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Renesas Electronics Corporation

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H8/300H Tiny Series

Comparison of 32-bit Binary Numbers (COMP)

Introduction

Determines which relation of {>, =, <} exists between a pair of 32-bit binary numbers, and indicates the result through the C and Z flags of the CCR.

Target Device

H8/300H Tiny Series

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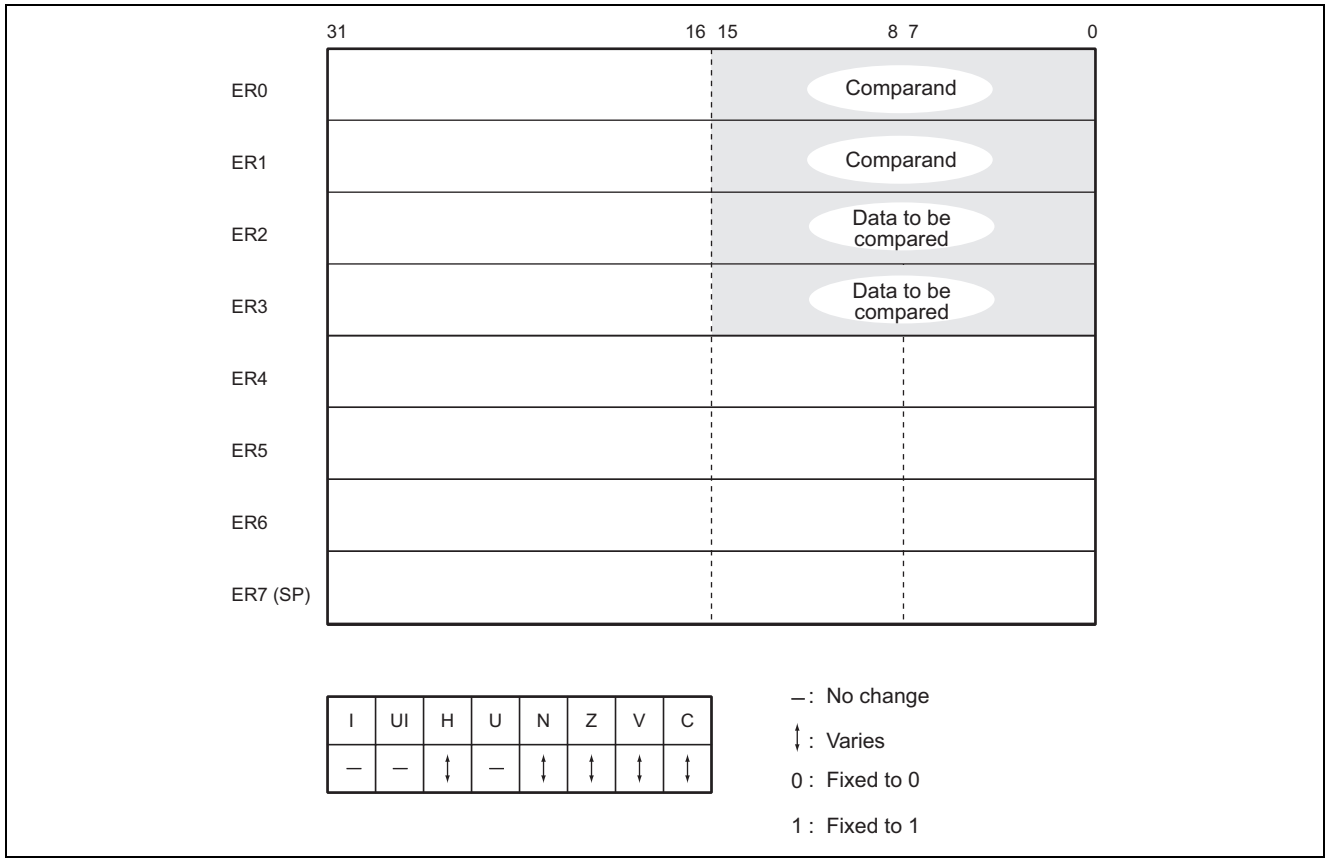
1. Function

1. Determines which relation of {>, =, <} exists between a pair of 32-bit binary numbers, and indicates the result through the C and Z flags of the CCR.
2. The input arguments should be specified as unsigned integers.

