[Notes]
C/C++ Compiler Package for RX Family

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Outline

When using the C/C++ compiler package for RX family CC-RX, note the following points.

1. Point for caution when the -misra2012 option is specified (CCRX#050)
2. Point for caution regarding constant expressions that include type conversion from the floating-point type to the 64-bit integer type (CCRX#051)

Note: The number following the note is an identifying number for the precautionary note.

1. Point for caution when the -misra2012 option is specified (CCRX#050)

1.1 Applicable Products

CC-RX V2.05.00 to V2.08.00, V3.00.00 [Professional edition] (Rule 16.1 and 16.4)

CC-RX V2.06.00 to V2.08.00, V3.00.00 [Professional edition] (Rule 15.6, 15.7, and 16.2)

1.2 Details

When checking source code against MISRA-C:2012 rules by specifying -misra2012 option, the compiler may output a message for a code which does not violate the rules and may not output a message for a code which violates the rules.

MISRA-C is a set of software development guidelines whose purpose is to maintain the safety, portability and reliability of embedded systems programmed in the C language.

1.3 Conditions

An error occurs when following rule numbers are specified to be checked.

- Rule 15.6
  No message is output for a code that violates the rule if the -lang=c99 option is specified.
- Rule 15.7
  No message is output for a code that violates the rule if the -lang=c99 option is specified.
- Rule 16.1
  No message is output for a code that violates the rule if all of the following conditions are met:
  (1) “{“ is written immediately after a switch statement (controlling expression).
  (2) Both a case clause and a default clause are written in the switch statement (1).
  (3) Each case clause and default clause in (2) ends with a break statement or a compound statement (Note1) (block) which includes a break statement at the end.
  (4) At least one of the case clauses or default clauses in (3) meets all the conditions below.
  (4-1) A compound statement (block) which is neither a selection statement (if or switch) nor a repeat statement (while, do-while, or for) is written at the end.
  (4-2) A statement is written before the compound statement (block) in (4-1).
  Note 1: A compound statement is a statement enclosed with “{ }”. An if statement enclosed with “{ }” is also a compound statement.

- Rule 16.2

  No message is output for a code that violates the rule if all of the following conditions are met.

  (1) The -lang=c99 option is specified.

  (2) A case or default label is written immediately after switch (controlling expression) without “{”.

- Rule 16.4

  A message may be output for a code that does not violate the rule if either of the following conditions is met:

  (1) -lang=c is specified and a compound statement (block) is written in the function definition.

  (2) -lang=c99 is specified, and a compound statement (block), selection statement (if or switch), or repeat statement (while, do-while, or for) is written in the function definition.
  (This includes a case where a selection statement or repeat statement is written without “{ }”.)

1.4 Example

The example of an error is shown below. Characters in red are the parts corresponding to the conditions.

[C source code] (rule 16.1)

```
 1: int x;
 2: void func(void) {
 3:     switch(x) {                    // Condition (1)
 4:     case 1:                        // Condition (2)
 5:         ++x;                       // Condition (4-2)
 6:         {                          // Condition (4-1)
 7:             --x;
 8:             break;                 // Condition (3)
 9:         }                          // Condition (4-1)
10:     default:                       // Condition (2)
11:         break;                     // Condition (3)
12:     }                              // Condition (1)
13: }
```

Although the C source code above violates rule 16.1 of MISRA C: 2012, no message is output.

Lines 3 and 12: Condition (1) is met because “{” is written immediately after switch (controlling expression).

Lines 4 and 10: Condition (2) is met because both a case clause and a default clause are written.

Lines 8 and 11: Condition (3) is met because the case clause and default clause end with a break statement.

Lines 6 and 9: Condition (4-1) is met because the case clause ends with a compound statement (block).

Line 5: Condition (4-2) is met because a statement is written before a compound statement (block).

[C source code] (rule 16.2)

```
1:  int x;
2:    void func(void) {
3:        switch(x)                          // Condition (2)
4:        case 1:                            // Condition (2)
5:          break;
6:  }
```

The C source code above violates rule 16.2 of MISRA C:2012. Although a message is output when -lang=c is specified, no message is output when -lang=c99 is specified.
Lines 3 and 4: Condition (2) is met because a case label is written without "{" immediately after switch (controlling expression).

