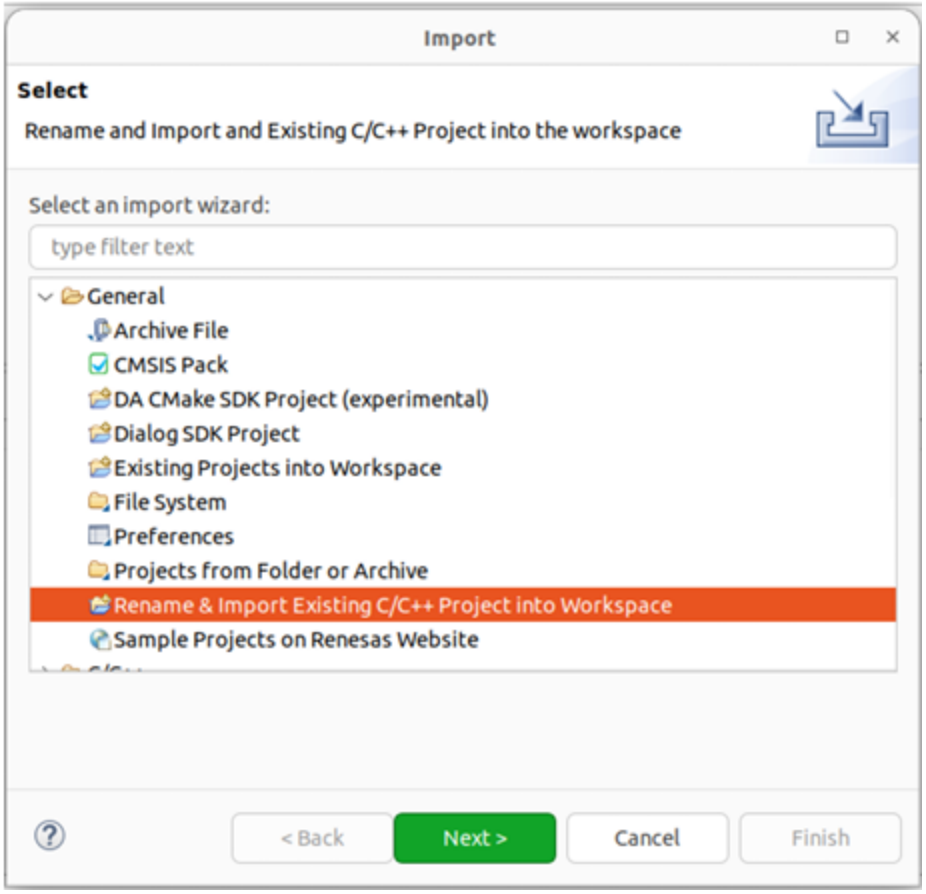


Figure 2. Rename and import

4. Navigate to the project template directory, unzip `matter_wifi_lock_ek_ra6w1`, and enter the project name.
5. The *zap_generated* files, which include the cluster and endpoint feature configurations, are generated using the ZAP tool integrated into e² studio.Renesas provides the **Renesas QE for Matter tool** for configuring and generating the required ZAP files. To add and use the Renesas QE for Matter tool to generate zap_generated files for the Matter Door Lock application, see the Renesas QE for Matter section in *Wi-Fi Matter Quick Start Guide*.
6. To build the project, right-click the project, and then select **Build Project**.

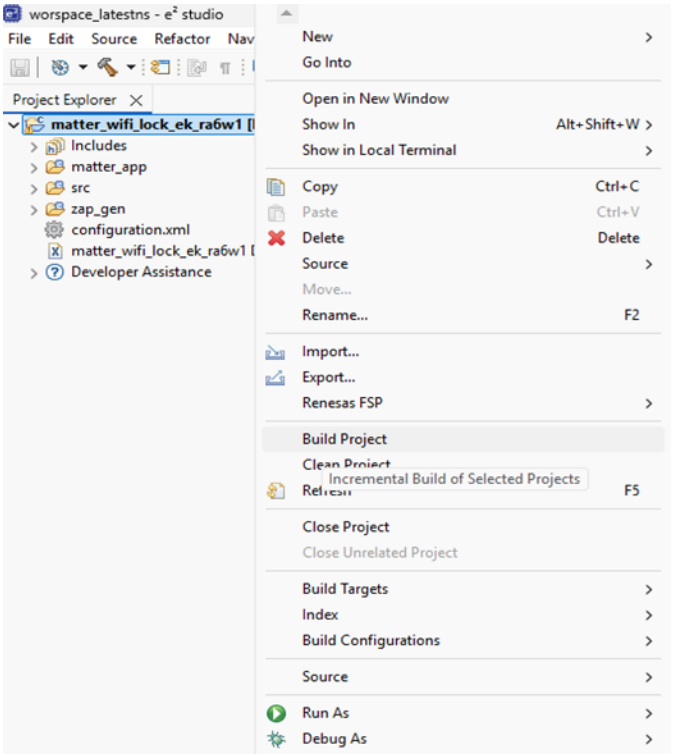


Figure 3. Build project

7. Check the console window shown in Figure 4 to confirm that the build is progressing.

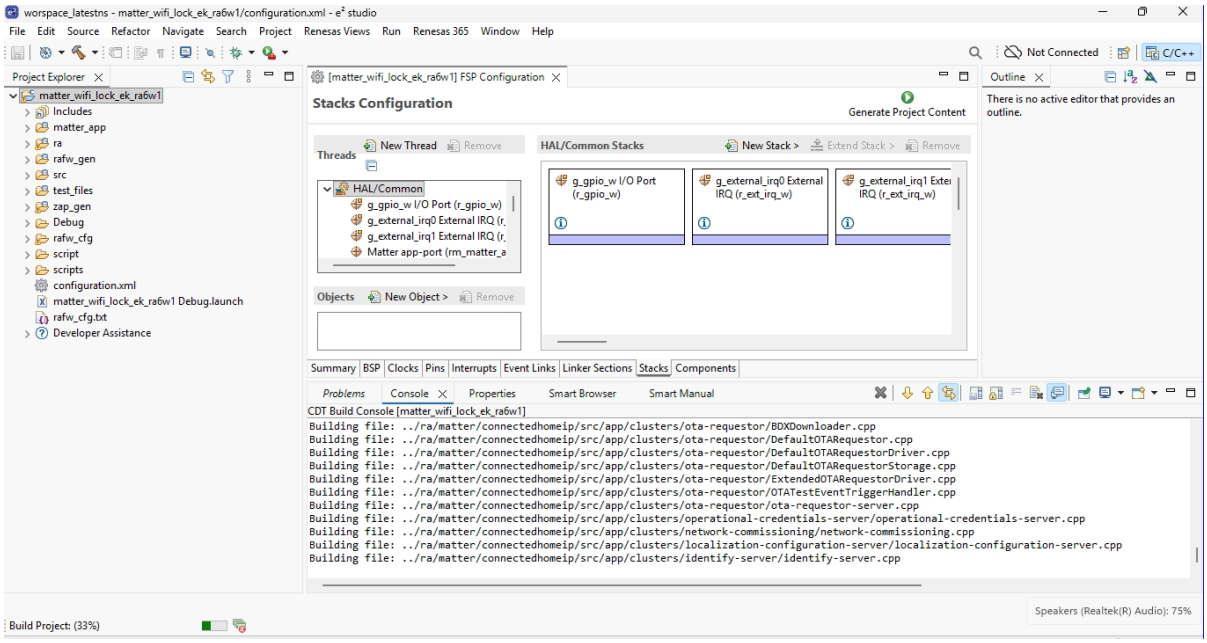


Figure 4. Console window

Figure 5 shows the successfully completed build.

