Bluetooth® Low Energy Protocol Stack

Quick Start Guide

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Introduction

This manual describes how to install and operate the Bluetooth low energy software (BLE software) manufactured by Renesas Electronics Corporation.

BLE software is a suite of software that includes the Bluetooth Low Energy protocol stack (BLE protocol stack) that conforms to the Bluetooth Low Energy specification (Bluetooth specification v4.2). BLE protocol stack has been designed to work on Bluetooth Low Energy microcontroller RL78/G1D.

Target Device

RL78/G1D

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1. Introduction

It will be possible following by operating according to this document.

- Installation of the BLE software
- Build the BLE software
- Writing to the BLE software to RL78/1D
- Connection and data communication by BLE

Following marks are inserted in this document in order to guide the use of the BLE software according to the user environment.

CS+/CC	Read on if your development environment is CS+ for CC.
e2/CC	Read on if your development environment is e^2 studio with RL78 Family C Compiler .
IARv2	Read on if your development environment is IAR Embedded Workbench for Renesas RL78 V2.20.
CS+/CA	Read on if your development environment is CS+ for CA,CX.
Modem	Read on if you are using the Modem configuration.
Embedded	Read on if you are using the Embedded configuration.

— Modem configuration:
The BLE function implemented on RL78/G1D is the two-chip configuration usage that are used from the host MCU. The user application is implemented on the host MCU.

— Embedded configuration:
This configuration is the usage for the application realized by using a BLE function and MCU function on RL78/G1D only. The user application is implemented on the RL78/G1D.

Refer to *Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095) '5.1 Configuration'* about details for system configuration.

In addition, this document describes the BLE software version in 'Ver_X_XX'. Substitute with your version in use.

2. Getting the Software

CS+/CC | e2/CC | IARv2 | CS+/CA | Modem | Embedded

You can download the BLE software from My Renesas site after My Renesas User registration.

https://www.renesas.com/software-tool/bluetooth-low-energy-protocol-stack-rl78-family

The BLE software package includes the followings:

- Documents
  - Bluetooth Low Energy Protocol Stack User's Manual
  - Bluetooth Low Energy Protocol Stack API Reference Manual
  - Bluetooth Low Energy Protocol Stack Sample Program Application Note
  - rBLE command specifications
- Project files used for creating the executable file
  - Program file for evaluation
  - BLE software library
  - Sample source code
  - Source code that configures parameters
  - CS+ project files
  - IAR Embedded Workbench workspace files (v2)
  - e^2 studio project files
- Sample applications for computer
  - Executable file
  - Source code
  - Microsoft Visual Studio Express 2015 project file

Note that the following versions of the library are included in the BLE software package V1.21:

- EEPROM Emulation Library and Data Flash Access Library
  - CS+ for CC/e^2 studio (CC-RL):

    "RL78 Family EEPROM Emulation Library Pack02 for the CC-RL Compiler V1.01"
  - CS+ for CA,CX:

    "RL78 Family EEPROM Emulation Library Pack02 for the CA78K0R Compiler V1.01"
  - IAR V2.21.5

    "FDL_EEL_RL78_Type02_Installer_V200.zip"
- Code Flash Library
  - CS+ for CC/e^2 studio (CC-RL):

    "Flash Self-Programming Library Type01 for CC-RL Compiler for the RL78 Family V2.21"
  - CS+ for CA,CX:

    "Flash Self-Programming Library Type01 for CA78K0R Compiler for the RL78 Family V2.20"
  - IAR V2.21.5

    "RENESAS_FSL_RL78_T01E_IARV2_V1.00.zip"

3. Environmental Arrangement

Prepare the environment to meet your purpose in order to use the BLE software. Contact our sales about how to get each product.

3.1 PC

CS+/CC **e2/CC** **IARv2** **CS+/CA** **Modem** **Embedded**

Prepare the following environment of a computer to install, develop and evaluate of the BLE software.

- Processor : At least 1.6 GHz
- Main memory : At least 1 GB
- Display : 1024 x 768 or higher resolution and 65,536 colors
- Interface : USB2.0 (E1 and USB-serial conversion cable)
- OS : Windows 7 or later

3.2 Evaluation Board

Modem **Embedded**

How to evaluate the BLE software using the evaluation board manufactured by Renesas Electronics Corporation (RTK0EN0001D01001BZ) is described in this document. In addition, prepare the USB cable for power supply.

3.3 E1 Emulator

Modem **Embedded**

How to write the BLE software to the evaluation board using the E1 emulator (R0E000010KCE00) is described in this document.

Note: The E1 Emulator has been discontinued product. In this manual, read E1 as also mianing E2 emulator Lite.

3.4 Renesas Flash Programmer

Modem **Embedded**

Get the latest version of the Renesas Flash Programmer (RFP) from the following site in order to write the BLE software to the evaluation board.

https://www.renesas.com/software-tool/renesas-flash-programmer-programming-gui

3.5 Terminal Emulator

Embedded

It is possible to evaluate the BLE software of Embedded configuration by command input from a terminal emulator on your computer. Prepare the terminal emulator for your evaluation. This document describes about usage of the Tera Term.

3.6 Development Environment

The BLE software has been created with the following development environment. Prepare as your build environment.

CS+/CC

Renesas Electronics Corporation

Renesas CS+ for CC V4.00.00/RL78 Compiler CC-RL V1.03.00

e2/CC

Renesas Electronics Corporation

e^2 studio 4.3.1.001/RL78 Family C Compiler Package V1 (without IDE) V1.03.00

IARv2

IAR Systems Inc.

IAR Embedded Workbench for Renesas RL78 V2.20.1

CS+/CA

Renesas Electronics Corporation

Renesas CS+ for CA,CX V3.02.00/Renesas CA78K0R V1.72

3.7 Flash Libraries

The BLE software uses the following products in order to write the internal flash memory (code flash and data flash) in RL78/G1D. These products can be downloaded from Renesas website with the following procedure.

Open the Renesas website. Select [Home] → [DESIGN & SUPPORT] → [DEVELOPMENT TOOLS] → [Code Flash Libraries] or [Data Flash Libraries].

CS+/CC **e2/CC** **CS+/CA** **IARv2**

- EEPROM Emulation Library Pack02 Package Ver.2.00(for CA78K0R/CC-RL Compiler) for RL78 Family.
- Flash Self Programming Library Type01 Package Ver.3.00 for the RL78 Family [for the CA78K0R/CC-RL Compiler]

Note: For the library for IAR, select "America/Europe/Middle East/Africa" when you run the installer. The Library version select "IAR compiler version 2.10".

The detail of the acquation of the flash libraries, the installation procedure and the usage notice are described following document.

Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095)
+ *4.3 Installation Procedure*
+ *8. EEPROM Emulation Library*
+ *9. Code Flash Library*

4. Installing Software

Install the BLE software in the following procedure.

4.1 Installing BLE software

CS+/CC **e2/CC** **IARv2** **CS+/CA** **Modem** **Embedded**

The BLE software does not use an installer. Copy the decompressed package to a folder path that does not include a space or multi-byte characters in your computer.

4.2 Installing EEPROM Emulation Library

Copy to the folders in the installed BLE software to meet your development environment.

CS+/CC **e2/CC**

Destination folder:

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\driver\dataflash\cc_rl

Files:

eel.h
eel.lib
eel_types.h
fdl.h
fdl.lib
fdl_types.h

IARv2

Destination folder:

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\driver\dataflash\iar_v2

Files:

eel.h
eel.a
eel_types.h
fdl.h
fdl.a
fdl_types.h

CS+/CA

Destination folder:

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\driver\dataflash\cs

Files:

eel.h
eel.lib
eel_types.h
fdl.h
fdl.lib
fdl_types.h

4.3 Installing Flash Self Programming Library

Copy to the folders in the installed BLE software to meet your development environment.

CS+/CC **e2/CC**

Destination folder:

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\driver\codeflash\cc_rl

Files:

fsl.h
fsl.lib
fsl_types.h

IARv2

Destination folder:

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\driver\codeflash\iar_v2

Files:

fsl.h
fsl.a
fsl_types.h

CS+/CA

Destination folder:

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\driver\codeflash\cs

Files:

fsl.h
fsl.lib
fsl_types.h

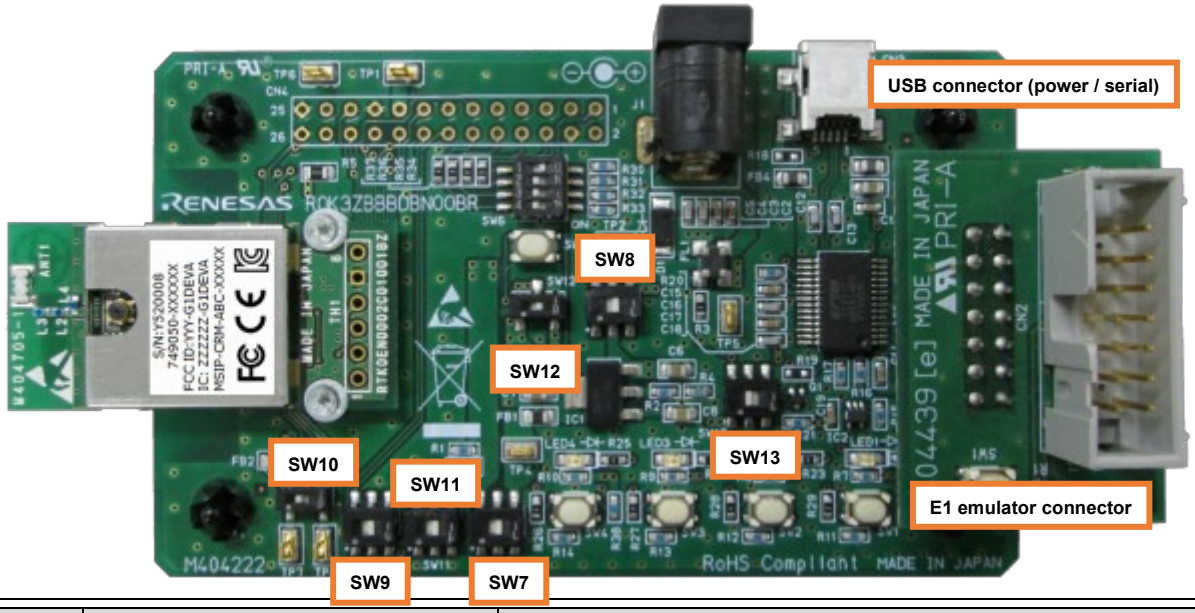
5. Writing Programs

Modem **Embedded**

A built program file (Intel HEX format) is written into the RL78/G1D for your evaluation of the BLE software.

