CS+ RH850 Compiler CC-RH V1.05.00 Release Note

R20UT3936EJ0100
Rev.1.00
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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

Chapter 1. Target Devices

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

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.

Manual Name	Document Number
CC-RH Compiler User's Manual	R20UT3516EJ0102
CS+ Integrated Development Environment User's Manual: CC-RH Build Tool Operation	R20UT3283EJ0103

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 V1.05.00” from “Programs and Features” of the control panel.

Chapter 4. Changes

This chapter describes changes to the CC-RH compiler.

4.1 Changes to the CC-RH compiler

This section describes changes to the CC-RH compiler from V1.04.00 to V1.05.00. Note that the features which are only available to users holding a registered license for the Professional edition are indicated as [Professional edition].

4.1.1 Support for a half-precision floating-point type [Professional edition]

The professional edition supports a half-precision floating-point type.

For microcontrollers which have a floating-point unit (FPU), when the **-Xuse_fp16** option is specified, the **__fp16** type can be used as the half-precision floating-point type. The size is treated as 2 bytes and the alignment condition is also 2 bytes.

Operands of the __fp16 type are converted to the float type by the CVTF.HS instruction of the FPU. When the result of the operation is stored in memory, the CVTF.SH instruction converts it from the float type to the __fp16 type.

[Examples of using the half-precision floating-point type]

```
extern __fp16 hpvar1, hpvar2, hpvar3;
extern float fvar;
extern double dvar;
extern int ivar;

__fp16 hpvar = 1.0;              // Definition of a half-precision floating-point type external variable
void fun() {
    hpvar = 2.0;                 // Assignment of a constant
    hpvar1 = hpvar2;             // Assignment between __fp16-type variables
    fvar = hpvar;                // Conversion of type to the single-precision floating-point type;
                                 // the operation is the same as that of fvar = (float)hpvar;.
    dvar = hpvar;                // Conversion of type to the double-precision floating-point type;
                                 // the operation is the same as that of dvar = (double)(float)hpvar;.
    hpvar = dvar;                // Conversion of type from the double-precision floating-point type;
                                 // the operation is the same as that of hpvar = (__fp16)(float)dvar;.
    ivar = hpvar;                // Conversion of type to integer;
                                 // the operation is the same as that of ivar = (int)(float)hpvar;.
    hpvar = ivar;                // Conversion of type from integer;
                                 // the operation is the same as that of hpvar = (__fp16)(float)ivar;.
    hpvar3 = hpvar1 + hpvar2;    // Arithmetic operation;
                                 // the operation is the same as that of
                                 // hpvar3 = (__fp16)((float)hpvar1 + (float)hpvar2;).
```

In comparison with variables of the single-precision or double-precision floating-point types, the range of values is narrower and the accuracy of results is lower for variables of the half-precision floating-point type. **However, if this is permissible, half-precision values can reduce the amounts of data for applications which have large amounts of floating-point data.**

4.1.2 Improvements to the feature for checking source code against MISRA-C:2012 rules [Professional edition]

The following rule numbers have been added to those which can be designated as arguments of the -Xmisra2012 option, which selects checking by the compiler of source code against the specified MISRA-C:2012 rules.

[Mandatory rules] **9.1**

[Required rules] **2.2 , 3.2 , 5.1 , 5.6 , 5.7 , 5.8 , 8.3 , 12.2**
21.1 , 21.2 , 21.3 , 21.4 , 21.5 , 21.6 , 21.7 , 21.8 , 21.9 , 21.10

[Advisory rules] **5.9 , 8.9**

The following are the numbers of MISRA-C:2012 rules against which the V1.03.00, V1.04.00, and V1.05.00 compilers can check source code for compliance.

Rule classification (number of rules in the standard)	*V1.03.00*	*V1.04.00*	*V1.05.00*
Mandatory rules (10)	3	3	**4**
Required rules (101)	31	58	**76**
Advisory rules (32)	7	21	**23**
Total number of rules (143)	41	82	**103**

4.1.3 Enhanced optimization

For V1.05.00, optimization has been further enhanced on point (1), listed and described below.

