Quick Start Guide

RA4W1 Group

Evaluation Kit for RA4W1 Microcontroller Group
EK-RA4W1
Quick Start Guide

Renesas RA Family
RA4 Series

Renesas Electronics
www.renesas.com

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Precautions

This Evaluation Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

• Ensure attached cables do not lie across the equipment.

• Reorient the receiving antenna.

• Increase the distance between the equipment and the receiver.

• Connect the equipment into an outlet on a circuit different from that which the receiver is connected.

• Power down the equipment when not in use.

• Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

• The user is advised that mobile phones should not be used within 10 m of the product when in use.

• The user is advised to take ESD precautions when handling the equipment.

The Evaluation Kit does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

Renesas RA Family

EK-RA4W1

Contents

Figures

1. Introduction

This Quick Start Guide (QSG) provides:

- An overview of the Quick Start example project that the EK-RA4W1 board comes pre-programmed with.
- Instructions for running the Quick Start example project.
- Instructions for importing, modifying, and building the Quick Start example project using Flexible Software Package (FSP) and e^2 studio Integrated Development Environment (IDE).
- Bluetooth communication with your smartphone.
- Preparation for Bluetooth functionality evaluation.
- Restoring factory software.

Figure 1 illustrates the top view of the EK-RA4W1 board.

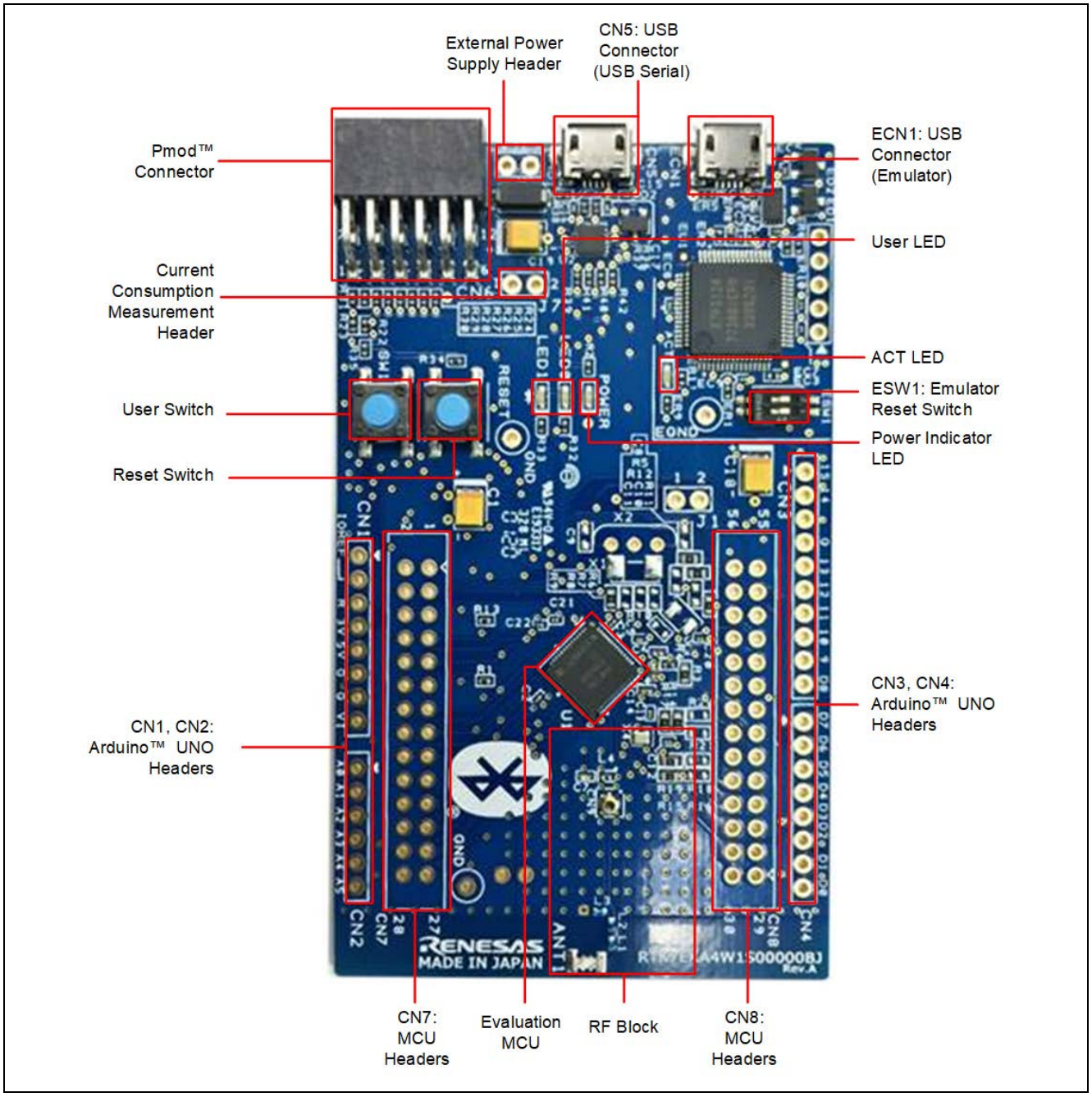

Figure 1. EK-RA4W1 Board (Top View)

For details of this product, refer to RA4W1 Group EK-RA4W1 User's Manual (R20UT4683xxxxxx).

1.1 Assumptions and Advisory Notes

1. Tool experience: It is assumed that the user has prior experience working with IDEs such as e² studio and terminal emulation programs such as Tera Term.
2. Subject knowledge: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, and FSP to modify the example project described in this document.
3. Prior to running the Quick Start example project or programming the EK-RA4W1 board, default jumper settings must be used. Refer to the EK-RA4W1 user's manual for the default jumper settings.
4. The screen shots provided throughout this document are for reference. The actual screen content may differ depending on the version of software and development tools used.

2. Kit Connection

The kit contains the EK-RA4W1 board that is connected to the host PC using a USB cable (not included in the kit). The IDE can be installed from the URL, renesas.com/IDE/e²studio on to the host PC. The installer automatically installs all the required drivers along with the IDE.

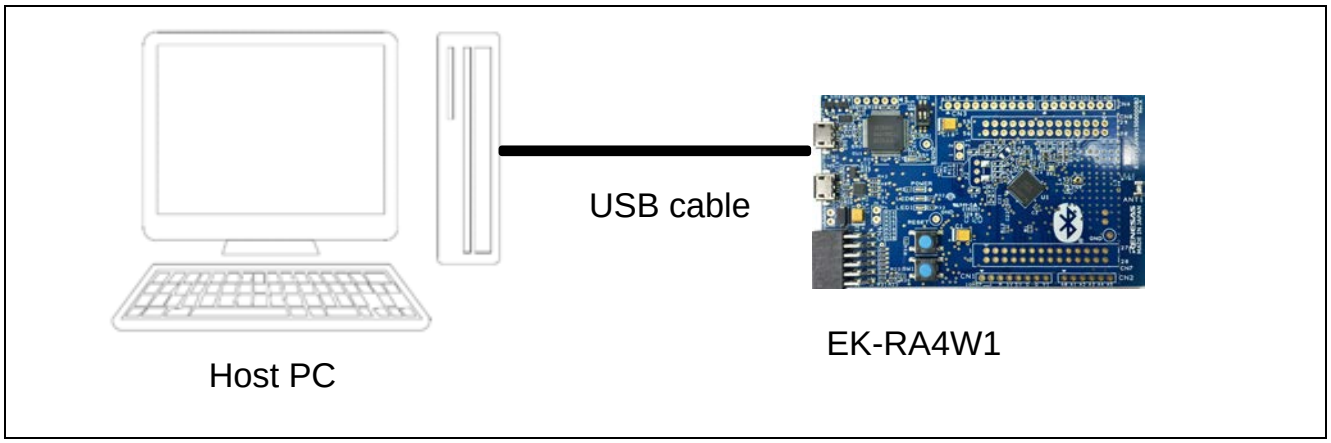

Figure 2. EK-RA4W1 Kit Contents

Overview of the Quick Start Example Project shows the operating flow of this example project.

