RX23W Group

Target Board for RX23W module Quick Start Guide

1. Introduction

1.1 About This Document

This document is a quick start guide for Target Board for RX23W module (Hereafter referred to as **this product**) equipped with **Bluetooth**® technology-compatible microcontroller RX23W.

This document describes:

- Startup procedure for this product
- Bluetooth communication with your smartphone
- Preparation for Bluetooth functionality evaluation
- Restoring factory software

1.2 Product Feature

Figure 1-1 illustrates the product feature of this product.

Target Board for RX23W module (RTK5RX23W0C01000BJ)

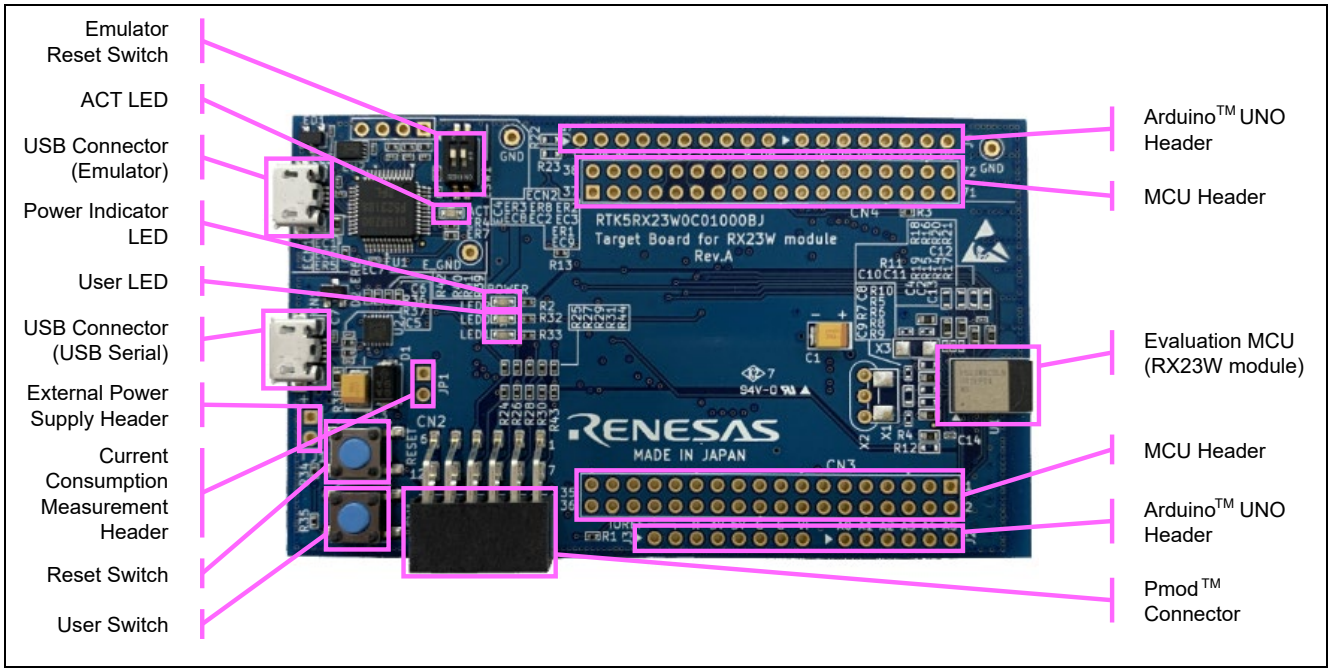

Figure 1-1 Product Feature of Target Board

For details of this product, refer to RX23W Group Target Board for RX23W module User's Manual (R20UT4890).

1.3 Necessary Equipment

Since this product does not include a USB cable, prepare an A – micro B type USB cable.

To check the operation according to this document, prepare a smartphone with the OS shown in Table 1-1 and the smartphone app “GATTBrowser” made by Renesas Electronics.

Table 1-1 Supported OS

OS	Version
iOS	9.0 or later
Android	5.0.1 or later

GATTBrowser

iOS version:

https://itunes.apple.com/app/gattbrowser/id1163057977

Android version:

https://play.google.com/store/apps/details?id=com.renesas.ble.gattbrowser

2. Startup Procedure

2.1 Power on

This product supports USB power supply. Confirm that ESW1-2 is OFF and connect USB connector CN1 to the USB port of your PC (or other power supply) with a USB cable.

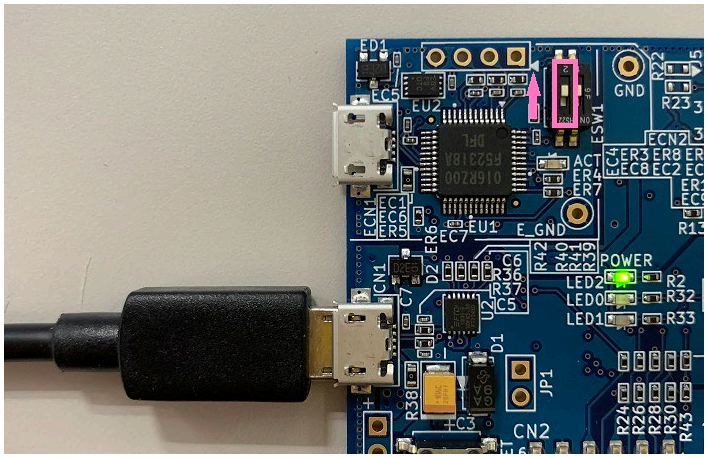

Figure 2-1 USB Connector CN1

When connecting to your PC for the first time, a driver installation message will appear on the PC screen as shown in Figure 2-2. After that, the driver installation completion message is displayed on your PC.

