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R8C/25 Group

Interrupt Handling in C Language

1. Abstract

This document describes how to set up and use the interrupt handling in C language in the R8C/25 Group.

2. Introduction

The application example described in this document is applied to the following MCU and parameter(s):

• MCU: R8C/25 Group

This program can be used with other R8C/Tiny Series MCUs which have the same special function registers (SFRs) as the R8C/25 Group. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

3. Application Description

3.1 Writing Interrupt Handling Function

The NC30 allows the interrupt handling to be written as a C language function.
The procedure consists of the following two steps:
(1) Write the interrupt handling function.
(2) Register it to the interrupt vector table.
This sections describes an example for writing a function for each interrupt handling.

3.1.1 Writing Hardware Interrupt (#pragma INTERRUPT)

#pragma INTERRUPT interrupt function name

When declared as the above, the program saves and restores all registers in the R8C/Tiny Series and generates the **reit** instruction, in addition to ordinary function procedures on entry and exit to and from the specified function. The valid type of interrupt handling function is **void** only for both arguments and return values. Declaring any other types generates a warning when compiling.
Figure 3.1 shows the Expanded Image of Interrupt Handling Function.

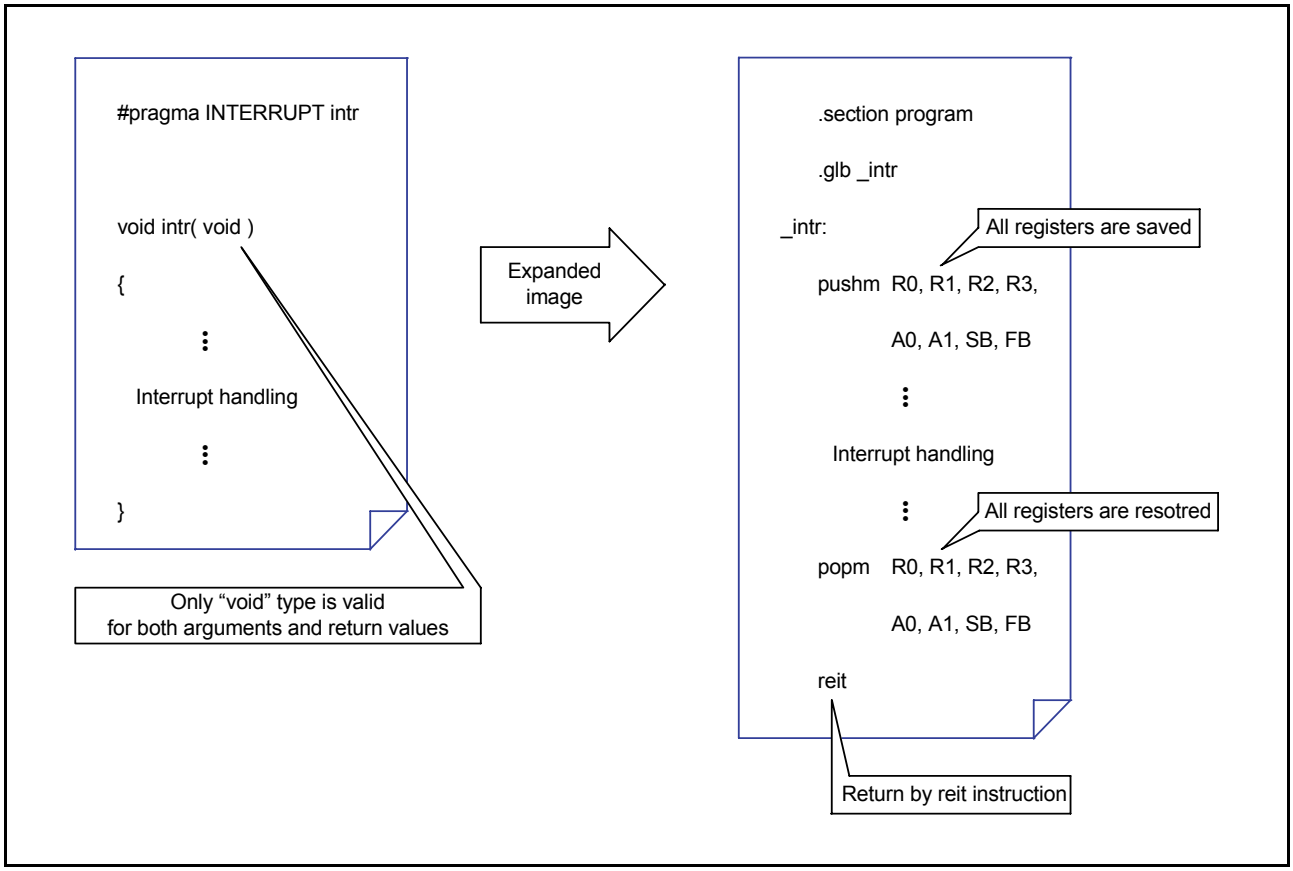

Figure 3.1 Expanded Image of Interrupt Handling Function

3.1.2 Writing Interrupt to be Activated in Short Time (#pragma INTERRUPT/B)

The R8CTiny Series can provide shorter interrupt activation time by switching the register banks while protecting the contents such as those of the registers. To use this function, write as follows:

#pragma INTERRUPT/B interrupt function name

When written as above, the program generates the **reit** instruction, instead of the instruction for saving and restoring the registers. Note that only one interrupt can be specified because the register banks of the R8C/Tiny Series are the sets of register bank 0 and 1(1). Use this function for interrupts to be activated in the shortest time. Figure 3.2 shows an Expanded Image of Interrupt Handling Function.

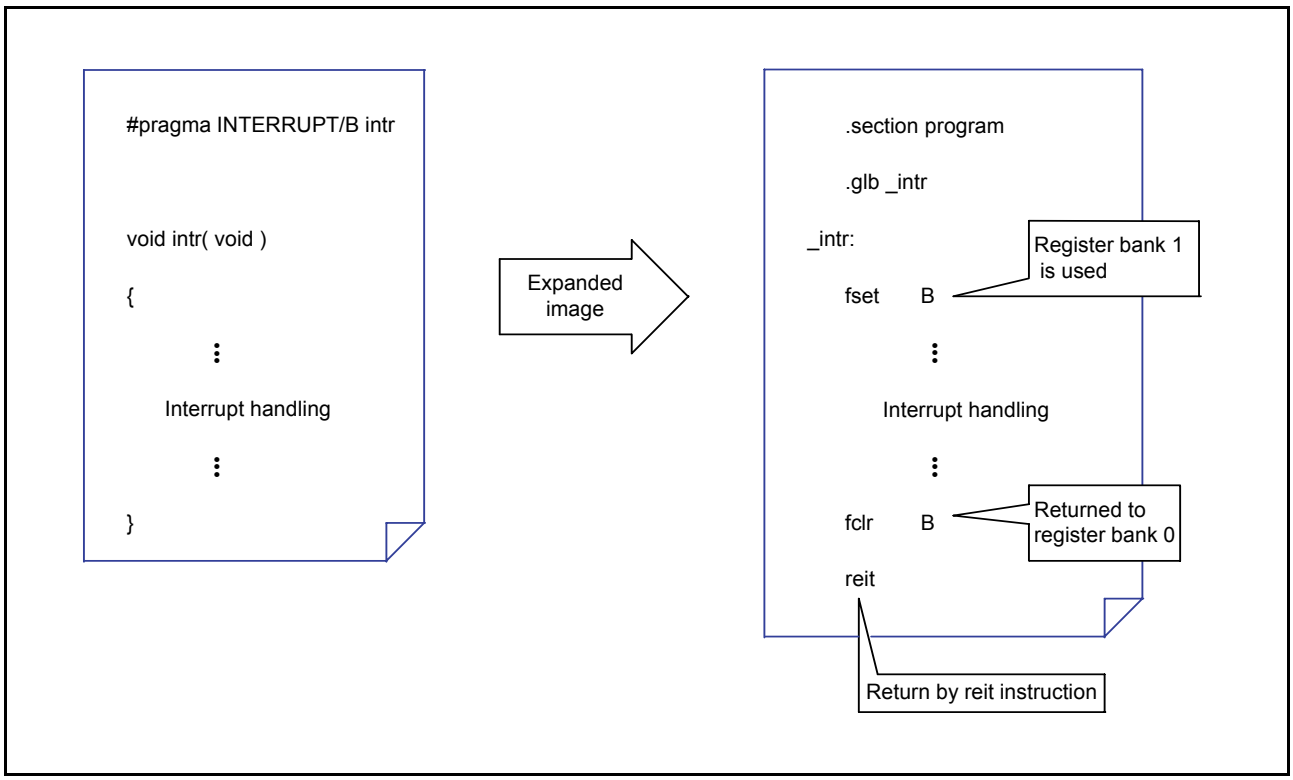

Figure 3.2 Expanded Image of High-speed Interrupt Handling Function

NOTE:
1. These register banks are available for all interrupts if multiple interrupts are not used.

