RENESAS

FSP Example Project
Usage Guide

User's Manual

Renesas RA Family

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FSP Example Project Usage Guide

Contents

1. Introduction

This Example Project Usage Guide provides steps and guidelines for operating projects which use API and source generated by Renesas Flexible Software Package **(FSP)**.

1.1 Prerequisites

1. Tool experience: It is assumed that the user has prior experience working with integrated development environments, such as e^2 studio, Segger RTT Viewer, 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 projects. First time users are recommended to refer to FSP User Manual for Tutorial on *Starting Development*, paying special attention to sections *First RA MCU Project* – Blinky, *Importing an Existing Project into e2 studio,* and Tutorial on *Using HAL Drivers – Programming the WDT*. When working with Microcontrollers which have support for Arm® TrustZone®

refer to section *Primer: TrustZone Project Development*. Also consult the RA Arm® TrustZone® Example Project QSG.

3. Prior to running the example projects or programming the kits, all jumper settings must be set to the default settings. Refer to each kits' 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. Hardware and Software Requirements

RA FSP Example projects are designed to operate using RA MCU kits officially supported by Renesas. Supported kits are identified for each group of microcontrollers on the Rensas website.

Refer to the readme.txt file in the specific module folder of */example_projects* folder for additional hardware and software requirements for running the projects.

Note:

1. Some projects may require external hardware as mentioned in the respective readme.txt files
2. Some pin numbers may be printed on the back of the Evaluation Kit board.

Software Requirements

- Windows® 10 operating system
- e² studio v2024-01.1or later
- FSP v5.2.0 or later
- RASC 2024-01.1
- IAR Embedded Workbench v.9.50.1 or later
- Keil MDK v5.39 or later
- ARM Compiler 6.21 or later
- ARM GNU Toolchain: 13.2
- QE for Capacitive Touch: 3.3.0 or higher
- QE for BLE: 1.6.0
- QE for Motor: 1.3.0
- Renesas E2 and E2 Lite: 2.1.3
- SEGGER J-Link RTTViewer v7.94g or later
- SEGGER J-Flash Lite v7.92o or later
- LLVM 17.0.1 or later
- GNU ARM Compiler v13.2 or later

3. Tool Installation

3.1 FSP and tools installation

Refer to https://github.com/renesas/ra-fsp-examples/tree/master/example_projects/version_info_table.md to identify the version(s) of FSP needed to operate the example project(s) of interest. Download and install the latest version of FSP and tools from FSP GitHub repository.

1. Open FSP GitHub repository: https://github.com/renesas/fsp
2. Go to the *Releases* section of Git and navigate to latest FSP section.
3. Follow the instructions on installing and using FSP and e² studio, Keil MDK and IAR.

3.2 JFlashLite and JLink RTTViewer Installation

Download and install SEGGER J-Link Software for Windows from https://www.segger.com/downloads/jlink#J-LinkSoftwareAndDocumentationPack.

Default download path is `C:\Program Files\SEGGER\JLink`.

Note: Select version 7.86b or later from the drop-down menu in Version tab.

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4.   Importing and Running the Project

4.1   Downloading the Project

4.1.1   Downloading the Project from GitHub

1. Open FSP Examples Repository: https://github.com/renesas/ra-fsp-examples/releases.
2. Navigate to **Assets** section.
3. Download the project bundle for specific kit. For e.g.: EK-RA2A1-exampleprojects.pdf and ek_ra2a1-exampleprojects.zip.

4.1.2   Downloading the Project from Renesas.com.

1. Download the example project bundle for the specific kit from https://www.renesas.com/us/en/products/software-tools/software-os-middleware-driver/software-package/ra-fsp.html#downloads

Note: Some example projects projects for a kit bundle may require an older version of FSP to be installed due to identified problems found in operating with latest version of FSP.

4.2   Running the project

There are two ways of running the project:

1. Flashing the pre-built binary (.hex file) and running the project is explained in section 4.2.1. This method is recommended when you are only interested in operating the microcontroller and evaluating the functionality described for the project.
2. Importing the project into e^2 studio, building, loading and running the project is explained in section 4.2.2. This method is recommended when you are interested in operating the microcontroller with a debugger attached to it and/or modifying the project to your needs.

4.2.1   Flashing pre-built binary

MCUs such as RA6M4, RA6M5, RA4E1, RA6E2, and RA6T2 may require Device Lifecycle Management State and TrustZone boundary setting adjustments. For these MCUs it is easier to evaluate functionality using instructions provided in section 4.2.2.

