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Chapter 1 User's Manuals

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

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<thead>
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<th>Document Number</th>
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<tbody>
<tr>
<td>CC-RL Compiler User's Manual</td>
<td>R20UT3123EJ0109</td>
</tr>
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Chapter 2 Changes

This section describes changes to CC-RL from V1.08.00 to V1.09.00. 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.

2.1 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 -misra2012 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.

<table>
<thead>
<tr>
<th>Classification of Rules: Number of Rules</th>
<th>V1.08.00</th>
<th>V1.09.00</th>
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<tbody>
<tr>
<td>Mandatory rules: 16</td>
<td>7</td>
<td>7</td>
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<tr>
<td>Required rules: 108</td>
<td>88</td>
<td>90</td>
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<tr>
<td>Advisory rules: 32</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Total: 156</td>
<td>121</td>
<td>124</td>
</tr>
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</table>

2.2 Writing the #pragma section directive within functions

The #pragma section directive can be written within functions. The following target sections are individually specifiable: sections for static variables within functions, sections for string literals within functions, and sections for initial values for aggregate-type automatic variables.
2.3 C99 standard library functions

Support for standard library functions of the C99 language has newly been added and functionality for compliance with the C99 standard have been added to existing standard library functions as listed below.

- `scalbn`  
- `scalbnf`  
- `scalbnl`  
- `scalbln`  
- `scalblnf`  
- `scalblnl`  
- `nearbyint`  
- `nearbyintf`  
- `nearbyintl`  
- `rint`  
- `rintf`  
- `rintl`  
- `lrint`  
- `lrintf`  
- `lrintl`  
- `round`  
- `roundf`  
- `roundl`  
- `lround`  
- `lroundf`  
- `lroundl`  
- `llround`  
- `llroundf`  
- `llroundl`  
- `trunc`  
- `truncl`  
- `copysign`  
- `copysignf`  
- `copysignl`  
- `nan`  
- `nanf`  
- `nanl`  
- `fdim`  
- `fdimf`  
- `fdiml`  
- `fmax`  
- `fmaxf`  
- `fmaxl`  
- `fmin`  
- `fminf`  
- `fminl`  
- `isgreater`  
- `isgreaterequal`  
- `isless`  
- `islessequal`  
- `islessgreater`  
- `isunordered`  
- `va_copy`  

2.4 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.
2.5 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.

```c
void update(unsigned int* array, unsigned n, unsigned value) {
    unsigned i;
    for (i = 0; i < n; ++i) {
        if (i & 1) {
            array[i] = value / 3;
        }
    }
}
```
<Code output by CC-RL V1.08.00>
_update:
  push ax
  push de
  push bc
  movw ax, [sp+0x00]
  or a, x
  bz $.BB@LABEL@1_8
.BB@LABEL@1_1:
  movw ax, [sp+0x00]
  xor a, #0x80
  cmpw ax, #0x8002
  mov h, #0x00
  bc $.BB@LABEL@1_5
.BB@LABEL@1_2:
  movw ax, [sp+0x00]
  shrw ax, 0x01
  movw [sp+0x00], ax
  movw ax, [sp+0x04]
  addw ax, #0x0002
  movw hl, ax
.BB@LABEL@1_3:
  movw ax, [sp+0x02]
  movw de, #0x0003
  divhu
  movw [hl], ax
  movw ax, hl
  movw [sp+0x00], ax
  addw ax, #0xFFFF
  movw [sp+0x00], ax
  bnz $.BB@LABEL@1_3
.BB@LABEL@1_4:
  addw sp, #0x06
  ret
.BB@LABEL@1_5:
  mov a, h

<Code output by CC-RL V1.09.00>
_update:
  push hl
  push ax
  push bc
  pop hl
  movw ax, hl
  or a, x
  movw ax, de
  bz $.BB@LABEL@1_8
.BB@LABEL@1_1:
  movw ax, [sp+0x00]
  xor a, #0x80
  cmpw ax, #0x8002
  mov h, #0x00
  bc $.BB@LABEL@1_5
.BB@LABEL@1_2:
  movw ax, [sp+0x00]
  shrw ax, 0x01
  movw [sp+0x00], ax
  movw ax, [sp+0x04]
  addw ax, #0x0002
  movw hl, ax
.BB@LABEL@1_3:
  movw ax, [sp+0x02]
  movw de, #0x0003
  divhu
  movw [sp+0x02], ax
  movw ax, hl
  xor a, #0x80
  cmpw ax, #0x8002
  clrb b
  bc $.BB@LABEL@1_5
.BB@LABEL@1_2:
  movw ax, hl
  shrw ax, 0x01
  movw hl, ax
  movw ax, [sp+0x00]
  addw ax, #0x0002
  movw bc, ax
.BB@LABEL@1_3:
  movw ax, [sp+0x02]
  movw 0x0000[bc], ax
  movw ax, bc
  addw ax, #0x0004
  movw bc, ax
  movw ax, hl
  addw ax, #0xFFFF
  movw hl, ax
  bnz $.BB@LABEL@1_3
.BB@LABEL@1_4:
  addw sp, #0x04
bf a.0, $.BB@LABEL@1_7

.BB@LABEL@1_6:
    movw ax, [sp+0x02]
    movw de, #0x0003
    divhu
    movw bc, ax
    movw ax, [sp+0x04]
    movw de, ax
    movw ax, bc
    movw [de], ax
.BB@LABEL@1_7:
    movw ax, [sp+0x04]
    addw ax, #0x0002
    movw [sp+0x04], ax
    inc h
    movw ax, [sp+0x00]
    addw ax, #0xFFFF
    movw [sp+0x00], ax
    bnz $.BB@LABEL@1_5
.BB@LABEL@1_8:
    addw sp, #0x06
    ret

ret

.BB@LABEL@1_5:
    mov a, b
    bf a.0, $.BB@LABEL@1_7
.BB@LABEL@1_6:
    pop de
    push de
    movw ax, [sp+0x02]
    movw [de], ax
.BB@LABEL@1_7:
    movw ax, [sp+0x00]
    addw ax, #0x0002
    movw [sp+0x00], ax
    inc b
    movw ax, hl
    addw ax, #0xFFFF
    movw hl, ax
    bnz $.BB@LABEL@1_5
.BB@LABEL@1_8:
    addw sp, #0x04
    ret
2.6 Rectified point for caution

The following point for caution no longer applies. For details, refer to Tool News.

- Mathematical library function atan (CCRL#024)
- Using the -Oalias=ansi option (CCRL#025)

2.7 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 -misra2012 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) Correction of internal errors

Internal errors sometimes occurred in the build process in previous revisions. These errors have been corrected.
Chapter 3 **Points for Caution**

### 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.

### 3.2 Other points for caution

Please refer to the user's manual for other points for caution regarding V1.09.00 of the CC-RL compiler.

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