

RL78/G10 Simulator V3.12.00

Release Note

Thank you for using the RL78/G10 simulator.

This document describes restrictions on and points for caution regarding the simulator.

Read this document before using the product.

Contents

Chapter 1. Target Devices and Supported Simulation Functions	2
Chapter 2. Changes	3
2.1 Improvements to the RL78/G10 simulator	3
Chapter 3. Points for Caution	4
3.1 Differences in behavior between the target devices and the simulator	4
3.2 Usage of simulation functions	9
Revision History	11

Chapter 1. Target Devices and Supported Simulation Functions

The RL78/G10 simulator supports the following target devices.

Device group	Device name
RL78/G10	R5F11B7C
	R5F11BBC
	R5F11BCC
	R5F11BGC
	R5F11BLC
	R5F11B7E
	R5F11BBE
	R5F11BCE
	R5F11BGE
	R5F11BLE

The RL78/G10 simulator is capable of simulating the following items as well as CPU instructions.

- Peripheral modules such as timers, the serial array unit, and the serial interface
- Virtual target board (simulation via the [I/O panel] window)
- MCU pin signal waveforms (simulation via the [Timing chart] window)
- Current drawn

Chapter 2. Changes

This chapter describes changes from V3.11.00 to V3.12.00 of the RL78/G10 simulator.

2.1 Improvements to the RL78/G10 simulator

2.1.1 Improvement to canceling clock stretching of the IICA serial interface

When all conditions listed below were satisfied, clock stretching of the eighth clock cycle during the reception of addresses could not be cancelled by setting bit 5 (WREL0) in IICA control register 00 (IICCTL00). This problem has now been rectified so that setting the bit cancels clock stretching under those conditions.

- Operation is in slave mode.
- An extension code is received.
- Bit 3 (WTIM0) in IICA control register 00 (IICCTL00) is 1.
- Bit 3 (TRC0) in IICA status register 0 (IICS0) is 1 (sending state).

Chapter 3. Points for Caution

This section lists points for caution on using the RL78/G10 simulator. These points for caution are in the following two categories.

- Differences in behavior between the target devices and the simulator due to simulator specifications
- Usage of simulation functions (operations in and configuration of the GUI windows)

CS+ for CC supports the [Virtual Board] panel which is described in those points for caution.

3.1 Differences in behavior between the target devices and the simulator

3.1.1 Peripheral functions not supported by the simulator

The simulator is not capable of simulating the following peripheral functions of the target devices.

- Regulator
- Selectable power-on-reset circuit

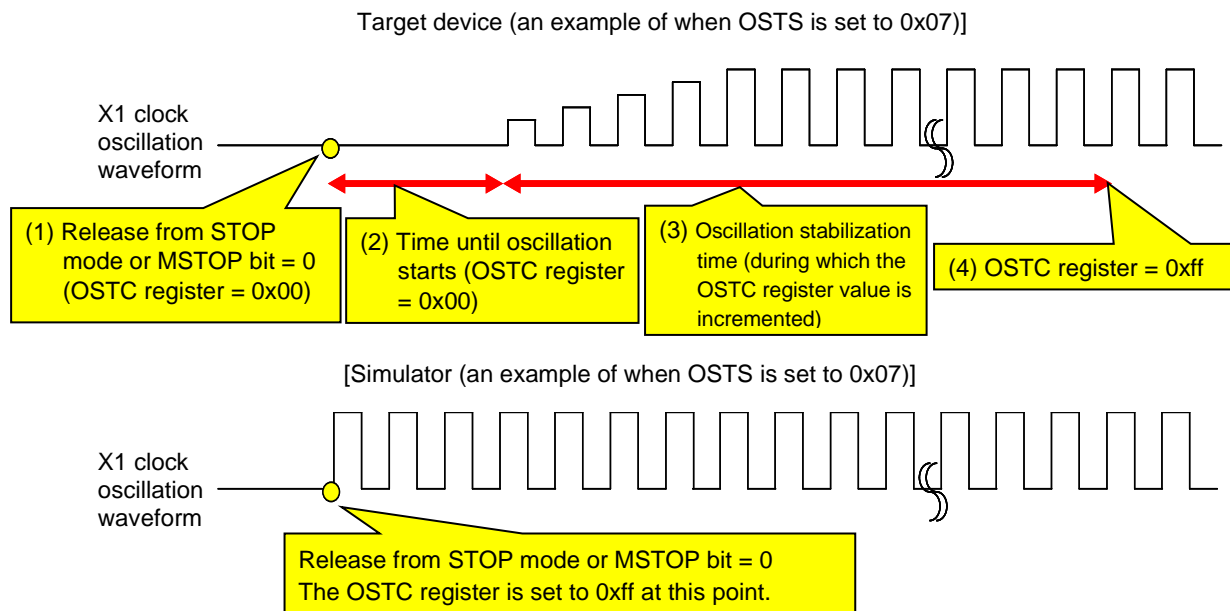
3.1.2 Oscillation stabilization time for the clock generator

Since the simulator does not simulate the clock oscillator oscillation stabilization time, stabilization always takes no time. When the oscillation is started, the OSTC register is set to one of the following values (i.e. not incremented).