1. In the **e2studio, Keil, and IAR,** folder for each module, a prebuilt binary i.e. **.hex** file included.
2. Navigate to the latest downloaded (or installed) `JLink` folder and open J-Flash Lite by double clicking on `JFlashLite.exe`.
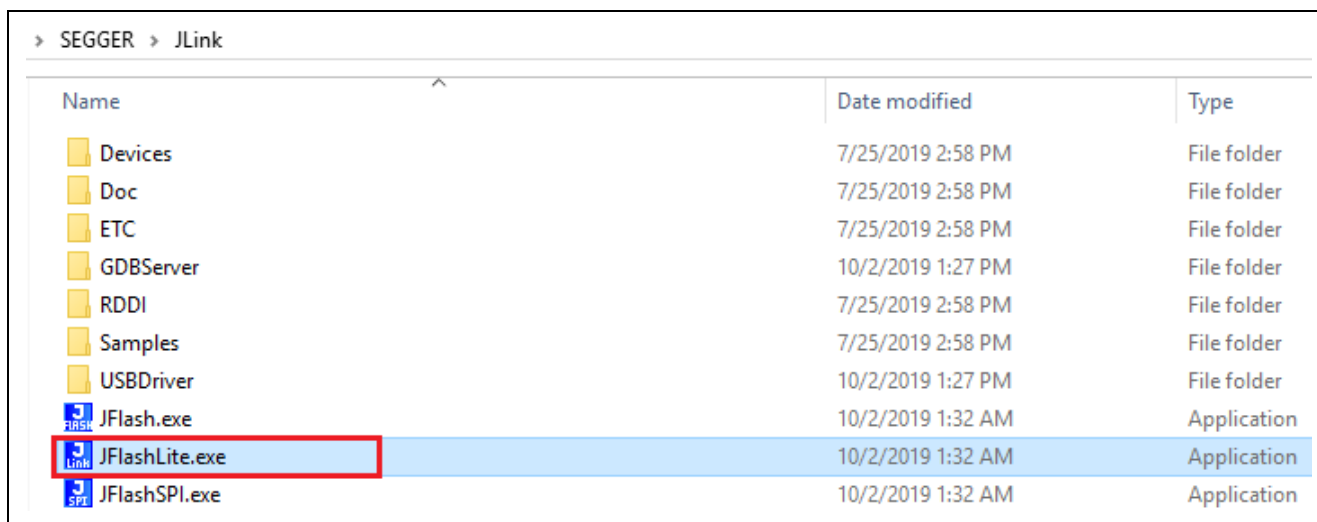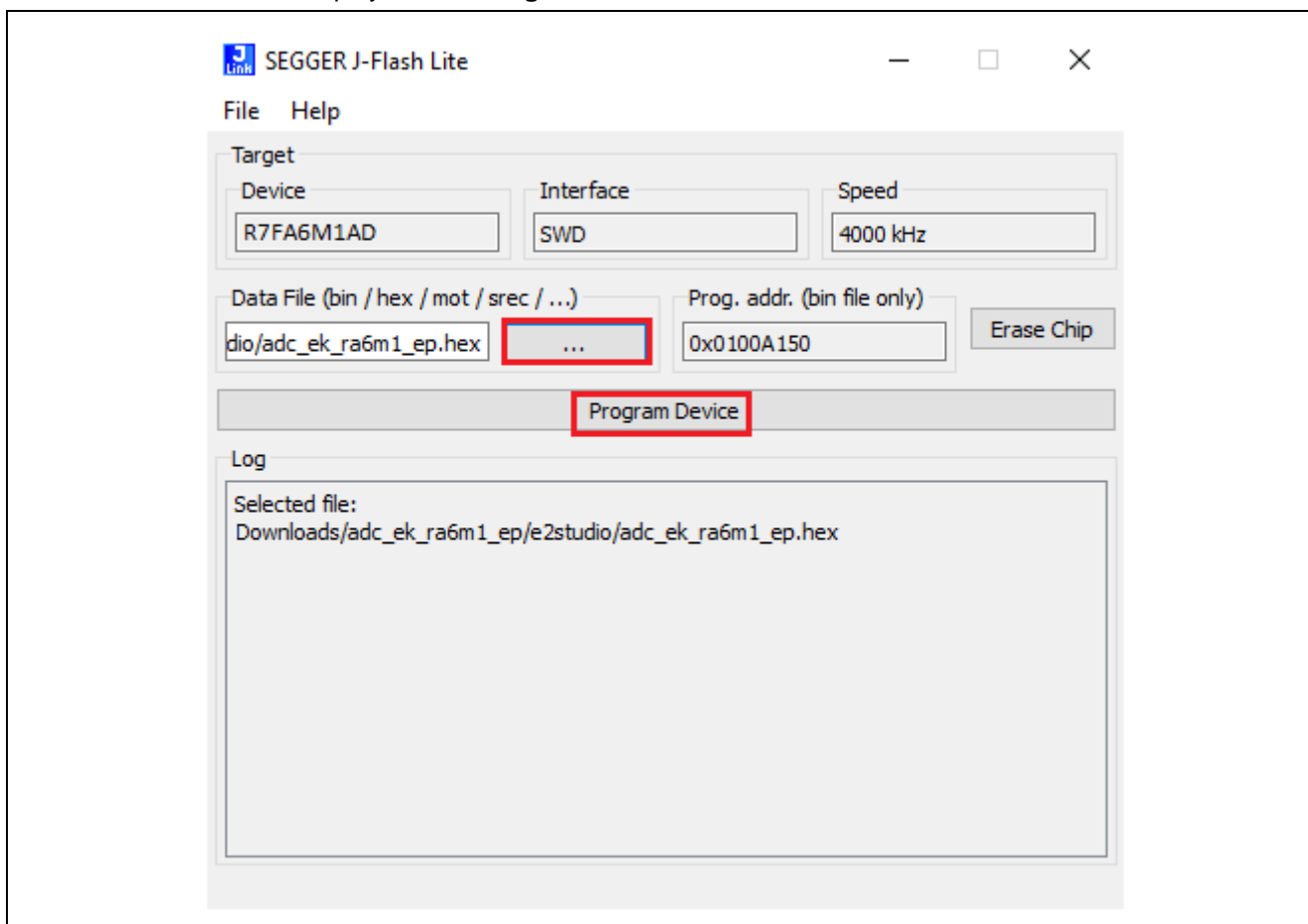
3. Click **OK** to get past the warnings.
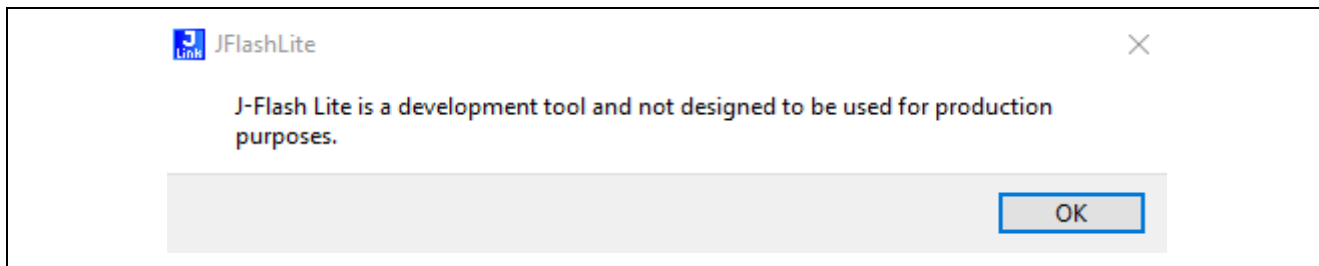
4. Click on the [...] tab for the list of supported devices and choose Renesas RA device. Click **OK**.