Note: The display may vary depending on the PC OS.

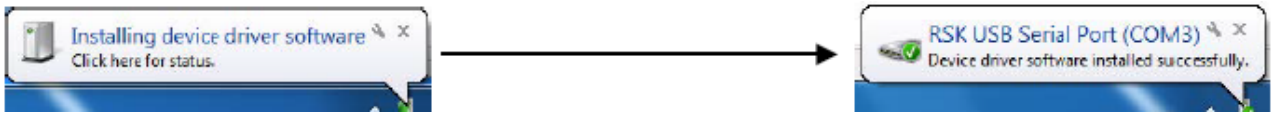

Figure 2-2 USB Serial Driver Installation Message

2.2 Startup Confirmation

After turning on the power, confirm that LED0 blinks at 1-second intervals. If it does not blink, check that the USB connector CN1 is used or that ESW1-2 is OFF.

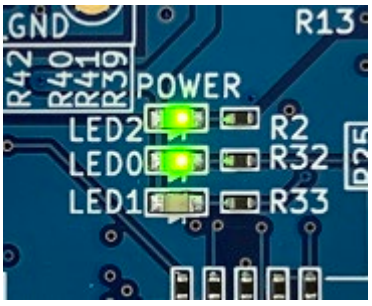

Figure 2-3 LED Blinking

3. Operation Check

Software stored at the time of shipment to this product will start advertising to be connected after the power is turned on. After connecting, it communicates with a remote device such as a smartphone to perform the user switch operation and the user LED blink control. Figure 3-1 shows the operation of this product.

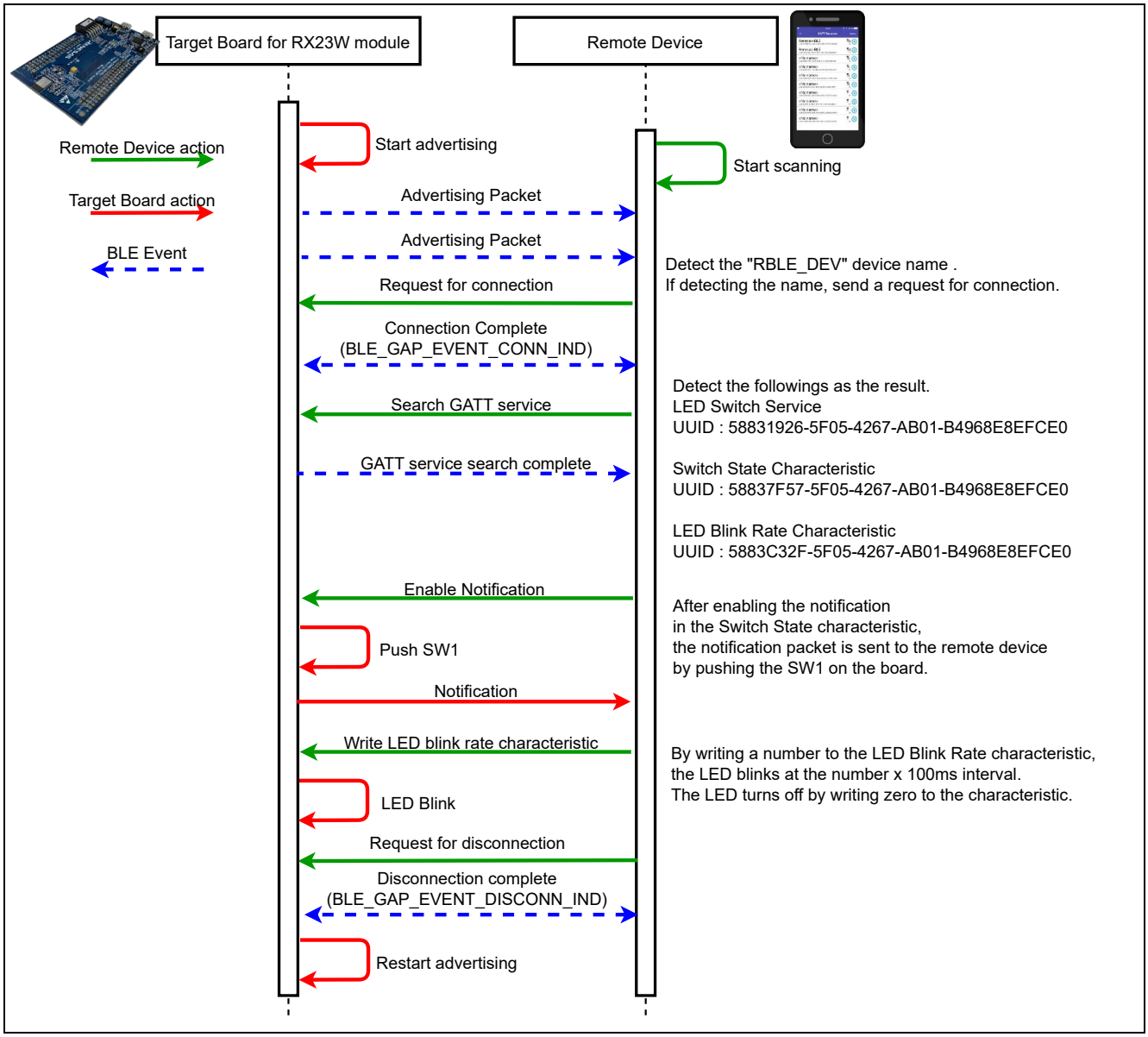

Figure 3-1 Operating Flow

3.1 Communication with Smartphone

To operate this product from a smartphone, follow the steps below.

