

# QuickConnect Direct Debug

## Introduction

The Direct Debug feature in Renesas QuickConnect Platform enables developers to perform hardware-assisted software debugging on the Renesas RA MCU hardware kits directly from a browser window by eliminating the requirement for local IDEs, toolchains, or complex driver setups.

This feature enables minimal setup debugging so that users can plug in an evaluation kit, open the QuickConnect platform, design an application, and start debugging instantly.

## Contents

- 1. Getting Started** ..... **2**
  - 1.1 Prerequisites ..... 2
    - 1.1.1 Verify the J-Link F/W in the RA MCU Kit is Up to Date ..... 2
  - 1.2 Run Direct Debug Session ..... 5
    - 1.2.1 Build the Application ..... 5
    - 1.2.2 Launch Direct Debug ..... 5
    - 1.2.3 Debug the Code ..... 7
    - 1.2.4 Core Debug Panels ..... 9
  - 1.3 End the Debug Session ..... 10
    - 1.3.1 Known Limitations ..... 10
- 2. Revision History** ..... **11**
- A. Appendix** ..... **12**

**Table 1. Key Benefits**

Feature	Description
No Local Setup	Debug directly from your browser; no local IDE or JTAG setup required.
Secure, Isolated Sessions	Every debug session is containerized. Each user's workspace, code, and debug environment are isolated to prevent cross-access or interference.
Full Debugging Control	Set breakpoints, watch variables, inspect registers, and step through code.
Faster Development Feedback Loop	Immediate flashing, live debugging, and visibility into runtime behavior drastically reduce turnaround time for testing and iteration.

**Table 2. MCU Device Families Supported<sup>[1]</sup>**

MCU Series	MCU Devices
RA0	RA0E1, RA0E2
RA2	RA2A1, RA2A2, RA2E1, RA2E2, RA2E3, RA2L1, RA2L2
RA4	RA4M1, RA4M2 <sup>[2]</sup> , RA4M3 <sup>[2]</sup> , RA4E1 <sup>[2]</sup> , RA4W1
RA6	RA6E1 <sup>[2]</sup> , RA6E2, RA6M3, RA6M4 <sup>[2]</sup> , RA6M5 <sup>[2]</sup> , RA6T1, RA6M1, RA6M2
RA8	RA8D1, RA8E1, RA8M1, RA8P1

1. Keep the MD pin jumper in the Open state in all the RA MCU kits before initiating a direct debug session.
2. Clear the TZ boundaries before the debug session using RFP. For details, refer to the Reset TZ Boundaries section.