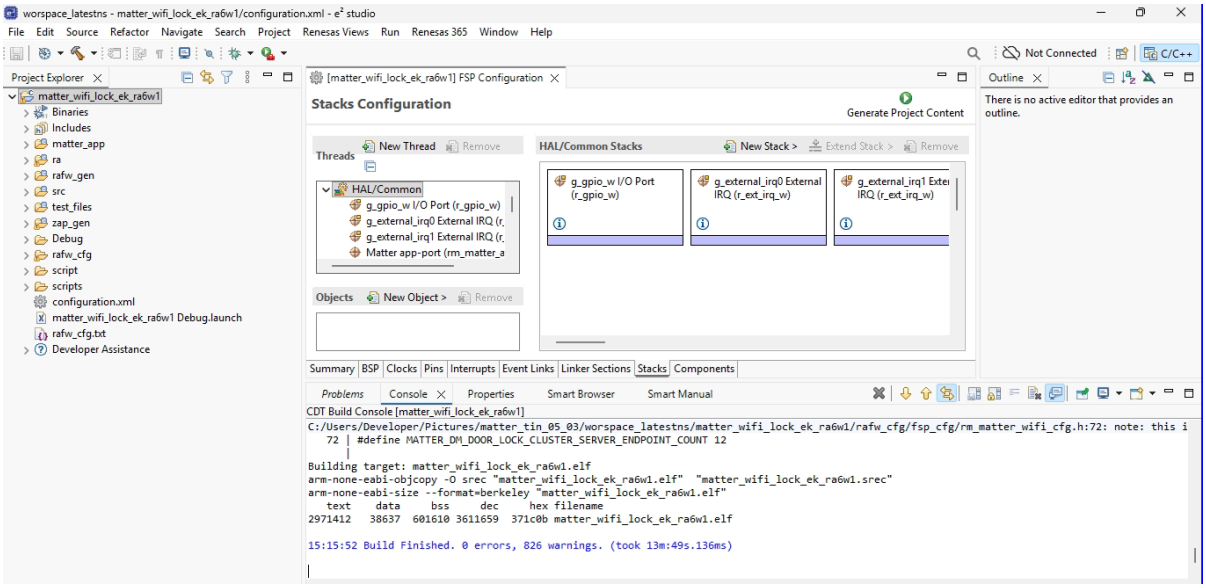


Figure 5. Successful build

3.4 Flash Firmware to Hardware

After compilation, the `.img.bin` file can be found in the `Debug` folder as shown in Figure 6.

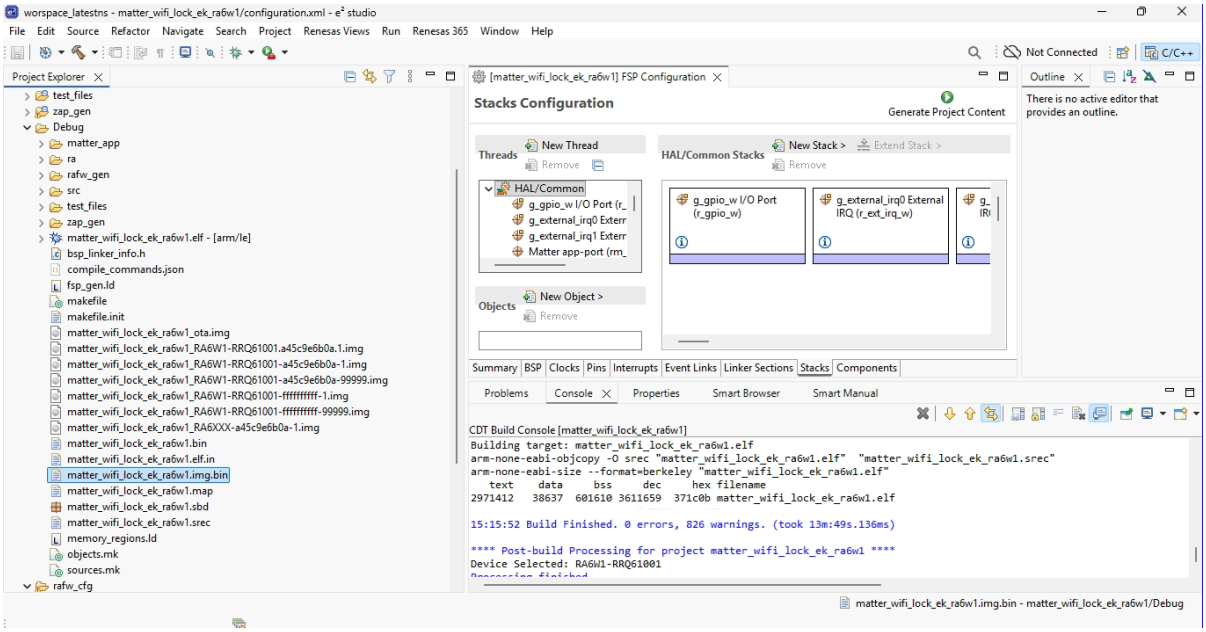


Figure 6. Debug folder

The firmware image is generated and flashed onto the EK-RA6W1 or EK-RA6W2 using e^2 studio with J-Link support. e^2 studio provides an integrated build and flash environment, eliminating the need for external flash programming scripts.

To flash the firmware image:

1. Open e^2 studio and connect your EK-RA6W1 board or EK-RA6W2 to the PC through the USB (using the inbuilt SEGGER J-Link).
2. Go to **Debug Configurations**, and then on the **Startup** tab, select your `.img.bin` firmware file.
3. Click **Apply**, and then click **Debug**.

e^2 studio automatically flashes the firmware image to the RA6W1 and RA6W2.

4. Configure the Google Nest Hub on Home Application

To integrate a Google Nest device with the Google Home application, follow these steps:

1. Install the Google Home application from the Google Play Store (Home Application) or Apple App (Home Application), depending on the mobile device being used.
2. Power on the Google Nest device and ensure that it is in Setup mode.
3. Connect the mobile device to the Wi-Fi network that will be used for the Nest device.
4. Open the Google Home application, and then select the **Add Device** option.
5. Choose **Set Up Device**, and then select **New Device** to initiate the discovery process.
   The application automatically searches for nearby compatible devices. After the Google Nest device is detected, proceed with the on-screen instructions.
6. If prompted, confirm the device identification code, and then select the appropriate Wi-Fi network.
7. Complete the setup by assigning the device to a specific room and finalizing the configuration.

After successful completion of these steps, the Google Nest device is connected to the Google Home application and is available for control and management through the application interface.

For setting up the Google Nest hub, see the following videos:

- Google Nest Hub: How to Update/Change WiFi Password & Network Name (SSID)
- How to Add Google Nest Hub to the Google Home App – First Connection Guide

