

Thank you for using our product.

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

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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	R20UT3123EJ0110
CS+ Integrated Development Environment User's Manual: CC-RL Build Tool Operation	R20UT3284EJ0109

## Chapter 2. Changes

This section describes changes to CC-RL from V1.09.00 to V1.10.00.

### 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 `-Obranch_chaining` option

The `-Obranch_chaining` option has been added for optimization to reduce the code size of branch instructions.

When this option is specified, a branch instruction may not directly branch to the final destination; but branch to another branch instruction with the same destination by using a smaller branch instruction. This slows down the execution speed, but reduces the code size.

### 2.3 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.

### 2.4 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.

## 2.5 Enhanced of the `-Osame_code` option

The ability to aggregate common sequences of instructions has been enhanced.

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

<Example of source code>

```
int mac0(int src, int lhs, int rhs){  
    return (src + lhs * rhs);  
}
```

```
int mac1(int src, int lhs, int rhs){  
    return (src + lhs * rhs);  
}
```

<Code output by CC-RL V1.09.00 (-cpu=S2 -Osame\_code)>

```
_mac0:  
    .STACK _mac0 = 6  
    push ax  
    call $! __CommonCode@0  
    pop hl  
    ret  
  
_mac1:  
    .STACK _mac1 = 6  
    push ax  
    call $! __CommonCode@0  
    pop hl  
    ret  
  
__CommonCode@0:  
    .STACK __CommonCode@0 = 4  
    movw ax, de  
    call !! __COM_imul  
    movw bc, ax  
    movw ax, [sp+0x04]  
    xchw ax, bc  
    addw ax, bc  
    ret
```

```
< Code output by CC-RL V1.10.00 (-cpu=S2 -Osame_code)>
```

```
_mac0:
    .STACK _mac0 = 4
    br $ __CommonCode@0

__CommonCode@0:
    .STACK __CommonCode@0 = 6
    push ax
    movw ax, de
    call !!__COM_imul
    movw bc, ax
    movw ax, [sp+0x00]
    addw ax, bc
    pop hl
    ret

_mac1:
    .STACK _mac1 = 4
    br $ __CommonCode@0
```

## 2.6 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-RL V1.09.00 (-cpu=S2)>

```
_test:
    .STACK_test = 4
    clrw ax
    movw !LOWW(_GlobalVariable), ax
    movw de, #0x0080
    movw bc, #LOWW(_Source)
    movw ax, #LOWW(_Destination)
    call !!_memcpy
    BB@LABEL@1_1:
        movw ax, !LOWW(_GlobalVariable)
        or a, x
        bnz $.BB@LABEL@1_1
    BB@LABEL@1_2:
    ret
```

< Code output by CC-RL V1.10.00 (-cpu=S2)>

```
_test:
    .STACK_test = 4
    clrw ax
    movw !LOWW(_GlobalVariable), ax
    movw de, #0x0080
    movw bc, #LOWW(_Source)
    movw ax, #LOWW(_Destination)
    call !!_memcpy
    ret
```

## 2.7 Rectified point for caution

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

- Using the -Ointermodule option (CCRL#026)

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## 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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