RX Compiler CC-RX V2.04.01

Release Notes

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Contents

Chapter 1. Changes

This section describes changes on CC-RX from V2.03.00 to V2.04.01.

1.1 Problems fixed (Changes from V2.04.00 to V2.04.01)

The following problems, of which we informed you in RENESAS TOOL NEWS Document No. 151106/tn1, have been fixed:

"-stack_protector" and "-stack_protector_all" options (RXC#037)

http://tool-support.renesas.com/eng/toolnews/151106/tn1.htm

1.2 Standard and Professional editions

The CC-RX complier has the following two editions.

- Standard edition
- Professional edition

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

1.3 Checking of source code against MISRA-C:2004 rules [Professional]

The following options can only be used if the compiler is registered under the professional license.

- -misra2004
- -ignore_files_misra
- -check_language_extension

1.4 Checking of source code against MISRA-C:2012 rules [Professional]

The -misra2012 option, which selects the checking of source code against the MISRA-C:2012 rules, has been added. An –ignore_files_misra option for the selection of files that are not to be checked, and a –check_language_extension option which enables the source-code checking, which are partially suppressed by language extensions, are specifiable at the same time as each other and -misra2012.

Note that the -misra2012 and -misra2004 options cannot be specified at the same time.

Specifying these options to statically check source code makes improving the quality of user programs in early stages possible.

1.5 Detection of stack smashing [Professional]

A feature for the detection of stack smashing has been added. This feature can be realized by the -stack_protector/-stack_protector_all compiler options, or the extended language specification #pragma stack_protector/#pragma no_stack_protector.

This feature generates the codes which detect stack smashing at the entry and end of functions. Specifically, instructions to execute the following three processes are produced.

1. 4-byte immediately before (upper direction) the local variable area of the stack frame are allocated at the entrance to the function, and the values specified with the option are stored there.
2. A check is run on whether the value which was stored in step 1 has not been changed at the end of the function.
3. The __stack_chk_fail function is called when the value has been changed, which would lead to smashing the stack.

The __stack_chk_fail function is defined by user and describes the processing to be executed when stack smashing is detected. For example, the __stack_chk_fail function will be executed when the following code, which smashes the stack area, is executed.

```
void f1() {
  volatile char str[10];
  int i;
  for (i = 0; i <= 10; i++){
    str[i] = i;     // The stack is smashed when i=10
   }
    ...
```

Figure 1.1: Example of code that will lead to the __stack_chk_fail function being called

1.6 Extensions to CRC calculation

The -CRC option of the optimizing linkage editor has been extended as follows.

- The range for calculation can be specified by a section name.
- Various methods of calculation have been added. The methods added in this version are listed in table 1.1.

Table 1.1 Methods of CRC calculation added in CC-RX V2.04.00

Method	Description
16-CCITT-MBS	The result of calculation is obtained by applying CRC-16-CCITT to the input MSB first.
16-CCITT-MSB-LITTLE-4	The input is a 4-byte unit with little endian. The result of calculation is obtained by applying CRC-16-CCITT to the input MSB first.
16-CCITT-MSB-LITTLE-2	The input is a 2-byte unit with little endian. The result of calculation is obtained by applying CRC-16-CCITT to the input MSB first.
16-CCITT-LSB	The result of calculation is obtained by applying CRC-16-CCITT to the input LSB first.

SENT-MSB	The input is 1 byte, with the higher- and lower-order 4 bit units in little endian. The result of calculation on the input MSB first is obtained with SENT compliance.
32-ETHERNET	The result of calculation is obtained by applying CRC-32-ETHERNET to the input. The initial value of the result is 0xFFFFFFFF, and is XOR inverted and the bit order is reversed.

1.7 Enhanced support for UTF-8

The following options have been extended or added.

- Extended the -utf8 option and -outcode=utf8 option.
  Those options are now always selectable, not only when -lang=c99 option is also selected.
- Added a new assembler option –utf8.
  String literals and comments in assembly source are handled as encoded in UTF-8.

1.8 Other improvements

Other improvements are described below.

(a) Improved debugging information
Unnecessary debugging information was deleted to reduce the sizes of object files (*.obj) and load module files (*.abs).

(b) Fixed incorrect display when stepping
When stepping over an if statement, and it has a condition expression including any of the operators below, the debugger displayed an incorrect result. The problem has been fiexed.
&& || ! ?:

(c) Internal errors
Some of internal errors has been fixed.

(d) Optimization
The performance and the size of generated code have been improved.

(e) Compiling time
Compiling some programs with optimization took excessive time. This problem has been relieved by shortening the times.

Chapter 2. Points for Caution

This section describes points for caution regarding CC-RX.

