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Chapter 1. Target Devices

The target devices supported by the CS+ are listed on the Website.
Please see this URL.
CS+ Product Page

<https://www.renesas.com/cs+>

Chapter 2. User's Manuals

Please read the following user's manuals along with this document.

Manual Name	Document Number
CS+ V8.02.00 Installer	R20UT4525EJ0100
CS+ V8.06.00 Editor	R20UT4972EJ0100
CS+ V8.08.00 Python Console	R20UT5139EJ0100
CS+ V5.00.00 Updater	R20UT3942EJ0100
CS+ V8.08.00 Message	R20UT5135EJ0100
CS+ V8.08.00 Project Operation	R20UT5134EJ0100
CS+ V8.06.00 Analysis Tool	R20UT4979EJ0100
CS+ V8.08.00 RH850 Debug Tool	R20UT5138EJ0100
CS+ V8.08.00 RX Debug Tool	R20UT5137EJ0100
CS+ V8.08.00 RL78 Debug Tool	R20UT5136EJ0100
CS+ V8.08.00 GHS CCRH850 Build Tool Operation	R20UT5133EJ0100

* GHS: Green Hills Software, LLC

Chapter 3. Uninstallation

There are two ways to uninstall this product.

- Use the integrated uninstaller from Renesas (uninstalls all CS+ components)
- Use the Windows uninstaller (only uninstalls this product)

To use the Windows uninstaller, select [CS+ for CC] from [Apps & features] from [Settings] of Windows or [Programs and Features] of the control panel.

Chapter 4. Improvements and Changes

This chapter describes changes from V8.07.00 to V8.08.00.

4.1 Improvements and changes to CS+

4.1.1 Change to the setting of properties of the build tool when the microcontroller is changed [RL78] [RH850]

When the following functions are executed, build options are automatically adjusted to suit the specified microcontroller. In addition, startup source files for the microcontroller are output to a subfolder of the project folder (since startup source files are for reference, they are not registered with the project).

Function	RH850	RL78
Changing microcontrollers	Adjusted	Adjusted
Creating projects (when reusing the file composition of an existing project to create a new project)	Adjusted	Adjusted
Converting projects	Not adjusted	Adjusted

4.2 Additions and improvements to the build tool

4.2.1 Enhanced support for GHS compilers [RH850]

Support for the following versions of the RH850 compiler from GHS has been added.

- 2022.1.4

4.2.2 Improved default values for the -cpu option in GHSCCRH850 projects [RH850]

When you create a project for GHSCCRH850, the default values of the -cpu option is set appropriately for the target MCU.

4.3 Additions and improvements to the debug tool

The abbreviations listed below collectively denote the corresponding tools in this section.

OCD (serial):

Serial or FINE interface connection for the E1 emulator, E20 emulator, E2 emulator, and E2 emulator Lite

OCD (JTAG):

JTAG interface connection for the E1 emulator, E20 emulator, E2 emulator, and E2 emulator Lite

OCD (LPD):

LPD connection for the E1 emulator, E20 emulator, and E2 emulator

4.3.1 Enhanced support for GHS compilers [RH850]

Support for the following versions of the RH850 compiler from GHS has been added.

- 2022.1.4

4.3.2 Extension of the range of products for which the simulation of current drawn is supported [RL78]

Applies to: The simulators for RL78/G10, RL78/G11, RL78/G12, RL78/G13, RL78/G13A, RL78/G14, RL78/L12, and RL78/G23 devices

Support for the simulation of current drawn has been extended to further products.

This enables the simulation of current drawn for those products in only a virtual environment on a PC, i.e. without having to connect CS+ to the actual MCU (on a board).

The products for the following MCU group have been added for the simulation of current drawn.

- RL78/G23*

Note: The simulation of current drawn has been made available for all products of the RL78/G23 group in this version.

4.3.3 Addition of types of components supported on the [Virtual Board] panel [RL78]

Applies to: The simulators for RL78/G10, RL78/G11, RL78/G12, RL78/G13, RL78/G13A, RL78/G14, RL78/L12, RL78/G1F, and RL78/G23 devices

Support for the following types of component has been added to the [Virtual Board] panel.

