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H8/300L Series

Shifting 16-Bit Data to the Right (SHR)

Introduction

1. The software SHR shifts a 16-bit binary number to the right.
2. The number of shifts can be specified within the range of 1 to 16.
3. This function is useful in multiplying a 16-bit binary number by 2^{-n} (n = shift count).

Target Device

H8/300L Series

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1. Arguments

Description		Memory area	Data length (bytes)
Input	16-bit binary number to be shifted right	R0	2
	Shift count	R1L	1
Output	Shifted result	R0	2

2. Changes to Internal Registers and Flags

R0	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)
10
Data memory (bytes)
0
Stack (bytes)
0
Clock cycle count
168
Reentrant
Possible
Relocation
Possible
Interrupt
Possible

4. Note

The clock cycle count in the specifications (162) is for shifting 16 bits to the right.

5. Description

5.1 Details of functions

1. The following arguments are used with the software SHR:
   R0: Sets a 16-bit binary number to be shifted right as an input argument. The result of shift is placed in R0 after execution of the software SHR.
   R1L: Sets, as an input argument, the number of right-shift operations on the 16-bit binary number.
2. The following figure illustrates the execution of the software SHR. When the arguments are set as shown in (1), the 16-bit binary number is shifted right as shown in (2). 0's are placed in the remaining upper bits.

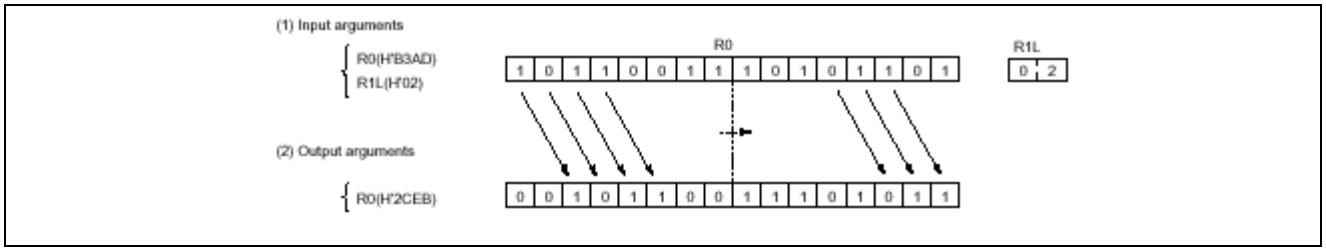


Figure 5.1 Example of Software SHR Execution

5.2 Note on usage

R1L must satisfy the condition H'01 ≤ R1L ≤ H'0F; otherwise, R0 will be all 0's.

5.3 Data memory

The software SHR uses no data memory.

5.4 Example of use

Set a 16-bit binary number and a shift count in the input arguments and call the software SHR as a subroutine

```
WORK1   .RES. W   1      ..... Reserves a data memory area in which the user program places the 16-bit binary number.
WORK2   .RES. B   1      ..... Reserves a data memory area in which the user program places the 16-bit binary number.
        MOV. W    @WORK1, R0   ..... Places the 16-bit binary number set by the user program in the input argument.
        MOV. B    @WORK2, R1L  ..... Places the shift count set by the user program in the input argument.
        JSR       @SHR         ..... Calls the software SHR as a subroutine.
```

5.5 Operation

1. The upper 8 bits of a 16-bit binary number are shifted right and the least significant bit is set in the C flag. Then the lower 8 bits are rotated right. This causes the least significant bit (in the C flag) to move to the most significant bit of the lower 8 bits.