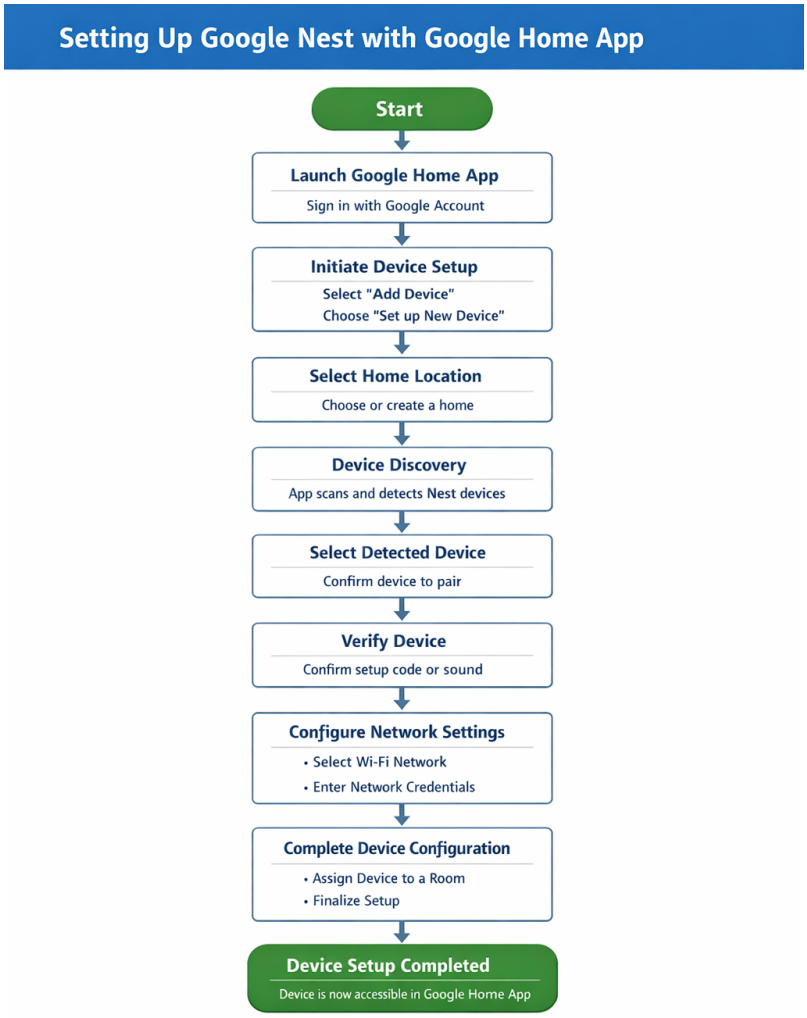


Figure 7. Google Nest hub configuration

5. Testing Procedures

This section provides a detailed overview of testing the Matter Door Lock reference application on RA6W1 and RA6W2. In RA6W1, provisioning is performed using the Easy Setup method, whereas in RA6W2, provisioning is carried out over Bluetooth® LE.

5.1 Access Serial Console of RA6W1 and RA6W2

You can access the serial console of the RA6W1 and RA6W2 using terminal applications such as Tera Term on Windows and Minicom on Linux systems.
To access the serial console:

- For Windows (Using Tera Term)
  a. Download Tera Term from the official release page: https://github.com/TeraTermProject/teraterm/releases. For a 64-bit Windows PC, you can download the installer directly from https://github.com/TeraTermProject/teraterm/releases/download/v5.6.1/teraterm-5.6.1-x64.exe.
  b. Install the application and launch Tera Term.
  c. T o open the serial console, select the appropriate COM port corresponding to the RA6W1 device e.
- For Linux (Using Minicom)
  a. Download Minicom from https://linux.softpedia.com/get/Communications/Telephony/minicom-753.shtml. Alternatively, install Minicom using the package manager: `sudo apt install minicom`.
  b. Configure Minicom using `sudo minicom -s`.
  c. Set the correct serial device (for example, `/dev/ttyUSB0`) and the baud rate as required.
  d. Start Minicom to access the RA6W1 and RA6W2 serial console.

5.2 Configure Tera Term for RA6W1 and RA6W2 Serial Console

1. Open the Tera Term application on the Windows system.
2. In the initial dialog box, select the appropriate serial (COM) port corresponding to the RA6W1 device, as shown in Figure 8, and click **OK**. See the Set Up RA6W1 EVK section in *RA6W1/RRQ61001 Application Development Guide*.

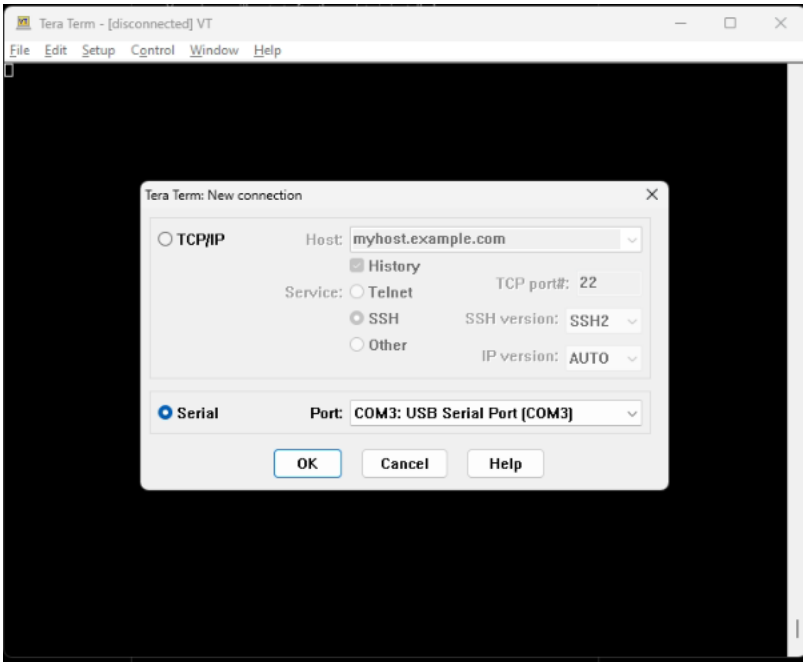


Figure 8. Serial port selection

3. To configure Terminal settings, go to **Setup** > **Terminal**, and set **Receive** to **AUTO** and **Transmit** to **CR+LF**, then click **OK**.

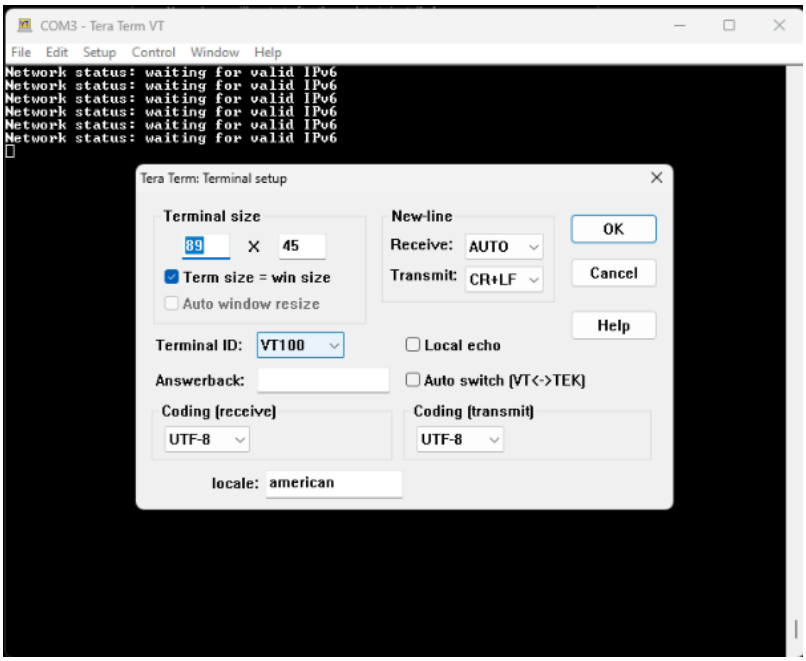


Figure 9. Configurations for Tera Term

To set the Baud rate, go to **Setup** > **Serial Port**, set the Baud rate **Speed** to **115200**, and ensure other serial parameters are configured correctly, as shown in Figure 10.

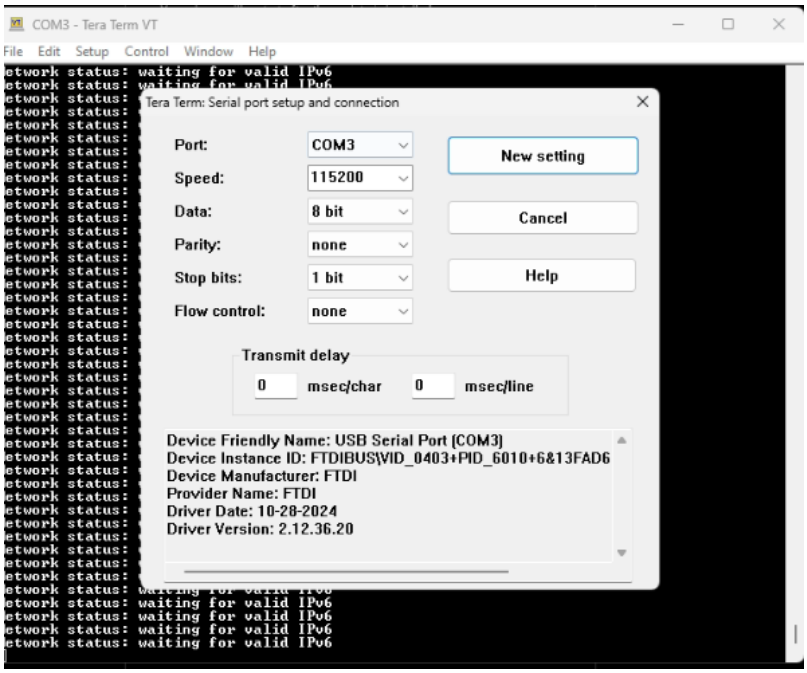


Figure 10. Serial baud rate setup

5.3 Testing in RA6W1 (Provisioning over Wi-Fi)

After flashing, press the **Reset** button on RA6W1 EVK to start execution.