First, prepare to use the evaluation board before writing the program file.

Referring to Figure 5-1 to set slide switches of the evaluation board.



Switch	Setting	Function
SW7	2-3 connected (right) **default**	Power is supplied from the DC/VBUS via a regulator.
SW8	2-3 connected (right)	Power is supplied from USB VBUS.
SW9	2-3 connected (right) **default**	Connected to a USB serial device.
SW10	1-2 connected (left) **default**	Power is supplied to the module.
SW11	2-3 connected (right) **default**	Power is supplied form a source other than E1 emulator.
SW12	2-3 connected (right) **default**	Set this switch to the right.
SW13	1-2 connected (left) **default**	The USB interface is connected.

Figure 5-1 Slide switch setting for the evaluation board

After the switch setting is complete, connect the E1 emulator to the connector on the evaluation board. Then, connect the USB cable to between the USB connector and PC or AC power supply.

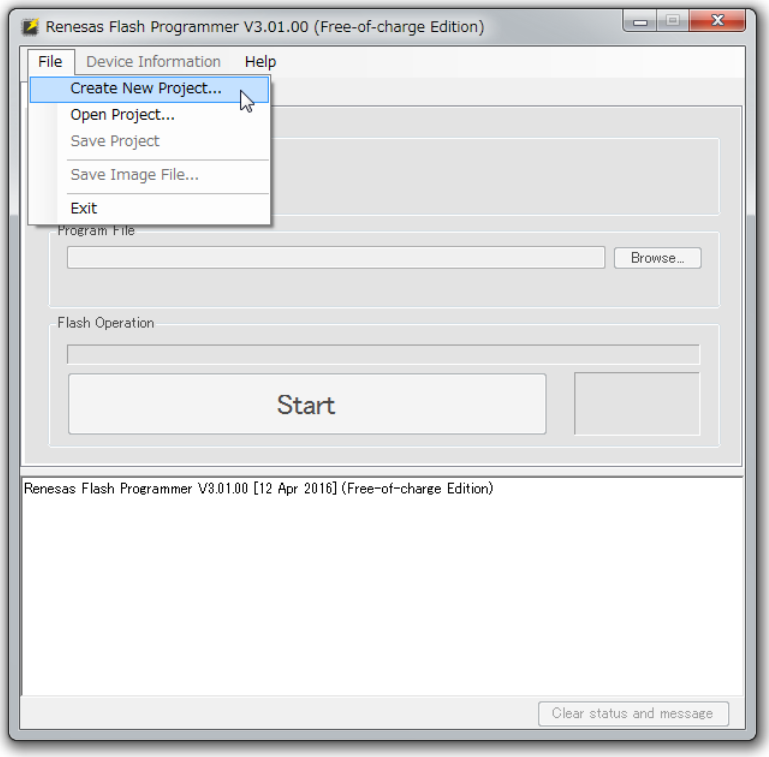
Note: If Windows PC requires a device driver for USB UART IC (FT232RL), use below link.
http://www.ftdichip.com/Drivers/D2XX.htm

After that create a new project for the RFP and write a program file in accordance with the following procedure.

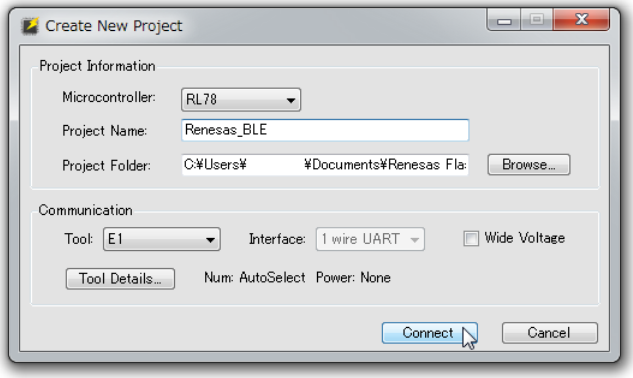
[Creating Project]

To create a new project if you use the RFP first time.

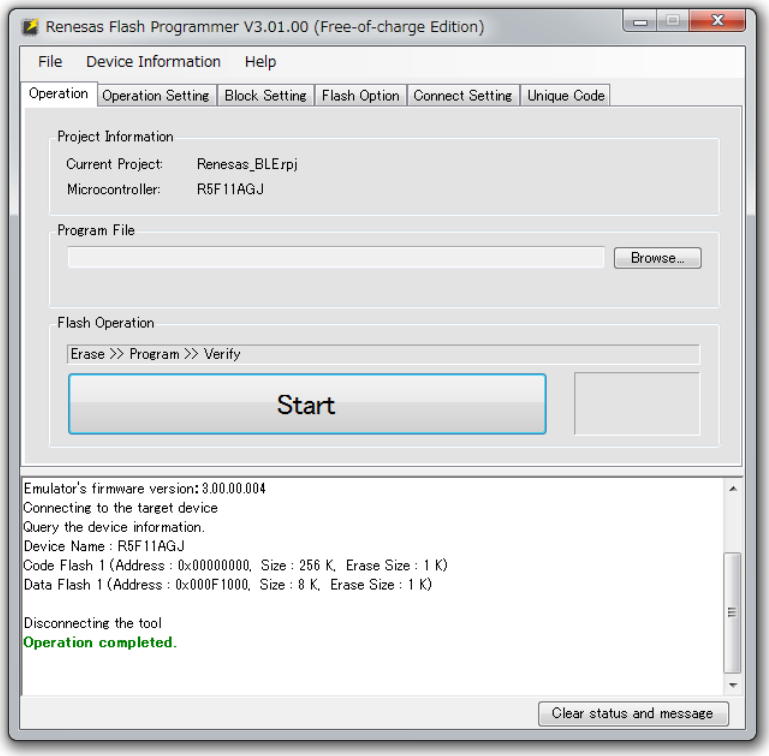
Note: Create a new project after connecting the evaluation board and E1 to Windows PC.



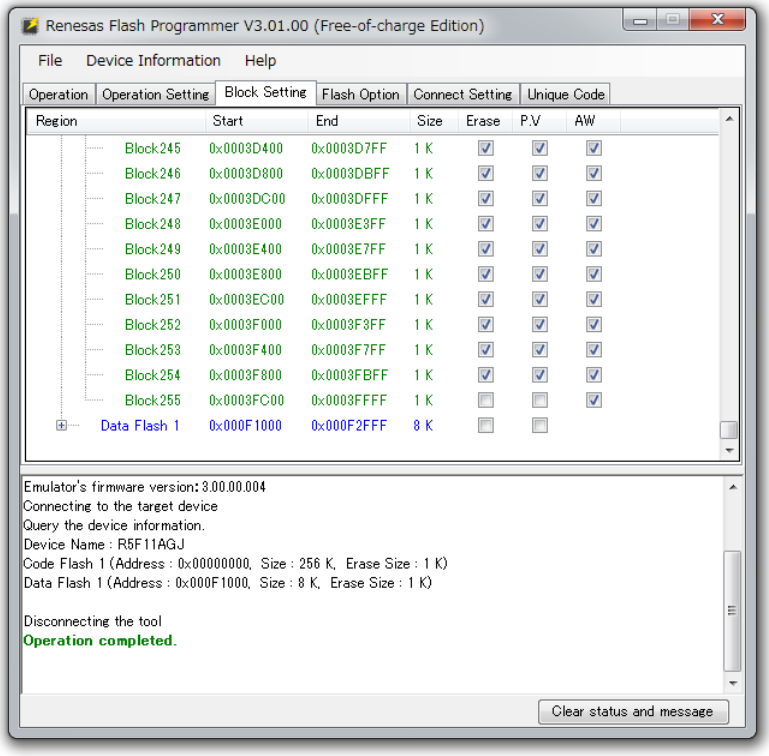
To select ‘Create a new project’ in ‘File’ menu.



To select ‘RL78’ in ‘Microcontroller’ and enter ‘Project Name’. Then, to press ‘Connect’.

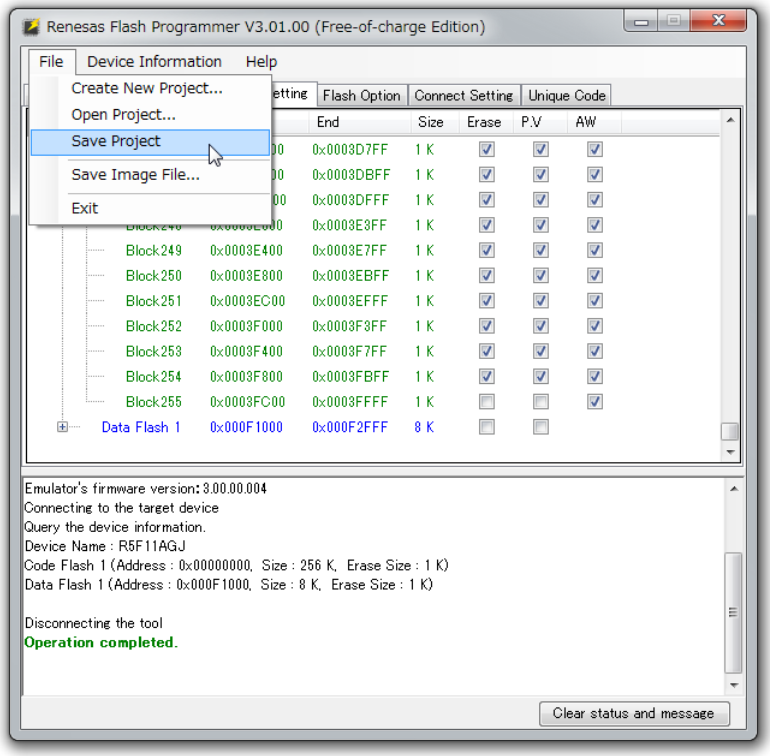


The new project is created after acquisition of device infromation.



