

C/C++ Compiler Package for RX Family V3.06.00

Release Note

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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1. User's Manuals

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

Name	Document Number
CC-RX Compiler User's Manual	R20UT3248EJ0113
CS+ Integrated Development Environment User's Manual: CC-RX Build Tool Operation	R20UT3478EJ0111

2. Changes

This section describes changes to the CC-RX compiler from V3.05.00 to V3.06.00.

2.1 Addition of the **-ALLOW_OPTIMIZE_ENTRY_BLOCK** option

The **-ALLOW_OPTIMIZE_ENTRY_BLOCK** option, which specifies the entry address of the execution program as a target for optimization, was added to the linker. Use of this option may enlarge the scope of optimization at the time of linkage.

2.2 Modification of the specifications of the **-ROM** option

The specifications were modified so that wildcard characters can be specified for the **-ROM** option of the linker.

2.3 Modification of the specifications of environment variables

The specifications were modified so that specifying environment variables **PATH** and **BIN_RX** can be omitted.

2.4 Rectification of the **E0562220** error

In V3.04.00 and V3.05.00, an unnecessary error (E0562220:Illegal mode type "double type size") may occur when all the following conditions are met. This issue has been rectified in V3.06.00.

- (1) The **-dbl_size=8** or **-dpfpu** option is specified.
- (2) The **-rtti=on** option is specified.

2.5 Rectified point for caution

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

- Transferring Data or Calculating String Length in a Loop (No. 66)

3. Restrictions

This chapter describes restrictions on the CC-RX compiler.

3.1 Usage of `math.h` functions (`frexp`, `ldexp`, `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)

`-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.

`-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 0xffffffffeh
.byte 1
.byte 2 ; 0xffffffffff
.section SS,ROMDATA
.org 0xfffffffffh
.byte 3; ; 0xffffffffff
.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.

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 Options	Microcontroller Options * ¹		
			-endian	-cpu	Others * ²
				-rtti -exception -noexception	
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.

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Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Dec.01.23	-	Newly created.

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

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1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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