OSTS Setting	OSTC Value
0x0 : $2^8/f_x$	0x80
0x1 : $2^9/f_x$	0xc0
0x2 : $2^{10}/f_x$	0xe0
0x3 : $2^{11}/f_x$	0xf0
0x4 : $2^{13}/f_x$	0xf8
0x5 : $2^{15}/f_x$	0xfc
0x6 : $2^{17}/f_x$	0xfe
0x7 : $2^{18}/f_x$	0xff

The following figure illustrates this operation.

In the target device, oscillation by the X1 clock starts after operation has passed through states (1) to (4). In the simulator, states (1) through (4) are skipped and oscillation instantly starts.



Therefore, pay attention to the code that waits for oscillation stabilization.

There is no problem if a program is created under the condition that execution proceeds after the oscillation stabilization wait period when the OSTC register value becomes the maximum value, or when the OSTC register value exceeds the specified value, but if a program is created under the condition that execution proceeds after the oscillation stabilization wait period when the OSTC register value becomes a value other than the maximum value, execution will enter an endless loop.

The following shows examples of code that causes and does not cause problems.

The examples are when the OSTS is set to 0x07.

Correct code example (1)

```
while(OSTC != 0xff)
{
  NOP();/* wait */
}
```

Correct code example (2)

```
while(OSTC <= 0xf0)
{
  NOP();/* wait */
}
```

Example of code that may cause problems

```
while(OSTC != 0xf0)
{
  NOP();/* wait */
}
```

3.1.3 AMPH bit of Clock operation mode control register (CMC)

The simulator does not simulate AMPH bit of Clock operation mode control register (CMC). Although read/write access for each register can proceed normally, the operation does not change even if the value is changed.

3.1.4 Operating clock of the timer array unit

Do not specify an operating clock that runs at or below 233 Hz. If the operating clock for the timer array unit runs at or below 233 Hz, then the timer array unit will not work properly (it will behave as if operating with a clock that is faster than the one selected).

3.1.5 Noise filter of the timer array unit

Although the target device's timer array unit has a function to turn the noise filters on and off in order to reduce noise from the timer input pins, the simulator does not simulate this function since there is no noise in the simulator's signals. That is, whether filtering is on or off makes no difference to the behavior.

3.1.6 Clock used in the serial array unit

Do not specify a clock that is 233 Hz or lower in the following cases. If the following clock of the serial array unit is 233 Hz or lower, then the serial array unit will not operate correctly (it will behave as if operating via a clock that is faster than the one selected).

- Operating clock(f_{MCK}) is 233Hz or lower.
- Transfer clock setting by dividing the operation clock ($f_{MCK} \div (SDR0nH[7:1] + 1)$) is 233Hz or lower.

3.1.7 Noise filter of the serial array unit

Although the target device's serial array unit has a function to turn the noise filter on and off in order to reduce noise on the input pin, the simulator does not simulate this function since there is no noise in the simulator's signals. That is, whether filtering is on or off makes no difference to the behavior.

3.1.8 SDR0nH registers of the serial array unit

The values read from the serial data registers (SDR0nH) during serial operation differ between the target device and the simulator.

[Target device]

0 is read.

[Simulator]

The value read is that at the time serial operation starts.

3.1.9 Reset

The behavior differs as follows if a reset signal is input from the RESET pin.

[Target device]

The MCU is reset when the RESET pin goes low. Release from the reset state proceeds when the RESET pin goes high.

[Simulator]

The MCU is not reset when the RESET pin goes low. The simulator is reset momentarily and then released when the RESET pin goes high.

3.1.10 Reset control flag register (RESF)

The simulator only supports the WDTRF bit of the reset control flag register (RESF).

The simulator is not capable of simulating the operations of the other bits (TRAP and SPORF). Only the default values of these bits are indicated.

The reset control flag register (RESF) of the target device is automatically cleared if it is read by an 8-bit memory manipulation instruction; however, this does not clear the register in the case of the simulator.

3.1.11 A/D converter

When no voltage is being applied to the VDD pin, the default reference voltage of the A/D converter is 5.0 V.

To change the reference voltage, input the desired voltage values for VDD via the [Signal Data Editor] window.

3.1.12 Digital filters in the comparators (CMP)

The simulator does not simulate the digital filters in the comparators (CMP).

Bit 0 and bit 1 of COMPFIR register are not operated.

3.1.13 Response delay time of Comparators

The simulator does not simulate the response delay time of Comparator.

The operation of high-speed mode and low-speed mode is same.

3.1.14 Clock output/buzzer output controller

When f_{MAIN} is selected as an output clock, the [Timing chart] window does not show the clock waveform of the PCLBUZn signal.