To uncheck ‘Erase’ and ‘P.V’ for ‘Block 255’ of ‘Code Flash 1’ and all blocks of ‘Data Flash 1’ in the ‘Block Setting’ tab.

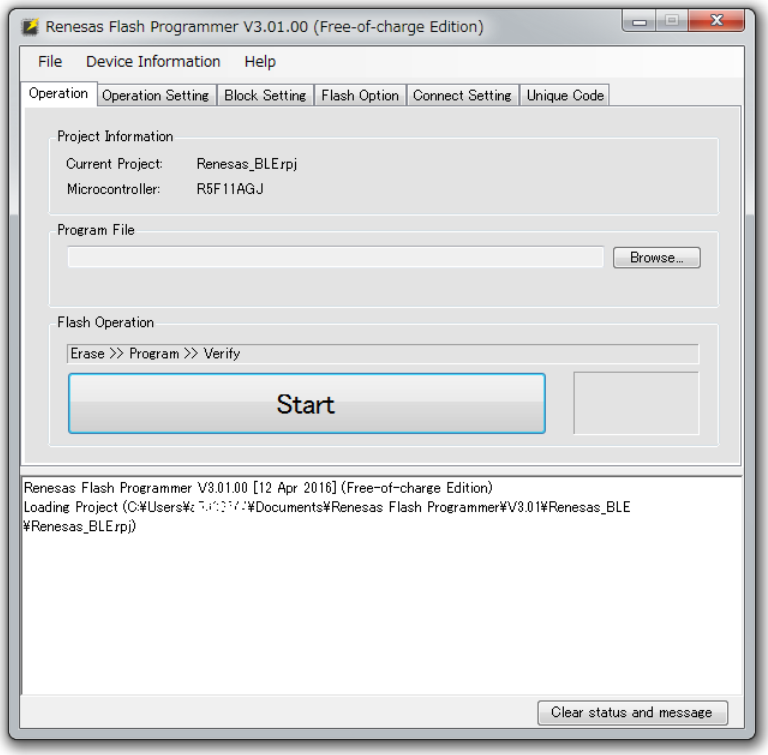
Note: The last block of Code Flash is defined as the customer-specific information area. Uncheck the ‘Block 255’ in order to not erase the area. Refer to *Bluetooth Low Energy Protocol Stack User’s Manual (R01UW0095) ‘5.5 Customer-specific information’* about the customer-specific information area.



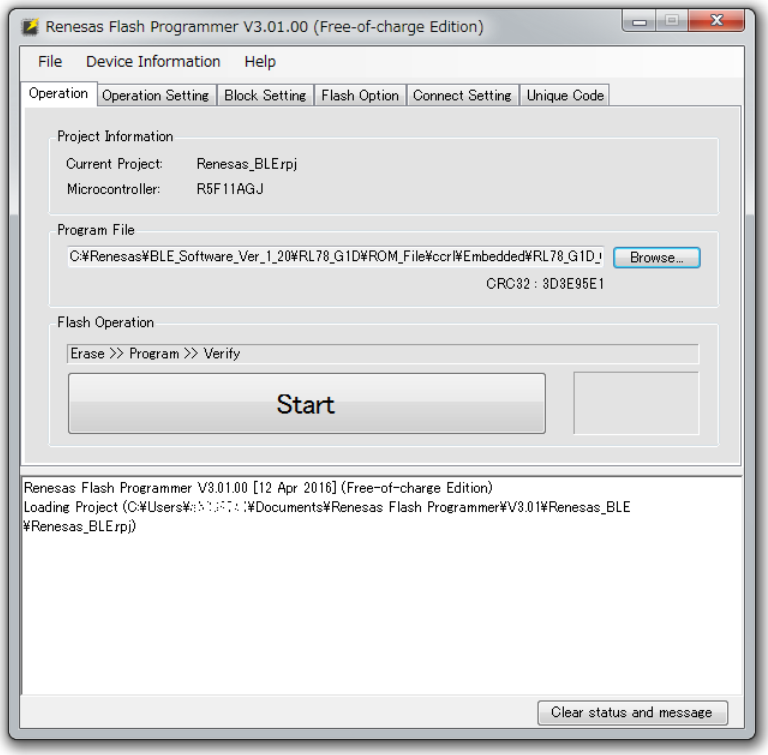
Finally, to save the current project in the 'File' menu, it is complete the creation of the new project. If you don't proceed writing a program file, to terminate the RFP.

[Writing Program]

The following window will be displayed when you restart the RFP after creating a new project.

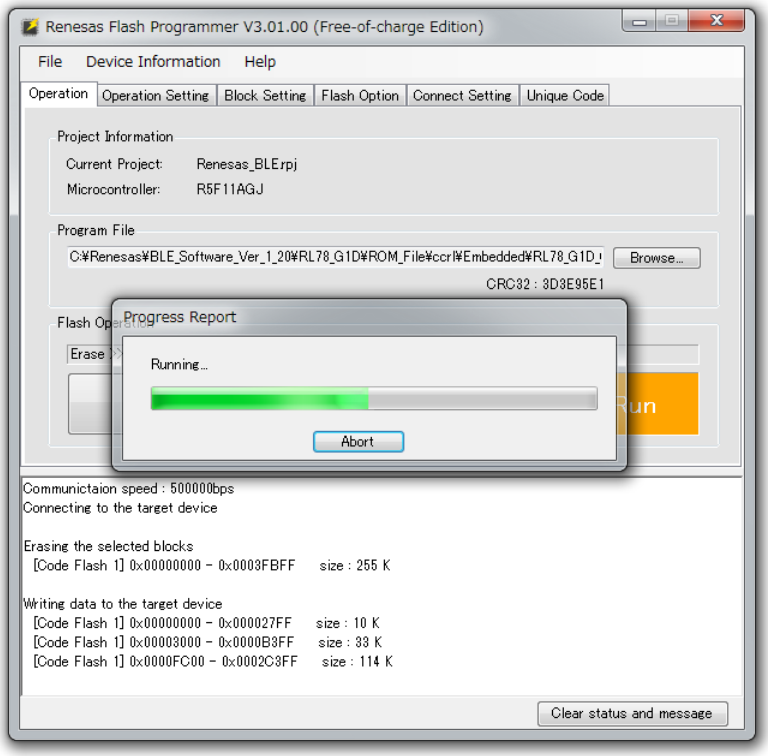


It will make the selection and writing of program files in this display.

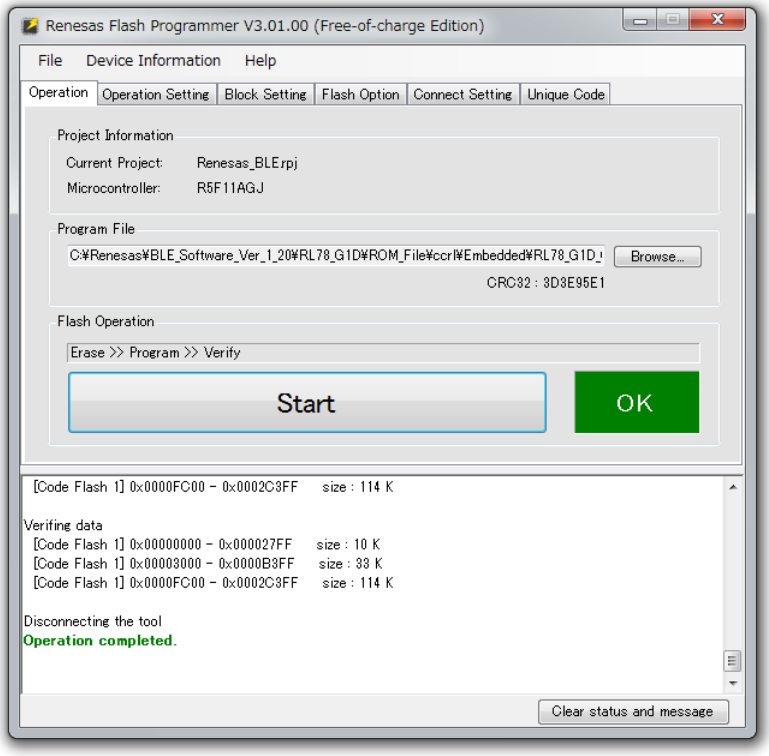


To select a program file which is stored in the location described in 5.1 or 5.2 by ‘Browse’, and to press ‘Start’.

Note: If you test the data communication by following with the procedure of “7.2 Data Communication by BLE”, select the program files including ‘FMP’ which is stored in the location described in 5.1.



The progress report in writing is displayed in during writing.



'OK' is displayed when the writing of the program file is completed.

Disconnect the E1 emulator from the evaluation board after the writing is completed.

5.1 Storage Location of Program File for Evaluation

There are several program files for your evaluation in the BLE software installation data. Write the program files which is stored in the following folders.

CS+/CC **e2/CC** **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\ROM_File\ccrl\Modem\

CS+/CC **e2/CC** **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\ROM_File\ccrl\Embedded\

IARv2 **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\ROM_File\iar_v2\Modem\

IARv2 **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\ROM_File\iar_v2\Embedded\

CS+/CA **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\ROM_File\ca78k0r\Modem\

CS+/CA **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\ROM_File\ca78k0r\Embedded\

5.2 Storage Location of Built Program File

Your built program file will be stored in the following folders. Write the program file by using RFP. The build procedure is described in Chapter 9.