Note: The smartphone display varies depending on the OS. In this document, the Android version GATTBrowser screen is used for explanation.

1. Turn on this product.
2. Start GATTBrowser on your smartphone.
3. Tap the arrow icon ▶ of the device displayed as “RBLE-DEV” on GATTBrowser to connect.

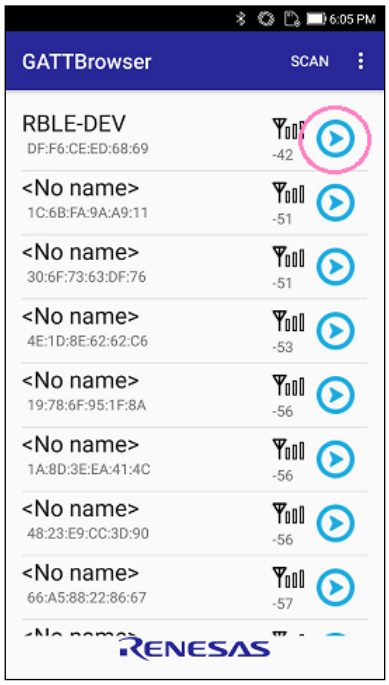

Figure 3-2 Connect to This Product

3.1 If many devices are discovered and difficult to find, enable the filter function.

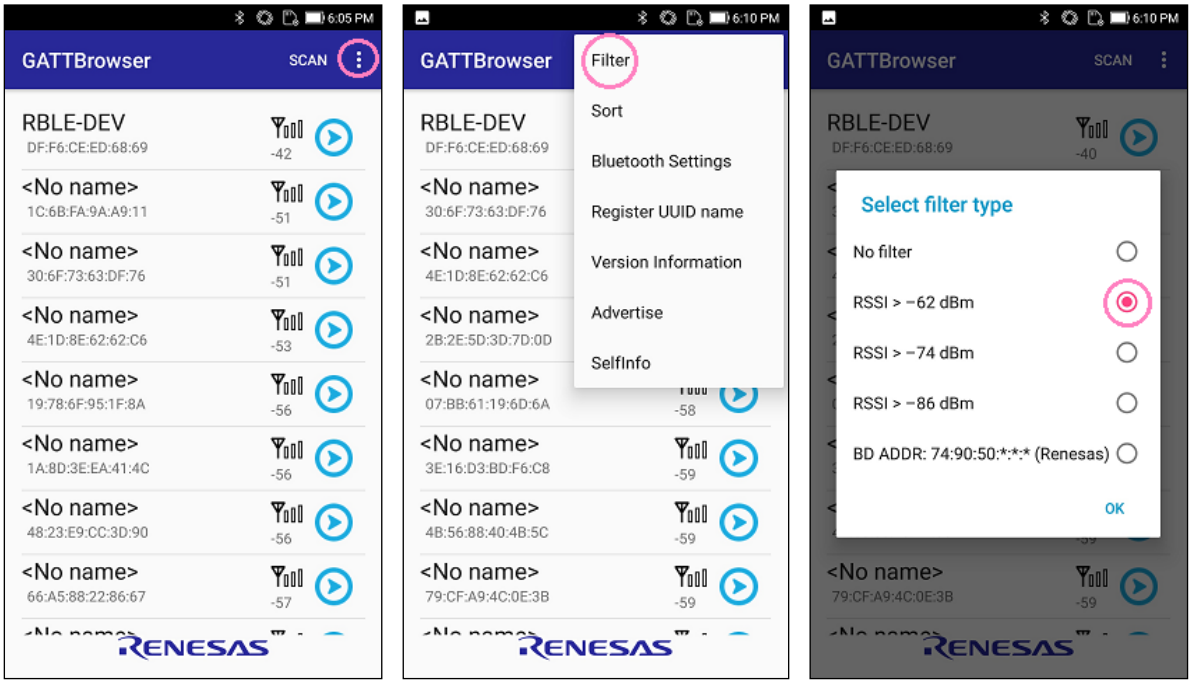

Figure 3-3 Filter Function

4. Confirm that the following are detected.
   - LED Switch Service (UUID: 5883**1926**-5F05-4267-AB01-B4968E8EFCE0)
   - Switch State Characteristic (UUID: 5883**7F57**-5F05-4267-AB01-B4968E8EFCE0)
   - LED Blink Rate Characteristic (UUID: 5883**C32F**-5F05-4267-AB01-B4968E8EFCE0)

Figure 3-4 Confirmation of Connection Establishment

5. Tap the Switch State characteristic to notify the smartphone of pressing SW1 on this product.

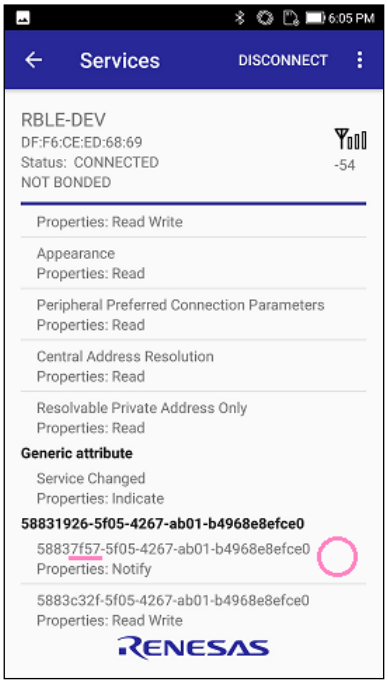

Figure 3-5 Selecting Switch State Characteristic

6. Allow notifications from your smartphone. Tap the “Notification Off” button to change the display to “Notification On”.
   Note: In the iOS version of GATTBrowser, tapping the “Enable Notification” button will change the display to “Disable Notification”.