5.3.1 Connect Device to Wi-Fi

If the RA6W1 device has already been commissioned and paired with a Nest Hub, perform a factory reset to clear the existing commissioning data before proceeding. If the device is already connected to a hub, use the factory reset command from the console of RA6W1.
On the RA6W1 console, execute the `factory` command, as shown in Figure 11. Confirm the factory reset operation and verify that the **Start Factory-Reset** action is displayed in the console window.



Figure 11. Factory reset action

After the factory reset, the RA6W1 device loses Wi-Fi connectivity and must be reconnected to the Wi-Fi network. This application note is intended for testing the Door Lock application. Currently, the Easy Setup method is used for Wi-Fi provisioning, and no alternative provisioning method is currently available .

On the RA6W1, the Wi-Fi connection is established using the Easy Setup method. In the RA6W1 console, enter the `setup` command , and a screen similar to the one shown in Figure 12 is displayed.

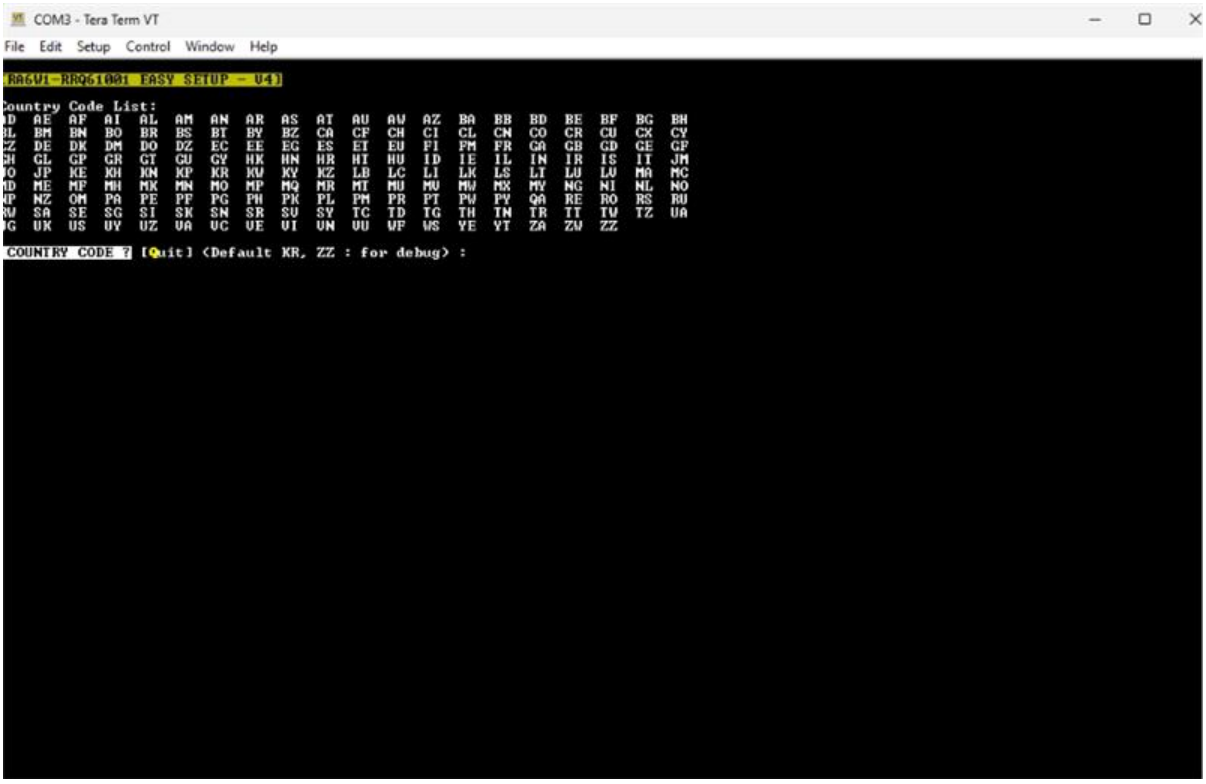


Figure 12. Setup window

- Enable Device Power Management (DPM) and apply the default configuration settings.
- Complete the connection process and wait to establish the Wi-Fi connection successfully.

When the device is successfully connected to the network, a screen similar to the one shown in Figure 13 is displayed.

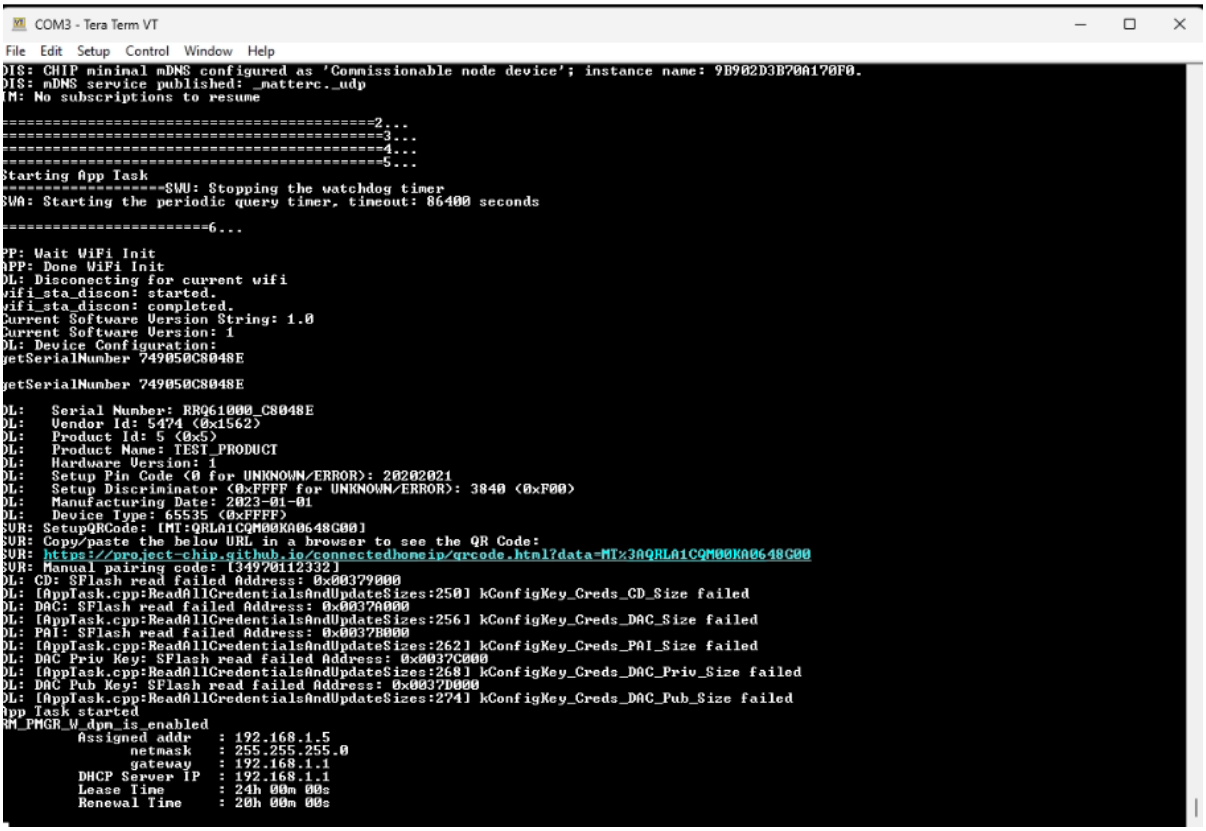


Figure 13. Confirmation screen after Wi-Fi connection

5.3.2 Add Device in Google Home App

The device can be added to Google Nest using either a pairing code or by scanning the device QR code. Both approaches are explained in the following sections.