CS+/CC **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CS_CCRL\BLE_Modem\rBLE_Mdm\DefaultBuild\

CS+/CC **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CS_CCRL\BLE_Embedded\rBLE_Emb\DefaultBuild\

e2/CC **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\e2studio\BLE_Modem\rBLE_Mdm\DefaultBuild\

e2/CC **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\e2studio\BLE_Embedded\rBLE_Emb\DefaultBuild\

IARv2 **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\iar_v2\BLE_Modem\BLE_Emb\Debug\Exe\

IARv2 **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\iar_v2\BLE_Embedded\BLE_Emb\Debug\Exe\

CS+/CA **Modem**

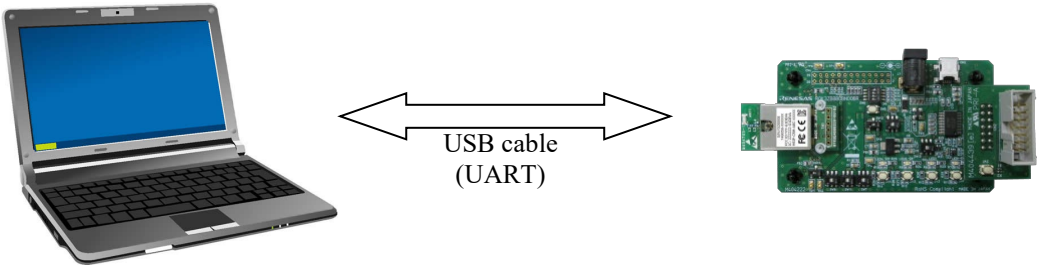
\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CubeSuite\BLE_Modem\rBLE_emb\DefaultBuild\

CS+/CA **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CubeSuite\BLE_Embedded\BLE_Emb\DefaultBuild\

6. Creating Evaluation Environment

You can evaluate the BLE software by command inputs in your computer.



First, referring to table to set slide switches of the evaluation board.

Table 6-1 Slide switch setting for the evaluation board

Switch	Setting	Function
SW7	2-3 connected (right) **default**	Power is supplied from the DC/VBUS via a regulator.
SW8	2-3 connected (right)	Power is supplied from USB VBUS.
SW9	2-3 connected (right) **default**	Connected to a USB serial device.
SW10	1-2 connected (left) **default**	Power is supplied to the module.
SW11	2-3 connected (right) **default**	Power is supplied form a source other than E1 emulator.
SW12	2-3 connected (right) **default**	Set this switch to the right.
SW13	1-2 connected (left) **default**	The USB interface is connected.

After the switch setting is complete, connect the USB cable to between the USB connector and PC.

6.1 Usage of Sample Program

Modem

The BLE software of Modem configuration can be checked the operation by the accompanying sample program.

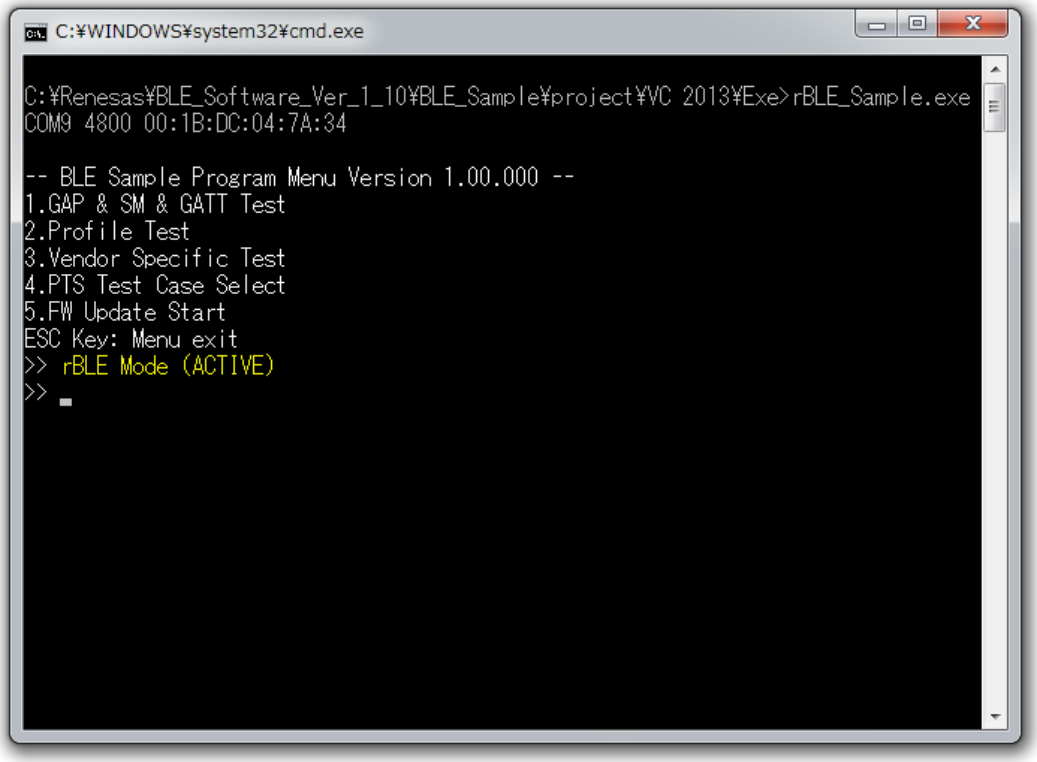
The sample program is started by executing the EXE file ‘rBLE_Sample.exe’ that is stored in the following folder.

\Renesas\BLE_Software_Ver_X_XX\BLE_Sample\project\windows\Exe\

The sample program ‘rBLE_Sample.exe’ requires arguments at its start time, edit the contents of the batch file ‘run.bat’ stored in the same folder as the EXE file. Now, edit to the port number as same as the number that is connected to an evaluation board in the batch file.

```
rBLE_Sample.exe COM9 4800 00:1B:DC:04:7A:34
```

When you double-click the batch file that completed editing, the sample program is activated and the following window is displayed.



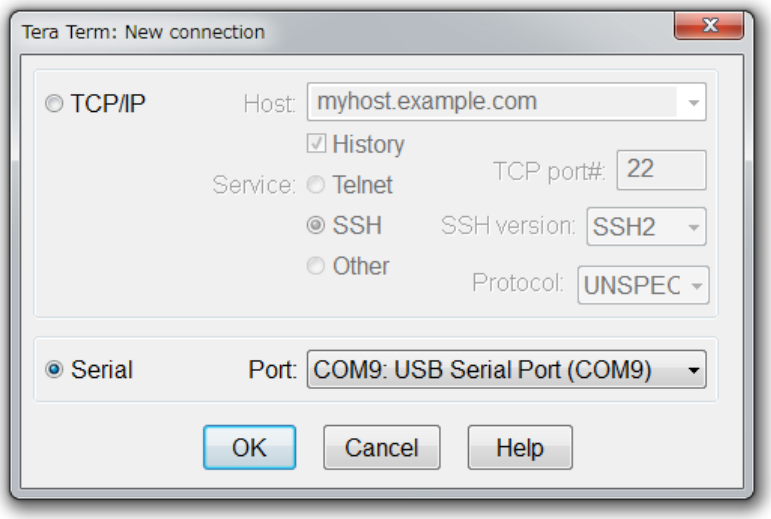
The BLE software of Modem configuration is now ready.

Note: If you connect two or more evaluation board that work with Modem configuration to one computer, start the sample program to each evaluation board after you copy the batch file and edit the number of each files.

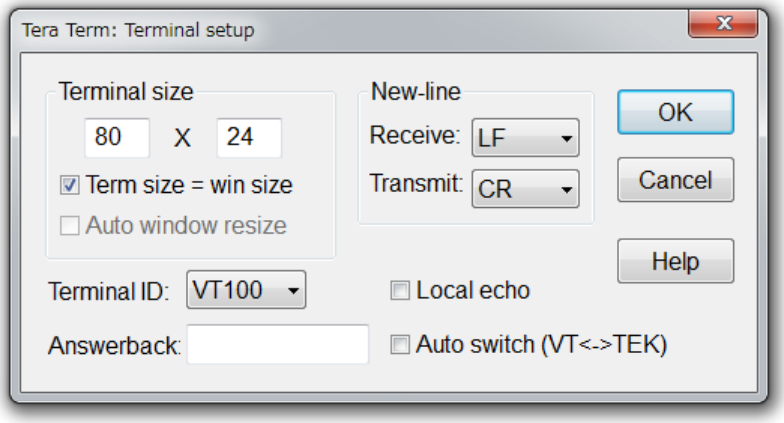
6.2 Usage of Terminal Emulator

Embedded

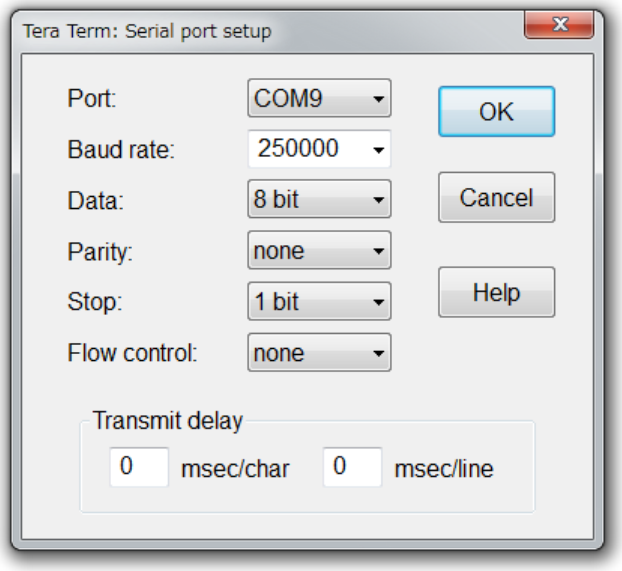
The BLE software of Embedded configuration is evaluated by the terminal emulator on your computer. This document describes the case of using the Tera Term as terminal emulator.