1.5 Workaround

There is no workaround for this problem.

1.6 Schedule for Fixing the Problem

This problem is fixed in CC-RX V3.01.00. (Scheduled to be released on January 21.)

2. Point for caution regarding constant expressions that include type conversion from the floating-point type to the 64-bit integer type (CCRX#051)

2.1 Applicable Products

CC-RX V1.00.00 to V1.02.01, V2.00.00 to V2.08.00, and V3.00.00

2.2 Details

The result of a constant expression that includes type conversion from the floating-point type to the 64-bit integer type may be incorrect.

2.3 Conditions

An error occurs when all of the following conditions (1) through (5) are met.

(1) The -round=zero option is specified.

(2) A constant expression is written.

(3) A subexpression in (2) (Note1) includes a constant expression of the float, double, or long double floating-point type.

Note 1: Cases where (2) itself is a constant expression of the float, double, or long double type are included.

(4) There is a type conversion from the subexpression in (3) to the signed long long or unsigned long long 64-bit integer type, including implicit type conversion.

(5) The value of the subexpression in (3) falls within the following range:

(5-1) When converting a float-type constant expression or a double- or long double-type constant expression with the -dbl_size=4 option specified to the following type:

(5-1-a) When converting to the signed long long type:

- 2.147483e+09 to 3.602880e+16

or

- -2.147483e+09 to -3.602880e+16

(5-1-b) When converting to the unsigned long long type:

- 4.294967e+09 to 3.602880e+16

(5-2) When converting a double-type constant expression with the -dbl_size=8 option specified or a long double-type constant expression to the following type:

(5-2-a) When converting to the signed long long type:

- 2.147483e+09 or more

  or

  -2.147483e+09 or less

(5-2-b) When converting to the unsigned long long type:

- 4.294967e+09 or more

2.4 Example

The example of an error is shown below.

```
long long ll = (long long)(123456789123.0+123+456);    // Condition (2)(3)(4)(5)
```

-Condition (2) is met because constant expression “(long long)(123456789123.0+123+456)” is written.

-Condition (3) is met because a subexpression of the constant expression includes the double type (123456789123.0).

-Condition (4) is met because conversion to the long long type is included.

-Condition (5-2-a) is met because the calculation result (123456789702.0) of the constant expression falls within the range.

[Assembler source code (wrong compilation result)]

```
1:  _ll:
2:          .lword      0BE992000H,0FFFFFFFFH
```

-Line 2: Compilation result applicable to this note is produced when condition (1) and condition (2) through (5) in the example above are met.

[Assembler source code (correct compilation result)]

```
1:  _ll:
2:          .lword      0BE992000H,000000000H
```

-Line2: The correct result of compilation is as shown above.

2.5 Workaround

To avoid this problem, take either of the following steps.

(1) Describe the constant expression in (2) as a converted integer-type constant. Refer to [Workaround example of C source code (1)] below.

(2) Describe conversion as code-based runtime processing using either (2-1) or (2-2) below instead of a constant expression.

(2-1) Assign the value to the 64-bit integer type variable via double-type variable. Refer to [Workaround example of C source code (2-1)] below.

(2-2) Replace the variable with an inline function call that returns a double type value. Refer to [Workaround example of C source code (2-2)] below.

[Workaround example of C source code (1)]

```
long long ll = 123456789702ll;
```

[Workaround example of C source (2-1)]

```
1:  void func(){
2:    double la = 123456789123.0+123+456; //Define la of a double type variable
3:    long long ll = la;                  //Assign the value of la to the 64-bit
4:                                        //integer type
5:  }
```

[Workaround example of C source (2-2)]

```
1:  #pragma inline dvalue
2:  static double dvalue(){
3:    return 123456789123.0+123+456;    //Define the inline function returning double
4:                                      //type value
5:  }
6:
7:  void func(){
8:    long long ll = dvalue();          //Call the inline function and assign it to the
9:                                      //variable II
10: }
```

2.6 Schedule for Fixing the Problem

This problem is fixed in CC-RX V3.01.00. (Scheduled to be released on January 21.)

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jan. 16, 2019	-	First edition issued

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