3.1.3 Writing Software Interrupt (#pragma INTCALL)

To use the **R8C** software interrupt, write as follows:

#pragma INTCALL INT number function name

The software interrupt can pass arguments via registers and acknowledge return values except for struct/union types.
Figure 3.3 shows an Example of Writing "#pragma INTCALL".

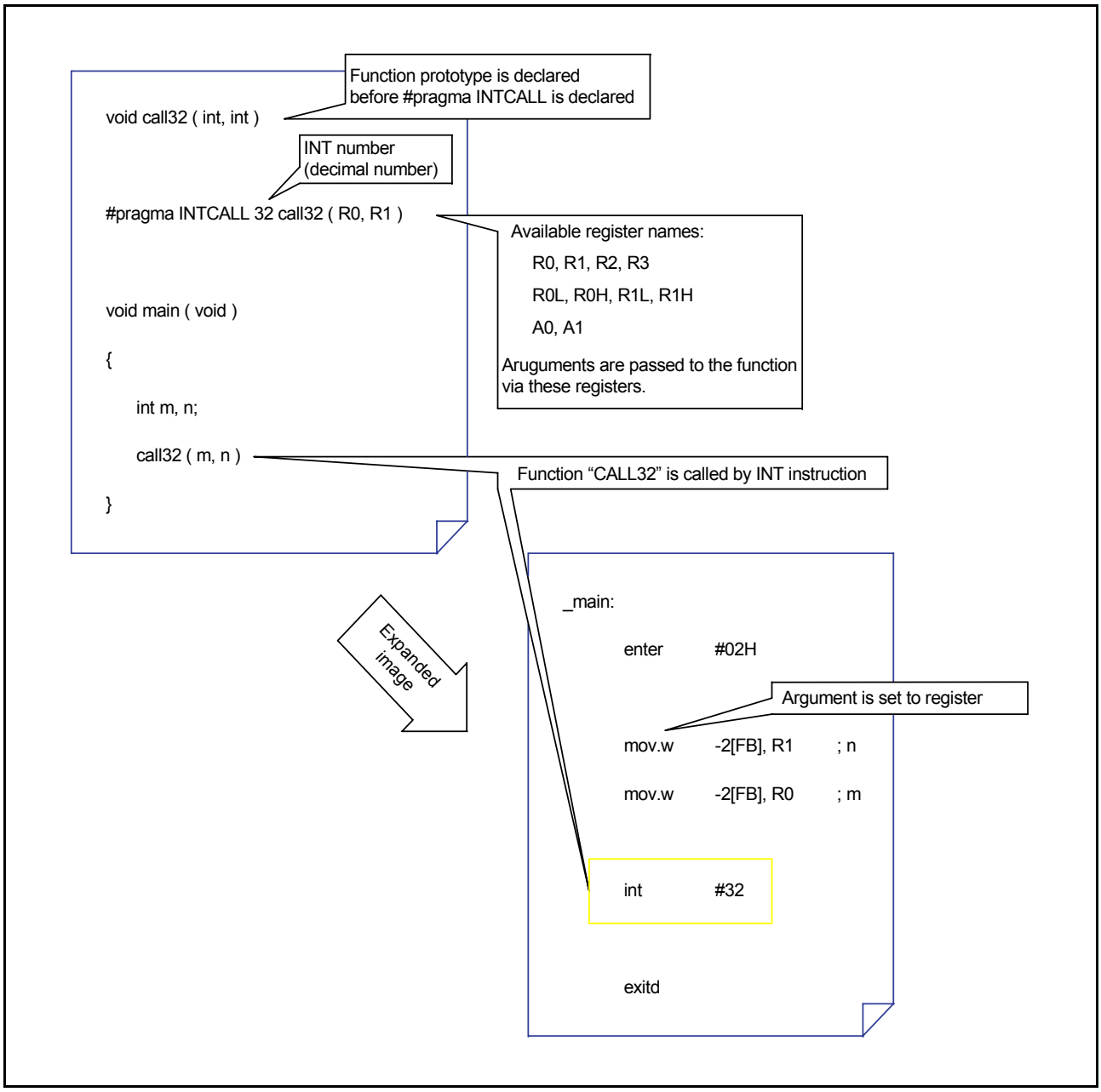

Figure 3.3 Example of Writing "#pragma INTCALL"