- Wi-Fi Module (UART)

4.3.4 Improvement to the facility for displaying a list of pins in the [Virtual Board] panel [RL78]

Applies to: The simulators for RL78/G10, RL78/G11, RL78/G12, RL78/G13, RL78/G13A, RL78/G14, RL78/L12, RL78/G1F, and RL78/G23 devices

A facility has been added to the [Virtual Board] panel for displaying a list of all pins of the MCU to confirm the states of the use of pins and to allow the input of digital or analog values to the pins.

4.3.5 Improvement to the operation in reading the information on the components of the evaluation board in the [Virtual Board] panel [RL78]

Applies to: The simulators for RL78/G10, RL78/G11, RL78/G12, RL78/G13, RL78/G13A, RL78/G14, RL78/L12, RL78/G1F, and RL78/G23 devices

When the [Virtual Board] panel is activated for the first time, whether or not the information on the connection between the components and the microcontroller of the displayed evaluation board is read can now be selected. However, this only applies in cases where the evaluation board is supported in the [Virtual Board] panel and the microcontroller selected for the project matches that used for the evaluation board.

4.3.6 Deleting monitoring points in the [Measuring Current Consumption] panel [E2] [RL78] [RX]

Deleting monitoring points for measuring current drawn has only been possible in the [Editor] panel. However, in this version, pressing the [Delete] key in [Monitor point list] can now also be used to delete monitoring points.

4.4 Improvements to the Python console

4.4.1 Addition of Python functions

The following Python functions have been added.

Function Name	Description
debugger.GetProcesserElementNames	Displays a list of the PE names of multiple cores.

4.4.2 Addition of Python properties

The following Python properties have been added.

Property Name	Description
build.Compile.FloatType	Setting or referring to the method of floating-point calculation. It is a compile option for the active project. [CC-RH]
debugger.ProcesserElementName	Setting or referring to the PE of multiple cores with the name.

4.4.3 Changes to Python classes

The following items have been added to the PerformanceInfo, PerformanceItem, and PerformanceEventInfo classes for measuring performance.

Item	Description
PerformanceItem.BackgroundInterrupt	Background interrupt count
PerformanceItem.BackgroundEILevelInterrupt	Background EI level interrupt count
PerformanceItem.BackgroundFELevelInterrupt	Background FE level interrupt count
PerformanceItem.BackgroundInstructionAsyncException	Background instruction async exception count

Chapter 5. Points for Caution

This section describes points for caution regarding CS+.

5.1 Points for caution regarding CS+ (general)

5.1.1 File names

The following rules apply to folder and file names.

- Folder and file names
 - Do not use folder or file names that cannot be created from Windows Explorer.
 - Network path names cannot be used. Include the drive names to which paths are allocated.
- Source file names, load module file names, and project file names
 - File names consist of the characters a-z, A-Z, 0-9, the period (.), the underscore (_), plus sign (+), and minus sign (-).
 - File names cannot start or end with a period (.
 - File names cannot start with a plus sign (+) or minus sign (-).
 - CS+ is not case-sensitive to file names.
 - File names may have up to 259 characters, including the path.
 - Do not use source files with the same file name. Even if they are on different paths, CS+ cannot classify them.
- File names other than the above
 - File names comply with Windows conventions.
 - Note that the following characters cannot be used in file names.
\\/: * ? " < > | ;
 - File names cannot start or end with a period (.) or space.
 - CS+ is not case-sensitive to file names.
 - File names may have up to 259 characters, including the path.
- Folder names
 - Folder names comply with Windows conventions.
 - Note that the characters below cannot be used in file names.
() , =

5.1.2 Panel display

If your hardware environment does not meet the recommended specifications for CS+, the [Property] panel may appear small and have scrambled contents.

If this happens, move the [Property] panel outside the split panel area.

- Enable [Dockable], and make it a docking panel
- Enable [Floating], and make it a floating panel

5.1.3 Problem with a Windows update program

Depending on the Windows update program, starting the CS+ for CC in Windows 8.1 may cause an error or the PC to crash.