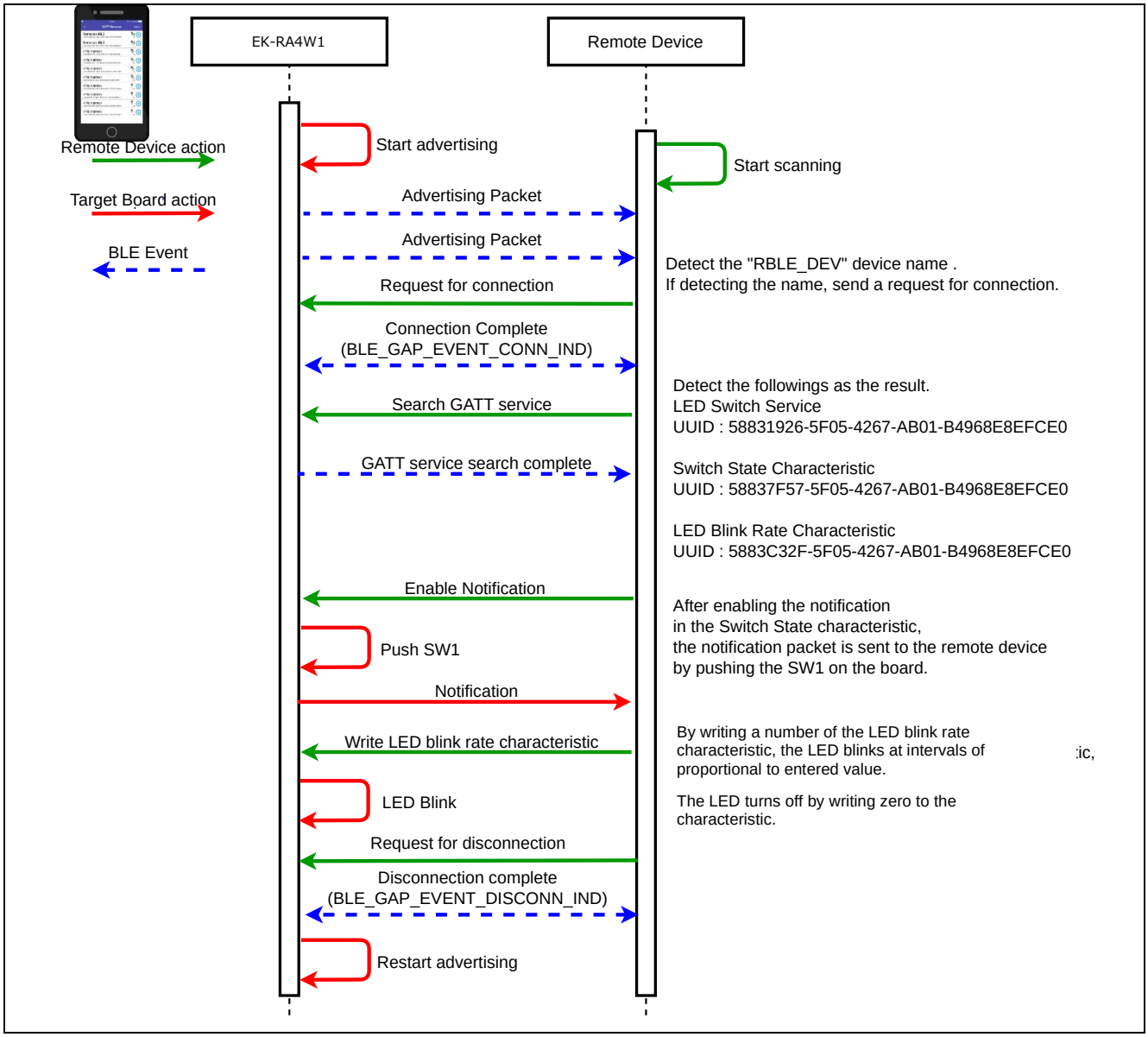

Figure 3. Operating Flow

3. Running the Quick Start Example Project

This section lists the requirements and instructions to power up the EK-RA4W1 board and run the Quick Start example project.

