C/C++ Compiler Package for RX Family

V3.04.00

Release Notes

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Thank you for using our product.

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

Contents

Chapter 1. User's Manuals

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

Name	Document Number
CC-RX Compiler User's Manual	R20UT3248EJ0111
CS+ Integrated Development Environment User's Manual: CC-RX Build Tool Operation	R20UT3478EJ0109

Chapter 2. Changes

This section describes changes to the CC-RX compiler from V3.03.00 to V3.04.00.

2.1 Addition of -type_size_access_to_volatile

The -type_size_access_to_volatile option has been added to select access to volatile-qualified variables with the sizes corresponding to the types of the variables.

2.2 Improvement of messages regarding the compiler license

The target type of license and the required actions have been added to messages regarding the compiler license.

Message number	Message
E0511178	"*string*" option is unavailable because the license of CC-RX V3 Professional edition is not found. Please consider purchasing the product of Professional edition.
W0511180	The evaluation period of CC-RX V3 has expired.
W0511185	The trial period for the features of the Professional edition expires in *number* days. Please consider purchasing the product of Professional edition.
W0561016	The evaluation version of CC-RX V3 is valid for the remaining *number* days. After that, link size limit (128 Kbyte) will be applied. Please consider purchasing the product.
W0561017	The evaluation period of CC-RX V3 has expired. Please consider purchasing the product.
F0563430	The total section size exceeded the limit of the evaluation version of CC-RX V3. Please consider purchasing the product.

2.3 Addition of a message

The following message has been added.

This error message will be output if an object file created with the compiler option -dbl_size=4 specified and another object file created with -dbl_size=8 specified are linked.

This error will not occur in the case of linkage to an object file created by V3.04 or an earlier version of the complier.

Message number	Message
E0562220	Illegal mode type "*double type size*" in "*filename*"

2.4 Modification of the storage duration of variables

The function for improving the efficiency of reference to variables defined with the storage class specifier "static" has been enhanced.

The storage duration of such variables is changed from static to automatic for acceleration.

To enable this function, omit the -optimize option or specify either of the following options.

- -optimize=2 or -optimize=max

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

Example of source code

```
unsigned id(unsigned parameter){
  static unsigned result;
  result = parameter;
  return result;
}
```

Code Output

V3.03 (-isa=rxv1)	V3.04 (-isa=rxv1)
.SECTION P,CODE _id: .STACK _id=4 MOV.L #__$result$1, R14 MOV.L R1, [R14] RTS .SECTION B,DATA,ALIGN=4 __$result$1: .blkl 1	.SECTION P,CODE _id: .STACK _id=4 RTS

2.5 Improvement of code generated for a function call immediately below the current function

The code generated in cases where a function immediately below the current function is called at the end of the current function has been improved.

To enable this function, specify options according to the following rules.

- Do not specify the -speed option.
- Omit the -optimize option or specify either -optimize=2 or -optimize=max.

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

Example of source code

```
#pragma noinline callee
void callee(void);
void caller(void){
  callee();
}
```

```
void callee(void){
}
```

Code Output

V3.03 (-isa=rxv1)	V3.04 (-isa=rxv1)
.SECTION P,CODE _caller: .STACK _caller=4 BRA _callee _callee: .STACK _callee=4 RTS .END	.SECTION P,CODE _caller: .STACK _caller=4 _callee: .STACK _callee=4 RTS .END

2.6 Rectified points for caution

The following points for caution no longer apply. For details, refer to Tool News.

- Initializing a union in a C++ source code (No.59)
- Use of struct/union type arguments (No.60)
- Cast from pointer type to other type (No.61)
- Use of an anonymous struct/union (No. 62)
- Use of an address read from memory after writing the address to the memory (No.63)
- Reference to global/static variables (No.64)

Chapter 3. Restrictions

This chapter describes restrictions on the CC-RX compiler.

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

When certain arguments of the **frexp**, **ldexp**, **scalbn**, and **remquo** functions in **math.h** are of the int type, compiling the C++ or EC++ program generates object code that will enter an endless loop.

Conditions:

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

(1) The 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 endless 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 ==> endless 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 and int * into long and 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 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. In case of C and C99, **-merge_files** can be used instead.

(b) -enable_register

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

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

(a) 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.

(b) 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 Using sections that include address 0xffffffff (in the 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 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 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 -merge_files

Under certain conditions, compilation with **-merge_files** or **-whole_program** specified as the translation unit of code that includes union-type variables will produce error code F0530800 or warning code W0530811.

[Conditions]
If all of the following conditions are satisfied, error code F0530800 or warning code W0530811 will be produced.

(1) **-merge_files** or **-whole_program** is specified.

(2) A union-type external variable having two or more members has been initialized outside any function, and, other than the members that have been initialized, a member has an alignment and size larger than the other member or members.

(3) The variable described in (2) above is declared as **extern** for reference by either of the following.

(3-1) Source files other than the one in which the definition of external variable described in (2) exists.

(3-2) Header files included directly or indirectly by the source files other than the one in which the definition of external variable described in (2) exists.

[Workarounds]

Take any of the following steps.

(1) Specify neither of the options in condition (1).

(2) Initialize the union-type external variable described in condition (2) within a function.

(3) Refer to the variables corresponding to condition (2) only in the source file that includes the definition of the external variable.

3.9 -cfi_ignore_module

When C/C++ source files are compiled with **-output=abs**, the generated object files are not specifiable for **-cfi_ignore_module**.
Only object files generated by using **-output=obj** are specifiable for **-cfi_ignore_module**.

3.10 Using fenv.h when -dpfpu is specified

For the following standard library functions provided by **fenv.h**, even if **-dpfpu** is specified when compilation proceeds, these functions only specify and refer to the relevant values of the FPSW register; and not to the values of the DPSW register.

* feclearexcept
* fegetexceptflag
* feraiseexcept
* fesetexceptflag
* fetestexcept
* fegetround
* fesetround
* fegetenv
* feholdexcept
* fesetenv
* feupdateenv

To specify and refer to the values of the DPSW register, use the **__set_dpsw** and **__get_dpsw** intrinsic functions.

Chapter 4. Standard Libraries

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

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.

Table 4.1 Library Files

Library File	**Purposes**	**Optimize[*2] Options**	**Microcontroller Options [*1] [*2]**		
			-endian	**-cpu** **-rtti** **-exception** **-noexception**	**Others [*3]**
rx600lq.lib	For use with RX600 MCUs Priority in optimization: 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 use with RX600 MCUs Priority in optimization: Size Little endian	-size -goptimize			
rx600bq.lib	For use with RX600 MCUs Priority in optimization: Speed Big endian	-speed -goptimize	-endian=big		
rx600bs.lib	For use with RX600 MCUs Priority in optimization: Size Big endian	-size -goptimize			

*Notes:

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

*2 The listed option settings produce the same behavior as the default settings.

4.2 Using the library files

Copy the library file(s) included in the package from the "lib" directory into a desired directory.

Then specify one of the copied library files for the **-library** option and start the linkage processing.

Revision History

Rev.	Date	Description	
		Page	Summary
Rev1.00	Dec 01, 2021		First Edition issued

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