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Chapter 1  Target Devices

The target devices the CC-RL supports 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.

<table>
<thead>
<tr>
<th>Manual Name</th>
<th>Document Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-RL Compiler</td>
<td>R20UT3123EJ0105</td>
</tr>
<tr>
<td>CS+ CC-RL Build Tool Operation</td>
<td>R20UT3284EJ0104</td>
</tr>
</tbody>
</table>
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-RL V1.05.00" from "Programs and Features" of the control panel.
Chapter 4  Changes

This chapter describes changes to V1.05.00 of the CC-RL compiler.

4.1  Changes to CC-RL

This section describes changes to CC-RL from V1.04.00 to V1.05.00.

The features of the latter can only be used if the compiler is registered under the professional license. They are indicated by [Professional edition] from here on.

4.1.1  Enhanced optimization

For V1.05.00, optimization has been further enhanced on points (1) to (2), listed and described below.

(1)  Handling of switch statements

```c
void sub(int);
void func(int key) {
    switch(key & 0x3) {
    case 0:
        sub(0);
        break;
    case 1:
        sub(1);
        break;
    case 2:
        sub(2);
        break;
    case 3:
        sub(3);
        break;
    default:
        sub(4);
        break;
    }
}
```

Since the result of (key & 0x3) at the third line will be 0, 1, 2, or 3, optimization in V1.05.00 takes the fact that the condition for the block default will never be satisfied into account.
<Code generated by V1.04.00>
  mov a, x
  and a, #0x03
  bz $.BB@LABEL@1_5
  .BB@LABEL@1_1: ; entry
  dec a
  bz $.BB@LABEL@1_6
  .BB@LABEL@1_2: ; entry
  dec a
  bz $.BB@LABEL@1_7
  .BB@LABEL@1_3: ; entry
  dec a
  bz $.BB@LABEL@1_8
  .BB@LABEL@1_4: ; bb5
  movw ax, #0x0004
  br !!_sub
  .BB@LABEL@1_5: ; bb
  clrw ax
  br !!_sub
  .BB@LABEL@1_6: ; bb2
  onew ax
  br !!_sub
  .BB@LABEL@1_7: ; bb3
  onew ax
  incw ax
  br !!_sub
  .BB@LABEL@1_8: ; bb4
  movw ax, #0x0004
  br !!_sub
</Code generated by V1.05.00>
  mov a, x
  and a, #0x03
  bz $.BB@LABEL@1_4
  .BB@LABEL@1_1: ; entry
  dec a
  bz $.BB@LABEL@1_5
  .BB@LABEL@1_2: ; entry
  dec a
  bnz $.BB@LABEL@1_6
  .BB@LABEL@1_3: ; bb3
  onew ax
  incw ax
  br !!_sub
  .BB@LABEL@1_4: ; bb
  clrw ax
  br !!_sub
  .BB@LABEL@1_5: ; bb2
  onew ax
  br !!_sub
  .BB@LABEL@1_6: ; bb4
  movw ax, #0x0003
  br !!_sub
(2) Alias analysis

Although the address of StructArray[p->index1] would be calculated three times in V1.04.00, it is only calculated once in V1.05.00.

```
<Example of source code>
struct tag1 {
    char member1;
    int   member2;
    long long member3;
} StructArray[2];

struct tag2 {
    short index0;
    short index1;
    short index2;
};

void func(struct tag2 *p) {
    StructArray[p->index1].member1 = 1;
    StructArray[p->index1].member2 = 2;
    StructArray[p->index1].member3 = 3;
}

<Code generated by V1.04.00>
    movw de, ax
    movw bc, #0x000C
    movw ax, [de+0x02]
    mulh
    movw bc, ax
    mov LOWW(_StructArray)[bc], #0x01
    movw ax, [de+0x02]
    movw bc, #0x000C
    mulh
    addw ax, #LOWW(_StructArray+0x00002)
    movw hl, ax
    onew ax
    incw ax
    movw [hl], ax
    movw ax, [de+0x02]
    movw bc, #0x000C
    mulh
    addw ax, #LOWW(_StructArray+0x00004)
    movw de, ax
    clrw ax
    movw [de+0x06], ax
    movw [de+0x04], ax
    movw [de+0x02], ax
    movw ax, #0x0003
    movw [de], ax
    ret
```
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 -misra2012 option, which selects checking by the compiler of source code against the specified MISRA-C:2012 rules.

The V1.05.00 compiler supports Amendment 1 of MISRA-C:2012.


[Advisory rules] 17.5, 17.8

The following are the numbers of MISRA-C:2012 rules against which each revision of compilers can check source code for compliance.