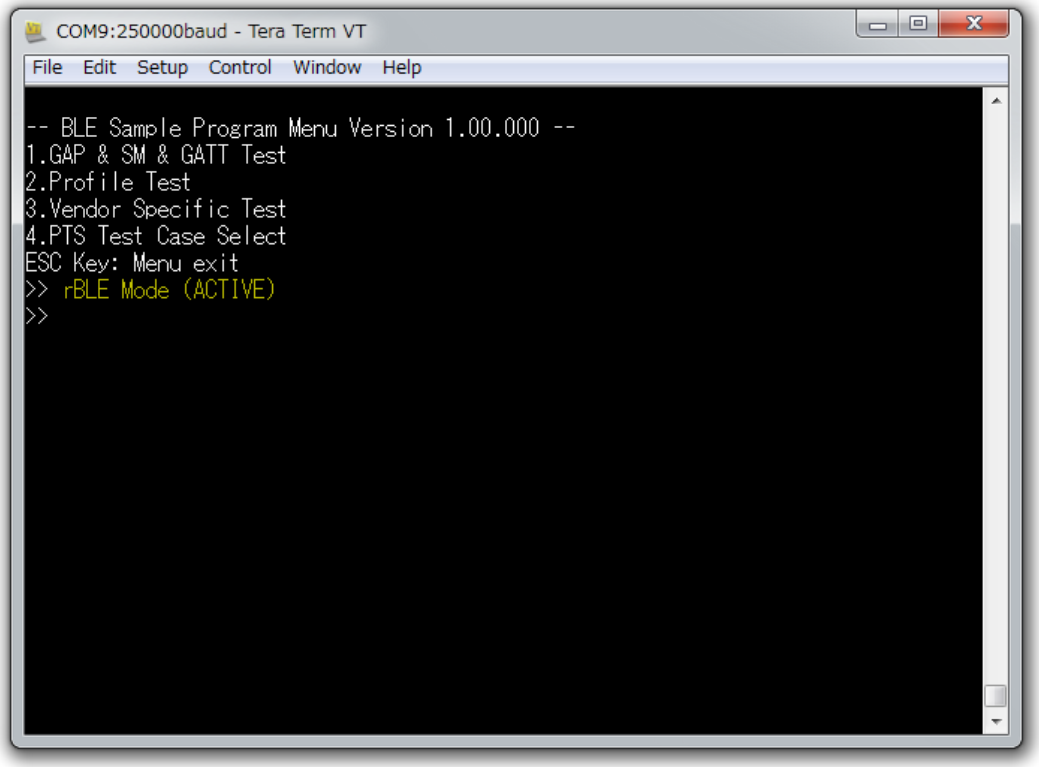
'New connection' window is displayed when starting the Tera Term. To select a port that is connected to an evaluation board from 'Serial', and to press 'OK'.



The terminal is set in 'Terminal setup'. To select 'LF' as 'Receive' in 'New-line', and to press 'OK'.



The serial port is set in ‘Serial port setup’. To set ‘250000’ in ‘Baud rate’, to press ‘OK’.



The menu is displayed when the evaluation board is reset with setting completion. The BLE software of Embedded configuration is now ready.

7. Operation

Modem **Embedded**

How to perform the connection and data communication by BLE software operations at the command prompt is described. The used screen shot in the following description is the display with executing EXE file in Modem configuration. However, it does not different the operation procedure by software configuration.

Refer to *Bluetooth Low Energy Protocol Stack Sample Program Application Note (R01AN1375) '5.4 Usage of Console-based Sample Program' – '5.19 Vendor Specific (VS)'* for the operation method of each profile function.

The evaluation program executes the operation which you may choose the menu item by its number. Then, the APIs corresponding to the selected command are called. Refer to *Bluetooth Low Energy Protocol Stack API Reference Manual – Basic (R01UW0088) and each Profile* about the detail of API.

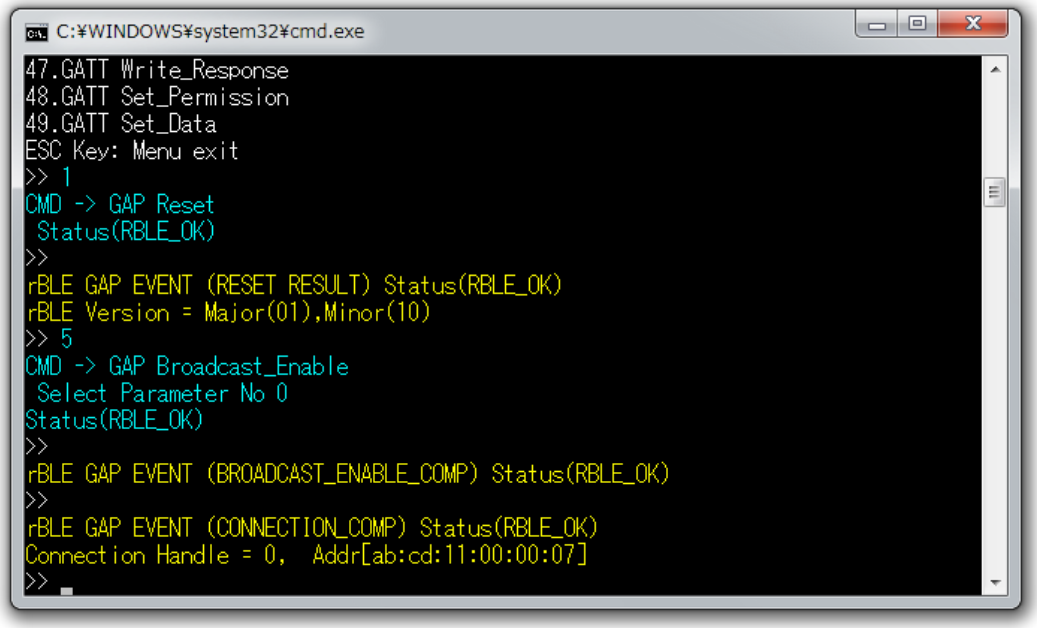
7.1 Connection by BLE

Modem **Embedded**

Function of the Generic Access Profile (GAP) between the master device and the slave device is used for BLE connection.

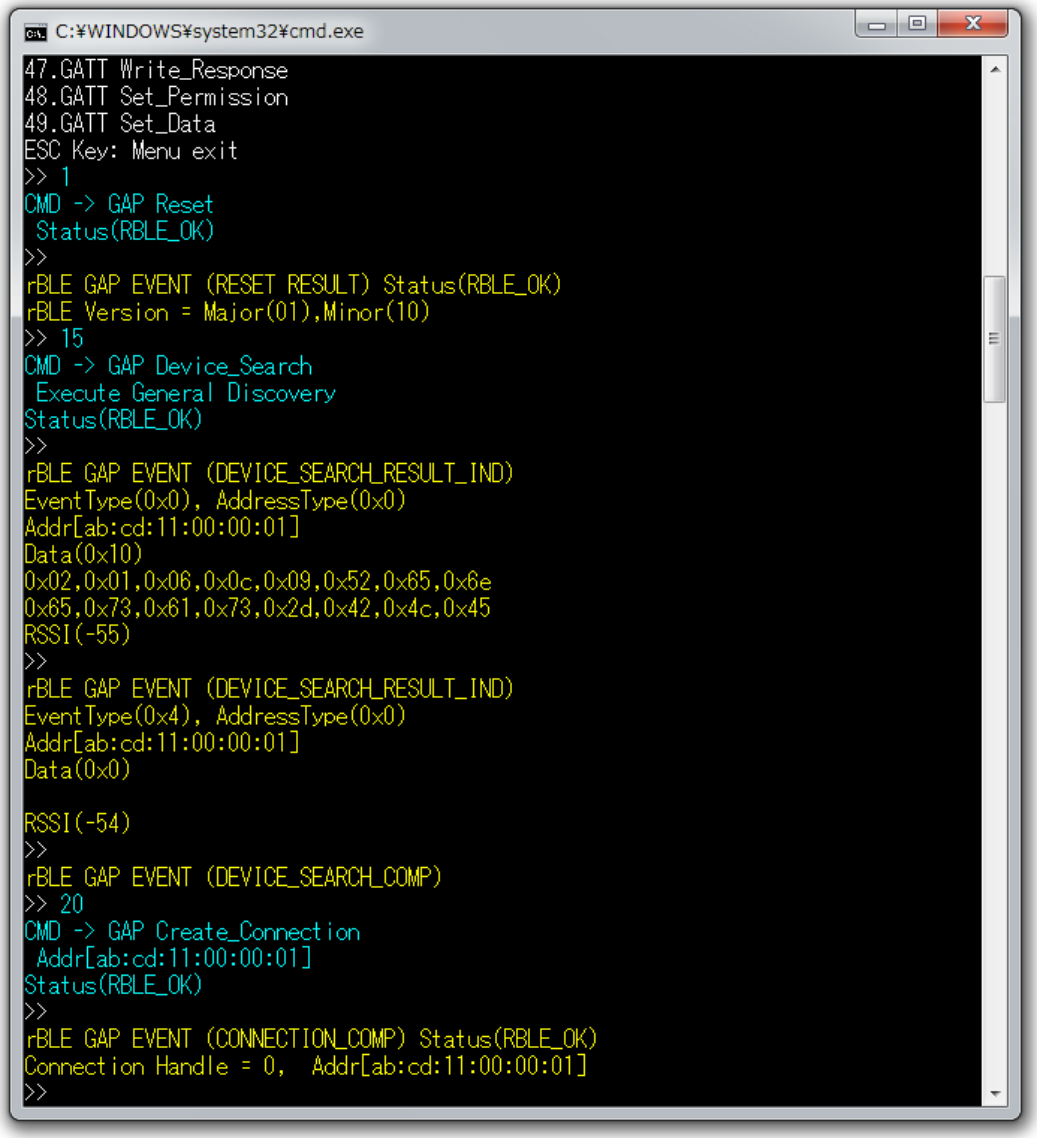
Advertising will be initiated by the slave device to enter the following command.

'1.GAP & SM & GATT Test' menu selection
'1.GAP Reset' selection (call RBLE_GAP_Reset)
'5.GAP Broadcast_Enable' selection (call RBLE_GAP_Broadcast_Enable)



Master device searches for slave device and connects with the following command input.

'1.GAP & SM & GATT Test' menu selection
'1.GAP Reset' selection (call RBLE_GAP_Reset)
'15.GAP Device_Search' selection (call RBLE_GAP_Device_Search)
'20.GAP Create_Connection' selection (call RBLE_GAP_Create_Connection, create a connection with the device discovered at the end of Device Search [Note])



'CONNECTION_COMP' event is displayed in both the master device and slave device if the connection is completed.