Hardware and Software Requirements

- EK-RA4W1 board
- Micro USB device cable (not included with this kit)
- A PC with at least 1 USB port
- A smartphone with the following OS and the smartphone App “GATTBrowser” from Renesas Electronics (shown in the following graphics).
  - iOS version 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

- Windows® 10 operating system
- USB Serial Drivers (included in Windows® 10)
- Tera Term (or similar) terminal console application
- SEGGER J-Link® firmware

3.1 Connecting and Powering Up the EK-RA4W1 Board

This product supports USB power supply. Confirm that ESW1-2 is OFF and connect USB connector CN5 to the USB port of your PC (or other power supply) with a USB cable.

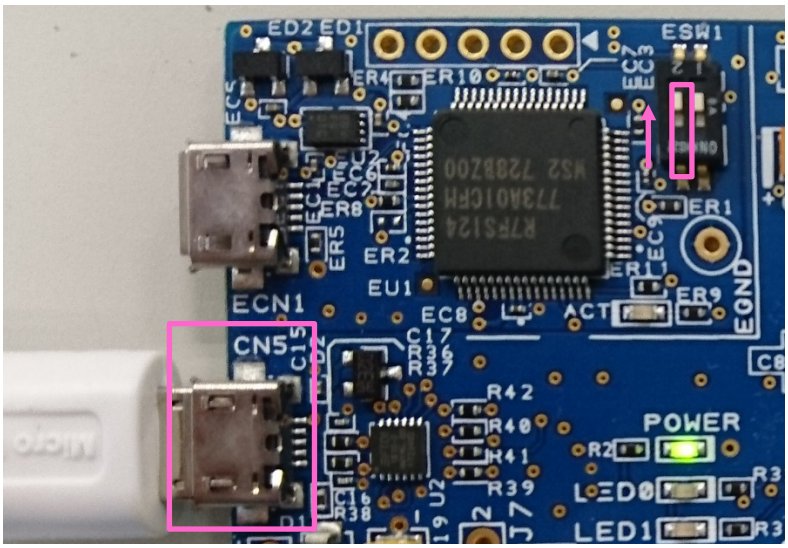

Figure 4. USB Connector CN5

When connecting to your PC for the first time, a driver installation message will appear on the PC screen as shown in Figure 5. After that, the driver installation completion message is displayed on your PC.

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

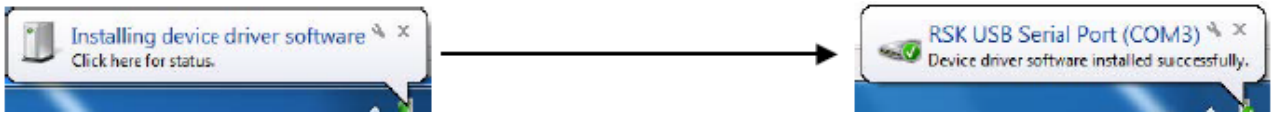

Figure 5. USB Serial Driver Installation Message

3.2 Startup Confirmation

After turning on the power, confirm that LED0 blinks. If it does not blink, check that the USB connector (CN5) to be connected is correct or that ESW1-2 is OFF.

Figure 6. LED Blinking

4. Checking Operation

Software stored at the time of shipment to this product will start advertising to be connected after the power is turned on. After pairing, it communicates with a remote device such as a smartphone to exchange information about user switch operation and allows the user to control LED0 state. See Figure 3 for the flow of operation of this product.