2.1 Note on a case of the W0523041 message [C/C++ Compiler]

When the int_to_short option is specified and a file including a C standard header is compiled as C++ or EC++, the compiler may show the W0523041 message. In this case, simply ignore the message because there are no problems.

[NOTE]

In compilation of C++ or EC++, the int_to_short option will be invalid.

Data that are shared between C and C++ (EC++) program must be declared as the long or short type rather than as the int type.

2.2 Note on using MVTC or POPC instructions [Assembler]

In the assembly language, the program counter (PC) cannot be specified for MVTC or POPC instructions.

2.3 Note on the delete option for linkage [Optimizing linkage editor]

When a function symbol is removed by the delete option, its following function in the source program is not allowed to have a breakpoint at its function name on the editor in your debugging. If you would like to set a breakpointvia the Label window at the function entrance, set the breakpoint via the Label window or at the program code of the function.

Chapter 3. Restrictions

This chapter describes restrictions on CC-RX.

3.1 Restriction on usage of math.h functions (frexp, ldex, scalbn and remquo) in C++ language (including EC++)

An object is generated which will be an infinit-loop at execution when the actual argument of some function (frexp, ldexp, scalbn or remquo) of math.h is int-type, at compiling C++ or EC++ program.

Conditions:

This problem occurs when both (1) and (2) are satisfied.

(1) This program is in C++ or the lang=cpp option is effective.

(2) math.h is included and any of the following functions is called.

(a) frexp(double, long*) with 'int *' type second argument (except when the first argument is float-type and the dbl_size=8 option is effective).

(b) ldexp(double, long) with 'int *' type second argument (except when the first argument is float-type and the dbl_size=8 option is effective).

(c) scalbn(double, long) with 'int *' type second argument (except when the first argument is float-type and the dbl_size=8 option is effective).

(d) remquo(double, double, long*) with 'int *' type third argument (except when the both the first and second arguments are float-type and the dbl_size=8 option is effective).

Examples:

file.cpp:

```
// Example of compiling C++ source that generates an infinity-loop
#include <math.h>
double d1,d2;
int i;
void func(void)
{
   d2 = frexp(d1, &i);
}
```

Command Line:

```
ccrx -cpu=rx600 -output=src file.cpp
```

file.src: Example of the generated assembly program

```
_func:
   ; ...(Omitted)
    ; Calling substitute function of frexp
   BSR __$frexp__tm__2_f__FZ1ZPi_Q2_21_Real_type__tm__4_Z1Z5_Type
   ; ...(Omitted)

__$frexp__tm__2_f__FZ1ZPi_Q2_21_Real_type__tm__4_Z1Z5_Type:
L11:
   BRA L11 ; Calls itself ==> infinity-loop
```

Countermeasures:

Select one of the following ways to avoid the problem.

(1) Compile the program with the lang=c or lang=c99 option.

(2) Change int or int * into long or long *.

(3) Append the following declarations to each function that is being used.

```
/* For the frexp function */
static inline double frexp(double x, int *y)
{ long v = *y; double d = frexp(x,&v); *y = v; return (d); }
/* For the ldexp function */
static inline double ldexp(double x, int y)
{ long v = y; double d = ldexp(x,v); return (d); }
/* For the scalbn function */
static inline double scalbn(double x, int y)
{ long v = y; double d = scalbn(x,v); return (d); }
/* For the remquo function */
static inline double remquo(double x, double y, int *z)
{ long v = *z; double d = remquo(x,y,&v); *z = v; return (d); }
```

Example of (2):

Change in file.cpp:

```
#include <math.h>
double d1,d2;
int i;
void func(void)
{
  long x = i; /* Accept as long type temporary */
  d2 = frexp(d1, &x); /* Call with long type argument */
  i = x; /* Set the result for variable 'i' */
}
```

Example of (3):

Change in file.cpp:

```
#include <math.h>
/* Append declaration */
static inline double frexp(double x, int *y)
{ long v = *y; double d = frexp(x,&v); *y = v; return (d); }
double d1,d2;
int i;
void func(void)
{
  d2 = frexp(d1, &i);
}
```

3.2 Restriction of PIC/PID function (pic and pid options)

When a standard library is created by the library generator (lbgrx) with the pic or pid option specified, the following warning may appear once or more.

```
W0591301:"-pic" option ignored (When the pic option has been specified)
W0591301:"-pid" option ignored (When the pid option has been specified)
```

Despite the warning, the created standard library has no problems.

3.3 Eliminated options (for the C/C++ compiler)

(a) -file_inline, -file_inline_path

Specifying these options has no effect and the compiler will output a warning. Instead of **-file_inline** or **-file_inline_path**, write **#include** in the source code.