5.3.2.1 Add the Device Using a Pairing Code

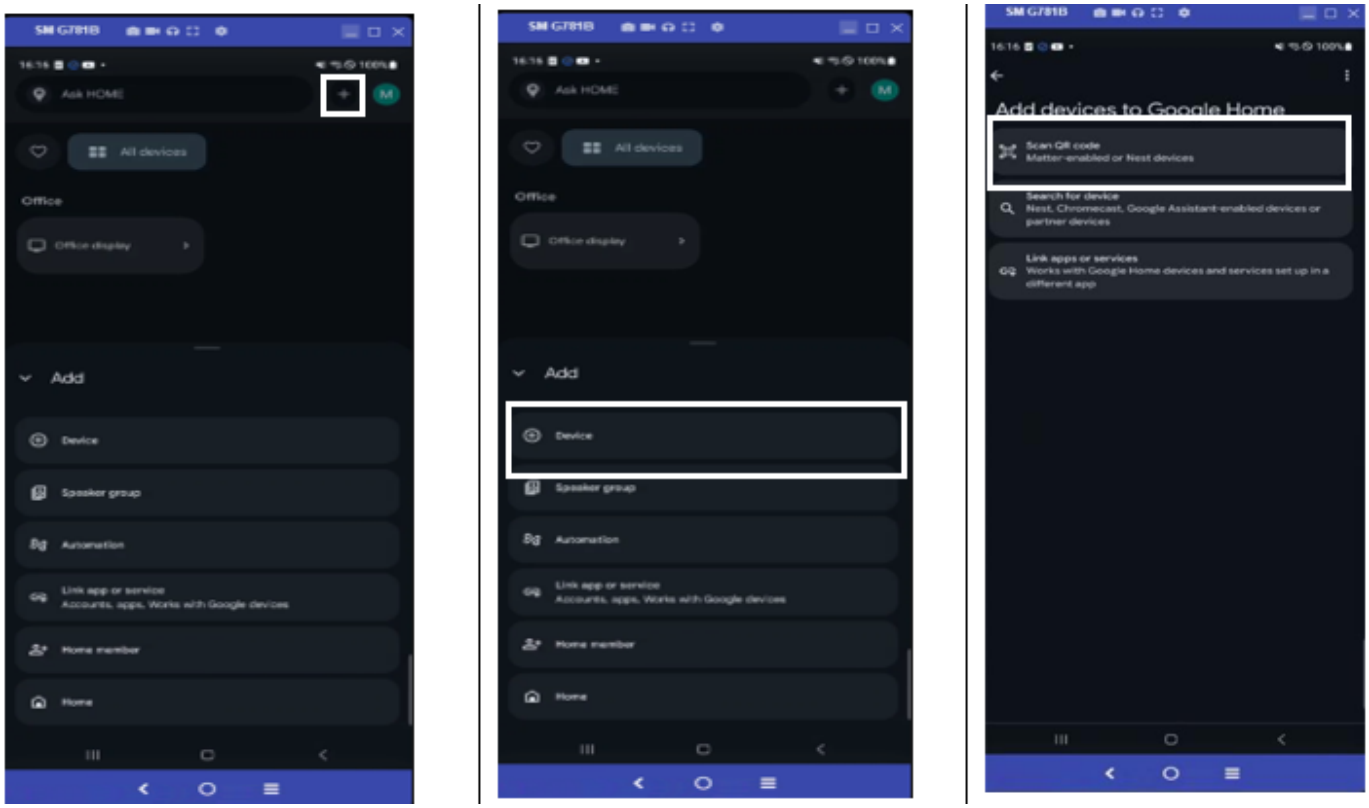


Figure 14. Configuring Google Nest Hub

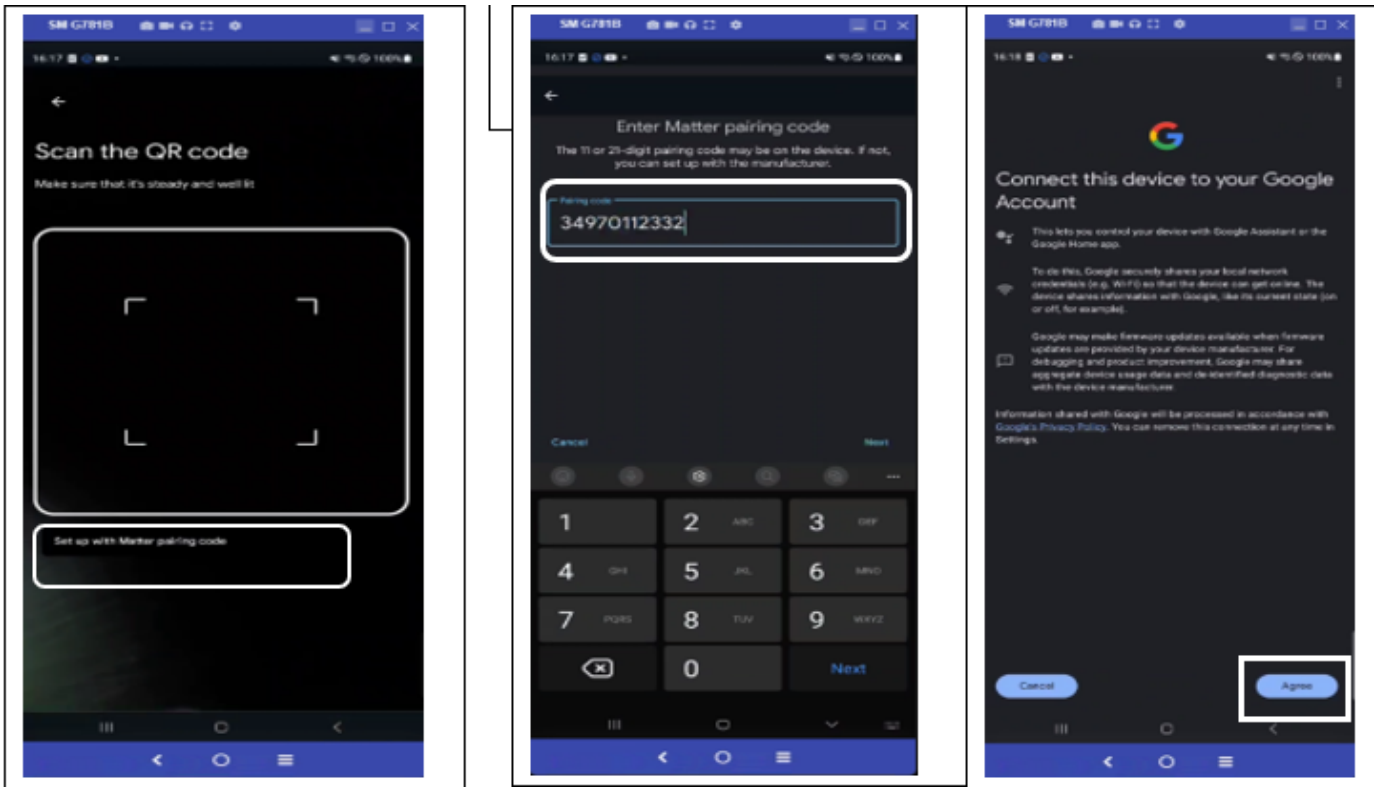


Figure 15. Configurations continue

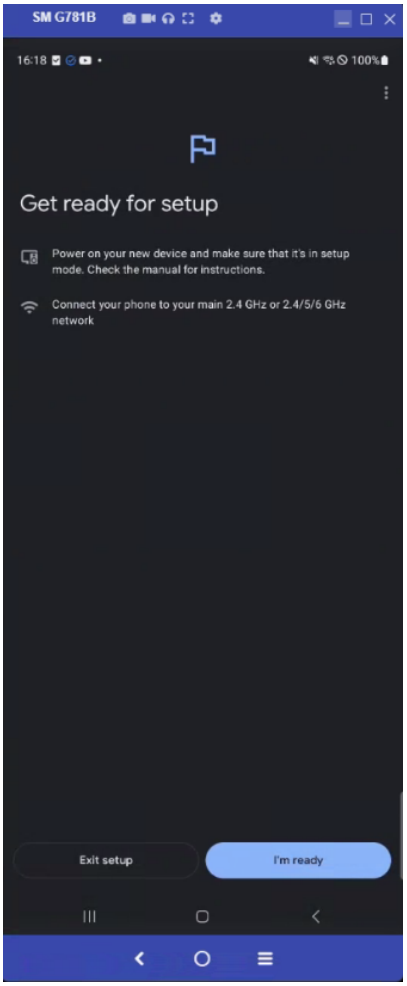


Figure 16. Starting setup process

NOTE
Before proceeding with the Set Up Anyway step shown in Figure 12, you must wait for the device to reboot and confirm that the "App Task started" message appears on the RA6W1 console, as shown in Figure 18. This step is mandatory; otherwise, the Matter commissioning process fails.

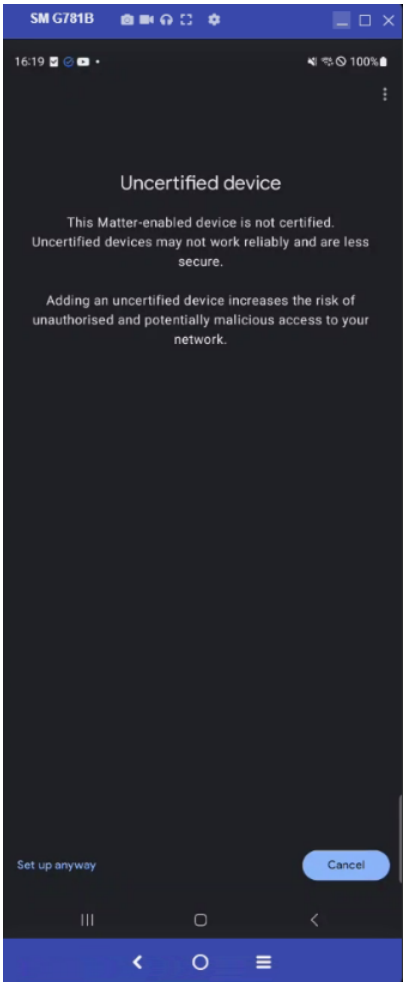


Figure 17. Set up anyway screen

```
P: Wait WiFi Init
PP: Done WiFi Init
L: Disconecting for current wifi
ifi_sta_discon: started.
ifi_sta_discon: completed.
urrent Software Version String: 1.0
urrent Software Version: 1
L: Device Configuration:
L:    Serial Number: RRQ61000_C8048E
L:    Vendor Id: 65521 (0xFFF1)
L:    Product Id: 32774 (0x8006)
L:    Product Name: TEST_PRODUCT
L:    Hardware Version: 1
L:    Setup Pin Code (0 for UNKNOWN/ERROR): 20202021
L:    Setup Discriminator (0xFFFF for UNKNOWN/ERROR): 3840 (0xF00)
