

Thank you for using our product.

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

Chapter 1. User's Manuals	2
Chapter 2. Changes	3
2.1 Addition of the -stuff option	3
2.2 Addition of the -Oalign option	3
2.3 Addition of the -VERBOSE option	3
2.4 Improved precision of alias analysis	3
2.5 Rectified points for caution	6
Chapter 3. Point for Caution	7
3.1 Note on specifying path names	7

Chapter 1. User's Manuals

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

Name	Document Number
CC-RH Compiler User's Manual	R20UT3516EJ0108
CS+ Integrated Development Environment User's Manual: CC-RH Build Tool Operation	R20UT3283EJ0109

Chapter 2. Changes

This chapter describes changes to the CC-RH compiler from V2.02.00 to V2.03.00.

2.1 Addition of the `-stuff` option

The `-stuff` option has been added to allocate variables in separate sections according to their alignment values.

By specifying this option, it is possible to reduce the ROM or RAM size.

2.2 Addition of the `-Oalign` option

The `-Oalign` option has been added for optimization which changes to the alignment conditions of variables. For example, when accessing contiguous fields of a structure-type variable, the number of instructions that are generated can be reduced by changing the alignment condition of the variable and merging two or more accesses into a single access. This reduces the code size and improves the execution speed.

2.3 Addition of the `-VERBOSE` option

The `-VERBOSE` option has been added to display detailed information at link time.

By specifying `crc` as a parameter, the results of CRC calculations and the output position addresses are displayed.

2.4 Improved precision of alias analysis

The precision of alias analysis has been improved to make it easier to apply optimizations such as moving memory access instructions across intrinsic function calls or aggregate copies.

The following source code shows how this reduces the code size and improves the execution speed.

```
<Example of source code>
unsigned GlobalVariable;
typedef struct{
    unsigned char _array[128];
} MyStruct;
MyStruct Source;
MyStruct Destination;
void test(void){
    GlobalVariable = 0;
    Destination = Source;
    while(GlobalVariable != 0){}
}
```

< Code output by CC-RH V2.02.00 (-Osize)>

_test:

```
.stack_test = 0
movhi HIGHW1(#_GlobalVariable), r0, r2
st.w r0, LOWW(#_GlobalVariable)[r2]
movea 0x00000080, r0, r5
mov #_Source, r6
mov #_Destination, r7
add r7, r5
br9 .BB.LABEL.1_2
```

.BB.LABEL.1_1:

```
ld.b 0x00000000[r6], r8
st.b r8, 0x00000000[r7]
add 0x00000001, r6
add 0x00000001, r7
```

.BB.LABEL.1_2:

```
cmp r7, r5
bnz9 .BB.LABEL.1_1
```

.BB.LABEL.1_3:

```
ld.w LOWW(#_GlobalVariable)[r2], r2
```

.BB.LABEL.1_4:

```
cmp 0x00000000, r2
bnz9 .BB.LABEL.1_4
```

.BB.LABEL.1_5:

```
jmp [r31]
```

< Code output by CC-RH V2.03.00 (-Osize)>

_test:

```
.stack_test = 0
movhi HIGHW1(#_GlobalVariable), r0, r2
st.w r0, LOW(#_GlobalVariable) [r2]
movea 0x00000080, r0, r2
mov #_Source, r5
mov #_Destination, r6
add r6, r2
br9 .BB.LABEL.1_2
```

.BB.LABEL.1_1:

```
ld.b 0x00000000[r5], r7
st.b r7, 0x00000000[r6]
add 0x00000001, r5
add 0x00000001, r6
```

.BB.LABEL.1_2:

```
cmp r6, r2
bnz9 .BB.LABEL.1_1
```

.BB.LABEL.1_3:

```
jmp [r31]
```

2.5 Rectified points for caution

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

- Note on writing the constant value 0 to a 2-byte area (No.29)
- Performing the tail call optimization (No.30)
- Using the -Xintermodule option (No. 31)
- Using the -pic option (No.32)
- Using the switch statement (No.33)

Chapter 3. Point for Caution

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

3.1 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.

Revision History

Rev.	Date	Description	
		Page	Summary
Rev1.00	Dec 01, 2020		First Edition issued
Rev1.01	Jan 16, 2021	4,5	The error in source codes is corrected.

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/.