4.1 Setting up Communication with a Smartphone

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

To operate this product from a smartphone, use the following steps:

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.

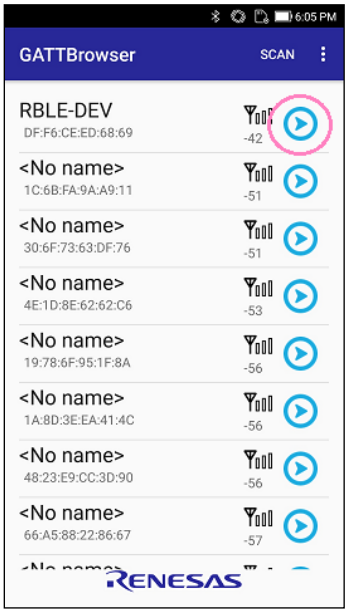

Figure 7. Connect to this Product

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

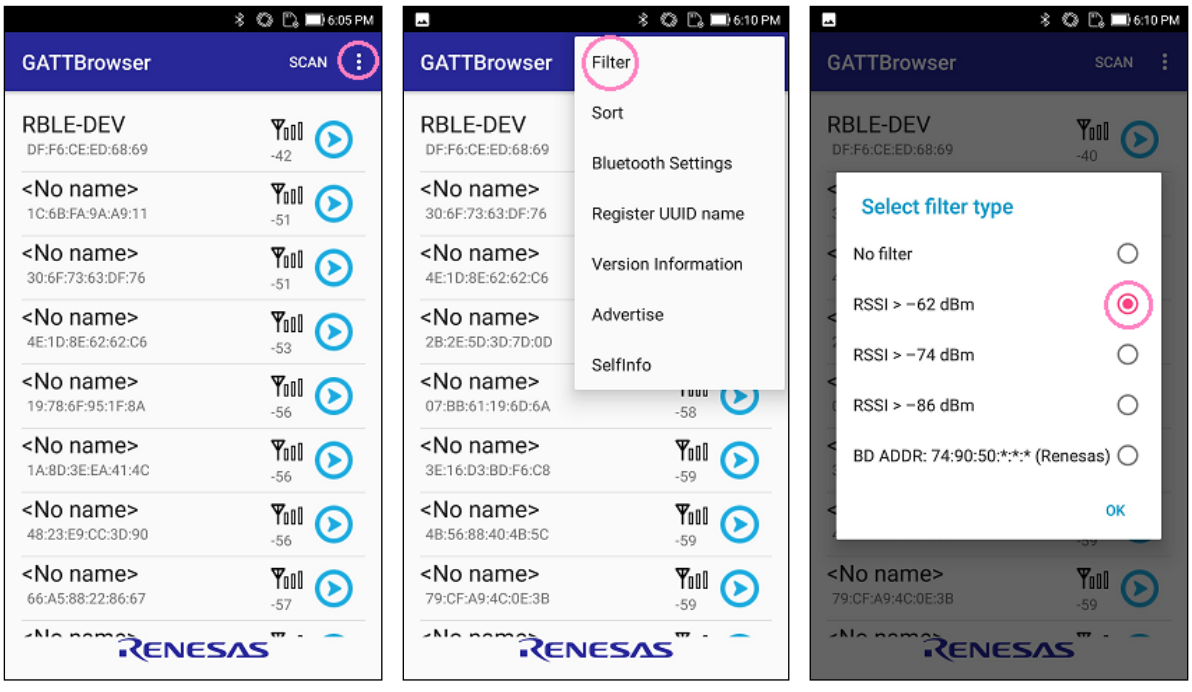

Figure 8. Filter Function

5. 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 9. Confirmation of Connection Establishment

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

Figure 10. Selecting Switch State Characteristic

7. 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**.