L:    Manufacturing Date: 2023-01-01
L:    Device Type: 65535 (0xFFFF)
VR: SetupQRCode: [MT:8IXS1AFN00KA0648G00]
VR: Copy/paste the below URL in a browser to see the QR Code:
VR: https://project-chip.github.io/connectedhomeip/qrcode.html?data=MT%3A8IXS1AFN00KA0648G00
VR: Manual pairing code: [34970112332]
L: CD: SFlash read failed Address: 0x00379000
L: [AppTask.cpp:ReadAllCredentialsAndUpdateSizes:250] kConfigKey_Creds_CD_Size failed
L: DAC: SFlash read failed Address: 0x0037A000
L: [AppTask.cpp:ReadAllCredentialsAndUpdateSizes:256] kConfigKey_Creds_DAC_Size failed
L: PAI: SFlash read failed Address: 0x0037B000
L: [AppTask.cpp:ReadAllCredentialsAndUpdateSizes:262] kConfigKey_Creds_PAI_Size failed
L: DAC Priv Key: SFlash read failed Address: 0x0037C000
L: [AppTask.cpp:ReadAllCredentialsAndUpdateSizes:268] kConfigKey_Creds_DAC_Priv_Size failed
L: DAC Pub Key: SFlash read failed Address: 0x0037D000
L: [AppTask.cpp:ReadAllCredentialsAndUpdateSizes:274] kConfigKey_Creds_DAC_Pub_Size failed
pp Task started
M_PMGR_W_dpm_is_enabled
```

Figure 18. Set up anyway confirmation prints

Continue with the commissioning process, as shown in Figure 19.

