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Renesas Electronics Corporation

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H8/300L Series

Counting the Number of Logical-1 Bits in 8-Bit Data (HCNT)

Introduction

1. The software HCNT counts logical-1 bits in given 8-bit data.
2. This function is useful in performing parity checks.

Target Device

H8/300L Series

Contents

1. Arguments

Description		Memory area	Data length (bytes)
Input	8-bit data	R0L	1
Output	Number of logical-1 bits	R1L	1

2. Changes to Internal Registers and Flags

R0H	R0L	R1H	R1L	R2	R3	R4	R5	R6	R7
•	×	×	↕	•	•	•	•	•	•

I	U	H	U	N	Z	V	C
•	•	•	•	×	×	×	×

• : No change
× : Undefined
↕ : Result

3. Specifications

Program memory (bytes)
18
Data memory (bytes)
0
Stack (bytes)
0
Clock cycle count
162
Reentrant
Possible
Relocation
Possible
Interrupt
Possible

4. Note

The clock cycle count in the specifications (162) is for 8-bit data = "FF".

5. Description

5.1 Details of functions

1. The following arguments are used with the software HCNT:
   R0L: Sets, as an input argument, 8-bit data for which logical-1 bits are to be counted.
   R1: The number of logical-1 bits in the 8-bit data is set here as an output argument.
2. The following figure illustrates the execution of the software HCNT. When the input argument is set as shown in (1), the number of logical-1 bits that have been found in the 8-bit data is placed in R1L as shown in (2).
3. The contents of R0L are retained after execution of the software HCNT.

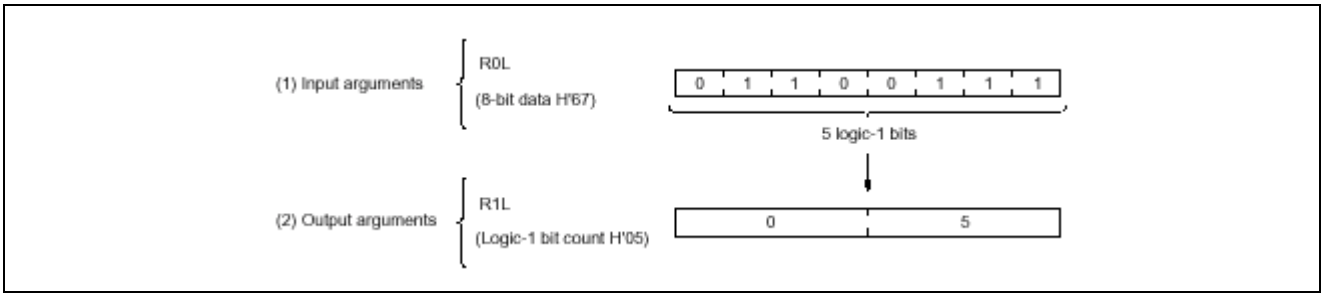


Figure 5.1 Example of Software HCNT Execution

5.2 Note on usage

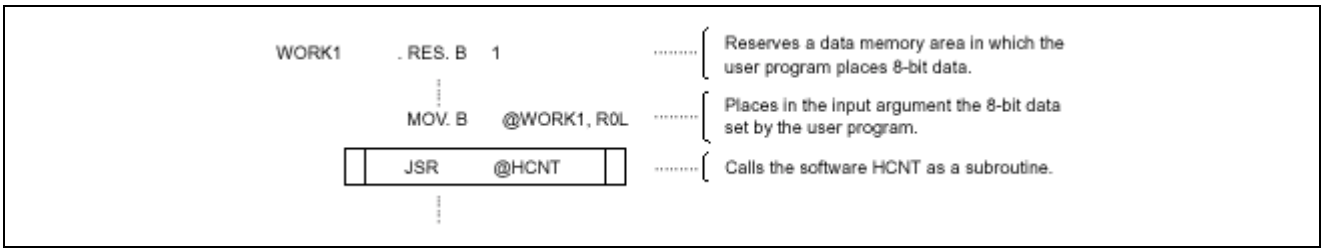
To count the logical-0 bits, invert the data in R0L (by using the NOT instruction) before executing the software HCNT.

5.3 Data memory

The software HCNT uses no data memory.