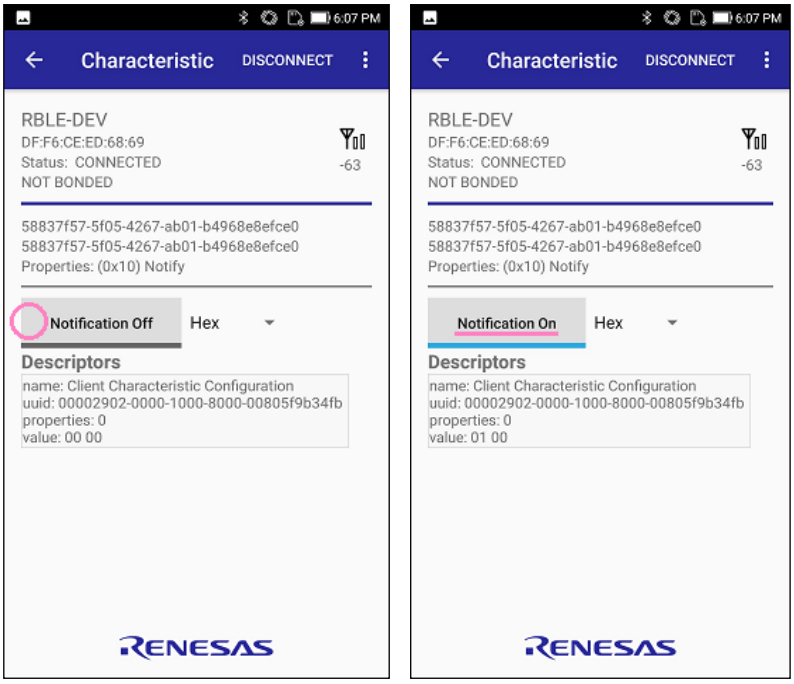

Figure 3-6 Allowing Notifications

7. When SW1 on this product is pressed, “01” is notified to GATTBrowser.

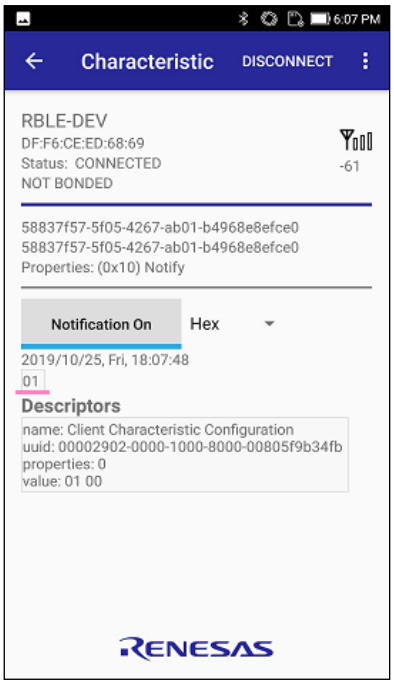

Figure 3-7 Notification of Switch Status

8. Return to the previous screen.
9. Tap the LED Blink Rate characteristic to change the LED0 blink rate from your smartphone.

Figure 3-8 Selecting LED Blink Rate Characteristic

10. Enter a 2-digit hexadecimal number in the text box and tap the “Write” button. LED0 blinks at intervals of entered value × 100ms. Entering 00 turns off LED0.

Figure 3-9 LED Blink Control

11. When disconnected, this product will return LED0 to blinking at 1-second intervals and restart Advertising.

3.2 Bluetooth Device Address Confirmation

Software stored at the time of shipment to this product starts advertising at Static Device Address after power-on. If it is necessary to identify this product with the Bluetooth Device Address when connecting to this product from a device other than a smartphone, you can check this product's address using the following procedure.

1. Connect this product to your PC.
2. Prepare a terminal emulator that supports VT100 emulation on your PC. In this example, Tera Term is used.
3. Start Tera Term and select the COM port labeled "USB Serial Port" to which this product is connected.

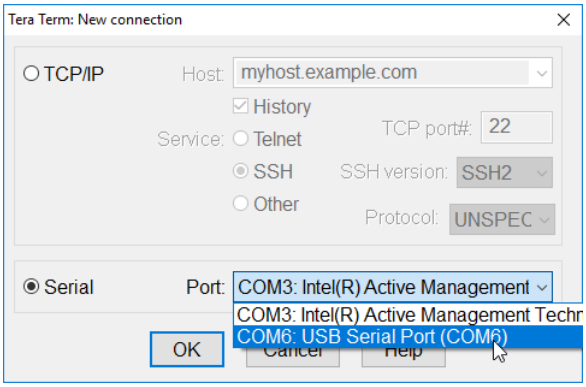

Figure 3-10 COM Port Selection

4. Set the terminal and serial port setup in Tera Term as shown in Table 3-1.

Table 3-1 Terminal Emulator Setting

Item	Setting
New-line (Receive)	LF
New-line (Transmit)	CR
Terminal Mode	VT100
Baud rate	115200
Data	8bit
Parity	none
Stop bits	1bit
Flow Control	none