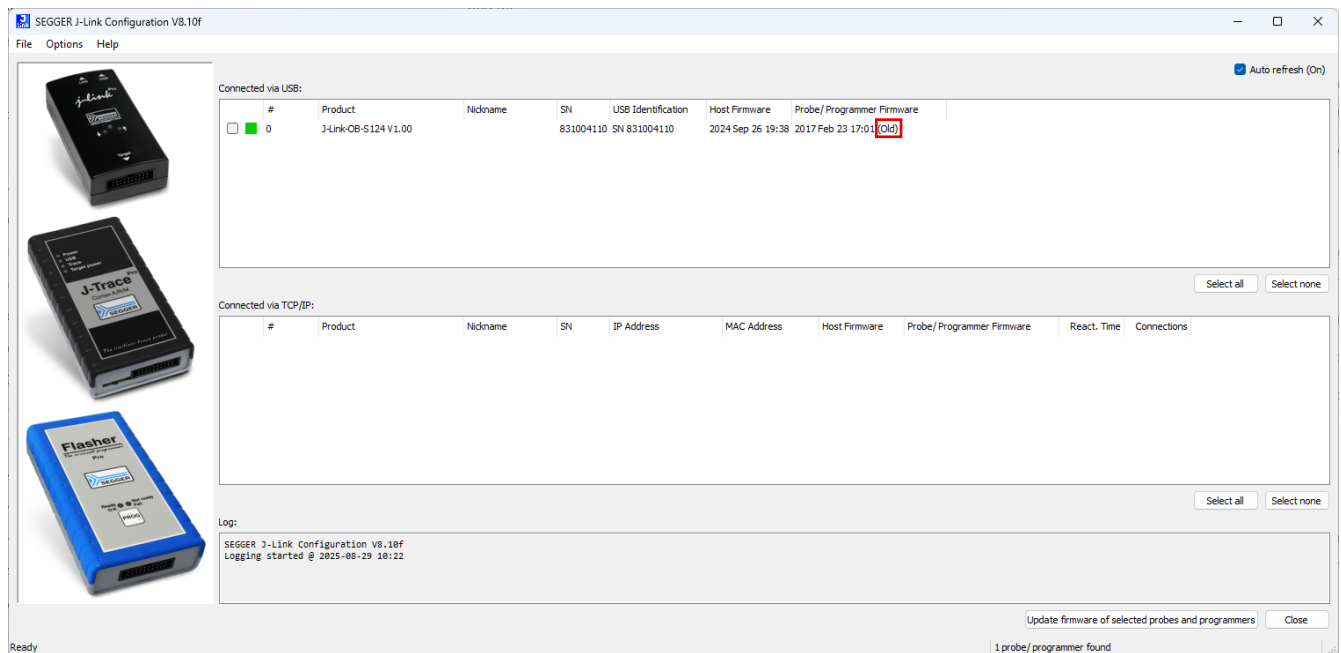
# 1. Getting Started

## 1.1 Prerequisites

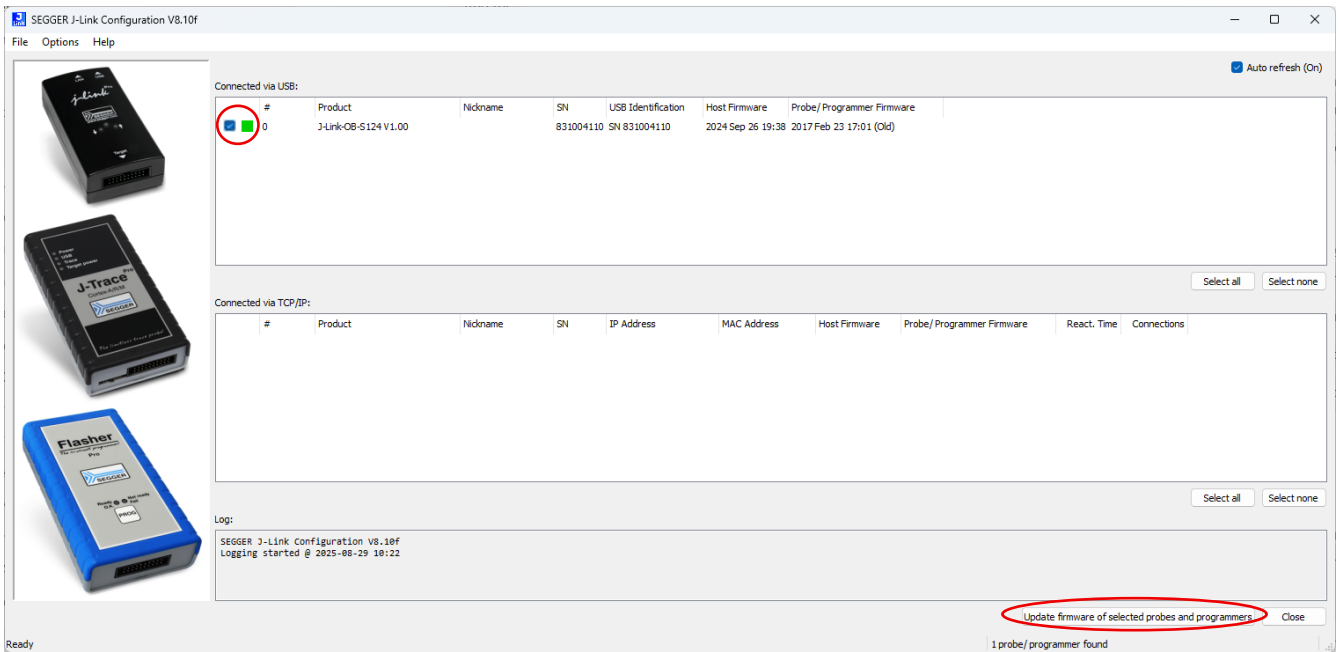
- Keep the MD pin jumper in the Open state in all RA MCU kits.
- Install the latest SEGGER J-Link software (<https://www.segger.com/downloads/jlink/>) on the PC where Renesas QuickConnect Studio (QCS) debugging is performed.