2. Arguments

Description		Storage Location	Data Length (Bytes)
Input	Comparand	R0, R1	4
	Data to be compared	R2, R3	4
Output	Result	C flag, Z flag (CCR)	—

3. Changes to Internal Registers and Flags



4. Programming Specifications

Program memory (bytes)
8
Data memory (bytes)
0
Stack (bytes)
0
Number of cycles
16
Re-entrant
Yes
Relocatable
Yes
Interrupts during execution
Yes

5. Descriptions

5.1 Descriptions of Functions

1. The arguments are as follows:
   R0, R1: Set the comparand (32-bit binary) here, as one input argument (see figure 1).
   R2, R3: Set the number to be compared with the comparand (32-bit binary) here, as the other input argument (see figure 1).

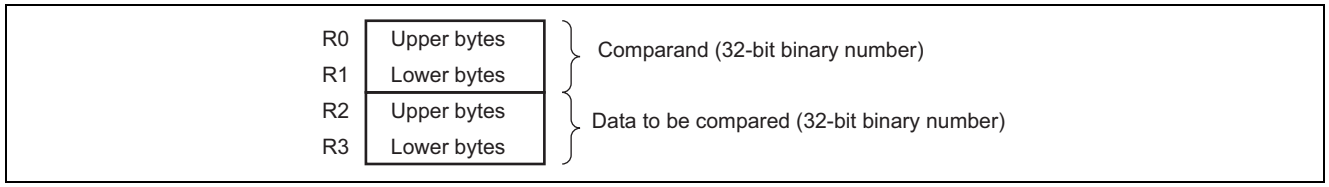


Figure 1 Setting the Input Arguments

   C and Z flags (CCR): The C and Z flags of the CCR act as the output arguments. The results of comparison are set here.
2. Table 1 shows the execution of the COMP subroutine with some examples.
   The C and Z flags of CCR are set according to the values of the input arguments in the way shown by the table.

Table 1 Examples of COMP Execution

Input Arguments					Output Arguments	
Comparand			Data to be Compared		CCR	
R0	R1	Relationship	R2	R3	C Flag	Z Flag
F67D	2001	>	2200	4001	0	0
2010	2020	=	2010	2020	0	1
4001	F000	<	A000	BB00	1	0

3. The input arguments are retained through the execution of COMP.

5.2 Usage Notes

Any higher-order bits of the input arguments that are not used should be explicitly set to zero. Otherwise, the result of comparison is likely to be incorrect because the undefined data in the higher-order bits is included in the comparison.

5.3 Description of Data Memory

No data memory is used by the COMP subroutine.

