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Chapter 1 User's Manuals

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

Name	Document Number
CC-RL Compiler User's Manual	R20UT3123EJ0109

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.

Classification of Rules: Number of Rules	V1.08.00	V1.09.00
Mandatory rules: 16	7	7
Required rules: 108	88	90
Advisory rules: 32	26	27
Total: 156	121	124

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	llrint	llrintf	llrintl
round	roundf	roundl	lround	lroundf	lroundl
llround	llroundf	llroundl	trunc	truncf	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.

<Example of source code>

```
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
    addw ax, #0x0004
    movw hl, ax
    movw ax, [sp+0x00]
    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 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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