### 1.1.1 Verify the J-Link F/W in the RA MCU Kit is Up to Date

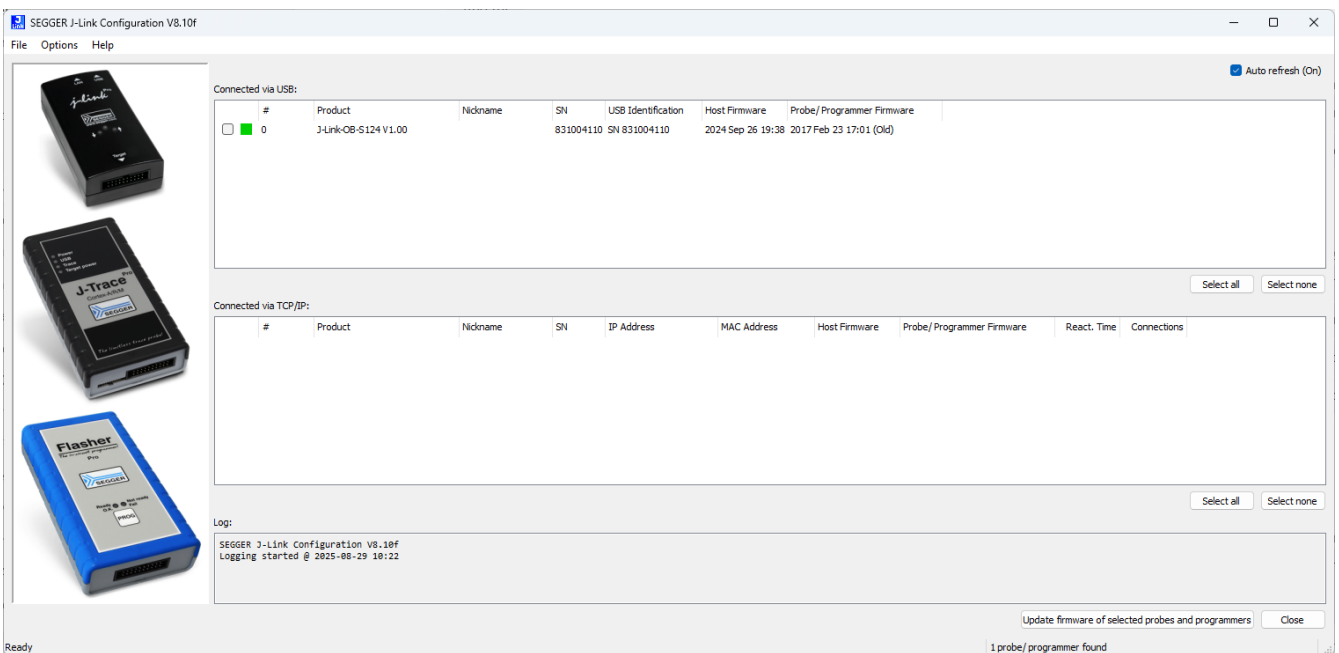
1. Attach the kit to the PC, launch the SEGGER J-Link Configurator, and check if the J-Link F/W in the kit is new or old.
  - a. In the case that the J-Link F/W in the MCU kit is the latest, skip to Step 2.
  - b. The following screenshot highlights an instance where the J-Link is running an outdated firmware (F/W) and requires an update.



2. Click on the MCU kit to update it. Next, click the **Update firmware of selected probes and programmers** button (see the following screenshot).



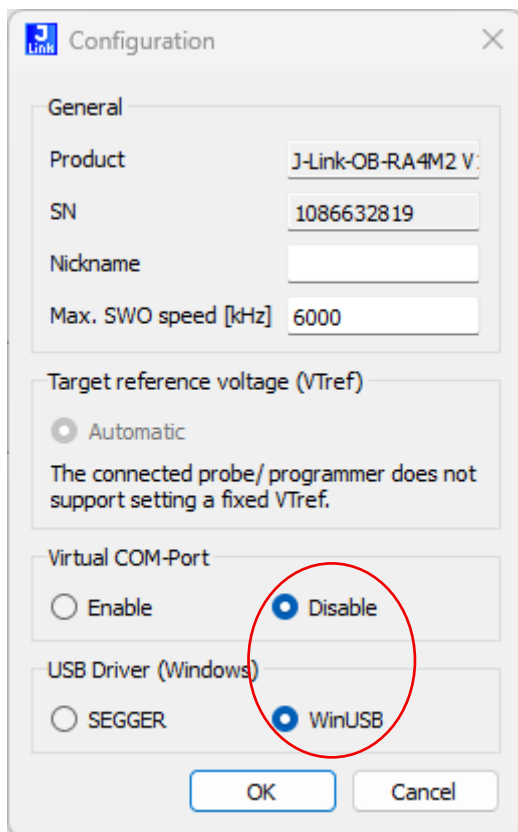
3. Upon a successful upgrade, the **(Old)** tag shown in the Step 1 is now removed (see the following screenshot).



*Note:* The J-Link F/W on the MCU kit should now be the latest; if not, follow Step 1 before continuing with the direct debugging.

4. Attach the kit to the PC, launch the SEGGER J-Link Configurator software, select the MCU kit, and double-click it to open the Configuration window.

5. For **Virtual COM-Port**, select **Disable**, and for **USB Driver (Windows)** select **WinUSB** (see the following screenshot).



6. Click the **OK** button to save the user selection.

## 1.2 Run Direct Debug Session

Complete the previous steps before proceeding with direct debugging.