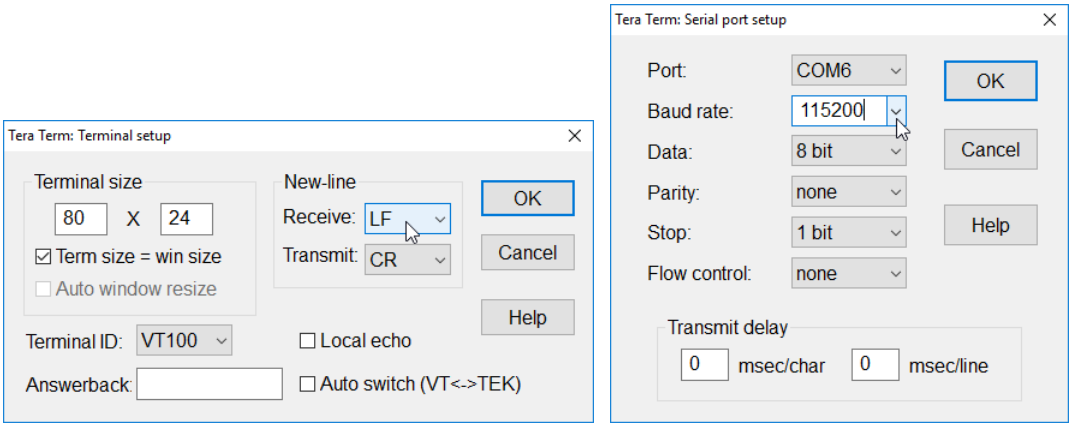

Figure 3-11 Setting Window of Tera Term

5. Press the Enter key in Tera Term, and the prompt “$” is displayed.
6. Enter “vs addr get curr rnd” and press the Enter key to check the Bluetooth Device Address.

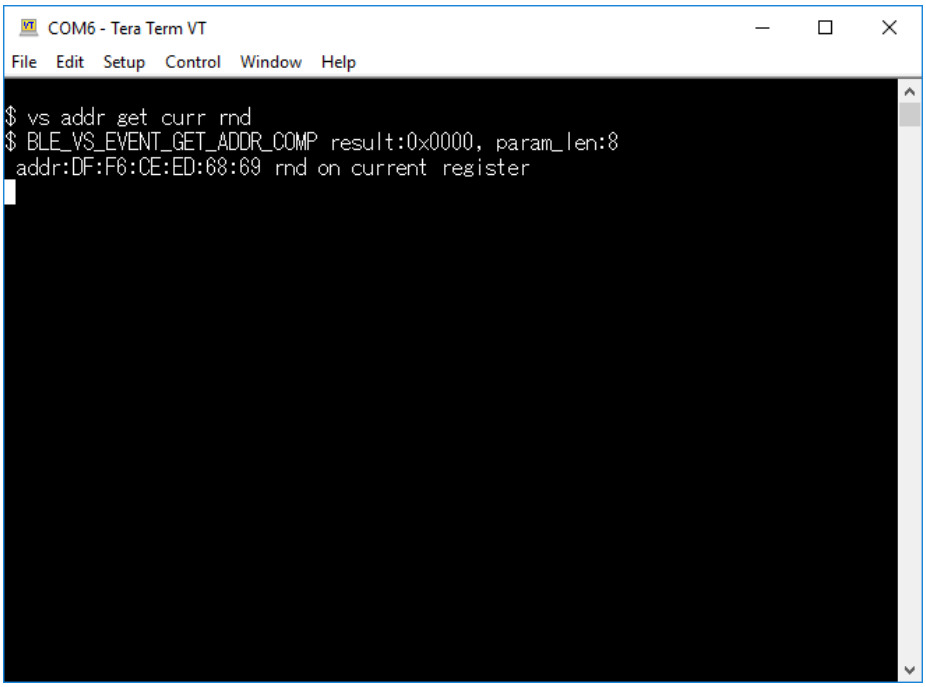

Figure 3-12 Address Confirmation

4. Functionality Evaluation

This section describes how to connect the evaluation tool Bluetooth Test Tool Suite (Hereafter referred to as **BTTS**) for Bluetooth function evaluation. Obtain the BTTS package in advance for the following procedure.

Bluetooth Low Energy MCU Bluetooth Test Tool Suite operating instructions Application Note - Sample Code (R01AN4554)

4.1 Programming HCI Firmware

To use BTTS, use the Renesas Flash Programmer (Hereafter referred to as **RFP**) to program the HCI firmware to this product.

Note: Use RFP v3.06.00 or later.