(1) Deleting redundant sign extensions

<Example of source code>

```
short func(short a) {

  return (a < 5) ? a : 5;

}
```

<Code generated by V1.04.00>

```
_func:
        .stack _func = 0
        cmp 0x00000005, r6
        cmov 0x0000000E, 0x00000005, r6, r6
        bge9 .BB.LABEL.1_2
.BB.LABEL.1_1:   ; bb
        sxh r6
.BB.LABEL.1_2:   ; bb7
        mov r6, r10
        sxh r10
        jmp [r31]
```

<Code generated by V1.05.00>

```
_func:
        .stack _func = 0
        cmp 0x00000005, r6
        cmov 0x0000000E, 0x00000005, r6, r6
.BB.LABEL.1_1:   ; bb7
        mov r6, r10
        jmp [r31]
```

4.1.4 Added compiler option: -g_line

When optimization is applied, a compiler option **-g_line** has been added to improve the precision of information for use in debugging source code. This eases the debugging of source code.

4.1.5 Extension to the #pragma inline_asm directive

The .public directive can now be included in functions for which the #pragma inline_asm directive is specified. This enables reference to the same external labels by different functions written in assembly language.

Note that the labels for which the .public directive is specifiable are restricted to those which have also been defined in a function for which the #pragma inline_asm directive has been specified.

4.1.6 Change to the specification of the __stcw intrinsic function

The return type of the __stcw intrinsic function has been changed from void to long.

You can now confirm success or failure of the execution of the stc.w by checking the return value.

4.1.7 Change to the specification of the -subcommand linkage option

The –subcommand option has now been made specifiable in subcommand files.

4.1.8 Change to the specifications of the –map and -list linkage options

When the –map option is specified, the specification has been changed so that errors are suppressed to the extent that it is possible when the external variable allocation information file is output, even if the section address exceeds the available range of addresses. In addition, if the –list option is specified at the same time as the –map option, symbol information is output to a linkage map file.

When the –Omap option is specified to enable optimization of access to external variables, once linkage has proceeded and the external variable allocation information file has been generated, the process from compilation to linkage is repeated with that file used for reference to generate efficient code for access to external variables relative to the element pointer (EP).

In the previous versions, if an error occurred during the first round of linkage and an external symbol allocation information file was provisionally generated, optimization of access to external variables was possible. Thus, even in cases where a second round of linkage should have been successful, exit from building proceeded during the first round of linkage so that no external symbol allocation information file was generated. With this change to the specification, access to external variables will still be optimized and exit from building will not proceed even in such cases.

4.1.9 Method of authenticating licenses

The way licenses are authenticated has been changed.

In response to the change in the authentication method, you will need to install V2.00.00 or a later version of the license manager. If you have not done so and attempt building by using V1.05.00 or a later version of CC-RH, CC-RH will generate the warning messages shown below and operate as the evaluation edition.

W0561014 License manager is not installed.

W0511183 License manager is not installed.

4.1.10 Rectified points for caution

Points for caution on the following four items no longer apply. For details, refer to Tool News.

- Built-in Function __stcw ( ) (No. 10)
- Programs which include loops that should be iterated more than once (No. 12)
- Updating of Values of Array Elements, Structure Members, or Union Members Not being Reflected (No.13)
- The loop that has the operation expression of which result is decremented by one (No. 14)

4.1.11 Other changes and improvements

Other major changes and improvements are described below.

(a) Restriction on the output of bit manipulation instructions

In versions earlier than V1.05.00, the compiler automatically determined the output of bit manipulation instructions from the level of optimization and the statements in source code. In V1.05.00, users can control the output. For details on the conditions for output, refer to the CC-RH Compiler User's Manual.

(b) Improved prevention of internal errors

A problem with an internal error during building has been corrected.

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Renesas Electronics America Inc.
2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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