5. Browse to the location of the .hex file using the [...] tab and click on the **Program Device** tab. The selected file will be displayed in the **Log** section.

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6. When downloading is complete, the status will be displayed as shown in the following figure.
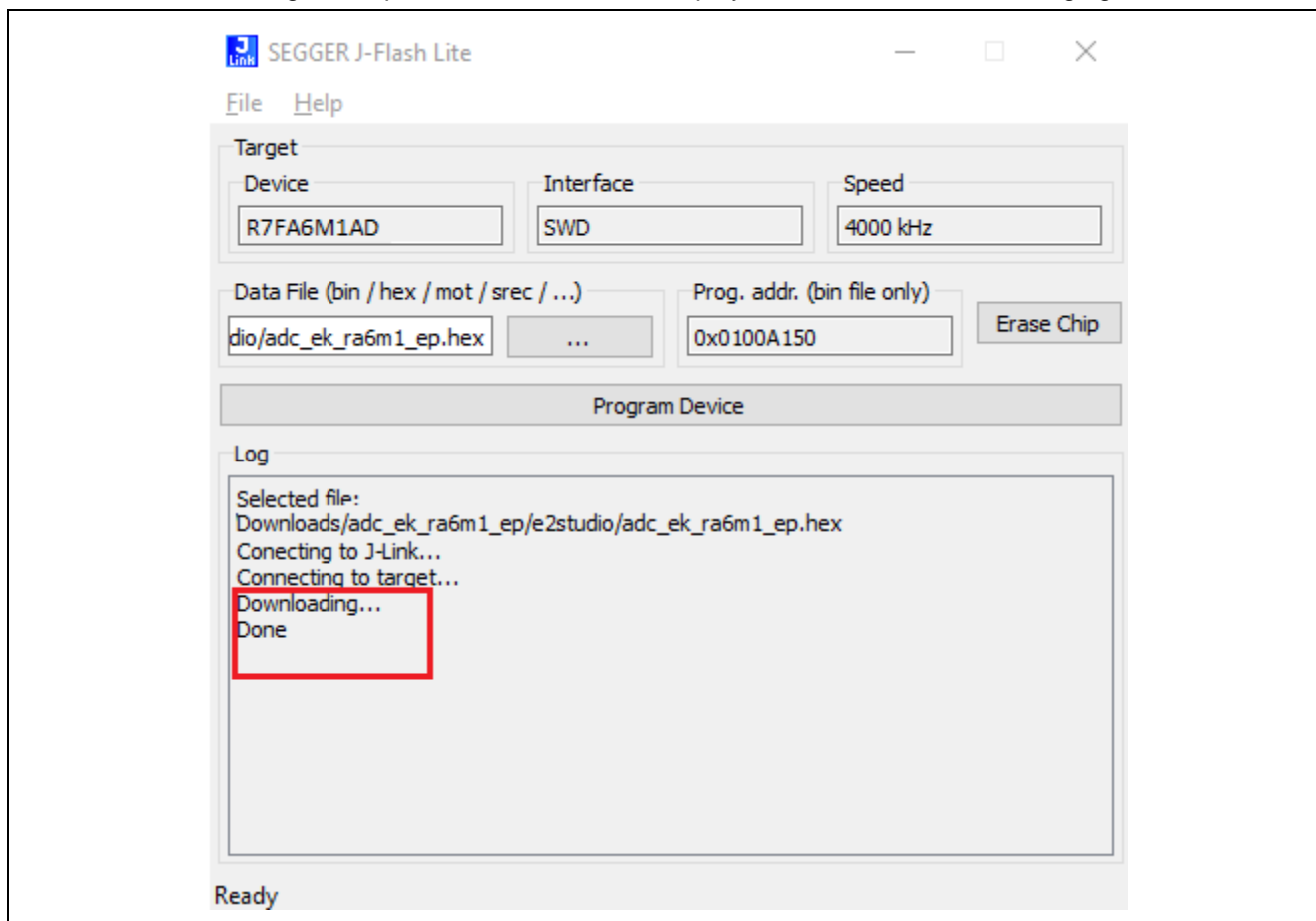
7. Skip to section 4.2.3 for steps on running the project.

4.2.2   Importing the project into e2studio, Keil MDK and IAR

Refer to FSP User Manual for steps on importing a project:

- Importing an existing project
- Generating Project content[1]
- Building the project
- Downloading the project image to the board

Then apply your learnings to the module/project of interest.

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[1] Upon importing some example projects a user may be prompted to upgrade the e2studio project to the FSP version distributed with the e2studio platform installer available on GitHub.

It is recommended that the user avoids this and instead opts to download and install the required (and missing) version of FSP from the available sources into the used e2studio platform installer.

Example projects distributed through https://github.com/renesas/ra-fsp-examples may not be upgraded to the most release of FSP due to technical issues found during regression testing. Refer to the version information table to identify the older version of FSP to use with the non-upgraded example project.