In this case, do any of the followings.

- install the latest VC++ 2015 runtime (x86 version)
- apply the latest Windows update program

5.1.4 [Editor] panel

- When a label is selected and the [Jump to Function or Variable] feature is used from the context menu, execution does not jump to the label.
- The following notes apply to the editor, when source files with the same name but from different folders are registered with a main project and a sub project, and load modules from both the main project and sub project are downloaded.
 - The address of the main project is displayed on the file.
 - At jumping to a source file from disassembled code, the file registered with the main project is opened.
 - If the file is opened from either project, only one file will be opened.
- On Windows 8.1, Windows 10 and Windows 11, the display may become unclear due to anti-aliasing.
- When saving a file in the [Save As] dialog box, the extension listed at the top of the [Save as type] drop-down list is automatically added unless another extension is specified. Note however, that an extension is not added when a file name is input with an extension that is selected in the [Save as type] drop-down list or with an extension that is registered with Windows. When an automatically added extension is not as expected, modify the name of the file by using, for example, Explorer.
- Printing the contents of the Editor panel is not possible in an environment with .NET Framework 4.6 installed. To do so in that case, use an editor other than that of CS+.
- When the floating [Editor] panel is displayed on Windows 11, snap layouts are not displayed even if the mouse cursor is hovered over the maximize button.
Workaround: Enter the Windows key + Z.

5.1.5 Creating new projects

Applies to: RX

If a new project is created by selecting [Empty Application[CC-RX]] under the environment for the RX, building the project may lead to the following errors.

- ** L2132 (E) Cannot find "D" specified in option "rom"
- ** L2132 (E) Cannot find "D_1" specified in option "rom"
- ** L2132 (E) Cannot find "D_2" specified in option "rom"

If you encounter these errors, change the setting of [ROM to RAM mapped section] on the [Link Options] sheet in CS+.

5.1.6 Tutorials

The Code Generator Plug-in, Pin Configurator Plug-in and Program Analyzer Plug-in are used in tutorials. Enable them through the [Plug-in Manager] dialog box.

5.1.7 Starting multiple instances of CS+

Two or more instances of CS+ can be started on the same host machine, but if you do so, take note of the points listed below.

- When two or more instances of CS+ are started, the most recent information to have been written is saved in the information file for each user's own PC.
- When two or more instances of CS+ are started, the most recent information to have been written is saved in the information file for the stack analysis tools (including CallWalker).
- When the same project file is used in two or more instances of CS+, the most recent information to have been written is saved.
- When the same project file is used in two or more instances of CS+, do not attempt building from more than one instance at the same time since the names of the output files will be identical.

5.1.8 Loading projects by using earlier versions of CS+

If the version of CS+ being used to load a project is earlier than the CS+ version with which the project was created, some settings may be cleared since the earlier versions of CS+ do not recognize them.

5.1.9 .NET Framework from Microsoft Corporation

CS+ outputs the following message and is closed if the version of the .NET Framework you are using is earlier than 4.5.2.

E0200010

Failed to launch this product.

Please install the Microsoft .NET Framework 4.5.2 or later on this PC.

In such cases, obtain a later version of the .NET Framework from the Web page of Microsoft Corporation and install it before starting up CS+ for CC.

Note that the update manager for CS+ for CC is not usable for updating the .NET Framework.

5.1.10 Dual-bank function of the code flash memory

Applies to: RX65N/RX651-2M group

Products of the RX65N and RX651 groups with 2 or 1.5 MB of ROM support the dual-bank function of the code flash memory. In CS+, you can select the linear or dual mode during the process of setting up a project. In use of dual mode, select the type name with “_DUAL”.

5.1.11 Smart Manual

Applies to: RX, RL78

When the Smart Manual does not support the target MCU of an open project, the user's manuals are not displayed.

5.1.12 CS+ Partner OS Aware Debugging Plug-in

Applies to: RL78, RX

When CS+ is started with the CS+ Partner OS Aware Debugging Plug-in enabled and by using CubeSuite+.exe (without the Main window), the error message “(0202002) Opening a project failed.” is returned.