1. Change ESW1-2 of this product to ON and connect your PC and ECN1 connector with an A – micro B type USB cable.

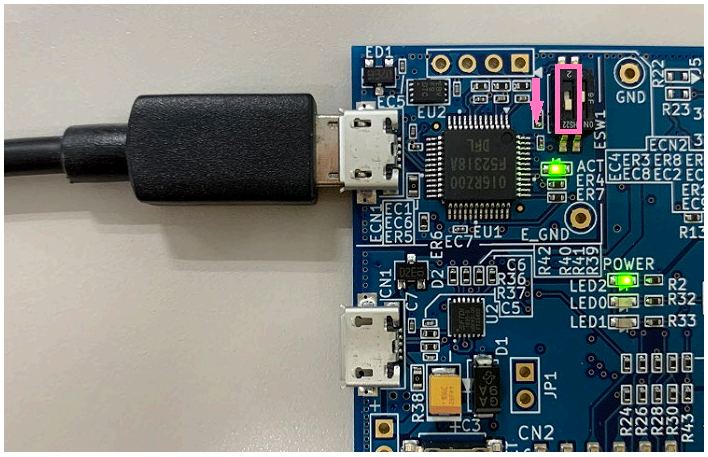

Figure 4-1 Connecting to PC

2. Start RFP and select “File” → “New Project…”.

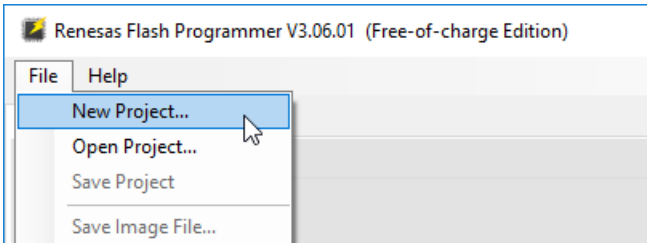

Figure 4-2 Creating New Project

3. In the “Create New Project” window, make the following settings and click the “Connect” button.
   - Microcontroller: RX200
   - Project Name: Any name
   - Project Folder: Any folder
   - Communication Tool: E2 emulator Lite
   - Communication Interface: FINE
   - Power: None (default)

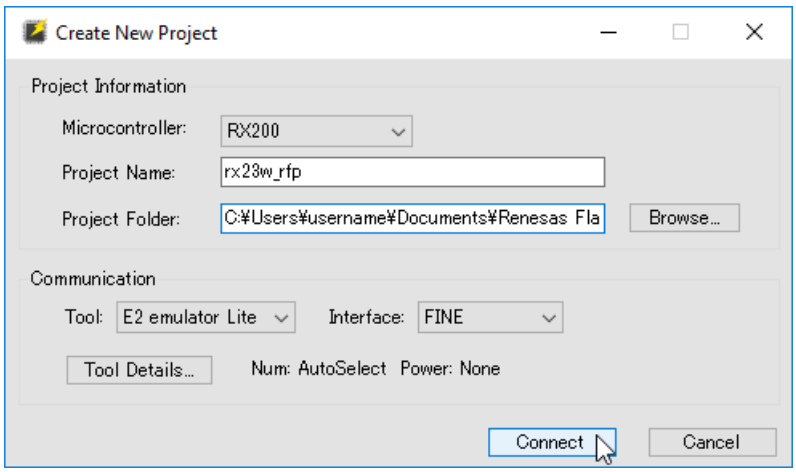

Figure 4-3 Project Setting

4. When prompted to enter the “Set ID Code”, enter “**45FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF**” and click the “OK” button.

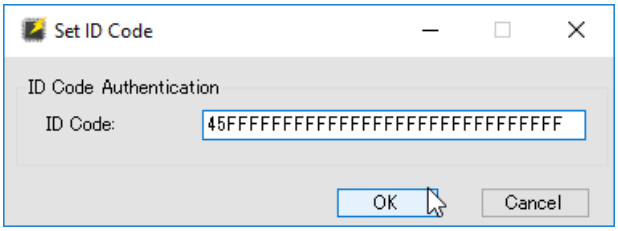

Figure 4-4 Set ID Code

5. If the connection is successful, “**Operation completed.**” is displayed.

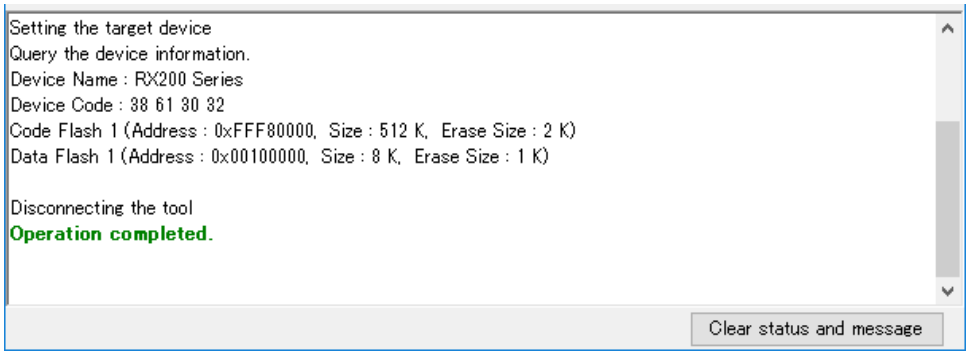

Figure 4-5 Successful Connection

6. Click the “Browse…” button, select “rx23w_uart_hci_sci8_br2000k_vx.xx.mot” in the mot folder in the BTTS package, and click the “Open” button.