Note: If there are many devices around, the device discovered at the end of Device Search may not be the device you want to connect. In that case, after checking the address of the device you want to connect with Device Search, close rBLE_Sample.exe once, and modify "run.bat" to set the device address to connect (set the address in place of "1B:DC:04:7A:34" of "rBLE_Sample.exe COM9 4800 00:1B:DC:04:7A:34"). After that, when execute command on Master, skip "15.GAP Device_Search" and execute "20. GAP Create_Connection". This is because Device Search overwrite the argument setting.

7.2 Data Communication by BLE

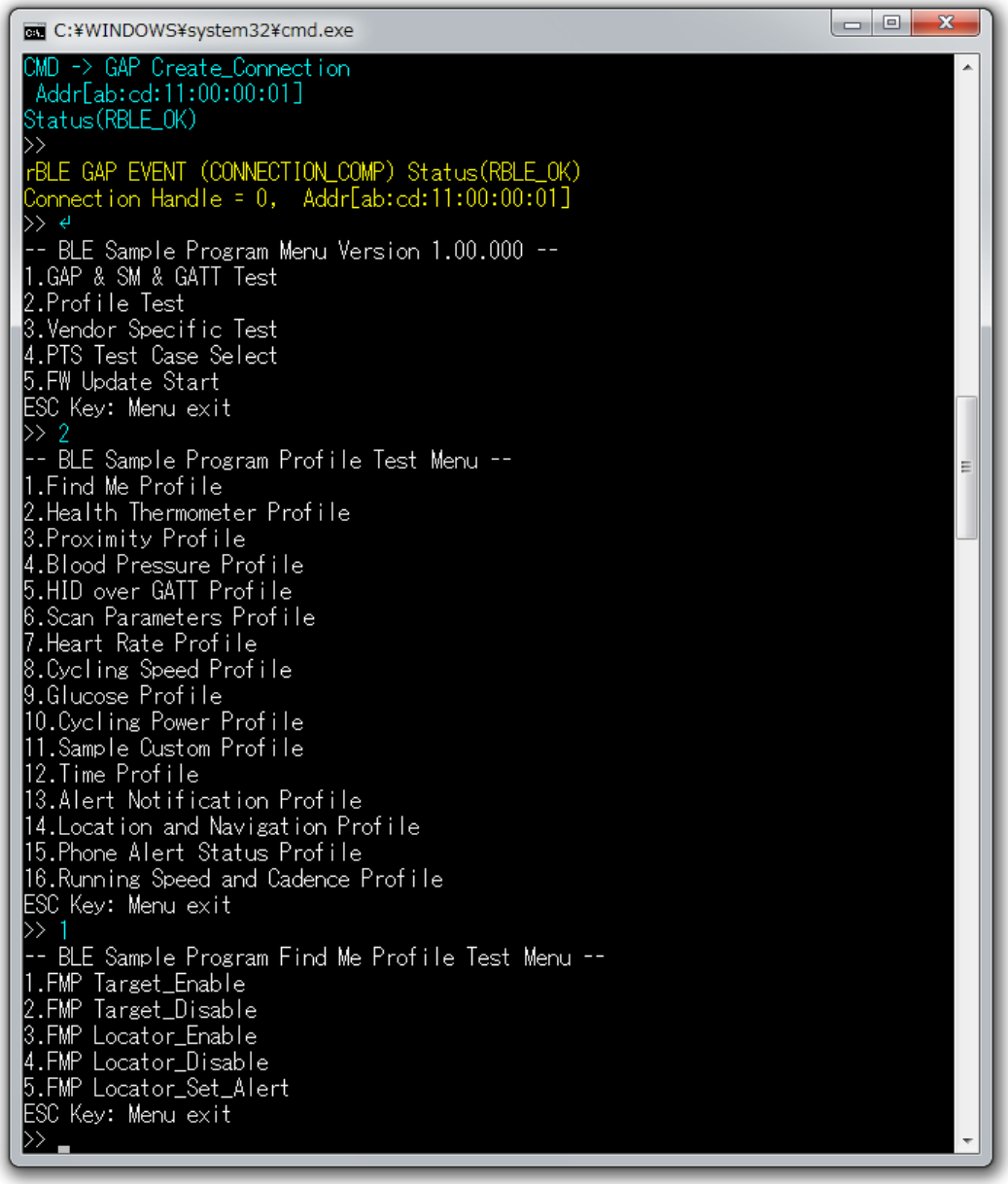
Modem **Embedded**

It will describe how to operate Find Me Profile (FMP) as an example of the data communication.

Locator role and Target role are defined in FMP. Target role will issue an alert in response to an instruction from Locator role. As a result, it will realize the function of search by the alert sound when the smart phones cannot be found.

To use the FMP function, perform the following procedures in both devices after the connection is completed.

Enter the ESC key to exit from 'GAP & SM & GATT Test' menu.
'2.Profile Test' menu selection
'1.Find Me Profile' menu selection

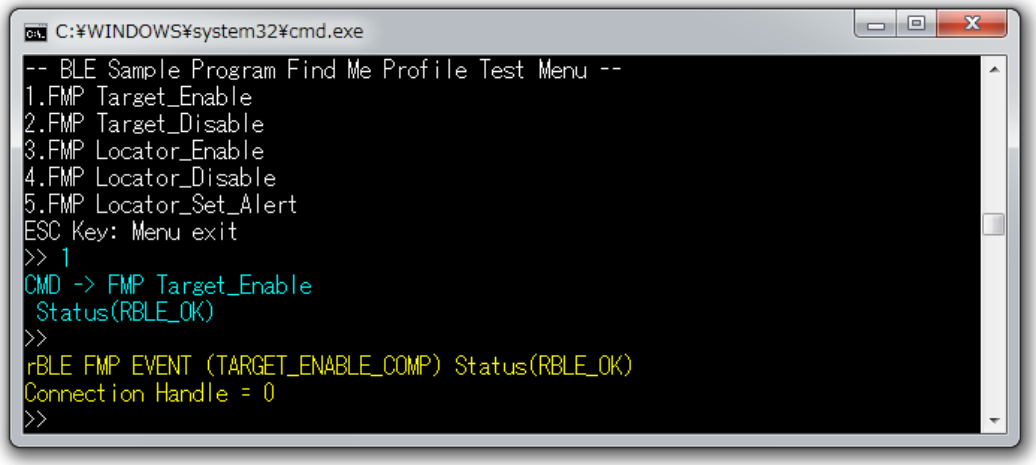


Master device of the FMP will be allowed to become both Locator role and Target role.

For example, if it is assumed that it is searching for a smartphone, the master device becomes the Target role.

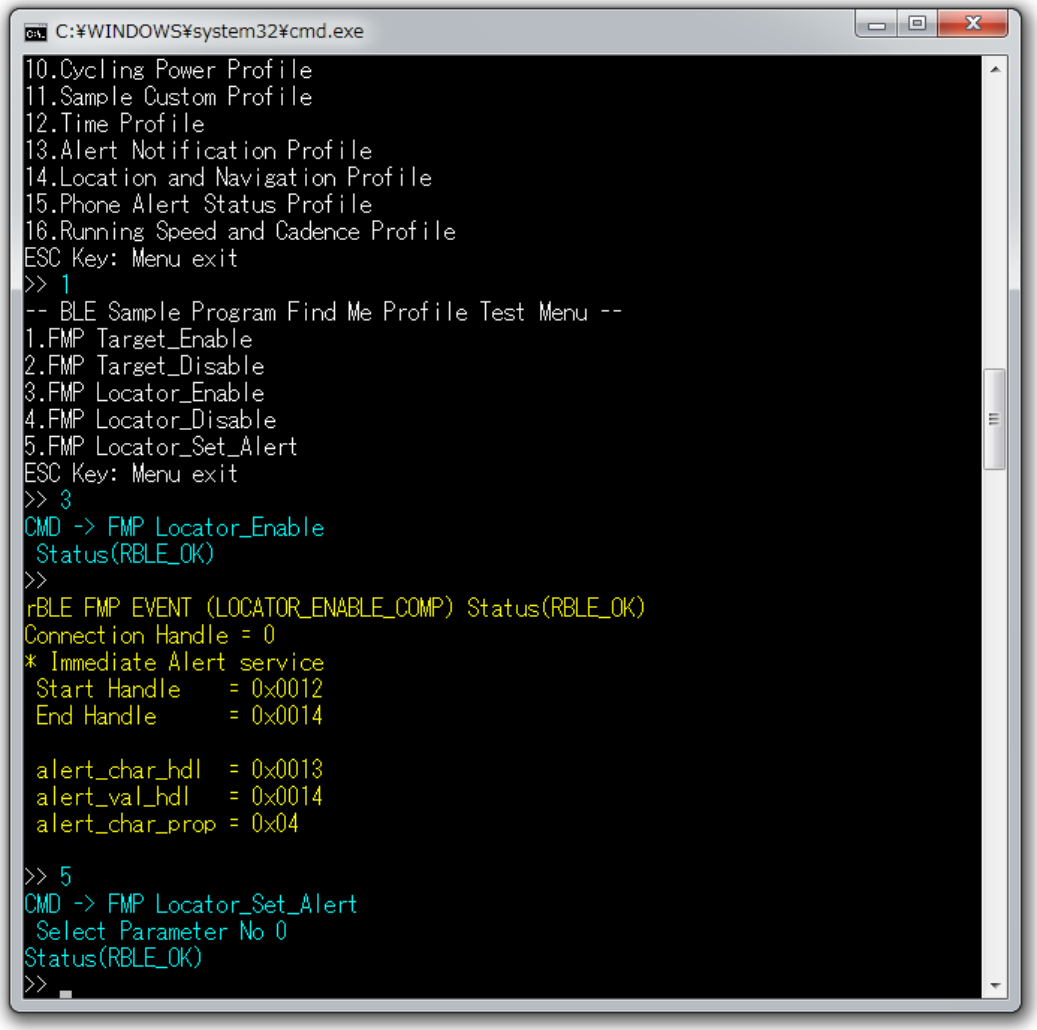
Initialize the Target role by entering the following command.