4.2.3   Running the Project

1. Open RTT Viewer by double clicking `JLinkRTTViewer.exe` in the downloaded `/Segger/JLink` folder.
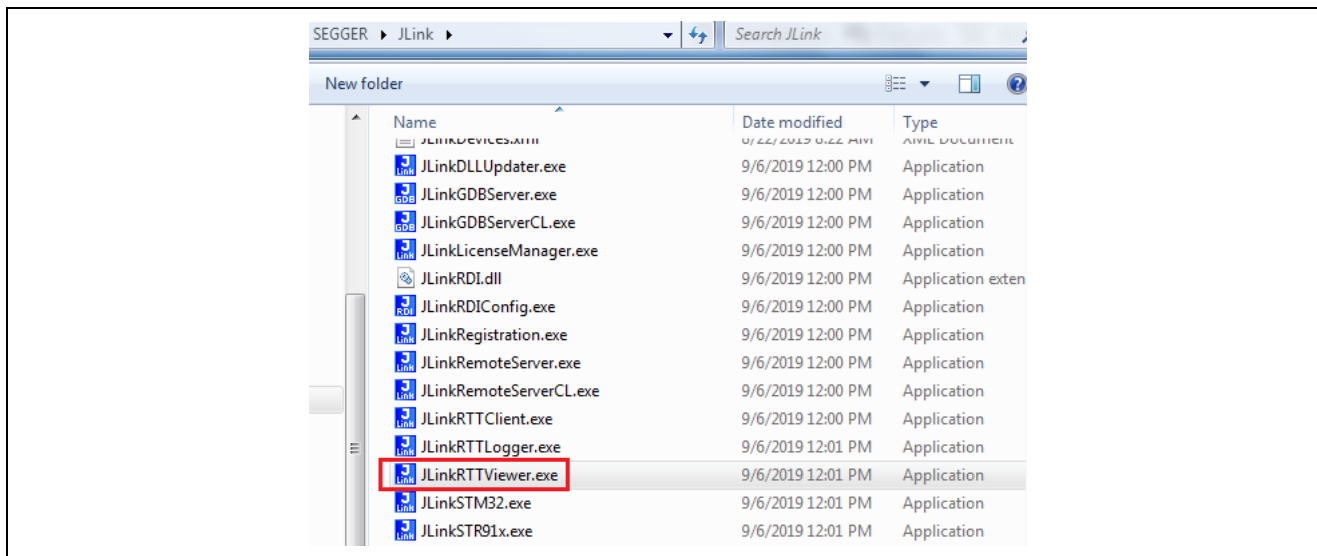
2. On opening, the field **Specify Target Device** shows up as **unspecified**. Click on the [...] tab to select the Renesas RA device.
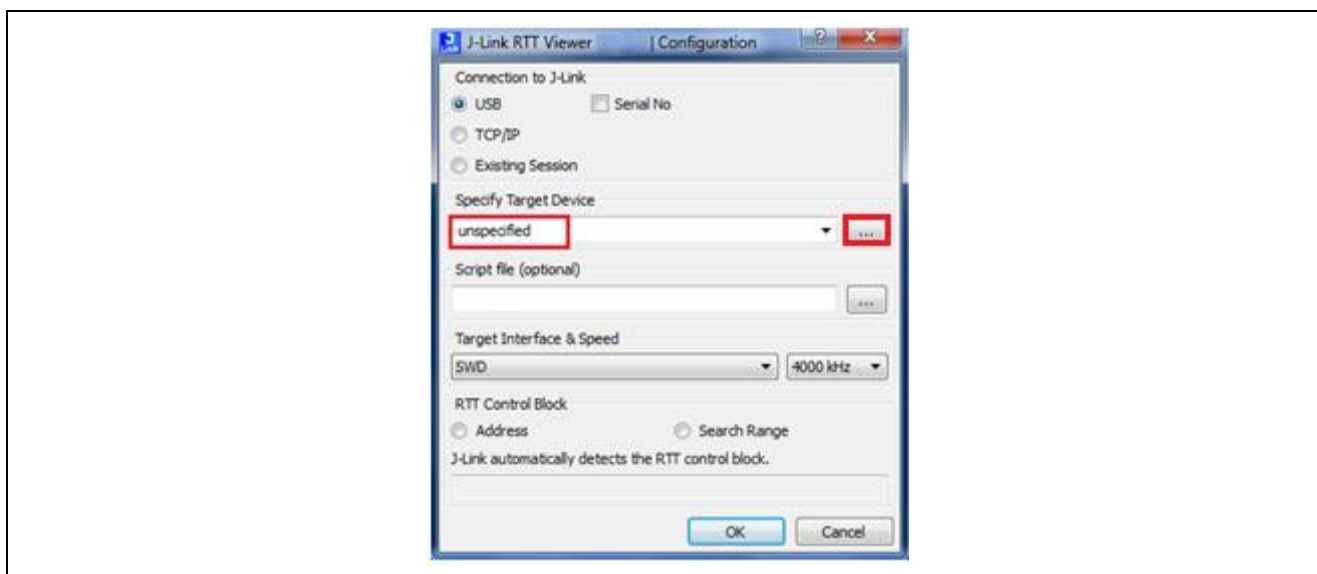
3. If multiple kits are connected to the PC, make sure to choose the corresponding serial number. The default is 0.
   Note: For MCUs such as RA6M4, RA6M5, RA4E1, RA6E2, and RA6T2, the exact address of the RTT Control Block