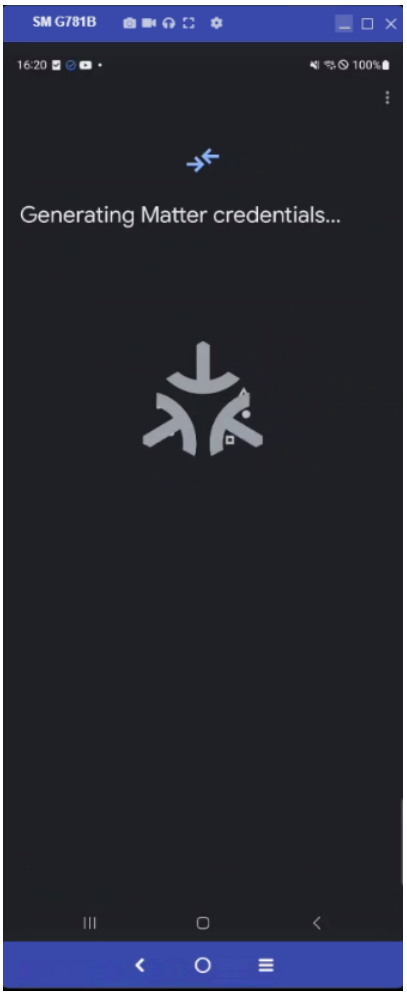


Figure 19. Generating Matter credentials

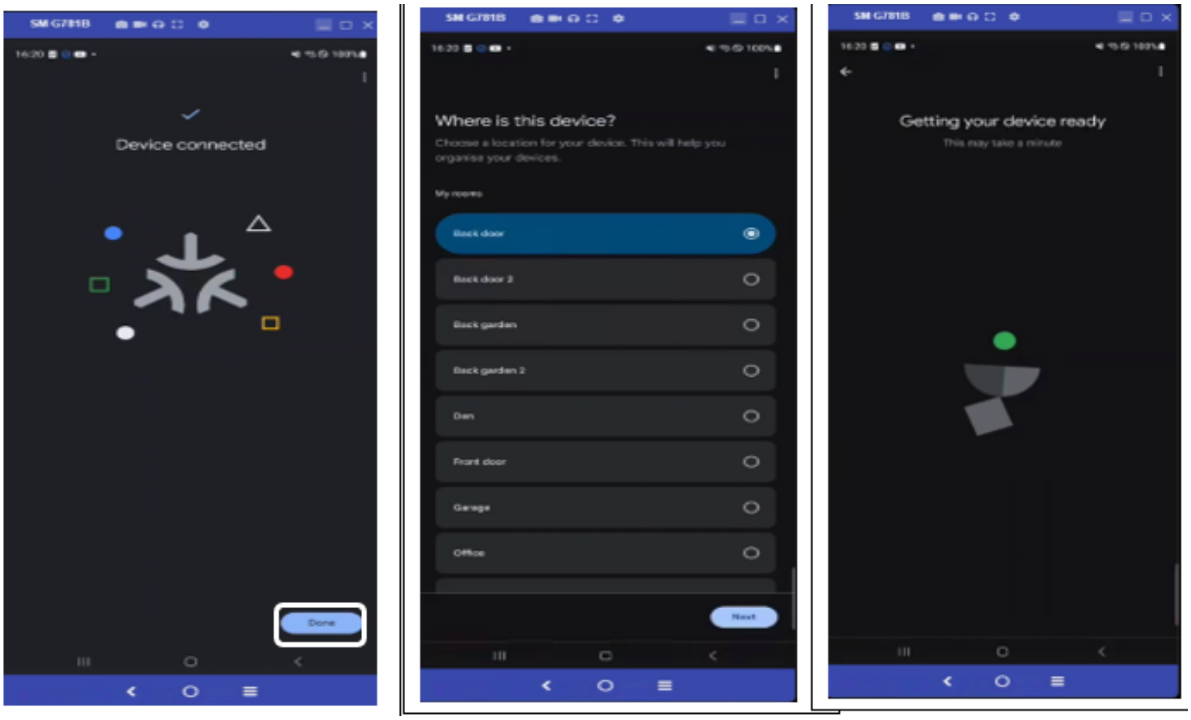


Figure 20. Successful connection of device to Google Nest Hub

5.3.2.2 Add the Device by Scanning the QR Code of Matter-enabled Device

When the device is successfully connected to the access point (network), as described in Section 5.3.1 Connect Device to Wi-Fi, a URL is displayed on the serial console, as shown in Figure 21.
Copy and paste this URL into any web browser to access the commissioning page. A QR code is generated, as illustrated in Figure 22.
Use the Google Home application and select the **Scan QR Code** option (see Figure 14) to scan the generated QR code and proceed with the commissioning process.

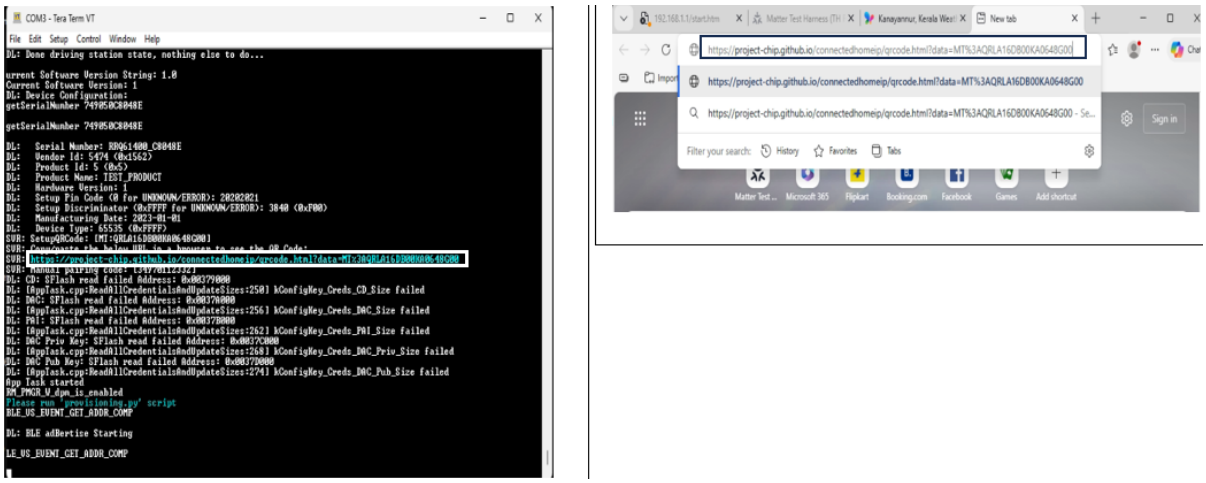


Figure 21. Generation of QR code

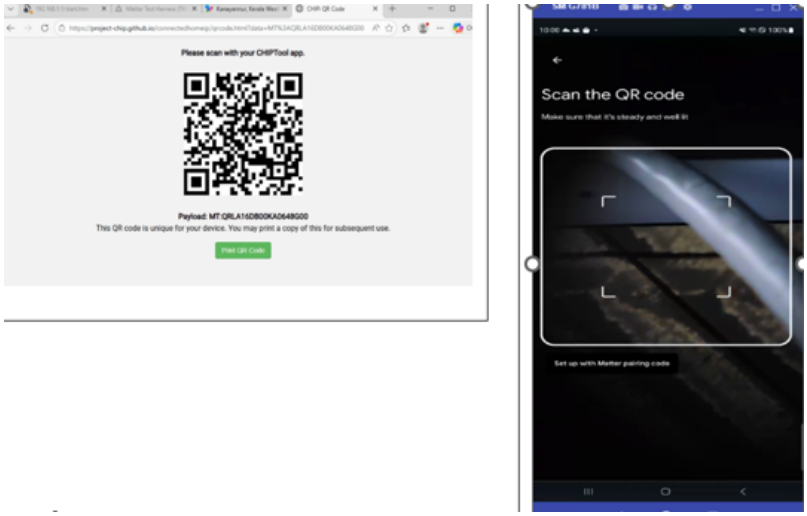


Figure 22. Scanning QR code

5.3.3 Testing the Application

5.3.3.1 Lock Action

While performing the lock operation in the home application, the message “Lock Action has been Completed” is displayed on the console.

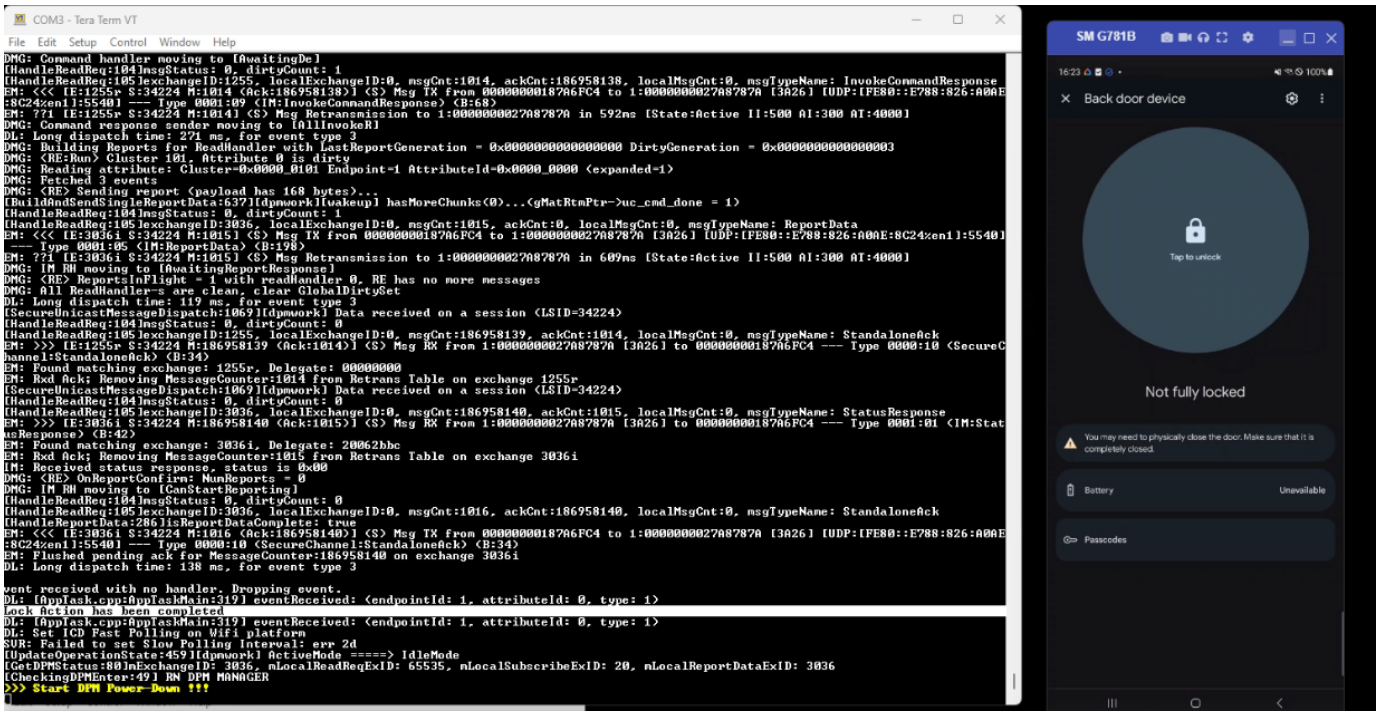


Figure 23. Lock action

5.3.3.2 Unlock Action

Unlocking the device through the application results in a “Unlock Action has been completed” message displayed on the console.