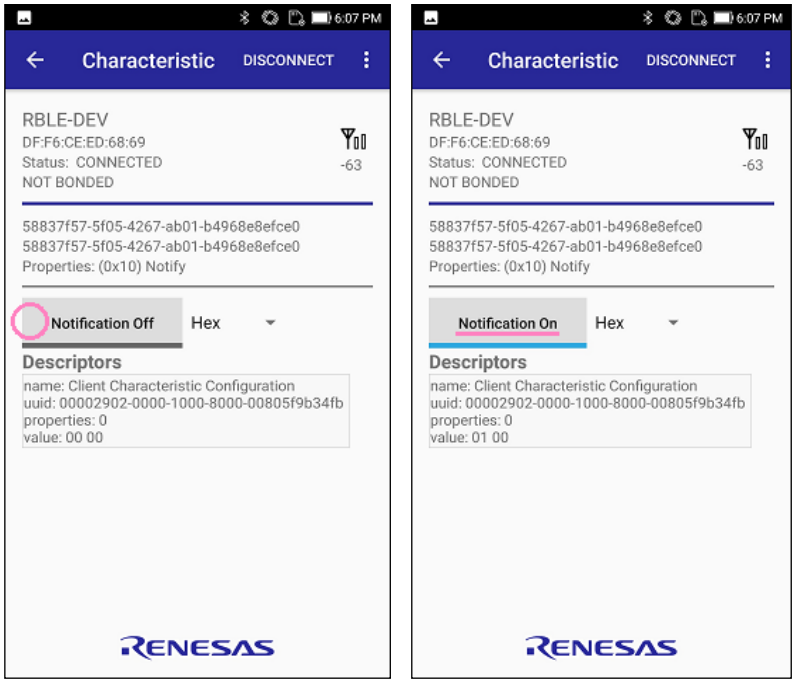

Figure 11. Allowing Notifications

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

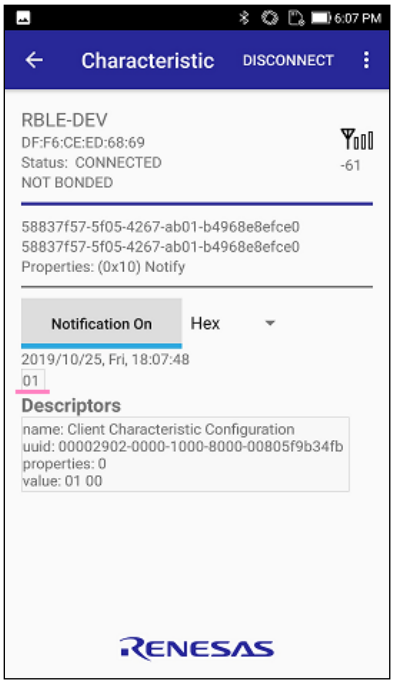

Figure 12. Switch Status Notification

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

Figure 13. Selecting LED Blink Rate Characteristic

11. Enter a 2-digit hexadecimal number in the text box and tap the **Write** button. LED0 blinks at intervals proportional to the entered value. Entering 00 turns off LED0.

Figure 14. LED Blink Control

12. When disconnected, this product will return LED0 to blinking and restart Advertising.

5. Evaluating the Functionality

This section describes how to connect the RA4W1 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 Test Tool Suite package (R01AN4554).

5.1 Programming HCI Firmware

To use BTTS, it is necessary to program HCI firmware to this product. The on-board programming functionality is provided using Renesas S124 Debug MCU and SEGGER J-Link® firmware. Programming USB Micro-B connector (ECN1) connects the S124 Debug MCU, allowing re-programming the target RA MCU firmware.

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

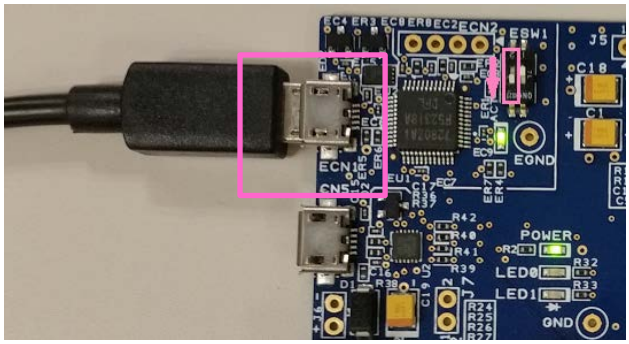

Figure 15. Connecting to PC for Programming HCI Firmware

2. Binary files of HCI firmware are shown as follows. These files include this document. Select the correct file for the preferred UART baud rate, then program the evaluation MCU.