<table>
<thead>
<tr>
<th>Rule classification (number of rules in the standard)</th>
<th>V1.02.00</th>
<th>V1.03.00</th>
<th>V1.04.00</th>
<th>V1.05.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory rules (16)</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Required rules (108)</td>
<td>31</td>
<td>58</td>
<td>76</td>
<td>80</td>
</tr>
</tbody>
</table>
4.1.3 Improvement to the method of authenticating licenses

The way licenses are authenticated was improved to reduce build times.
With this improvement, when a license for the professional edition has not been registered and the code includes #pragma extended language directives for the professional edition, the compiler operates as follows.
- Versions earlier than V1.05.00
  The compiler outputs a warning and ignores the option.
- V1.05.00 and later versions
  When the syntax of the #pragma extended language directive is correct, the compiler outputs a warning but still ignores the option.
  When the syntax of the #pragma extended language directive is not correct, the compiler outputs an error message.

4.1.4 Change to the output of the initial values for array type variables

The output of the initial values for array type variables in assembly source code has been changed so that the values are collectively output on one line. This change reduces the load of analytical processing during building and so can reduce build times.

<Example of source code>
float flt[4] = {1,2,3,4};

<Code generated by V1.04.00>
    _flt:                  
    .DB4 0x3F800000  ; float value: 1
    .DB4 0x40000000  ; float value: 2
    .DB4 0x40400000  ; float value: 3
    .DB4 0x40800000  ; float value: 4

<Code generated by V1.05.00>
    _flt:                  
    .DB4 0x3F800000,0x40000000,0x40400000,0x40800000 ; float 1,2,3,4

4.1.5 Specification of the type of end record of Motorola S-type files

A linker option -end_record for specifying the types of end records of Motorola S-type files has been added. In versions earlier than V1.05.00, the end record was output to suit the address of the entry point. In V1.05.00, Motorola S-type files can be generated with specified types of end record.

-end_record=record
For the argument "record", S7, S8, or S9 can be specified.

4.1.6 Change to the specification of link map files
The ATTRIBUTE column which is the relocation attribute was added to “Mapping List” of the link map file.
When -show=relocation_attribute is specified, the relocation attribute corresponding to the section is output. For details on the attributes, refer to the CC-RL Compiler User’s Manual.

4.1.7 Change to the messages for linkage errors
The file name is output in messages for the linkage error “F0563102”.
- Versions earlier than V1.05.00
  F0563102:Section contents overlap in absolute section <section name>.
- V1.05.00 and later versions
  When F0563102:Section contents overlap in absolute section <section name> in <file name>.

4.1.8 Addition of an option for inserting a local label and nop instruction
The -insert_nop_with_label option, which is used in the solution for measuring current drawn by CS+ or the e2 studio, was added.
This option is for use with CS+ or the e2 studio.

4.1.9 Extension of the functionality of the -vfinfo option
The output attribute attribute was added to the -vfinfo option.
In V1.05.00, specifying near functions as well as callt functions is now possible. In addition, information on functions in sections specified for the ROM option or the far area is not output.

4.1.10 Extension of the functionality of the -binary option
For the -binary option, items that are specifiable for the section attribute attribute have been extended.
- Versions earlier than V1.05.00
  CODE,DATA
- V1.05.00 and later versions
  CALLT0, CODE, TEXT, TEXTF, TEXTF_UNIT64KP, CONST, CONSTF, SDATA, DATA, DATAF, OPT_BYTE, and SECUR_ID

4.1.11 Addition of #pragma near/far
The #pragma directives can specify the near or far attribute of functions.
The near or far attribute can be specified at the same time for multiple functions.

4.1.12 Addition of #pragma pack/unpack
The #pragma directives can specify whether a structure is to be packed or not.
Packing can be specified for parts of C source files.

4.1.13 Extension of the functionality of #pragma address
#pragma address can specify an address for the allocation of const variables.

4.1.14 Acceptance of duplicated #pragma directives when the function to support porting is specified
When the function to support porting is specified, the duplication of #pragma directives such as #pragma nop in code will not lead to an error.

4.1.15 Addition of numbers to messages when using the evaluation version
Numbers W0561016 and W0561017 were added to the messages that may be output during building by using the evaluation version. This enables control by using -change_message such that the message is handled as an error when the evaluation version is in use.

- **W0561016:** The evaluation version is valid for the remaining *** days
- **W0561017:** The evaluation period has expired

4.1.16 Rectified point for caution
The point for caution on the following item no longer applies. For details, refer to Tool News.
- Assembly Statements Not in Accord with the Specification (CCRL#001)

4.1.17 Other changes and improvements
Other major changes and improvements are described below.

(a) Improved runtime library for arithmetic operations on the float type
Performance of the runtime library functions for the addition, subtraction, multiplication, and division of float type variables has been improved.

(b) Correction of a compiler
The generation of compiler error code “F0530800” in response to specification of the -merge_files option has been corrected.

(c) Improved prevention of interna errors
A problem with an internal error during building has been rectified.
Chapter 5  Points for Caution

Please refer to the user's manual for caution regarding V1.05.00 of the CC-RL compiler.
Revision History

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev.1.00</td>
<td>Jun 20,2017</td>
<td></td>
<td>First Edition issued</td>
</tr>
<tr>
<td>Rev.1.01</td>
<td>Jan 16,2021</td>
<td>11</td>
<td>The error in rectified point for caution is corrected.</td>
</tr>
</tbody>
</table>
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