(b) -enable_register

This option is simply ignored and does not affect the generated code.

3.4 Notes on C/C++ source-level debugging (for the C/C++ compiler)

(1) Even when **-debug** is specified, you may not be able to set a breakpoint or stop stepped execution on lines that

contain a dynamic initialization expression for a global variable (in C++),

are the first lines of functions that begin with a loop statement (e.g. **do** or **while**) and do not have an **auto** variable or of functions for which **#pragma inline_asm** has been specified, or

contain the control section and body of a loop statement (e.g. **for**, **while**, or **do**) written as a single line.

(2) The values of members of union type and of dummy variables that are to be passed via registers may be displayed incorrectly (e.g. in the [Watch] window).

3.5 Note on using sections that include the address 0xffffffff (in assembler)

If two or more **.section** directives in the assembly source code contain **.org** directives, the sections have the same name, and the sections overlap at 0xffffffff, the assembler outputs an internal error message (C0554098).

Example)

```
.section SS,ROMDATA
.org 0fffffffeh
.byte 1
.byte 2 ; 0xffffffff
.section SS,ROMDATA
.org 0ffffffffh
.byte 3; ; 0xffffffff
.end
```

3.6 Note on using **-form** and **-output** at the same time (in the linkage editor)

When **-form=rel** and **-output=<filename>** are specified for the linkage editor (**rlink**) at the same time, the filename extension given as **<filename>** is ignored and replaced with **.rel**.

Example)

```
rlink -form=relocate -output=DefaultBuild\lib_test.lib
```

The filename specified for output, **test.lib**, is changed to **test.rel**.

3.7 Note on using function names that begin with _**builtin** (for the C/C++ compiler)

Declaration of a function with a name that begins with _**builtin** and for which the definition is in **machine.h** in the **include** directory may lead to an internal error. In general, do not use any names that begin with an underscore (_) in your source code, since such names are reserved.

3.8 Note on using #**pragma interrupt** with functions for which **save_acc** is enabled and that have dummy arguments (for the C/C++ compiler)

When **#pragma interrupt** is specified for a function and the **save_acc** flag is enabled (including where this is done by using the **-save_acc** compiler option), the compiler may not output code that reflects the correct values of dummy arguments which are passed via R4.Note: In general, we do not recommend defining arguments for functions with the **#pragma interrupt** specification.

Chapter 4. Standard Libraries Included

This chapter describes restrictions on standard libraries included in RX Family C/C++ Compiler.

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This compiler package includes four library files (*.lib) for the RX600. You can use any of the library files if they correspond to the options that you wish to specify. Using these files shortens the time required for building.

4.1 Library files

Table 4.1 shows the standard library files and compiler options.

Note:

The compiler options you specify should be the same as the microcontroller options defined for each of the library files listed in table 4.1. Otherwise these library files are not usable, so specify your compiler options in the library generator to generate your own library file.

Library File	Purposes	Optimize[*2] Options	Microcontroller Options [*1 *2]		
			-endian	-cpu -rtti -exception -noexception	Others [*3]
rx600lq.lib	For the RX600 Optimization type:Speed Little endian	-speed -goptimize	-endian=little	-cpu=rx600 -rtti=on -exception	-round=nearest -denormalize=off -dbl_size=4 -unsigned_char -unsigned_bitfield -bit_order=right -unpack -fint_register=0 -branch=24
rx600ls.lib	For the RX600 Optimization type:Size Little endian	-size -goptimize			
rx600bq.lib	For the RX600 Optimization type: Speed Big endian	-speed -goptimize	-endian=big		
rx600bs.lib	For the RX600 Optimization type: Size Big endian	-size -goptimize			

Table 4.1 Library Files

*Notes:

*1 For details on microcontroller options, please see the “Microcontroller Options” columns of the “(1) Compile Options” of “section B.1.3 Options”, in the Integrated Development Environment User’s Manual:RX Build.

*2 These option selections are same from the each default of them.

4.2 Using the library files

The library files included in the compiler package must be linked in either of the ways given in sections 4.2.1 and 4.2.2.

4.2.1 Using the library files

When the e^2 studio has been installed in C:\Renesas\e2_studio, the library files are stored in the following location:

```
C:\Program Files\Renesas\RX\V2_4_0\lib
```

("V2.04.00" indicates the version and revision number of the compiler package.)

4.2.2 Directory specifying a library file in the optimizing linkage editor

Copy the library file(s) included in the package (stored in the location given in section 4.2.1) into a desired directory. Then specify one of the copied library files for the Library option and start the linkage processing.

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