

[Notes]

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Rev.1.00

C/C++ Compiler Package for SuperH Family (SHC-0101)

Mar. 16, 2022

Outline

When using the C/C++ compiler package for the SuperH RISC engine family, note the following point.

1. Note regarding the floating-point operation within interrupt functions (SHC-0101)

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

1. Note regarding the floating-point operation within interrupt functions (SHC-0101)

1.1 Applicable Products

All versions of the C/C++ compiler package for the SuperH RISC engine family

1.2 Details

For the floating-point operation within interrupt functions under the conditions described below, general illegal instruction exceptions may occur or the results of the operations may be incorrect.

1.3 Conditions

The problem may occur when all conditions listed below have been met.

- (1) One among sh2afpu, sh4, and sh4a is specified for the -cpu option.
- (2) Either of the following (A) or (B) is met.
 - (A) All conditions listed below are met.
 - (A1) The -fpu option is not specified. * "Mix" is selected on HEW.
 - (A2) A single-precision floating-point operation is performed within the interrupt function.
 - (A3) No double-precision floating-point operation is performed within the interrupt function, or it is performed but the single-precision floating-point operation preceded it.
 - (A4) Either of the following conditions is met within a program in which interrupts occur (i.e. the program to be interrupted).
 - A double-precision floating-point operation is performed.
 - At least one among the fprintf(), printf(), sprintf(), vfprintf(), vprintf(), and vsprintf() library functions is used with one among %g, %G, %f, %e, and %E used to specify a format.
 - (B) All conditions listed below are met.
 - (B1) -fpu=single is specified.
 - (B2) A single-precision floating-point operation is performed within the interrupt function.
 - (B3) At least one among the fprintf(), printf(), sprintf(), vfprintf(), vprintf(), and vsprintf() library functions is used with one among %g, %G, %f, %e, and %E used to specify a format within a program in which interrupts occur (i.e. the program to be interrupted).

[Example 1] *Only for the case where the -fpu option is not specified

```
/* tp.c */
#pragma interrupt hundlerFunc

float fff;
double ddd;

void hundlerFunc(void) {
    fff = fff * 7.0f; // (A2) (A3)
```

```

        return;
    }

    void mainFunc(void) {
        ddd = ddd * 3.0;    // (A4)
        return;
    }

```

[Example 2]

```

/* tp2.c */
#include <stdio.h>
#pragma interrupt hundlerFunc

float fff;

void hundlerFunc(void) {
    fff = fff * 7.0f;    // (B2) or (A2) (A3)
    return;
}

void mainFunc(void) {
    printf("%f¥n", fff); // (B3) or (A4)
    return;
}

```

1.4 Workaround

When the -fpu option is not specified, set the precision mode of the FPSCR to single-precision mode (0) at the entry to the interrupt function.

Example:

```
set_fpscr(get_fpscr())&0xFFF7FFFF;
```

When -fpu=single is specified, save the state of the PR bit of the FPSCR at the entry to the interrupt function, and set the precision mode to single-precision mode (0).

In addition, restore the state of the PR bit at the exit from the interrupt function.

Example:

Entry to a function

```

int original_fpscr = get_fpscr();
set_fpscr(original_fpscr&0xFFF7FFFF); // Set to single-precision mode.

```

Exit from a function

```
set_fpscr(original_fpscr); // Restore the precision mode.  
return;
```

1.5 Schedule for Fixing the Problem

There is no schedule for fixing this problem.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Mar.16.22	-	First edition issued

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