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# H8/300H Tiny Series

## Find the First 1-valued Bit in 32-Bit Data (FIND1)

### Introduction

Tests, in order from bit 31, the bits of the given 32-bit data and finds the bit number of the first 1-valued bit.

### Target Device

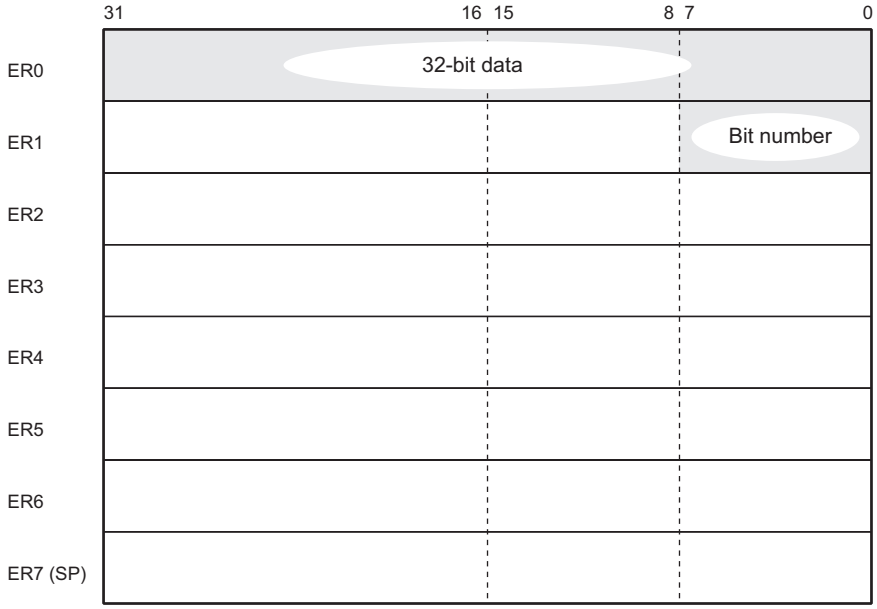
H8/300H Tiny Series

### Contents

## 1. Arguments

| Description | | Storage Location | Data Length (Bytes) |
|---|---|---|---|
| Input | 32-bit data | ER0 | 4 |
| Output | Bit number of the first detected 1-valued bit (bit 31-bit 0) | R1L | 1 |

## 2. Changes to Internal Registers and Flags




| I | UI | H | U | N | Z | V | C |
|---|---|---|---|---|---|---|---|
| – | – | – | – | 0 | ↕ | 0 | ↕ |

– : No change
↕ : Varies
0 : Fixed to 0
1 : Fixed to 1

## 3. Programming Specifications

| Program memory (bytes) |
|---|
| 14 |
| Data memory (bytes) |
| 0 |
| Stack (bytes) |
| 0 |
| Number of cycles |
| 398 |
| Re-entrant |
| Yes |
| Relocatable |
| Yes |
| Interrupts during execution |
| Yes |

## 4. Note

The number of cycles given in the programming specifications is the value when the 32-bit data is H'00000000.

# 5. Description

## 5.1 Description of Functions

1. The arguments are as follows:
   ER0: Set the 32-bit data.
   R1L: The bit number of the first 1-valued bit encountered is set here (from 31 to 0).
2. The following figure illustrates the execution of the software FIND1.
   When the input argument is set as shown below, the bit number of the first detected 1-valued bit is set in R1L.

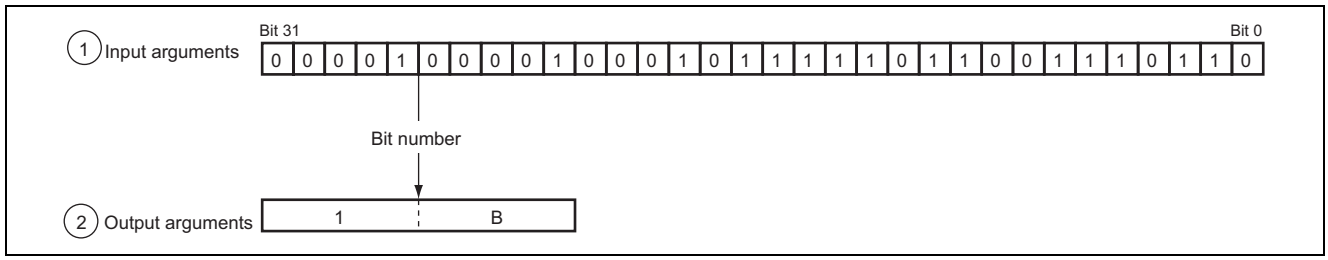



**Figure 1 Example of FIND1 Execution**

## 5.2 Usage Note

When the 32-bit data is H'00000000, H'FF is set as the bit number (R1L).

## 5.3 Description of Data Memory

No data memory is used by FIND1.