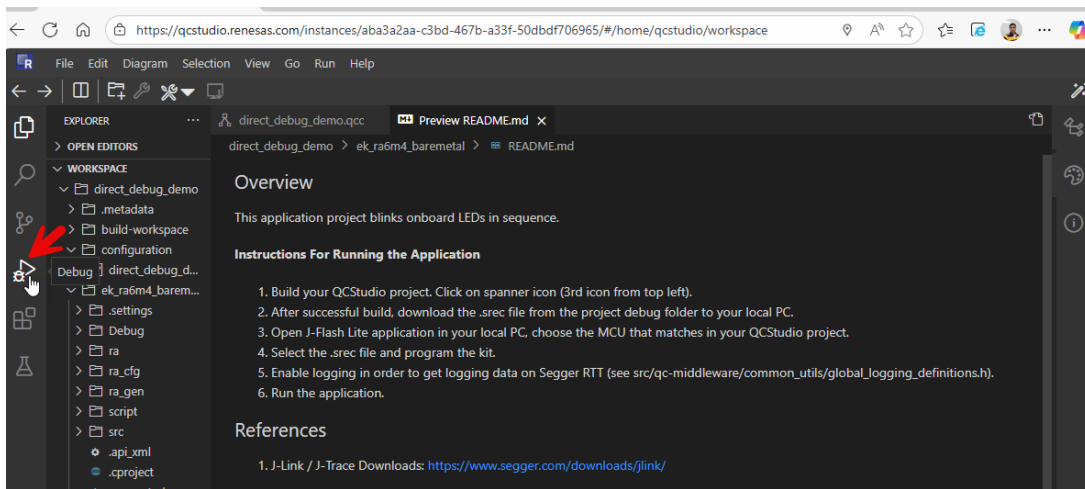
### 1.2.1 Build the Application

1. Launch the Renesas QuickConnect Studio application in the web browser.
2. Select the supported MCU kits as shown in the Devices Supported section of this document, select peripherals (if peripherals), and configure the application as required from the QCS Application Configuration Menu.
3. Build the application.

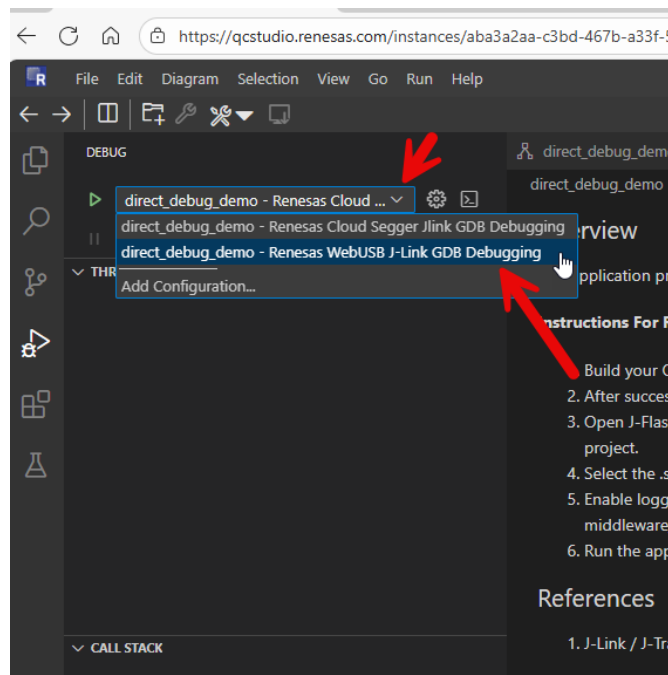
Note: For first time users of the QCS platform, refer to the [QCS User Manual](#) and follow the steps to create a QCS application.