This can be avoided in either of the following ways.

- Start CS+ by specifying an option to prevent reading of the CS+ Partner OS Aware Debugging Plug-in for CubeSuite+.exe.
Example: CubeSuite+.exe /np PartnerOS ...
- Turn off the CS+ Partner OS Aware Debugging Plug-in before starting CS+ with CubeSuite+.exe (without the Main window).

How to turn off the plug-in:

Start CS+ (with the Main window) or CubeSuite+ (CubeSuiteW+.exe).

Select [Plug-in Setting...] from the [Tool] menu to display the [Plug-in Manager] dialog box.

Deselect the [CS+ Partner OS Aware Debugging Plug-in] checkbox.

5.1.13 RX72M

When creating a new RX72M project, there are differences between the register definition contents of iodefine.h and the contents of the RX72M User's Manual.

Applicable iodefine.h file version is V1.00A and earlier.

1. Error : unsigned short ACKCMDER:1;
Correct : unsigned short ACKCMDERR:1;
2. Error : unsigned long PSADR:19;
Correct : unsigned long PSADR:17;

5.1.14 Mentions of “R8C” in user's manuals and online help

“R8C” is mentioned in the user's manuals and online help, but CS+ does not support the R8C family.

5.2 Points for caution regarding build tools

5.2.1 Build option import

Build option import fails if setting the value of "Select modules which are output in files" property in the "I/O Header File Generation Options" tab in Build tool property to "Yes" in the project in import destination/source and importing.

Set the value of "Select modules which are output in files" property to "No" in the project of the import destination, and save the project. Then, import the build option after opening the project again.

5.2.2 Build mode

In the [Build Mode Settings] dialog box, the build mode can be duplicated or renamed with different names in terms of upper- and lower-case letters from those of the existing name of the build mode.

Usually, the name of a build mode is that which has been specified for the [Intermediate file output folder] property on the [Common Options] tabbed page of the [Property] panel of the build tool or that which has been specified for the [Output folder] property on the [Link Options] tabbed page or [Hex Output Options] tabbed page. Note that the output destinations of two build modes having names that differ in terms of upper- and lower-case letters will be the same unless the following step is taken. Avoid this problem by specifying different folder names for the [Intermediate file output folder] and [Output folder] properties.

5.2.3 Project conversion from e² studio [RL78]

On the project conversion from e² studio, the settings of [Hex Output Options] tab may not take over in the second and subsequent build modes.

Workaround : After project conversion, set the [Hex Output Options] tab.

5.3 Points for caution regarding design tools

5.3.1 Saving projects

If you save a project that has sub-projects while the [Device Top View] or [Device Pin List] panel is open, then the device top view and device pin list of the main project will always appear.

5.3.2 Displaying Find and Replace dialog box

The position of the Find and Replace dialog box is remembered and restored. In a multi-display environment, for example, in case that the sub display is temporarily OFF, the Find and Replace dialog box may not appear due to being off the screen.

In the case, it is possible to move to the visible position in the following way:

1. Immediately after entering Ctrl+F, in other word, with the focus on the Find and Replace dialog box, enter the Alt+Spacebar. The control menu will appear, enter the M key to select [Move].
2. Enter the arrow keys in that state, or move the mouse cursor to display the dialog.

5.4 Points for caution regarding debugging tools

The abbreviations listed below collectively denote the corresponding tools in this section.

OCD (serial): E1 emulator (serial), E20 emulator (serial)

OCD (JTAG): E1 emulator (JTAG), E20 emulator (JTAG)

5.4.1 Adding sub-projects

Applies to: Common to all debugging tools and devices

If you add a sub-project while a debugging tool is connected, downloading and so on may fail. Only add sub-projects while the debugging tool is disconnected.

5.4.2 Assigning unions to registers

Applies to: All debugging tools for RX

When a union is assigned to a register, it is assumed that the members of the union are assigned to the lower-order bytes of the register. For this reason, the values of the members will be incorrect when displayed as big endian.