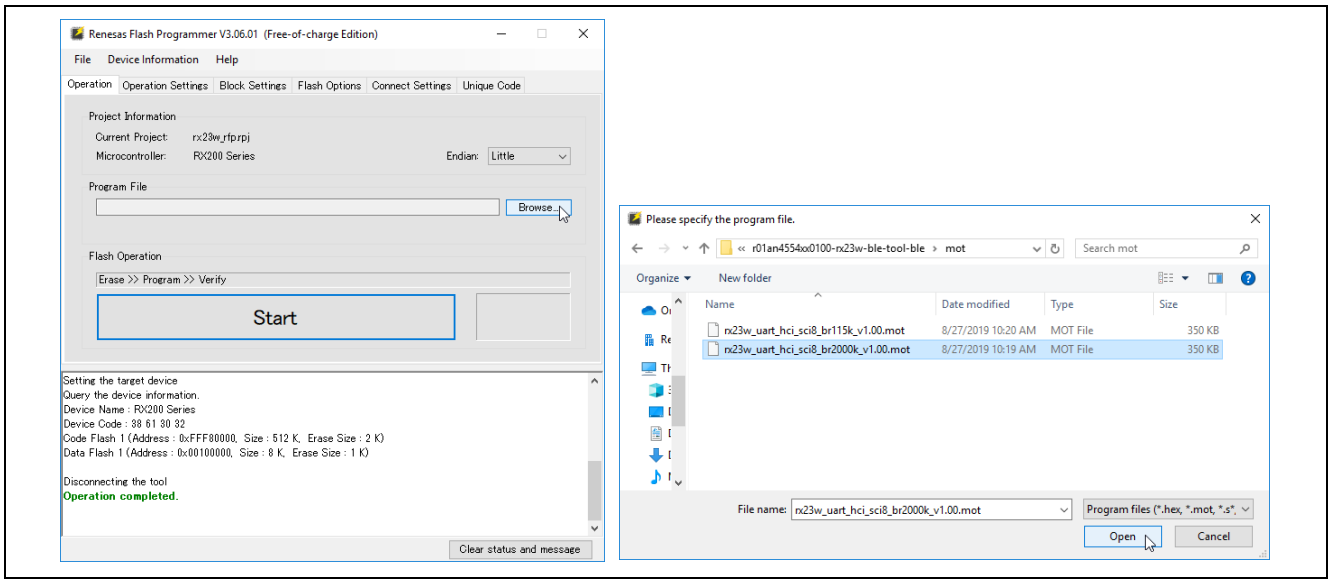

Figure 4-6 Selecting File

7. Click the “Start” button on the “Operation” tab to start programming the firmware.

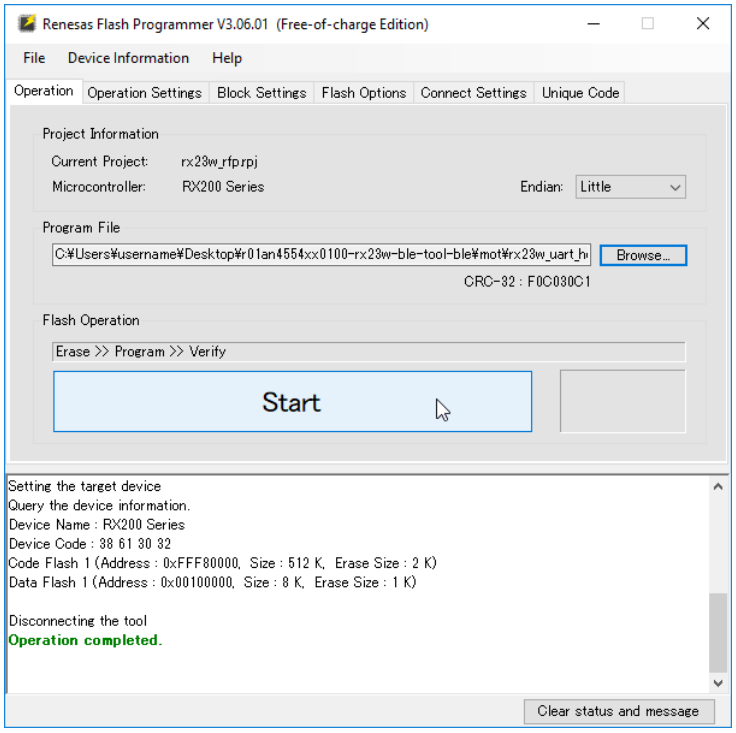

Figure 4-7 Programming Firmware

8. When programming is completed normally, “**Operation completed.**” And “**OK**” are displayed.

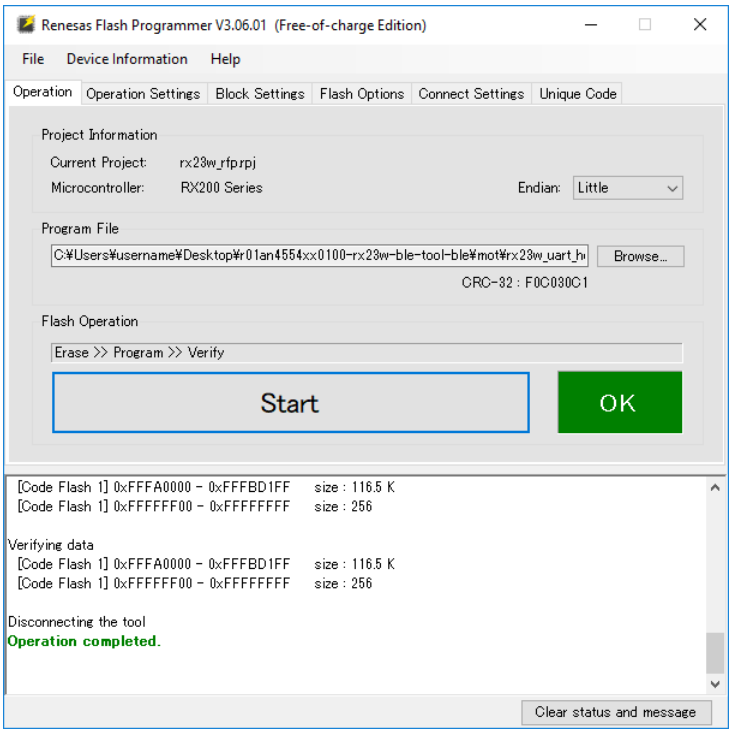

Figure 4-8 Programming Completion

9. After programming is complete, disconnect the USB cable that connected this product to your PC.

4.2 Connecting BTTS

1. Change ESW1-2 of this product to OFF and connect your PC and CN1 connector with an A – micro B type USB cable.

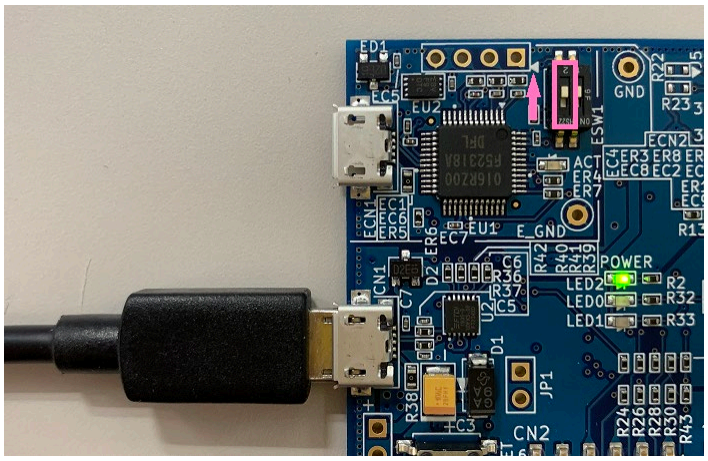

Figure 4-9 Connecting to PC

2. Refer to the Bluetooth Test Tool Suite operating instructions included in the BTTS package for PC settings and BTTS operation.

5. References

5.1 Restoring to Factory Software

To restore the factory software after programming the HCI firmware and other user programs to this product, follow the steps below.

1. The factory software is included in this document archive. If you have not already it, get by selecting “Sample Code” of zip format from the download list after you search for the document number “r20qs0022” on Renesas Electronics website (https://www.renesas.com/).