### 1.2.2 Launch Direct Debug

1. After the QCS application is ready, click on the Debug view as shown in the screenshot below.

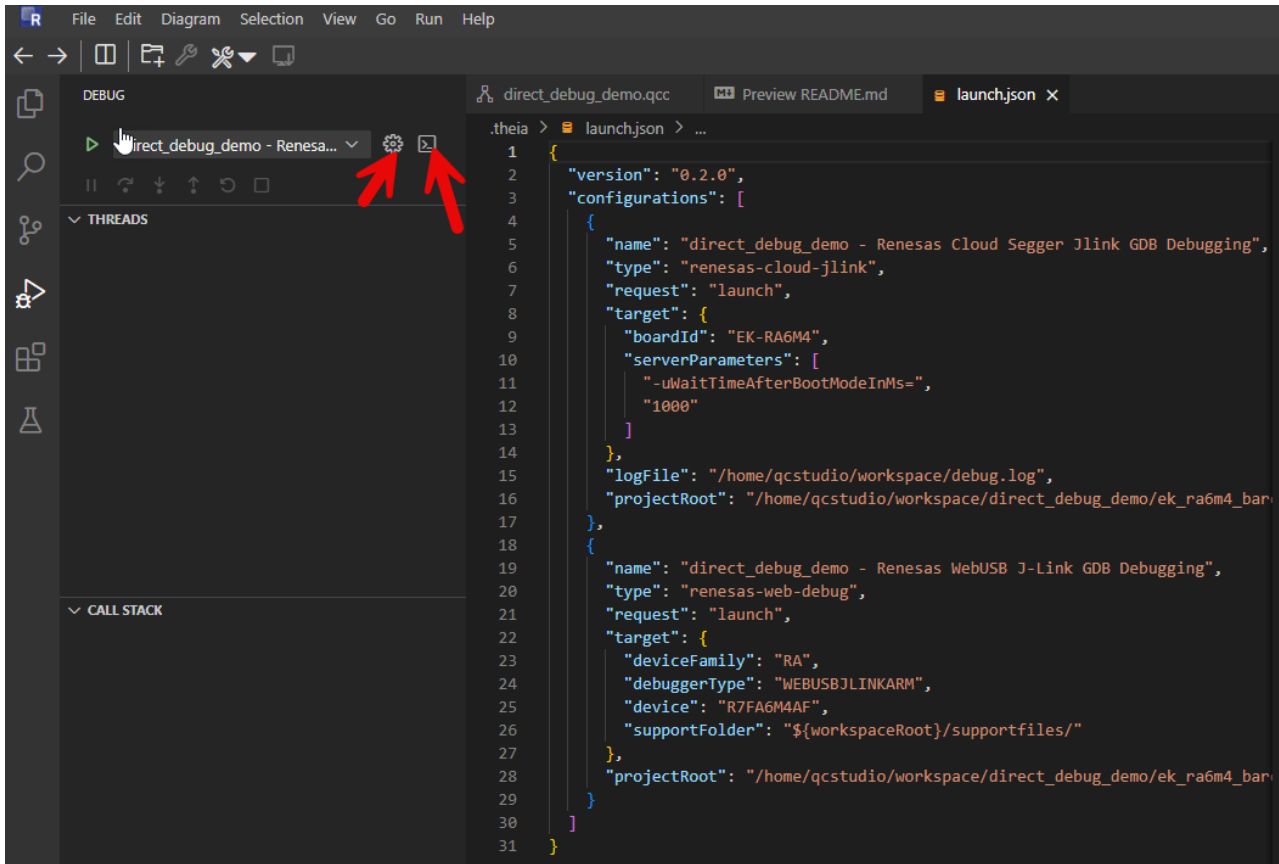


2. Click the drop-down menu from the Debug configuration window, as shown in the following screenshot, and select the **Renesas WebUSB J-Link GDB Debugging** option for the application.



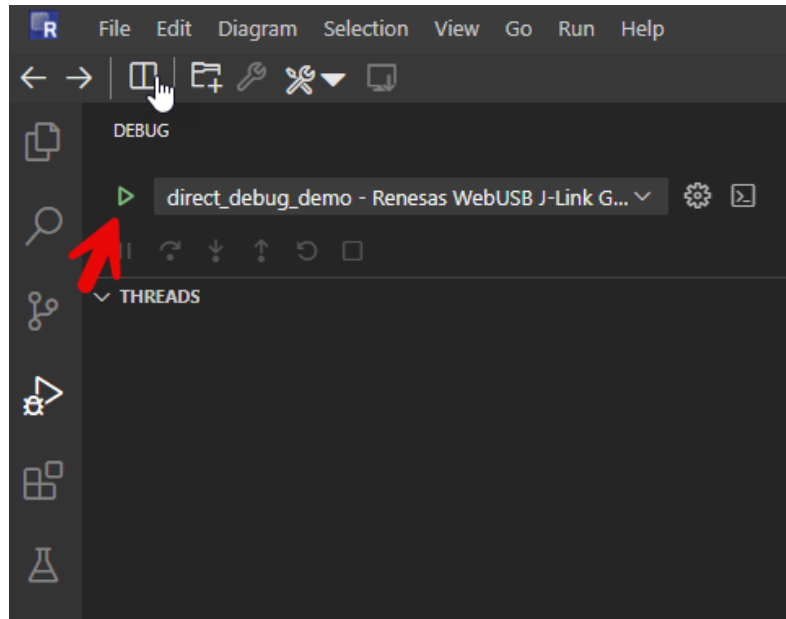
3. Click on the settings icon (Wheel) to open the launch.json file for your application.
4. Click on the console icon to open the Debug Console window in your browser. The debug console window shows the log message during the debug session.

*Note:* These icons are highlighted in the following screenshot for reference.