3.2 Registering Interrupt Handling Function

To use interrupts correctly, it is necessary to write and register the interrupt function to the interrupt vector table. This section describes how to register the interrupt function to the interrupt vector table.

3.2.1 Registering to Interrupt Vector Table

A written interrupt function is registered by changing the interrupt vector table in the sample startup program "sect30.inc".
To change the interrupt vector table, use the following procedure.

(1) Externally define the interrupt handling function name by the simulated instruction "**.glb**".
(2) Change the interrupt handling function name with the interrupt dummy function name "**dummy_int**"to be used.

Figure 3.4 shows an Example of Registering to Interrupt Vector Table ("sect30.inc").

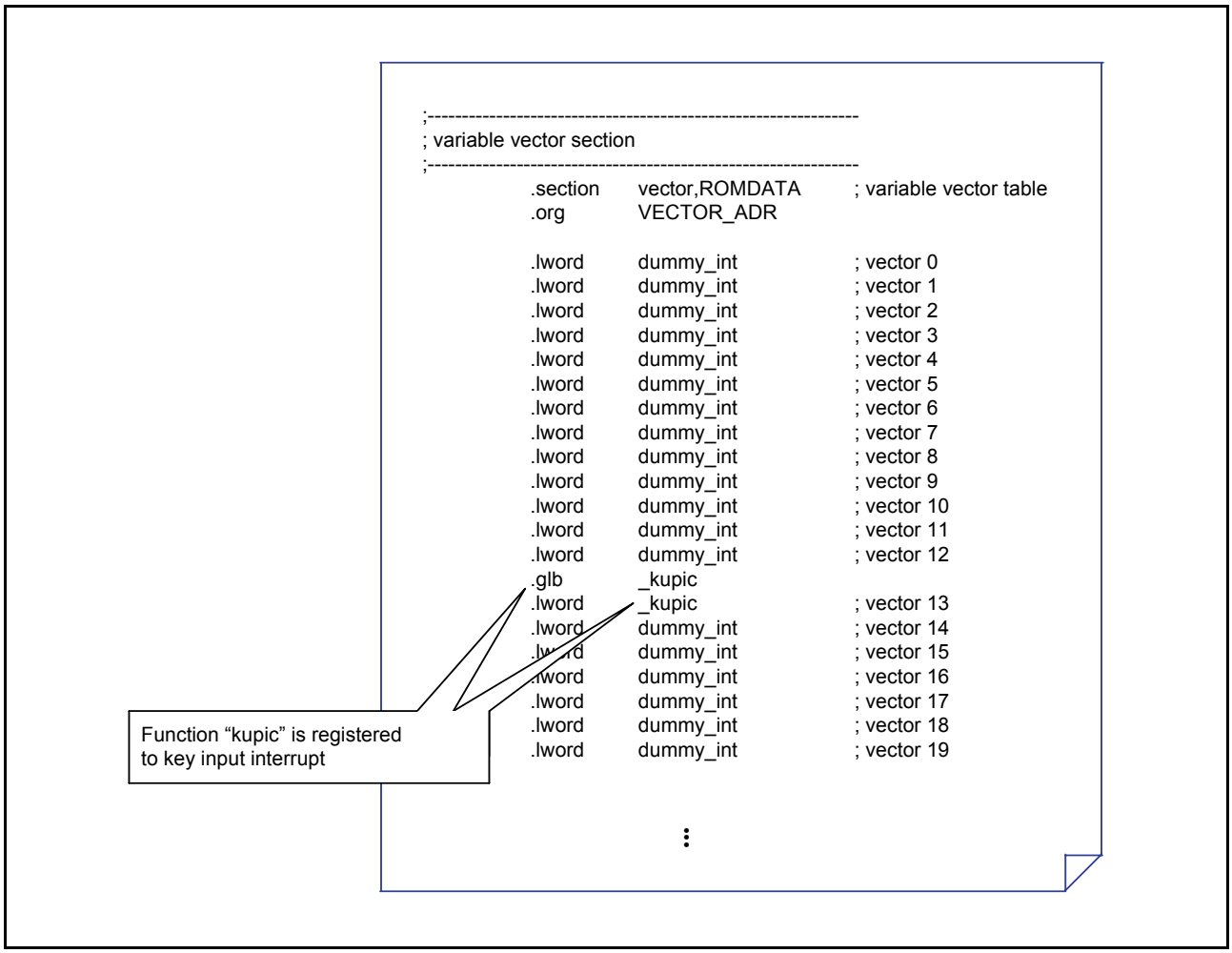

Figure 3.4 Example of Registering to Interrupt Vector Table ("sect30.inc")

3.3 Example of Writing Interrupt Handling Function

This section shows an example of writing a program that increments the content of the "**counter**" each time an $\overline{\text{INT0}}$ interrupt occurs.

3.3.1 Writing Interrupt Handling Function

Figure 3.5 shows an Example of Writing Source File.

```
/* prototype declaration ********************************************************************/
void int0( void );
#pragma interrupt int0
/*******************************************************************************************/

unsigned int counter = 0;

void int0( void )               /* interrupt handling function */
{
    if( counter < 9 ) {

        counter++;

    } else {

        counter = 0;

    }
}

void main( void )
{
    int0ic = 0x00;                  /* interrupt enabled */
    int0en = 1;                 /* INT0 interrupt enabled */
    int0pl = 1;                     /* INT0 input polarity: both edges selected */
    intf = 0x03;                /* INT0 input fiter: sampling with f32 */
    int0ic = 0x01;                  /* interrupt priority level setting */

    asm( " fset  I ");          /* interrupt disabled */

    while(1);                   /* interrupt wait loop */
}
```

Figure 3.5 Example of Writing Source File

3.3.2 Registering to Interrupt Vector Table

Figure 3.6 shows an Example of Registering to Interrupt Vector Table.

```
;------------------------------------------------------------------
; variable vector section
;------------------------------------------------------------------
                .section    vector,ROMDATA      ; variable vector table
                .org        VECTOR_ADR