5.4.3 Functions with the same name and char-type parameters

Applies to: All debugging tools for RX

When three functions with char-type parameters are defined as shown below, the address of "Func(signed char)" will not be displayed (i.e. the address of "Func(char)" will be displayed instead).

```
void Func(char);  
void Func(signed char);  
void Func(unsigned char);
```

5.4.4 Changing the priority section among overlaid sections

Applies to: All debugging tools for RX

Changing the priority section among overlaid sections is not immediately reflected in debugger operations. To update the display of addresses in the editor, for example, you need to close the file and open it again. To update the display of variables in the [Watch] panel, execute a single step of the program.

5.4.5 Linkage options of CC-RX

Applies to: All debugging tools for RX

CC-RX does not support the '-sdebug' linkage option.

Please set [Outputs debugging information] in the [output] category of the [Link Options] tabbed page to '-debug'.

5.4.6 Breakpoints in for statements or inline-expanded functions

Applies to: All debugging tools for all devices

If a line of C source code includes any of the functions or statements listed below, the instruction is placed at two or more addresses. However, the editor panel shows only one of the addresses.

In cases where a breakpoint is set on this line, the program stops only when the instruction at the address being displayed on the editor panel is executed.

1. Inline-expanded function (*)
 2. Template function
 3. First line of a for or do-while statement
- * Includes those inline-expanded by optimization

5.4.7 Notice of the project of dual mode

Applies to: All debugging tools for RX65N-2M, RX651-2M group

In case of a project of a dual mode of a device with less than 1.5 MB of ROM size, a gap exists during the address of the ROM in bank 0 and bank 1.

But data in a gap exists in the following function.

- Memory panel
- Watch panel
- Disassemble panel

[E1/E20/E2/E2Lite]

Read result is 0x00, Write is ignored.

[Simulator]

Read and Write operate correctly.

5.4.8 Notice regarding the IE850A

Applies to: IE850A for RH850

Values larger than 512 K can be specified for the [Trace memory size [frames]] property. If such values are specified, however, only the latest 512 Kbytes of trace data will be used in the display of the [Trace] panel and in the Python console.

5.4.9 Notice regarding the RL78/G1M, RL78/G1N

Applies to: OCD (serial) for RL78/G1M, RL78/G1N

The following properties cannot be used with RL78/G1M and RL78/G1N.

Connect Setting - Connection with Target Board - Low voltage OCD board

5.4.10 Simulation of peripheral modules

Applies to: The simulators for RL78/G10, RL78/G11, RL78/G12, RL78/G13, RL78/G13A, RL78/G14, RL78/L12, RL78/G1F, and RL78/G23 devices

Operation of CS+ may be incorrect if the user program or a debugging operation makes settings of the SFR which are prohibited in the user's manual for the target device.

5.4.11 Point for caution on time measurement by the simulator when the device is in standby mode

Applies to: The simulators for RL78 and RH850

When the program is on standby (in halt, stop, or snooze mode for an RL78 device and in halt mode for an RH850 device), time measurement by the following facilities does not operate correctly.

(1) Run-break timer facility (for RL78 simulator and RH850 simulator)

The run-break time is not correctly measured in the following cases.

- A forced break occurred in standby mode.
- A program is run following standby mode (run after a forced break).

(2) The Python function `debugger.Interrupt.SetTimer` (only for the RH850 simulator)

Even if the break time specified with `debugger.Interrupt.SetTimer` is matched on standby (in halt mode), the break does not occur until the program is released from standby.

This also applies in cases when the break time was specified with `debugger.XRumBreak.Set` since it is based on the same functionality.

Chapter 6. Restrictions

This section describes restrictions on CS+.

6.1 Restrictions imposed by debugging tools

The abbreviations listed below collectively denote the corresponding tools in this section.