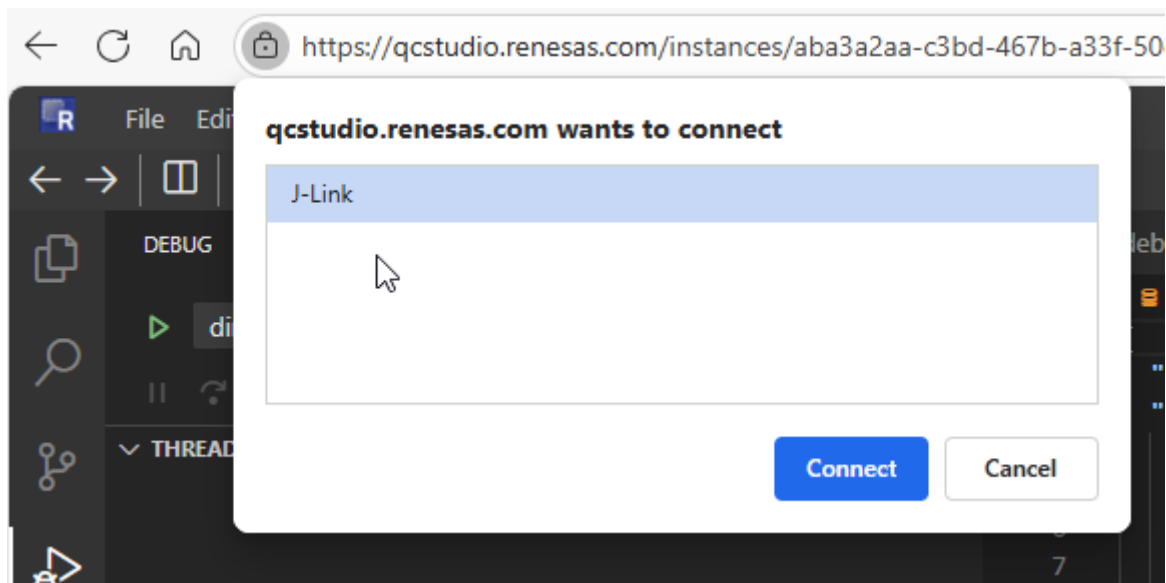


### 1.2.3 Debug the Code

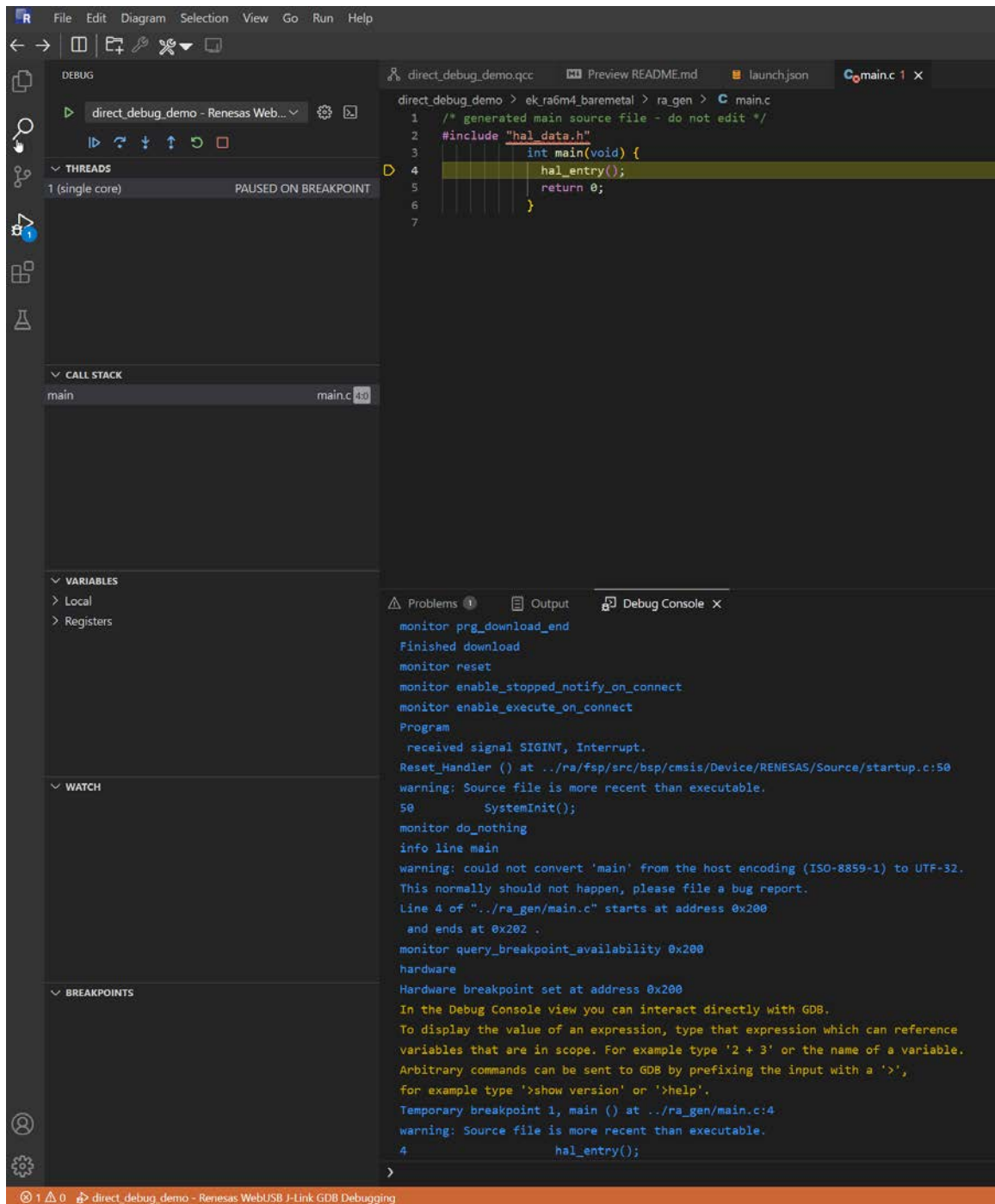
1. Users can launch the direct debugging session by clicking the Play icon highlighted in the following screenshot.



