

Thank you for using the CS+ integrated development environment.

This document describes the restrictions and points for caution. Read this document before using the product.

## Contents

|                                                                                                     |           |
|-----------------------------------------------------------------------------------------------------|-----------|
| <b>Chapter 1. Target Devices .....</b>                                                              | <b>2</b>  |
| <b>Chapter 2. User's Manuals .....</b>                                                              | <b>3</b>  |
| <b>Chapter 3. Keywords When Uninstalling the Product.....</b>                                       | <b>4</b>  |
| <b>Chapter 4. Changes .....</b>                                                                     | <b>5</b>  |
| 4.1 Extensions to the checking of source code against MISRA-C:2012 rules [Professional edition] ... | 5         |
| 4.2 Writing the #pragma section directive within functions .....                                    | 5         |
| 4.3 Generation of code to produce approximate results .....                                         | 6         |
| 4.4 Improvement to code generated for loop processing .....                                         | 7         |
| 4.5 Improvement of code for calculating absolute values .....                                       | 8         |
| 4.6 Allowing the specification of the same module names during the generation of a library .....    | 8         |
| 4.7 Rectified points for caution .....                                                              | 8         |
| 4.8 Other changes and improvements .....                                                            | 9         |
| <b>Chapter 5. Point for Caution .....</b>                                                           | <b>10</b> |
| 5.1 Note on specifying path names .....                                                             | 10        |

## Chapter 1. Target Devices

The target devices supported by the CC-RH compiler are listed on the Web site.

Please see the URL below.

CS+ Product Page:

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

## Chapter 2. User's Manuals

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

| Name                                                                                | Document Number |
|-------------------------------------------------------------------------------------|-----------------|
| CC-RH Compiler User's Manual                                                        | R20UT3516EJ0107 |
| CS+ Integrated Development Environment User's Manual:<br>CC-RH Build Tool Operation | R20UT3283EJ0108 |

---

## Chapter 3. Keywords When Uninstalling the Product

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+ CC-RH V2.02.00] from [Apps & features] from [Settings] of Windows or from [Programs and Features] of the control panel.

## Chapter 4. Changes

This chapter describes changes to the CC-RH compiler from V2.01.00 to V2.02.00.

Note that the features and changes that are only available to users holding a registered license for the Professional edition are indicated as **[Professional edition]**.

### 4.1 Extensions to the checking of source code against MISRA-C:2012 rules **[Professional edition]**

The following rule numbers have been added as arguments of the -Xmisra2012 option for checking source code against MISRA-C:2012 rules.

Required rules: **14.2** and **14.3**

Advisory rule: **8.13**

The following shows the number of MISRA-C:2012 rules which can be checked by each revision.

| <i>Classification of Rules:<br/>Number of Rules</i> | <i>V2.01.00</i> | <i>V2.02.00</i> |
|-----------------------------------------------------|-----------------|-----------------|
| Mandatory rules: 16                                 | 7               | 7               |
| Required rules: 108                                 | 88              | <b>90</b>       |
| Advisory rules: 32                                  | 26              | <b>27</b>       |
| Total: 156                                          | 121             | <b>124</b>      |

### 4.2 Writing the #pragma section directive within functions

The #pragma section directive can be written within functions.

The section to which each of the following objects are allocated is individually specifiable.

- Static variables within functions
- String literals within functions

### 4.3 Generation of code to produce approximate results

The -approximate option has been added for generating code which produces approximate results for floating-point calculations. Specifying this option leads to the generation of more efficient code to handle calculations but the results of operations will be less precise.

<Example of source code>

```
float func1(float a) {  
    return a/0.3f;  
}
```

<With this option not specified>

```
_func1:  
    mov 0x3E99999A, r2    ; 0.3f  
    divf.s r2, r6, r10  
    jmp [r31]
```

<With this option specified>

```
_func1:  
    mov 0x40555555, r2    ; 3.333....( $\approx 1.0f/0.3f$ )  
    mulf.s r2, r6, r10  
    jmp [r31]
```

## 4.4 Improvement to code generated for loop processing

Code has been improved so that calculations which satisfy all the following conditions and need not be executed in a loop are executed outside the loop.