5.4 Examples of Usage

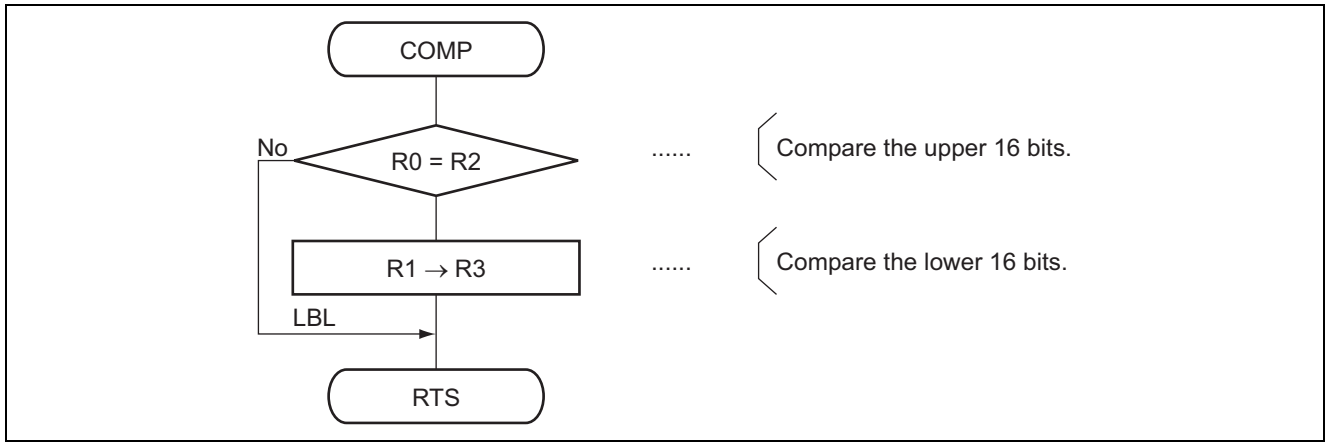
After setting the comparand and number to be compared, call the COMP subroutine.

```
WORK1   . RES. W 2          ..... Reservation of the data memory area for setting of the comparand (32-bit binary) by the user
                                  program.
WORK2   . RES. W 2          ..... Reservation of the data memory area for setting of the number to be compared (32-bit binary)
                                  by the user program.
          .
          .
          .
        MOV. W @WORK1, R0   ..... Sets, as an input argument, the comparand (32-bit binary) specified by the user program.

        MOV. W @WORK1+2, R1

        MOV. W @WORK2, R2   ..... Sets, as an input argument, the number for comparison (32-bit binary) specified by the user
                                  program.
        MOV. W @WORK2+2, R3

        JSR @COMP           ..... Subroutine call  of COMP

        BEQ SKIP1           ..... Branches to the routine for processing of the case where the comparand = the number to be
                                  compared.
        BCS SKIP2           ..... Branches to the routine for processing of the case  where the comparand < the number to be
                                  compared.
          .
          .
          .
        Processing routine for the case 'comparand  > number to be compared'
        BRA SKIP3
SKIP1   Processing routine for the case 'comparand  = number to be compared'
        BRA SKIP3
SKIP2   Processing routine for the case 'comparand  < number to be compared'
SKIP3   User program
          .
          .
          .
```

5.5 Principles of Operation

1. Successive one-word comparisons are applied to compare the two-word numbers.
2. The C and Z flags of the CCR are the output arguments, indicating the result of the comparison instruction (CMP.W).
3. The subroutine initially uses the word-comparison instruction (CMP.W) to compare the higher-order words.
   If the higher-order words are not equal, execution of COMP ends.
   If the higher-order words are equal, COMP compares the lower-order words.

6. Flowchart



7. Program Listing

```
 1                          1     ;*************************************************************
 2                          2     ;*                                                           *
 3                          3     ;*          NAME : 32 BIT COMPARISON                         *
 4                          4     ;*                 (COMP)                                    *
 5                          5     ;*                                                           *
 6                          6     ;*************************************************************
 7                          7     ;*                                                           *
 8                          8     ;*         ENTRY : R0          (COMPARAND DATA HIGH)        *
 9                          9     ;*                 R1          (COMPARAND DATA LOW)         *
10                         10     ;*                 R2          (COMPARATIVE DATA HIGH)      *
11                         11     ;*                 R3          (COMPARATIVE DATA LOW)       *
12                         12     ;*                                                           *
13                         13     ;*        RETURN : C flag & Z flag (RESULT OF COMPARISON)    *
14                         14     ;*                                                           *
15                         15     ;*************************************************************
16                         16     ;
17                         17             .CPU        300HN
18   0000                  18             .SECTION    COMP_code,CODE,ALIGN=2
19                         19             .EXPORT     COMP
20                         20     ;
21        00000000         21     COMP    .EQU        $           ;Entry point
22   0000 1D20             22             CMP.W       R2,R0
23   0002 4602             23             BNE         LBL1        ;Branch if Z=0
24   0004 1D31             24             CMP.W       R3,R1
25   0006                  25     LBL1
26   0006 5470             26             RTS
27                         27     ;
28                         28             .END
*****TOTAL ERRORS       0
*****TOTAL WARNINGS     0
```

Revision Record

Rev.	Date	Description	
		Page	Summary
2.00	Feb.28.06	—	Format has been changed from Hitachi version to Renesas version.

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