2. A pop-up window appears, select the J-Link option, and click the **Connect** button as shown in the following screenshot.



3. After a successful download, the program halts at the main thread of your application. The debug console window captures the logs during the download process.

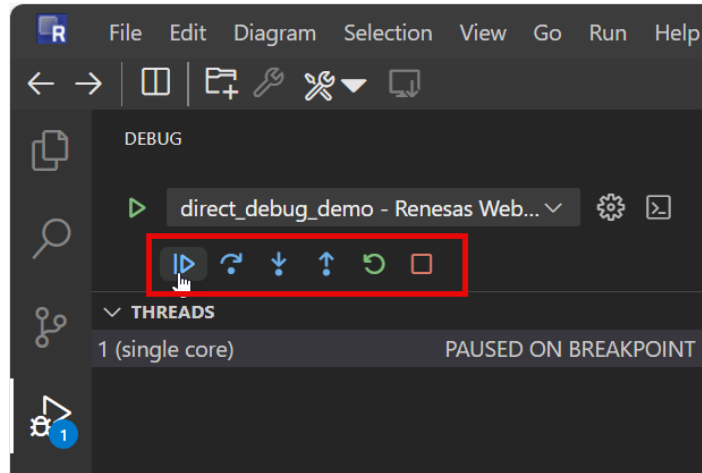


At this stage, the following are available:

- Use Step Into / Step Over / Continue to control execution.
- Use the Breakpoints Panel to set and remove breakpoints.
- Inspect variables, watch expressions, and monitor register values.

The **Debug** toolbar, highlighted in the following screenshot, provides the following actions:

- Continue – Resumes execution from the current breakpoint.
- Step Over – Executes the current line without entering functions.
- Step Into – Enters the function and execute line-by-line.
- Step Out – Exits the current function.
- Restart – Restarts the active debug session.
- Stop – Terminates the active debug session.



### 1.2.4 Core Debug Panels

#### 1.2.4.1 Call Stack

Current function call chain – Click a frame to jump to its source and inspect that scope, which helps to trace the execution flow.

#### 1.2.4.2 Threads/Tasks

Lists all threads or tasks currently active in your application.

#### 1.2.4.3 Breakpoints

Lists all breakpoints set in the application. The user can enable/disable current breakpoints from this panel.

#### 1.2.4.4 Registers

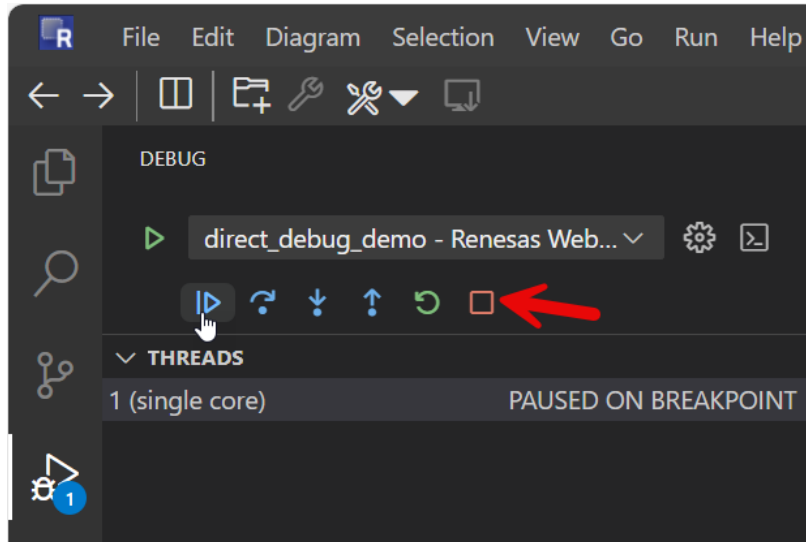
CPU registers (for example, Cortex-M33 core regs) with live values.

#### 1.2.4.5 Watch

Allows for monitoring specific variables or expressions continuously. Ideal for tracking values that are critical to the application logic.

## 1.3 End the Debug Session

1. Click the **Disconnect** icon as shown in the following screenshot to end the debug session.



### 1.3.1 Known Limitations

- When switching between different MCU kits, Renesas recommends restarting the QCS user workspace before initiating a debug session.
- Keep the MD pin in an open state for all the RA MCU kits.
- The following MCU kits are not supported in the QCS 1.6.1 release:
  - RA0L1, RA2T1, RA4C1, RA4L1, RA4E2, RA4T1, RA6T2/T3.
- Initial connection to the target MCU kit may take a few minutes.
- Line breakpoints crash on the RA6E2 MCU kit. Conditional, Functional, and data breakpoints work as expected.