                .lword      dummy_int           ; vector 0
                .lword      dummy_int           ; vector 1
                .lword      dummy_int           ; vector 2
                .lword      dummy_int           ; vector 3
                .lword      dummy_int           ; vector 4
                .lword      dummy_int           ; vector 5
                .lword      dummy_int           ; vector 6
                .lword      dummy_int           ; vector 7
                .lword      dummy_int           ; vector 8
                .lword      dummy_int           ; vector 9
                .lword      dummy_int           ; vector 10
                .lword      dummy_int           ; vector 11
                .lword      dummy_int           ; vector 12
                .lword      dummy_int           ; vector 13
                .lword      dummy_int           ; vector 14
                .lword      dummy_int           ; vector 15
                .lword      dummy_int           ; vector 16
                .lword      dummy_int           ; vector 17
                .lword      dummy_int           ; vector 18
                .lword      dummy_int           ; vector 19
                .lword      dummy_int           ; vector 20
                .lword      dummy_int           ; vector 21
                .lword      dummy_int           ; vector 22
                .lword      dummy_int           ; vector 23
                .lword      dummy_int           ; vector 24
                .lword      dummy_int           ; vector 25
                .lword      dummy_int           ; vector 26
                .lword      dummy_int           ; vector 27
                .lword      dummy_int           ; vector 28
                .glb        _int0
                .lword      _int0               ; vector 29
                .lword      dummy_int           ; vector 30
                .lword      dummy_int           ; vector 31
                .lword      dummy_int           ; vector 32
                .lword      dummy_int           ; vector 33
                .lword      dummy_int           ; vector 34
                .lword      dummy_int           ; vector 35
                .lword      dummy_int           ; vector 36

                :
```

Figure 3.6 Example of Registering to Interrupt Vector Table

4. Reference Documents

Hardware Manual
R8C/25 Group Hardware Manual
The latest version can be downloaded from the Renesas Technology website.

Technical News/Technical Update
The latest information can be downloaded from the Renesas Technology website.

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