must be specified. When Auto Detection is used, RTT Viewer parses all RAM memory to find the RTT Block. As TrustZone boundaries are configured for all projects for these MCUs, RTT Viewer will encounter access failures and you will not see the output logs in RTT viewer. The exact address for
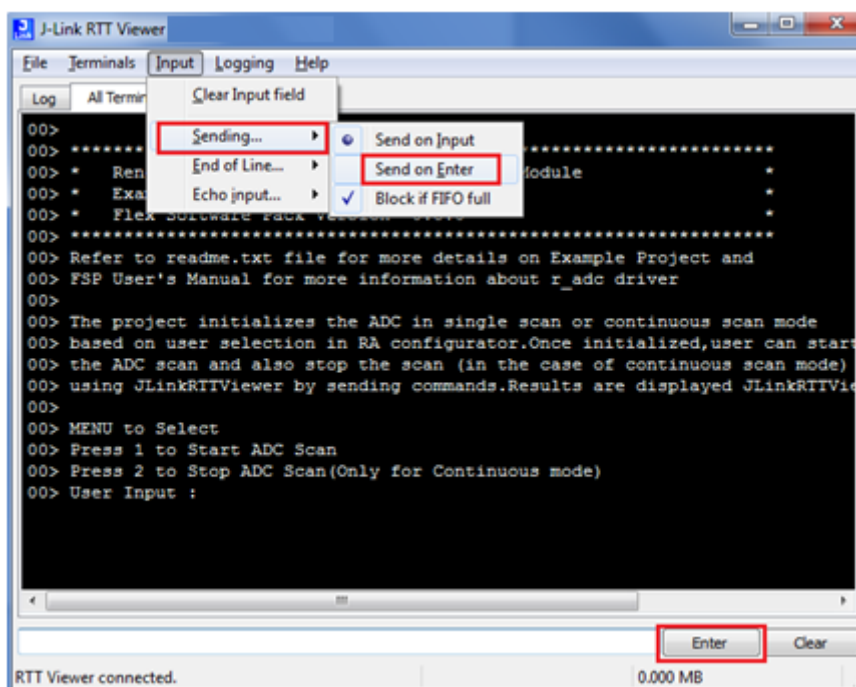
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the SEGGER_RTT data structure in RAM is found in the readme.txt file associated with the module under evaluation or in the map file when a binary is built. (Refer Appendix for an example).