When $f_{MAIN}/2$ or a slower signal is selected as an output clock, the [Timing chart] window shows the clock waveform.

3.1.15 Executing illegal instructions

If an illegal instruction (instruction code: 0xFF) is executed, the target device will be reset, but the simulator will go into an endless loop (the illegal instruction will be executed repeatedly).

3.1.16 IICA serial interface

IICA supports pin waveform generation and the communications through the [Serial] window. The following functions are not supported.

- Digital filter
- Arbitration
- Detection of transmission errors
- Communication reservation

3.1.17 SFR (IICCTL01) for the IICA serial interface

The following SFR which controls the IICA serial interface is not simulated.

Although read/write access for the register can proceed normally, the operation does not change even if the value is changed.

- Bit 2 (DFC0) ^{Note} and bit 3 (SMC0) of the IICA control register 01 (IICCTL01)

Note: In the simulator, the DFC0 bit can be set to 1 only when the SMC0 bit is 1.

3.1.18 SS0 register in the serial array unit

During serial communications, when the operation start trigger of channel n (SS0n) in the serial channel start register 0 (SS0) is set to 1, operation of the simulator differs from that of the actual target device in the way stated below.

[Target device]

The target device stops communications and enters the suspended state.

[Simulator]

The simulator does not stop communications. Accordingly, the TSF0n and BFF0n bits in the serial status register 0n (SSR0n) are not cleared to 0.

3.2 Usage of simulation functions

3.2.1 Simulation of current drawn

The following notes apply to the function of measuring current.

- The current is calculated roughly as that drawn by the MCU alone based on the typical values (TYP.) for the actual devices. Note that the current values other than for the MCU are not included.
- The number of change points of measurable current is 200,000. The program stops when the number exceeds 200,000.

3.2.2 Simulation speed

The simulation speed of RL78/G10 simulator depends on the number of operating peripheral functions.

If many peripheral functions are operating, the simulation speed becomes from several to ten times slower than the actual device. ^{Note}

With the use of only a few, or even no peripheral functions, the simulation speed may become faster than the actual device.

Note: The measurement environment for simulation speed is as follows.

CPU: 3.20 GHz (Quad-Core); memory: 8 Gbytes; OS: Windows10 64-bit edition

3.2.3 Pin waveforms in the [Timing chart] window

The maximum length of a pin waveform is 4096 signal-level changing points. After reaching this maximum length, the data will be overwritten from the oldest value. If this length is not sufficient, use the following methods.

- Reduce the number of registered pins
- Stop the user program at the place where you want to confirm the waveform by using a breakpoint

3.2.4 Controlling windows

The following keyboard operations are not available in the simulator windows ([Signal Data Editor], [I/O panel], and [Serial]).

- Navigation via tab or arrow keys (←, ↑, →, ↓)
- Deletion via the Del or Backspace keys
- Cut & paste and other operations via the Ctrl + C, V, X, A, or Z keys.

Perform the above operations as follows.

- Navigation: Navigate by using the mouse.
- Deletion: Right-click and perform the action from the context menu.
- Cut & paste, etc.: Right-click and perform the action from the context menu.

3.2.5 Closing the [Simulator GUI] window

The [Simulator GUI] window can only be closed by disconnecting from the debugging tool, or by closing CS+ in proper manner. The ☐ button cannot be used.

Additionally, although it appears that the ☐ button can be pressed if Aero is enabled in Windows, pressing this button will not close the [Simulator GUI] window.

3.2.6 Disconnecting the debug tool

CS+ may be closed if the debugging tool is disconnected while any of the following dialog boxes is open from the [Simulator GUI] window. Be sure that the following dialog boxes have been closed before disconnecting the simulator.

- | | |
|----------------|-------------------------------|
| •Save As | •Message (e.g. Error) |
| •Open | •Parts Button Properties |
| •New | •Analog Button Properties |
| •Color | •Parts Key Properties |
| •Font | •Parts Level Gauge Properties |
| •Customize | •Parts Led Properties |
| •Loop | •Parts Segment LED Properties |
| •Select Pin | •Parts Matrix Led Properties |
| •Search Data | •Parts Buzzer Properties |
| •Format (UART) | •Pull up / Pull down |
| •Format (CSI) | •Entry Bitmap |
| •Format (IIC) | •Object Properties |

3.2.7 [Serial] window

When using the [Serial] window as the data receiver for the simplified I²C of the serial array unit or IICA, only ACK can be generated after receiving the data. NACK cannot be generated.

3.2.8 Setting the pins in the simulator GUI or the [Virtual Board] panel

The peripheral I/O redirection register (PIOR) can be manipulated by a program or debugger operations to re-assign specific multiplexed pin functions to alternative port pins in the same way as on the actual device. After re-assigning a given pin function by using the PIOR, be sure to select the name of the pin you are currently using in the [Select Pin] dialog box of the simulator GUI or "Connected To" of the component in the [Virtual Board] panel.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jun.01.25	-	First Edition

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan

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/.