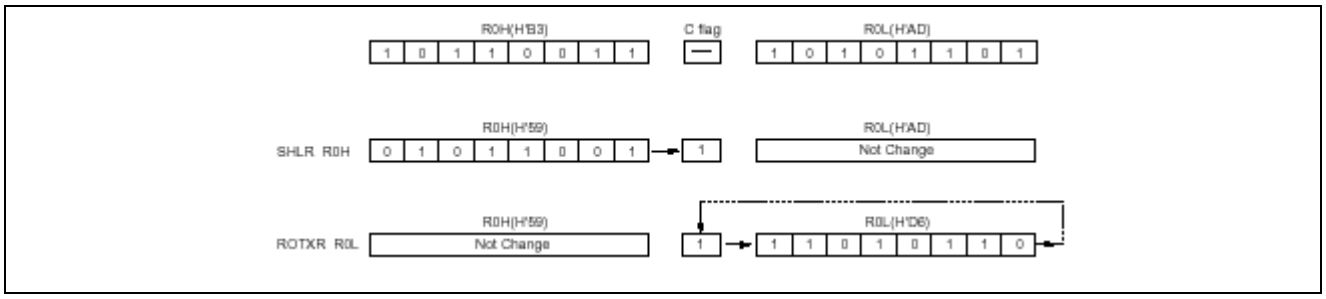
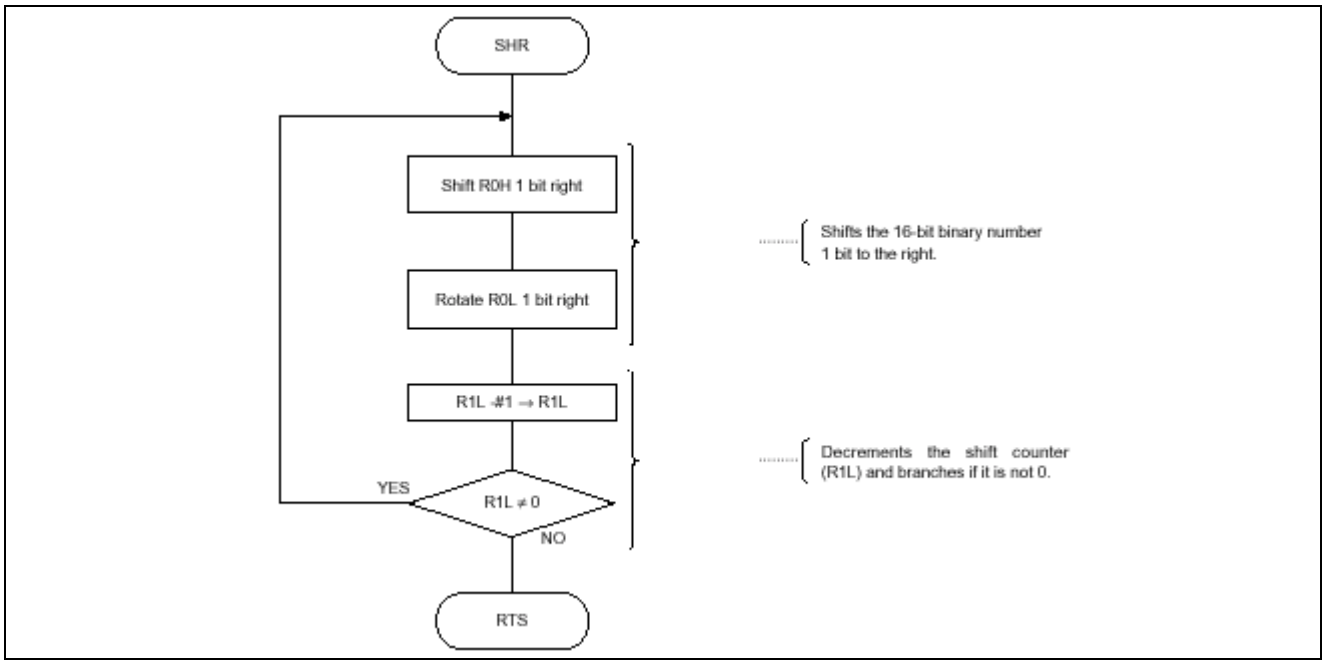


Figure 5.2 Example of Register Changes

2. R1L is used as the counter that indicates the shift count.
   R1L is decremented each time step 1 is executed. This process is repeated until R1L reaches 0.

6. Flowchart


SHR
Shift R0H 1 bit right
Rotate R0L 1 bit right
R1L -#1 → R1L
YES
R1L ≠ 0
NO
RTS
Shifts the 16-bit binary number 1 bit to the right.
Decrements the shift counter (R1L) and branches if it is not 0.

7. Program List

```
*** H8/300 ASSEMBLER VER 1.0B ** 08/18/92 09:51:29
PROGRAM NAME =
 1                                          ;*******************************************************************************
 2                                          ;*
 3                                          ;*      00 - NAME               :SHIFT OF 16 BIT DATA (SHR)
 4                                          ;*
 5                                          ;*******************************************************************************
 6                                          ;*
 7                                          ;*      ENTRY   :R0 (16 BIT BINARY DATA)
 8                                          ;*               R1L (SHIFT COUNTER)
 9                                          ;*
10                                          ;*      RETURN  :R0 (16 BIT BINARY DATA)
11                                          ;*
12                                          ;*******************************************************************************
13                                          ;
14       SHR_code C       0000                      .SECTION              SHR_code,CODE,ALIGN=2
15                                                  .EXPORT               SHR
16                                          ;
17       SHR_code C              00000000   SHR     .EQU $                ;Entry point
18       SHR_code C       0000   1100               SHLR    R0H           ;Shift 16 bit binary 1 bit right
19       SHR_code C       0002   1308               ROTXR   R0L
20       SHR_code C       0004   1A09               DEC     R1L           ;Decrement Shift counter
21       SHR_code C       0006   46F8               BNE     SHR           ;Branch if not R1L=0
22       SHR_code C       0008   5470               RTS
23                                          ;
24                                                  .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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