4.   Click **OK**.

5. Click on the **Input** tab and change **Sending** option to **Send on Enter**. Every time input in entered, you must either press the **Enter** or **Enter** tab on the RTT viewer.

6. Follow the instructions displayed on the RTT Viewer as shown above. Also refer to `readme.txt` file in the project folder (downloaded.zip file or in https://github.com/renesas/ra-fsp) to run the project.

Note:

1. Example Projects do not support floating point or special characters or any non-numeric characters.
2. Example projects do not handle cases where the user input is greater than the expected input array size.

5. References

|	
FSP GitHub:	https://github.com/renesas/fsp
FSP User Manual:	www.renesas.com/fsp#documents
	https://renesas.github.io/fsp
FSP Example Projects:	https://github.com/renesas/ra-fsp-examples
Evaluation Kit Manuals:	
	www.renesas.com/ra/ek-ra6m3g
	www.renesas.com/ra/ek-ra6m3
	www.renesas.com/ra/ek-ra6m2
	www.renesas.com/ra/ek-ra6m1
	www.renesas.com/ra/ek-ra4m1
	www.renesas.com/ra/ek-ra2a1
Knowledge Base:	
	Creating an RA Project with ARM Compiler 6 (AC6) in e2 studio
	Creating a Custom Board Support Package (BSP) for FSP
	www.keil.com/appnotes/docs/apnt_330.asp
Support:	www.renesas.com/ra/support