## 5.4 Example of Usage

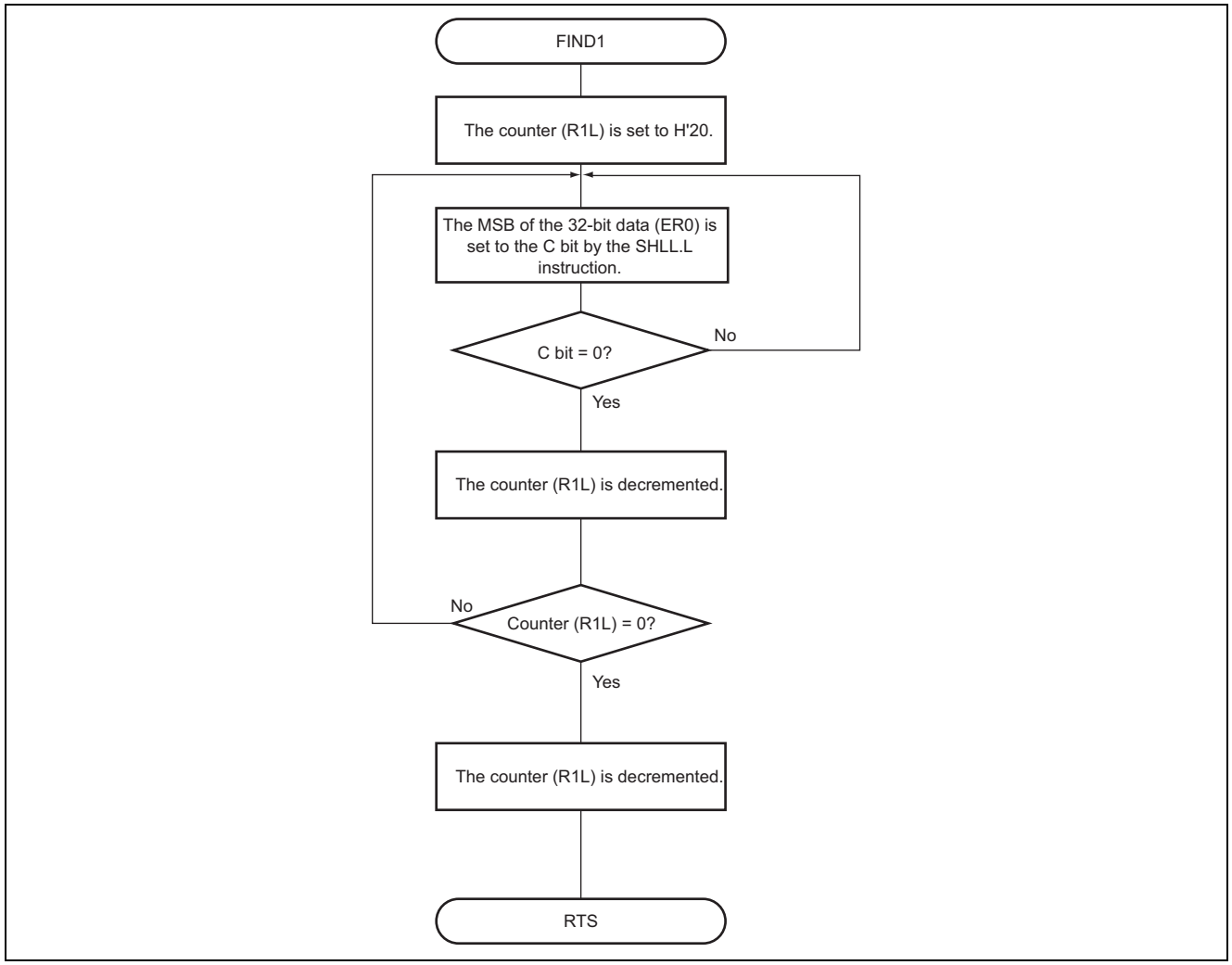
After setting the 32-bit data, call the FIND1 subroutine.

```
WORK1   . RES. L 1          ..... Reservation of the data memory area for setting of the 32-bit data by the user program.
WORK2   . RES. B 1          ..... Reservation of the data memory area for setting of the bit number of the first detected 1-valued bit.

        MOV. L @WORK1, ER0  ..... Sets the 32-bit data specified by the user program as an input argument.

        JSR    @FIND1       ..... Subroutine call of FIND1

        MOV. B R0H @WORK2   ..... Transfers the number of the first detected 1-valued bit that has been set as the output argument
                                  to the data memory area of the user program.
```

## 5.5 Principles of Operation

1. To test the bits in the 32-bit data in order from bit 31, the bits are shifted into the C bit, one by one by using the SHLL.L instruction.
2. When the C bit becomes 1, the counter used to find the bit number (R1L) is decremented and FIND1 ends.

## 6. Flowchart


FIND1
The counter (R1L) is set to H'20.
The MSB of the 32-bit data (ER0) is set to the C bit by the SHLL.L instruction.
C bit = 0?
No
Yes
The counter (R1L) is decremented.
No
Counter (R1L) = 0?
Yes
The counter (R1L) is decremented.
RTS

## 7. Program Listing

```
 1                                1    ;*********************************************************************
 2                                2    ;*                                                                   *
 3                                3    ;*        NAME  :     FIND  FIRST  1   (FIND1)                     *
 4                                4    ;*                                                                   *
 5                                5    ;*********************************************************************
 6                                6    ;*                                                                   *
 7                                7    ;*        ENTRY  :    ER0              (32  BIT  DATA)             *
 8                                8    ;*        RETURNS  :  R1L              (                   )       *
 9                                9    ;*                                                                   *
10                               10    ;*********************************************************************
11                               11    ;
12                               12              .CPU      300HA
13     001000                    13              .SECTION A,CODE,LOCATE=H'001000
14              00001000         14    FIND1     .EQU      $                  ;Entry point
15     001000   F920             15              MOV.B     #H'20,R1L          ;Clear
16     001002   1030             16    FIND11    SHLL.L    ER0
17     001004   58500004         17              BCS       FIND1
18     001008   1A09             18              DEC.B     R1L
19     00101A   46F6             19              BNE       FIND1
20     00100C   1A09             20    FIND12    DEC.B     R1L
21     00100E   5470             21              RTS
22                               22
***** TOTAL    ERRORS      0
***** TOTAL    WARNINGS    0
```

Note: The program listing included in this application note assumes compilation under the option for the advanced mode of H8/300H CPU. If you use this sample program with an H8/300H Tiny Series product, make the following change to the program code:
.CPU 300HA → .CPU 300HN

## 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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