- Integer division is in a loop.
- The dividend and divisor for the integer division in the loop have fixed values.
- The divisor is a non-0 constant.

<Example of source code>

```
void update(unsigned int* array, unsigned n, unsigned value) {
    unsigned i;
    for (i = 0; i < n; ++i) {
        array[i] = value / 3;
    }
}
```

<Code output by CC-RH V2.01>

```
_update:
    mov 0x00000000, r2
    mov 0x00000003, r5
.BB.LABEL.1_1: ; bb7
    cmp r7, r2
    bz9 .BB.LABEL.1_3
.BB.LABEL.1_2: ; bb
    mov r8, r9
    divhu r5, r9, r0
    st.w r9, 0x00000000[r6]
    add 0x00000004, r6
    add 0x00000001, r2
    br9 .BB.LABEL.1_1
.BB.LABEL.1_3: ; return
    jmp [r31]
```

<Code output by CC-RH V2.02>

```
_update:
    mov 0x00000003, r2
    divhu r2, r8, r0
    mov 0x00000000, r2
.BB.LABEL.1_1: ; bb7
    cmp r7, r2
    bz9 .BB.LABEL.1_3
.BB.LABEL.1_2: ; bb
    st.w r8, 0x00000000[r6]
    add 0x00000004, r6
    add 0x00000001, r2
    br9 .BB.LABEL.1_1
.BB.LABEL.1_3: ; return
    jmp [r31]
```

## 4.5 Improvement of code for calculating absolute values

Code has been improved so that instructions for simply calculating the absolute value are generated in the compiled result of the ternary expression `((f >= 0.0f) ? f : -f)` when the `-relaxed_math` option is specified.

<Example of source code>

```
float absolute(float value) {  
    return ((value >= 0.0f) ? value : (-value));  
}
```

<Code output by CC-RH V2.01>

```
_absolute:  
    mov 0x00000000, r2  
    cmpf.s 0x00000004, r6, r2  
    trfsr 0  
    bz9 .BB.LABEL.1_2  
.BB.LABEL.1_1:  
    mov r6, r10  
    jmp [r31]  
.BB.LABEL.1_2:  
    negf.s r6, r10  
    jmp [r31]
```

<Code output by CC-RH V2.02>

```
_absolute:  
    absf.s r6, r10  
    jmp [r31]
```

## 4.6 Allowing the specification of the same module names during the generation of a library

The `-allow_duplicate_module_name` option has been added.

Specifying this option allows the specification of the same module names during the generation of a library.

## 4.7 Rectified points for caution

The following four points for caution no longer apply. For details, refer to Tool News.

- Comparison expressions in a loop (No. 25)
- Mathematical library function `atan` (No. 26)
- `#pragma block_interrupt` directive (No. 27)
- Using the `-Xalias=ansi` option (No.28)

## 4.8 Other changes and improvements

Other major changes and improvements are described below.

- (a) Elimination of the output of messages on the results of MISRA-C checking to the standard header  
Specifying the -Xmisra2012 option so that source code was checked against the MISRA-C:2012 rules sometimes led to messages on the results of checking being output to the standard header. This has been corrected so that the messages are not output.
- (b) Elimination of the output of messages on the results of checking due to the -Xcheck option to the standard header  
Specifying the -Xcheck option so that source code was checked for compatibility sometimes led to messages on the results of checking being output to the standard header. This has been corrected so that the messages are not output.
- (c) Correction of internal errors  
Internal errors sometimes occurred in the build process in previous revisions. These errors have been corrected.

---

## Chapter 5. Point for Caution

This section states a point for caution regarding CC-RH.

### 5.1 Note on specifying path names

Absolute paths that include drive letters or relative paths can be used as the path names for specifying input/output files or folders.

All trademarks and registered trademarks are the property of their respective owners.

## 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 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. 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.4.0-1 November 2017)

## 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/](http://www.renesas.com/contact/).