6. Appendix

6.1 Limitations in connecting with J-Link RTT Viewer v7.94g or later

When using Auto Detection option for the RTT Control Block, J-Link RTT Viewer may not be able to find the `SEGGER_RTT` variable in RAM memory. If the RTT Control Block cannot be found by RTT Viewer, then output from an Example Project may not be visible in the RTT Viewer Console.
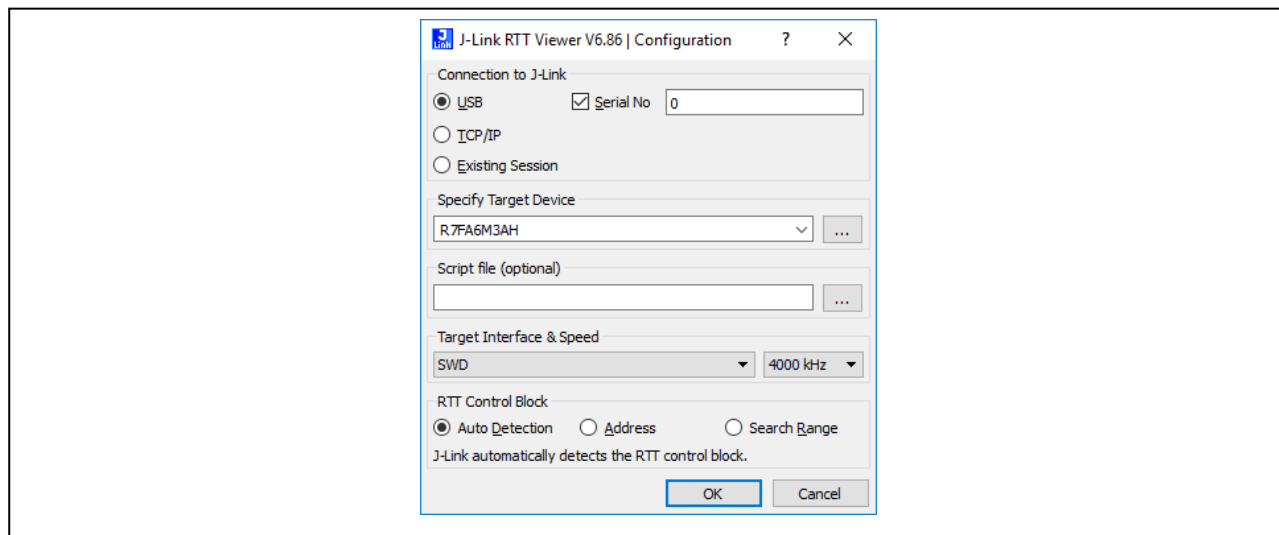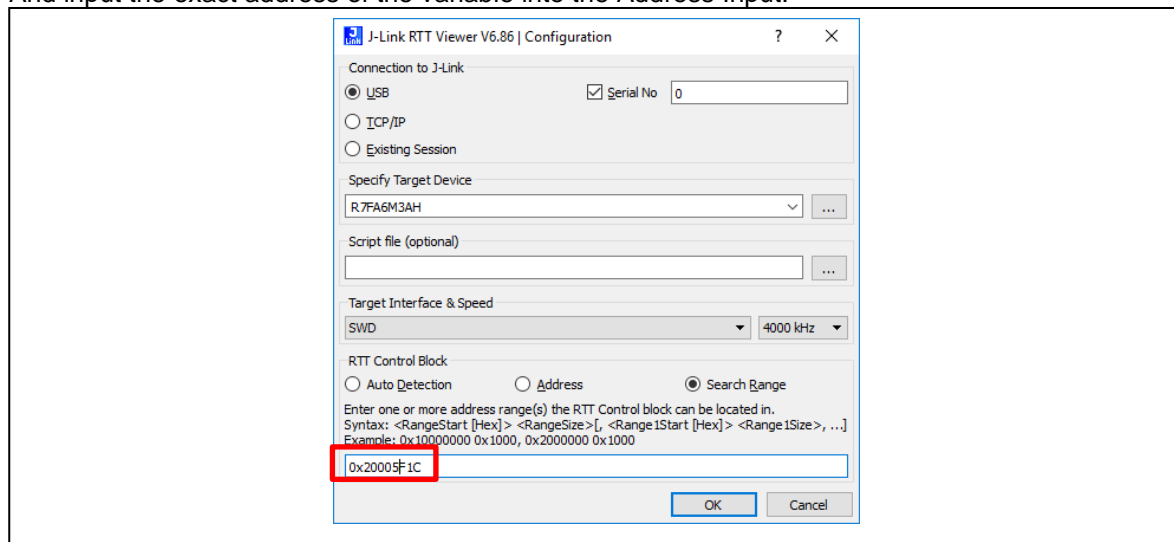

To circumvent this situation, you may use any one of the following approaches:

1. Search _SEGGER_RTT variable in the map file, generated upon successfully building a configuration of an Example Project, which is by default located in the address space for On-chip SRAM.
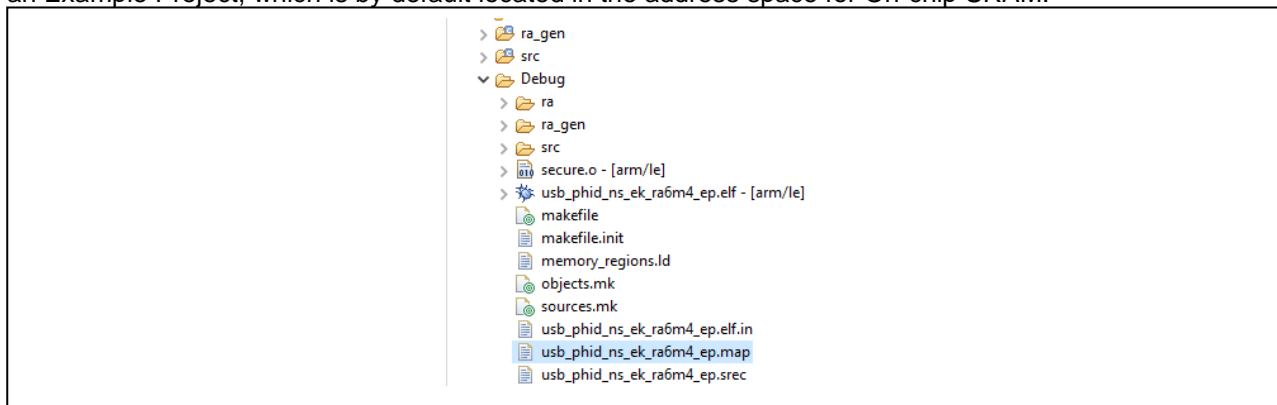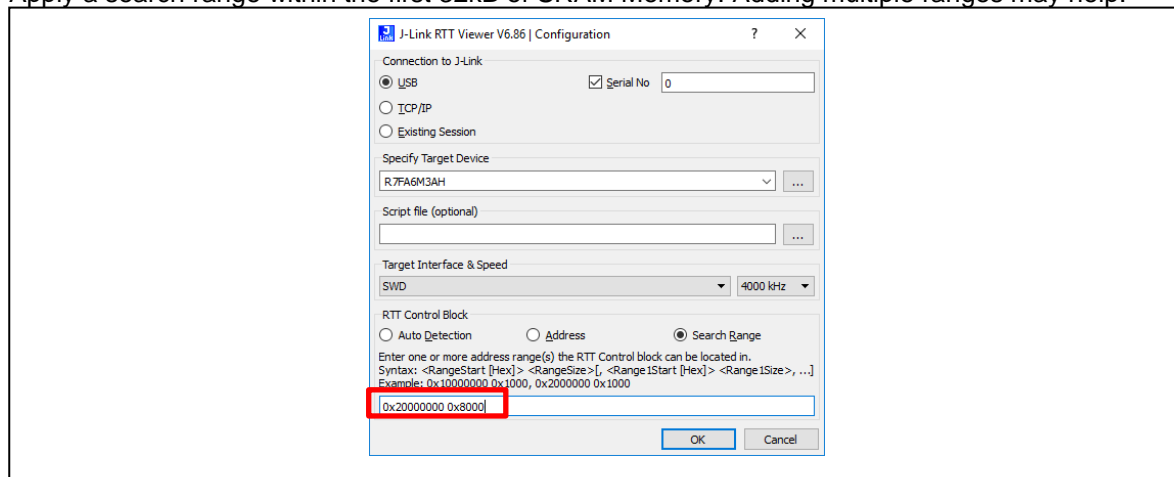
And input the exact address of the variable into the Address Input.

2. Apply a search range within the first 32kB of SRAM Memory. Adding multiple ranges may help.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Oct.03.19	—	Initial release
1.01	May.26.20	—	Support for IAR, EK-RA4W1
1.02	Jul.08.20	—	Updates for FSP v1.2.0
1.03	Aug.27.20	—	Support for FSP v1.3.0
1.04	Oct.07.20	—	Support for FSP v2.0.0. Appendix for known limitations.
1.05	Nov.30.20	—	Support for FSP v2.2.0
1.06	Jan.25.21	—	Support for FSP v2.3.0
1.07	Jun 19.21	—	Added footnote for usage with Platform Installers
1.08	Feb.09.22	—	Support for FSP v3.5.0
1.09	May.11.22	—	Support for FSP v3.7.0
1.10	July.14.22	—	Support for FSP v3.8.0
1.11	Sep.19.22	—	Support for FSP v4.0.0
1.12	Apr.28.22	—	Support for FSP v4.4.0
1.13	Oct.23.23	—	Support for FSP v4.6.0
1.14	Oct.31.23	—	Support for FSP v5.0.0
1.15	Dec.12.23	—	Support for FSP v5.1.0
1.16	Mar.11.24	—	Support for FSP v5.2.0

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