OCD (serial):

Serial or FINE interface connection for the E1 emulator, E20 emulator, E2 emulator, and E2 emulator Lite

OCD (JTAG):

JTAG interface connection for the E1 emulator, E20 emulator, E2 emulator, and E2 emulator Lite

OCD (LPD):

LPD connection for the E1 emulator, E20 emulator, and E2 emulator

6.1.1 List of restrictions imposed by debugging tools

No.	Target tool	Target device	Description	Remarks
1	All debugging tools	RL78, RX, RH850	Division of load modules	
2	All debugging tools	RL78, RX, RH850	Display of information on variables	
3	All debugging tools	RL78, RX, RH850	Source files with the same name	

6.1.2 Details of restrictions imposed by debugging tools

No.1 Division of load modules

Applies to: All debugging tools for RL78, RX, RH850

Description: The restrictions below apply when the CC-RH compiler is used to generate split load modules from a program.

- a. Source-level debugging becomes impossible.
- b. The second and subsequent output files are not automatically registered with the debugging tool.

Workaround: There is no workaround.

No.2 Display of information on variables

Applies to: All debugging tools for RL78, RX, RH850

Description: If two or more variables defined in a function have the same name, the values of variables that can be viewed when the program has stopped may differ from the expected values. Whether this phenomenon arises depends on the optimization level* selected during the process of compilation.

Note: The optimization level can be set via [Build Tool] – [Common Options] – [Frequently Used Options (Link)].

[Example] In the example below, char-type variable “a” is in the innermost scope at (*1) and int-type variable “a” is in the innermost scope at (*2). Under some conditions, however, only the value of one of the variables will be visible at (*1) and (*2).

```
void main()
{
    int a = 100;
    {
        char a = 'A';
        a++; <-( *1)
    }
    a++; <-( *2)
}
```

- Display of (*1) in the [Watch] panel
 - “a” ‘A’ (0x41) “signed char” “0xfeb1004” // Expected value
 - or “a” 100 (0x00000064) “int” “0xfeb1000”
- Display of (*2) in the [Watch] panel
 - “a” ‘B’ (0x42) “signed char” “0xfeb1004”
 - or “a” 100 (0x00000064) “int” “0xfeb1000” // Expected value

Condition: Optimization other than for debugging at the time of compilation.

Workaround: Select [Optimize for Debugging] as the optimization level before compilation.

No.3 Source files with the same name

Applies to: All debugging tools for RL78, RX, RH850

Description: When two or more files with the same name exist in a load module being debugged, line addresses are not displayed correctly in the editor. Setting of events also does not work correctly.

Example:

C:\Work\CS+\ProjA\ProjA.mtpj\Src\main.c -> A.abs

C:\Work\CS+\ProjB\ProjB.mtpj\Src\main.c -> B.abs

This is a case where the above two load modules are being debugged simultaneously.

Note: Although multiple load modules are used in the above example, this restriction is also applicable to cases where a single load module is in use.

[Conditions] The relative paths to the files from the compilation directory are the same (including the filenames).

Building by CS+

Project file directory (*.mtpj) = compilation directory

Building by using a makefile

Current directory = compilation directory

Workaround: Source files with the same name can be distinguished in either of the following ways.

- a. Change the configuration of the folders so that the relative paths to the files from the compilation directory differ.

Before: ProjA\Src\main.c

ProjB\Src\main.c

After: ProjA\SrcA\main.c

ProjB\SrcB\main.c

With this change, the relative paths will be as follows.

"SrcA\main.c"

"SrcB\main.c"

- b. Change the names of the source files so that all of the files to be debugged have unique names.

Before: ProjA\Src\main.c

ProjB\Src\main.c

After: ProjA\Src\mainA.c

ProjB\Src\mainB.c

6.2 Restrictions imposed by design tools

6.2.1 List of restrictions imposed by design tools

No.	Target tool	Target device	Description	Remarks
1	Code Generator	RH850	The project tree flickers when switching active project	

6.2.2 Details of restrictions imposed by design tools

No.1 The project tree flickers when switching active project

Applies to: The design tool for RH850

Description: If there are two or more projects on project tree and each project contains [Code Generator], when switching active project from one to the other, the project tree flickers several seconds.

Workaround: There is no workaround.

Notice

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(Rev.5.0-1 October 2020)

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