File Name	SCI port No. / Baud rate
ra4w1_uart_hci_sci4_br115k_v1.00.srec	SCI4 / 115200 bps
ra4w1_uart_hci_sci4_br2000k_v1.00.srec	SCI4 / 2000000 bps

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

5.2 Connecting BTTS

1. Change ESW1-2 of this product to OFF and connect your PC and CN5 connector with an A – micro B type USB cable.

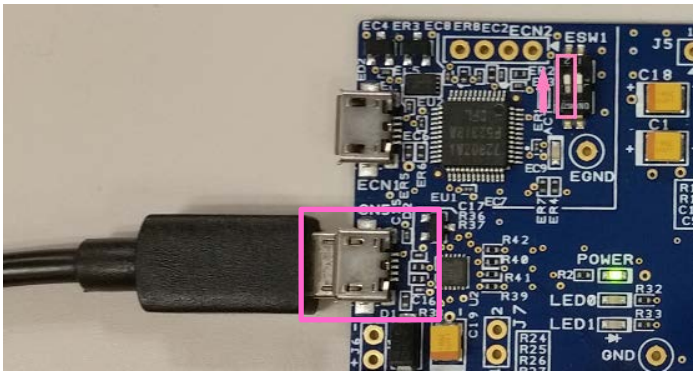

Figure 16. Connecting to PC for Connecting BTTS

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

6. Restoring Factory Settings

To restore the factory software after programming the HCI firmware and other user programs to this product, use the following steps:

1. The factory software is included in this document archive. If you do not have it already, search for the document “EK-RA4W1 Quick Start Guide (R20QS0015)” on Renesas Electronics website (https://www.renesas.com/) and get the accompanying software from the list of downloads.
2. Change ESW1-2 of this product to ON and connect your PC and ECN1 connector with an A – micro B type USB cable.

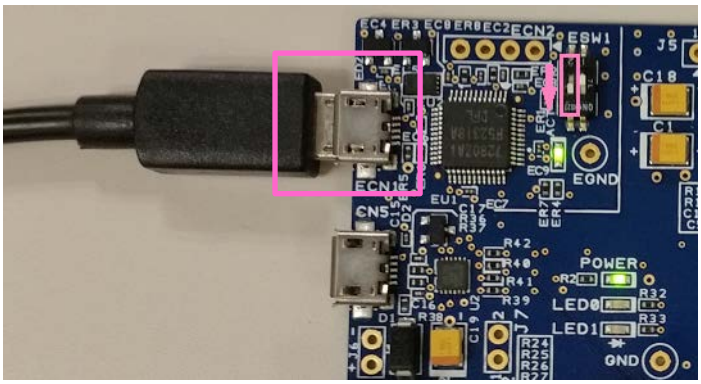

Figure 17. Connecting to PC for Programming Factor Software

3. Program the evaluation MCU using the factory software obtained in step 1 (`./bin/r20qs0015.srec`). The J-Link Software “J-Flash” or “J-Flash Lite” should be used to reprogram the factory software.

7. Website and Support

Visit the following URLs to learn about the kit and the RA family of microcontrollers, download tools and documentation, and get support.

EK-RA4W1 Resources	renesas.com/ra/ek-ra4w1
RA Product Information	renesas.com/ra
RA Product Support Forum	renesas.com/ra/forum
Renesas Support	renesas.com/support

Revision History

Rev.	Date	Description	
		Page	Summary
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1.01	May.22.20	—	Updated link to download IDE in section 2

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