5.4 Example of use

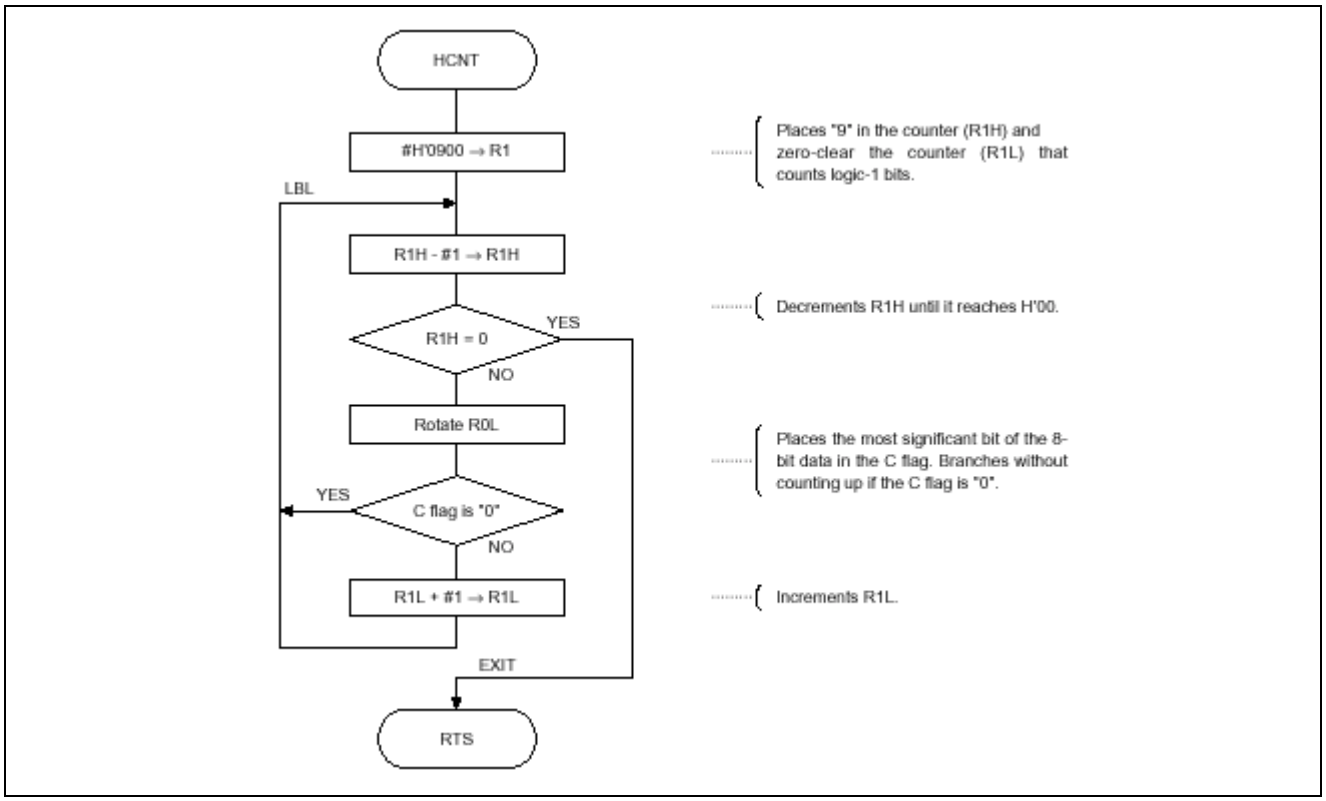
Set 8-bit data in the input argument and call the software HCNT as a subroutine.



5.5 Operation

1. R1H is used as the counter that counts the number of rotation operation performed on the 8-bit data.
2. The ROTXL instruction is used to set the data in R0L bit by bit into the C flag.
3. R1L is incremented when the C flag is 1. No operation occurs when the C flag is 0.
4. R1H is decremented each time steps 2 and 3 are executed. The process is repeated until R1H reaches 0.

6. Flowchart


HCNT
#H'0900 → R1
LBL
R1H - #1 → R1H
R1H = 0
YES
NO
Rotate R0L
YES
C flag is "0"
NO
R1L + #1 → R1L
EXIT
RTS
Places "9" in the counter (R1H) and zero-clear the counter (R1L) that counts logic-1 bits.
Decrements R1H until it reaches H'00.
Places the most significant bit of the 8-bit data in the C flag. Branches without counting up if the C flag is "0".
Increments R1L.

7. Program List

```
*** H8/300 ASSEMBLER VER 1.0B ** 08/18/92 09:51:00
PROGRAM NAME =
 1                                          ;*******************************************************************************
 2                                          ;*
 3                                          ;*       00 - NAME              :HIGH LEVEL BIT COUNT (HCNT)
 4                                          ;*
 5                                          ;*******************************************************************************
 6                                          ;*
 7                                          ;*      ENTRY   :R0L (8 BIT DATA)
 8                                          ;*
 9                                          ;*      RETURN  :R1L (HIGH LEVEL BIT COUNTER)
10                                          ;*
11                                          ;*******************************************************************************
12                                          ;
13       HCNT_cod C        0000                    .SECTION               HCNT_code,CODE,ALIGN=2
14                                                 .EXPORT                HCNT
15                                          ;
16       HCNT_cod C                00000000  HCNT    .EQU $                 ;Entry point
17       HCNT_cod C        0000    79010900          MOV.W   #H'0900,R1
18       HCNT_cod C        0004              LBL
19       HCNT_cod C        0004    1A01              DEC     R1H
20       HCNT_cod C        0006    4708              BEQ     EXIT           ;If R1H = 0 then exit
21       HCNT_cod C        0008    1288              ROTL    R0L
22       HCNT_cod C        000A    44F8              BCC     LBL            ;Branch if C flag = 0
23       HCNT_cod C        000C    0A09              INC     R1L
24       HCNT_cod C        000E    40F4              BRA     LBL            ;Branch always
25       HCNT_cod C        0010              EXIT
26       HCNT_cod C        0010    5470              RTS
27                                          ;
28                                                 .END
*****TOTAL ERRORS 0
*****TOTAL WARNINGS 0
```

Revision Record

		Description	
Rev.	Date	Page	Summary
1.00	Sep.18.03	—	First edition issued

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