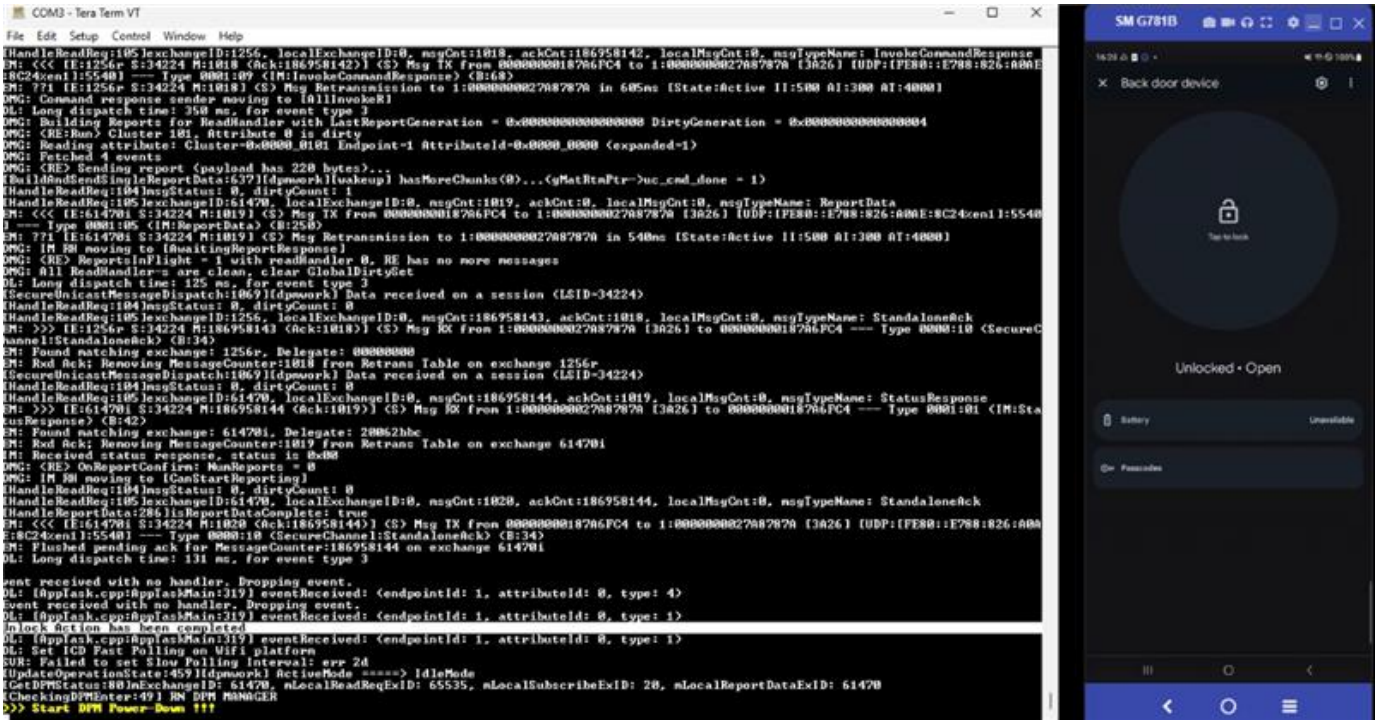


Figure 24. Unlock action

5.4 Testing in RA6W2 (Provisioning over Bluetooth® LE)

The only difference lies in the initial provisioning process. In RA6W2, provisioning is performed using Bluetooth® LE. After flashing the image, press the **Reset** button, and the device console is displayed as shown in Figure 18.

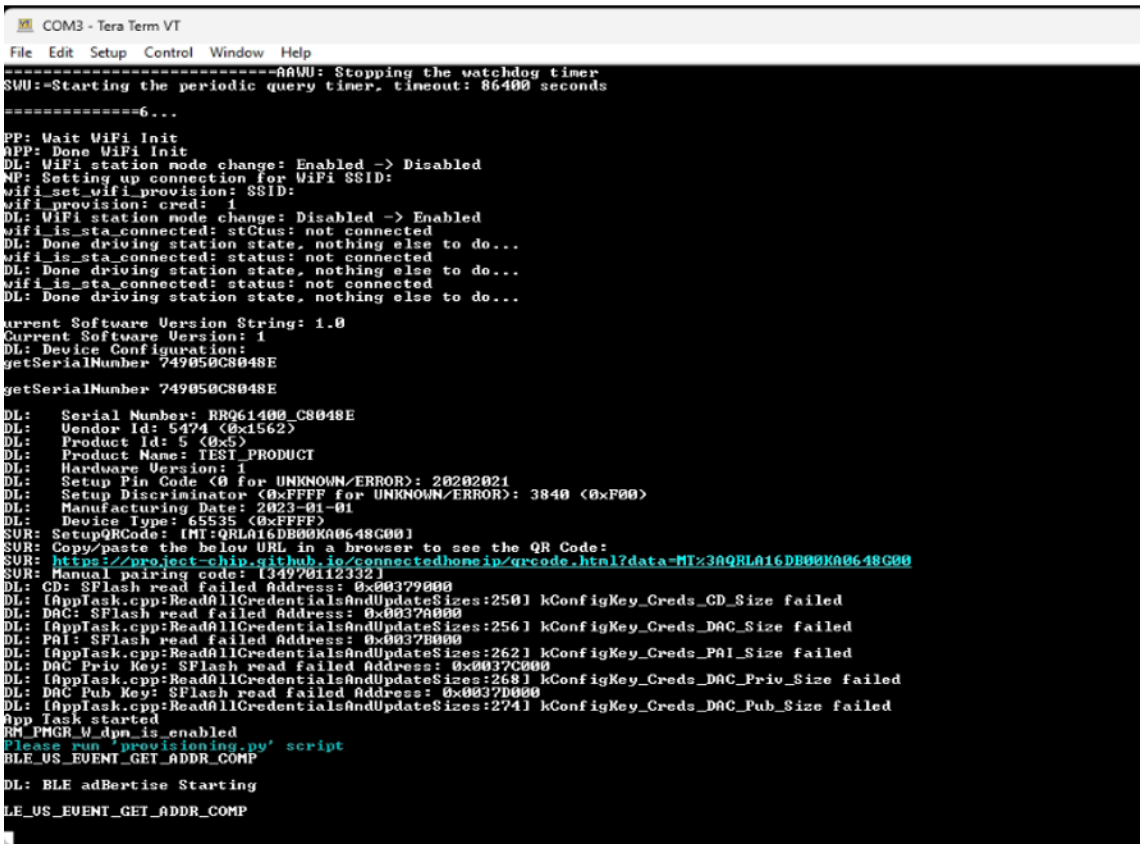


Figure 25. Bluetooth® LE advertisement

Follow the same steps as mentioned in Section 5.3.2 Add Device in Google Home App. Use either Pairing code or QR code for adding device.

6. Revision History

Revision	Date	Description
1.02	Sep 21, 2026	Updated the ZAP file generation workflow to use the Renesas QE for Matter tool. Refreshed the pack version and e^2 studio installer details for the FSP 2.2.0 or later release.
1.01	July 21, 2026	Added RA6W2 Matter application details alongside the existing RA6W1 application details
1.00	May 19, 2026	Initial release

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