2. Connect this product from RFP according to 1 to 5 of “4.1 Programming HCI Firmware”.
3. Click the “Browse…” button of RFP, select “ble_demo_mtbrx23w_profile_server_preinstall_yyyymmdd.mot” in the mot folder of the downloaded archive, and click the “Open” button.

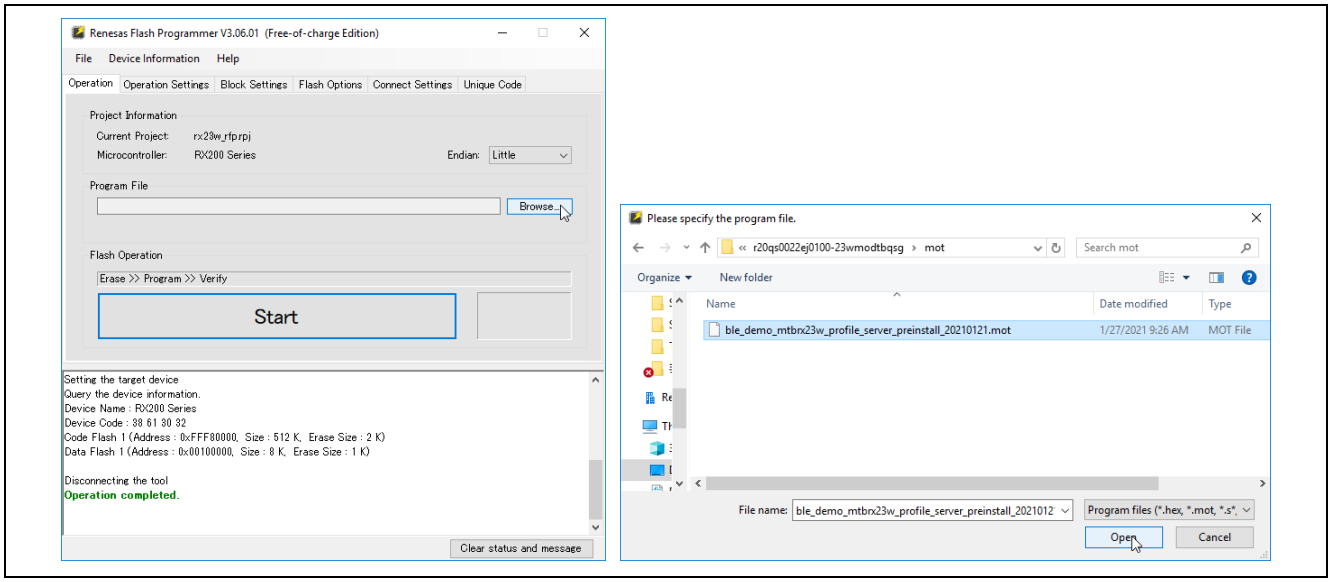

Figure 5-1 Selecting File

4. Follow steps 7 to 9 of “4.1 Programming HCI Firmware” to complete the factory software programming.
5. Change ESW1-2 of this product to OFF.

5.2 Notes on Creating New Development Project

The factory software of this product has the flash memory protection enabled to prevent inadvertent overwriting.

When creating a new development project for code design with this product, the ID code “45FFFFFFFFFFFFFFFFFFFFFFFFFFFF” must be set before connecting to the on-board emulator of this product from the integrated development environment.

Refer to the following document for details on how to create a project including ID code settings.

RX23W Group BLE Module Firmware Integration Technology Application Note (R01AN4860)

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Mar. 30. 21	-	First edition issued.

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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