‘1.FMP Target_Enable’ selection (call RBLE_FMP_Target_Enable)

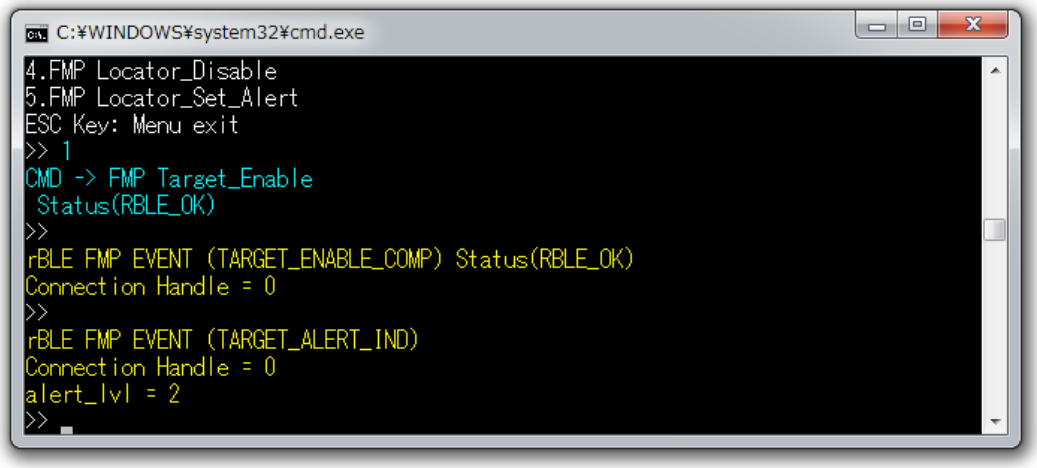


When the following command is entered to the Locator role, Locator device will confirm the Target role feature and send an alert to the Target role.

‘3.FMP Locator_Enable’ selection (call RBLE_FMP_Locator_Enable)
‘5.FMP Locator_Set_Alert’ selection (call RBLE_FMP_Locator_Set_Alert)



Target role appears ‘TARGET_ALERT_IND’ event and receive alerts.


C:¥WINDOWS¥system32¥cmd.exe
4.FMP Locator_Disable
5.FMP Locator_Set_Alert
ESC Key: Menu exit
>> 1
CMD -> FMP Target_Enable
Status(RBLE_OK)
>>
rBLE FMP EVENT (TARGET_ENABLE_COMP) Status(RBLE_OK)
Connection Handle = 0
>>
rBLE FMP EVENT (TARGET_ALERT_IND)
Connection Handle = 0
alert_lvl = 2
>>

8. Customizing

BLE software can be used immediately after installing, but you will be able to customize to fit the evaluation of functions. The customizable features are shown below.

8.1 Selecting Profile

CS+/CC **e2/CC** **IARv2** **CS+/CA** **Modem** **Embedded**

The following profile set of BLE software for evaluation has been prepared.

- Proximity / Find Me / Alert Notification
- HID over GATT / Scan Parameters
- Health Thermometer / Blood Pressure / Heart Rate
- Cycling Speed and Cadence / Cycling Power
- Location and Navigation / Running Speed and Cadence
- Glucose / Phone Alert Status / Time

If you evaluate in different combinations, select the profile function. The Table 8-1 of defined macros that are described in the following file is set to 1 and then select the profile.

Note: The build error will occur when the program size by changing the combination of profiles is over the memory capacity of RL78/G1D.

Folder: \Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\src\arch\rl78
File: prf_sel.h

Table 8-1 Macro name to enable / disable each profile role

Profile	Role	Macro Name
Find Me Profile	Locator	PRF_SEL_FMPL
	Target	PRF_SEL_FMPT
Proximity Profile	Monitor	PRF_SEL_PXPM
	Reporter	PRF_SEL_PXPR
Health Thermometer Profile	Collector	PRF_SEL_HTPC
	Thermometer	PRF_SEL_HTPT
Blood Pressure Profile	Collector	PRF_SEL_BLPC
	Sensor	PRF_SEL_BLPS
HID over GATT Profile	HID Device	PRF_SEL_HGHD
	Boot Host	PRF_SEL_HGBH
	Report Host	PRF_SEL_HGRH
Scan Parameters Profile	Scan Client	PRF_SEL_SPPS
	Scan Server	PRF_SEL_SPPC
Heart Rate Profile	Collector	PRF_SEL_HRPC
	Sensor	PRF_SEL_HRPS
Cycling Speed and Cadence Profile	Collector	PRF_SEL_CSCC
	Sensor	PRF_SEL_CSCS
Cycling Power Profile	Collector	PRF_SEL_CPPC
	Sensor	PRF_SEL_CPPS
Alert Notification Profile	Client	PRF_SEL_ANPC
	Server	PRF_SEL_ANPS
Location and Navigation Profile	Collector	PRF_SEL_LNPC
	Sensor	PRF_SEL_LNPS
Glucose Profile	Collector	PRF_SEL_GLPC
	Sensor	PRF_SEL_GLPS

Time Profile	Client	PRF_SEL_TIPC
	Server	PRF_SEL_TIPS
Phone Alert Status Profile	Client	PRF_SEL_PASC
	Server	PRF_SEL_PASS
Running Speed and Cadence Profile	Collector	PRF_SEL_RSCC
	Sensor	PRF_SEL_RSCS

It is possible to set the parameters of the service used in each profile. Refer to *Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095) '6.1.11 Setting the Profile Service'* in detail.

8.2 Compiling Options

CS+/CC **e2/CC** **IARv2** **CS+/CA** **Modem** **Embedded**

There are the following macro definition as the variable compile options of the BLE software. Use a setting that matches the evaluation of functions according to the manuals.

- CFG_CON: Maximum Number of Simultaneous Connections (**Default value: 4**)
  >Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095)
  + 6.1.1 Maximum Number of Simultaneous Connections
- CFG_USE_PEAK: Peak current consumption notification (**Default value: not use**)
  >Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095)
  + 7.20.1 Peak current consumption notification
- USE_SAMPLE_PROFILE: Using of Sample Custom Profile (**Default value: not use**)
  >Bluetooth Low Energy Protocol Stack Sample Program Application Note (R01AN1375)
  + 7.5 Sample Custom Profile
- USE_SIMPLE_SAMPLE_PROFILE: Using of Simple Sample Profile (**Default value: not use**)
  >Bluetooth Low Energy Protocol Stack Sample Program Application Note (R01AN1375)
  + 7.6 Simple Sample Profile
- USE_FW_UPDATE_PROFILE: FW Update feature (**Default value: not use**)
  >Bluetooth Low Energy Protocol Stack Sample Program Application Note (R01AN1375)
  + 7.10 Project Setting to use FW Update Sample Program
- CLK_HOCO_8MHZ: Operating frequency setting (**Default value: 8 MHz using high-speed on-chip oscillator**)
  >Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095)
  + 6.1.3 Changing the Operating Frequency
- CLK_SUB_XT1: Sub system clock setting (**Default value: using external clock / PCLBUZ0 input**)
  >Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095)
  + 6.1.3 Changing the Operating Frequency
- CFG_PKTMON: HCI Packet Monitor feature (**Default value: not use**)
  >Bluetooth Low Energy Protocol Stack User's Manual (R01UW0095)
  + 12. HCI Packet Monitoring Feature

Project files for each development environment except e² studio has been stored in the following folders.

CS+/CC **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CS_CCRL\BLE_Modem\BLE_Modem.mtpj

CS+/CC **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CS_CCRL\BLE_Embedded\BLE_Embedded.mtpj

IARv2 **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\iar_v2\BLE_Modem\BLE_Modem.eww

IARv2 **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\iar_v2\BLE_Embedded\BLE_Embedded.eww

CS+/CA **Modem**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CubeSuite\BLE_Modem\BLE_Modem.mtpj

CS+/CA **Embedded**

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D\Project_Source\renesas\tools\project\CubeSuite\BLE_Embedded\BLE_Embedded.mtpj

The IDE start when you double-click a project file or workspace.

e2/CC **Modem** **Embedded**

If you open the e² studio project, select the following the work space folder to e² studio startup. Then, execute [Files] → [Import] → [General: Existing Project into Workspace] when importing the project is not completed.

\Renesas\BLE_Software_Ver_X_XX\RL78_G1D

CS+/CA **CS+/CC**

The macro definition of CS+ will be displayed as open the 'Property' tab of the 'Build Tool' in the subproject. (See Figure 8-1)