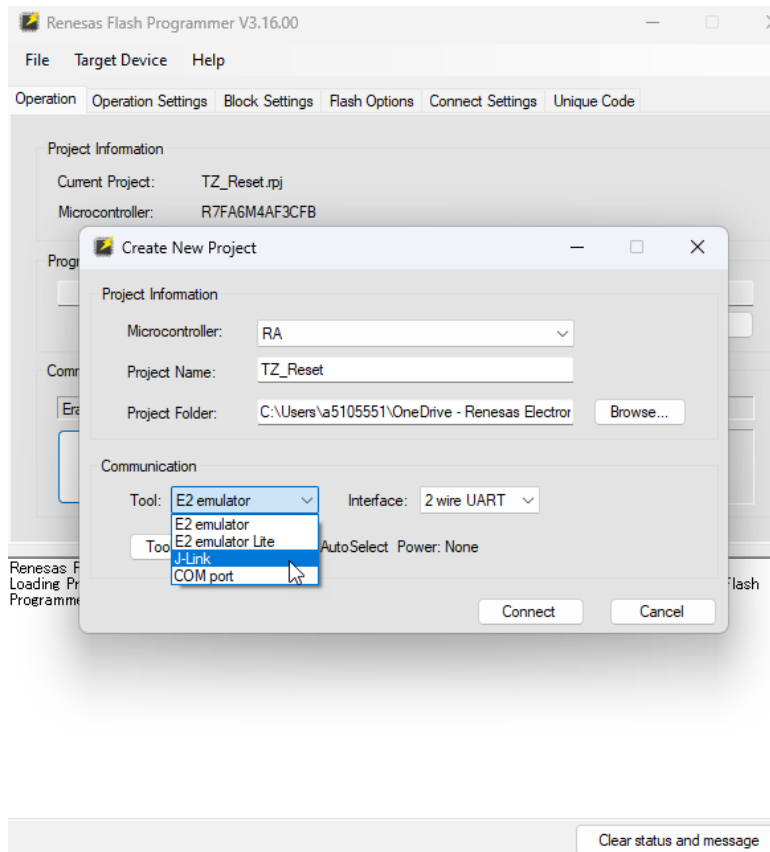
## 2. Revision History

Revision	Date	Description
1.00	Jan 26, 2026	Initial release.

## A. Appendix

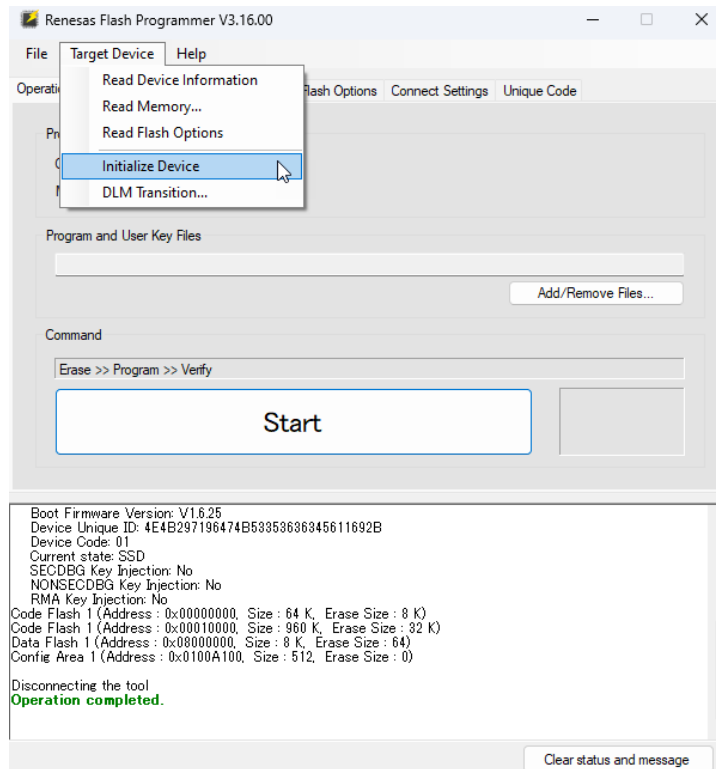
### A.1 Reset TZ Boundaries

1. Install the [Renesas Flash Programmer Utility](#).
2. Keep the MD pin in the MCU kit closed.
3. Attach the MCU kit to the PC through the USB cable.
4. Launch the Renesas **Flash Programmer Utility** on the PC. Open the **File** menu and click **New Project**. The **Create New Project** window appears. Enter the Project Name, select **RA** under the **Microcontroller** option, and select **J-Link** from the dropdown menu under the **Tool** option.



5. Click the **Connect** button. Check the log message for Operation Completed status.

- Click the **Target Device** menu and select the **Initialize Device** option, which initializes the device into factory defaults. Check the log message for the Operation Completed status.



- Next, change the MD pin to the open state. This is a critical step before starting the direct debugging session.

# 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.

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).