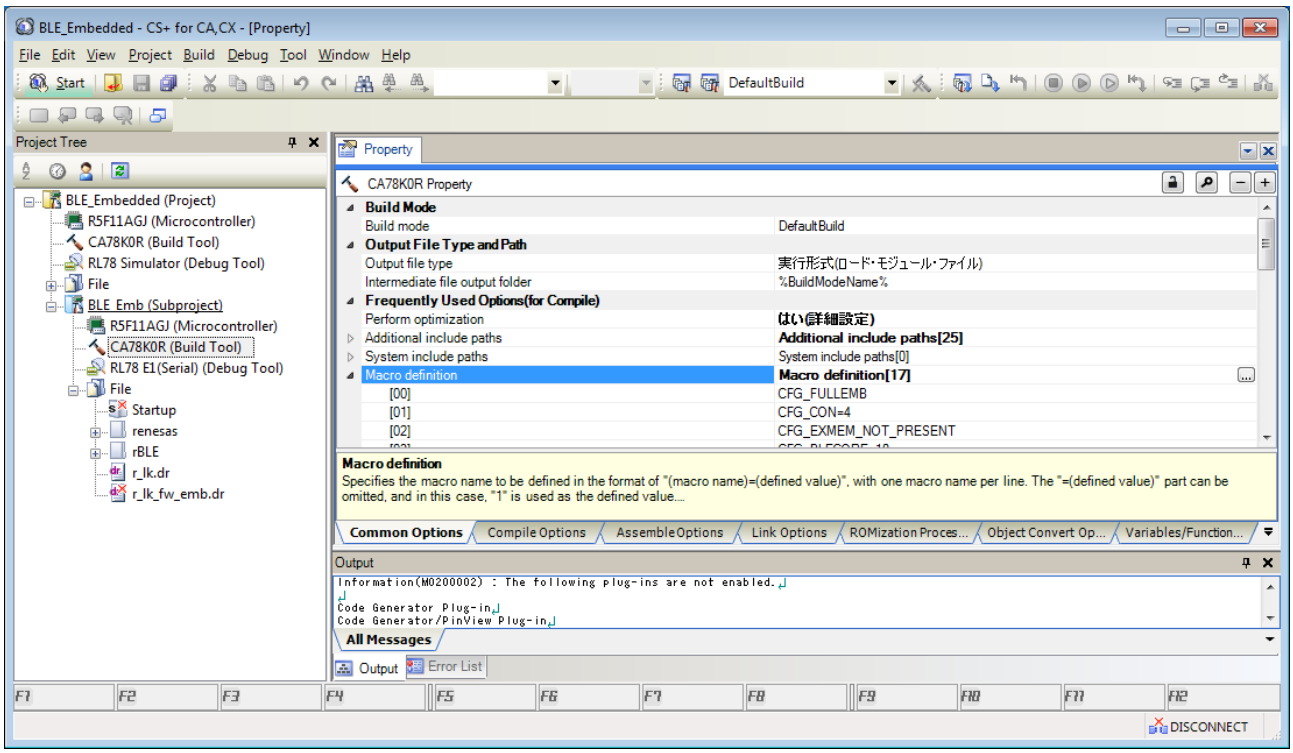


Figure 8-1 Setting display for the macro definition of CS+

e2/CC

The macro definition of e² studio will be displayed as open the Tool Settings tab of the C/C++ Build in the project properties window. (See Figure 8-2)

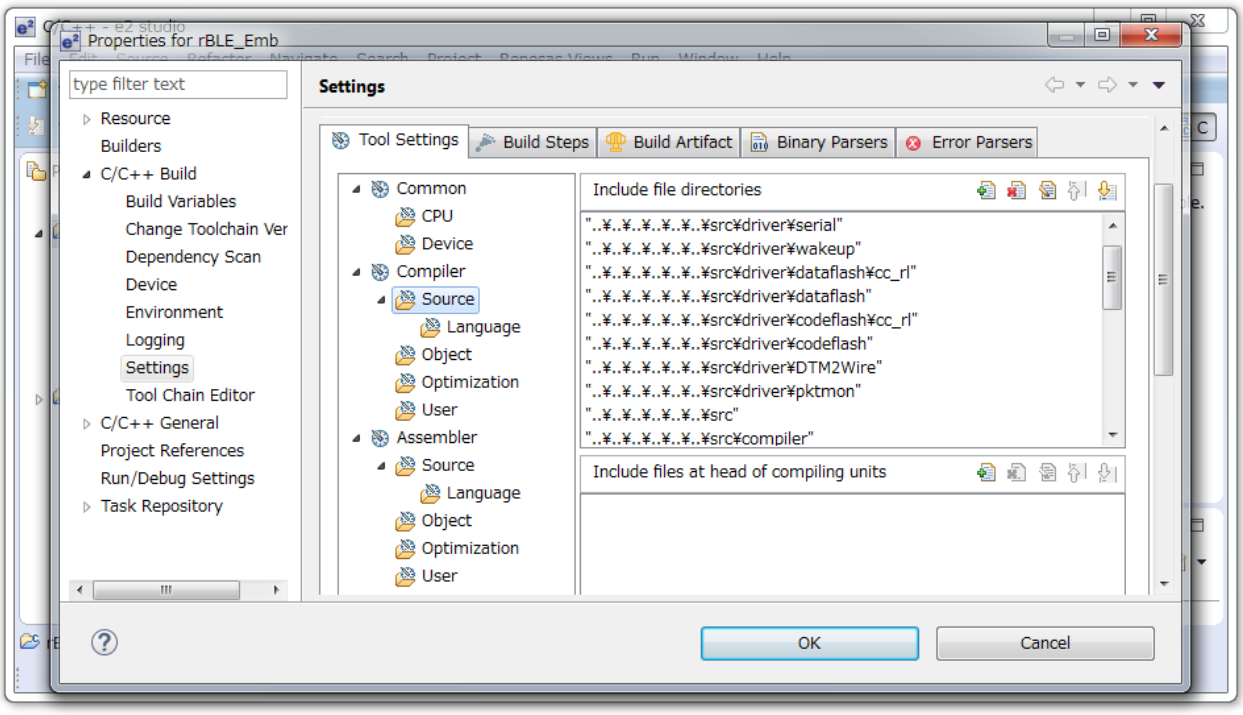


Figure 8-2 Setting display for the macro definition of e² studio

IARv2

The macro definition of IAR Embedded Workbench V2.20 will be displayed as open the 'Preprocessor' tab of the 'C/C++ Compiler' at the node options. (See Figure 8-3)

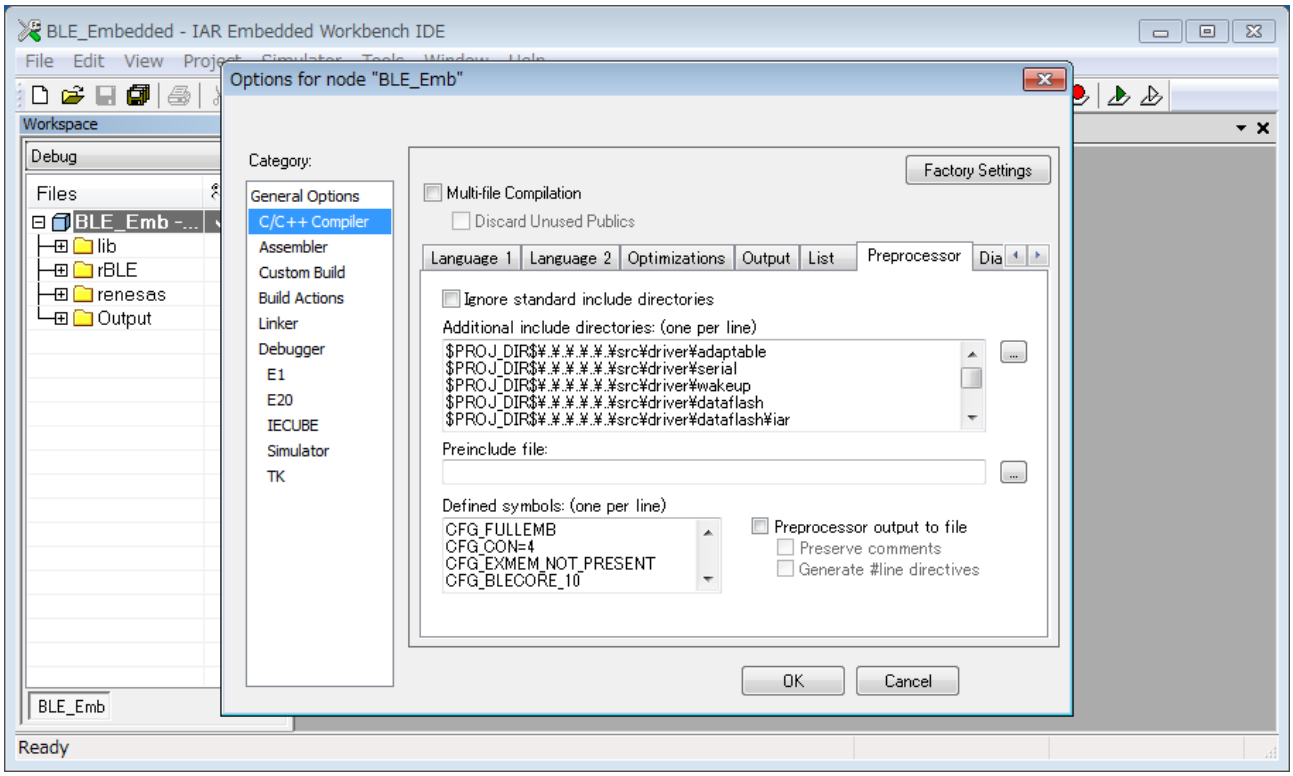


Figure 8-3 Setting display for the macro definition of IAR Embedded Workbench V2.20

9. Building

Build after customizing BLE software.

9.1 Building in CS+

CS+/CA **CS+/CC**

Select ‘build (subproject name)’ in the right click of subproject or ‘Build’ menu.

9.2 Building in e² studio

e2/CC

Select ‘Build Project’ in the right click of project or ‘Project’ menu.

9.3 Building in IAR Embedded Workbench

IARv2

Select ‘Make’ in the right click of node or ‘Project’ menu.

Appendix. FAQ

Bluetooth® low energy FAQ

https://en-support.renesas.com/knowledgeBase/category/31069

Homepage and Technical support

Renesas electronics homepage
https://www.renesas.com/
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Revision Record

Rev.	Issued on	Description	
		Page	Summary
1.00	Apr 29, 2015	-	First edition issued
1.10	Nov 25, 2015	-	Add descriptions of the e^2 studio and CC-RL environment associated with the BLE software version up.
		10, 17	Add tables of the evaluation board switch settings.
1.20	Feb 12, 2016	10	Add note about device driver installation when conntcting the evaluation board.
		10	Change to the support to RFP V3.
1.30	Aug 31, 2016	3, 6, 8, 9, 16, 27	Add descriptions of IAR Embedded Workbench V2.20.
		5	Update the URL information for downloading.
		6	Update the version information for development environment.
		6	Update the version information for flash libraries.
1.40	Jul 31, 2017	-	Remove IAR Embedded Workbench V1.40 descritpion Update the supported version of Visual Studio Express

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. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   ¾ 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   ¾ The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   ¾ The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   ¾ 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. Moreover, 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.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   ¾ The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the 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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(Rev.4.0-1 November 2017)

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