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2010年4月1日
瑞萨电子公司

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H8/300L Super Low Power 系列

8 位 BCD 的减法

要点

进行 8 位 BCD（2 进制编码 10 进制数）的减法运算，并将减法结果（8 位 BCD）设定到通用寄存器。

动作确认器件

H8/38024

目录

1. 参数

内容		保存位置	数据长度（字节）
输入	被减数	R0、R1	4
	减数	R2、R3	4
输出	减法结果	R0、R1	4
	有无借位	C 标志（CCR）	—

2. 内部寄存器变化和标志变化

R0		R1
○	○	○
R2		R3
•	•	•
R4		R5
•		•
R6		R7
•		•

I	U	H	U
•	•	×	•
N	Z	V	C
×	×	×	○

•：不变，×：不定，○：结果

3. 程序设计

程序存储器（字节）
18
数据存储器（字节）
0
堆栈（字节）
0
时钟周期数
24
重入
可
再定位
可
中途中断
可

4. 说明

4.1 功能

(1) 参数的详细内容如下：

R0、R1：设定 8 位 BCD（32 位长）的被减数。

执行软件 SUBD1 后，设定 8 位 BCD（32 位长）的减法结果。

R2、R3：输入参数，设定 8 位 BCD（32 位长）的减数。

C 标志（CCR）：输出参数，表示软件 SUBD1 执行后的有无借位。

C 标志= 1：表示减法结果产生借位（参照图 20-1）。

C 标志= 0：表示减法结果没有产生借位。

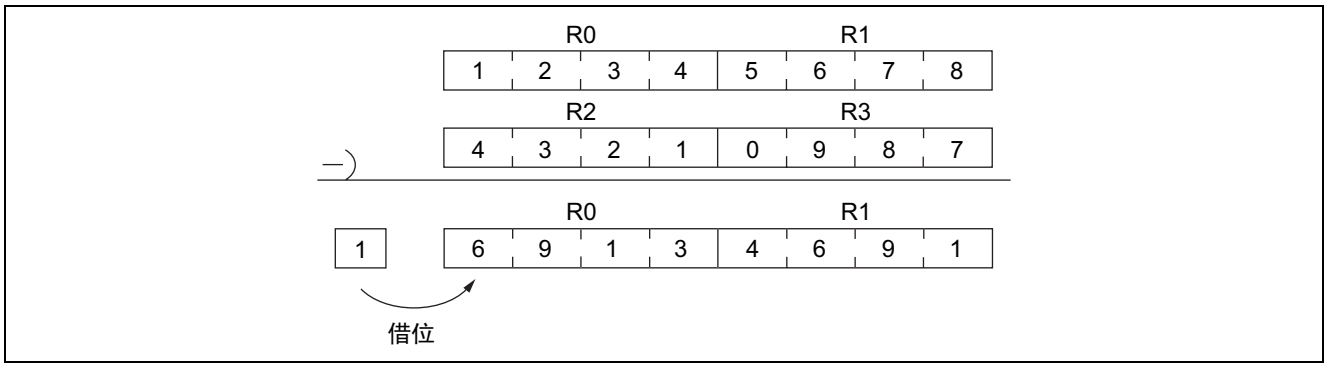


图 20-1 产生借位的减法例子

(2) 软件 SUBD1 的执行例子如图 20-2 所示。

一旦如①设定输入参数，就如②将减法结果设定到 R0、R1。

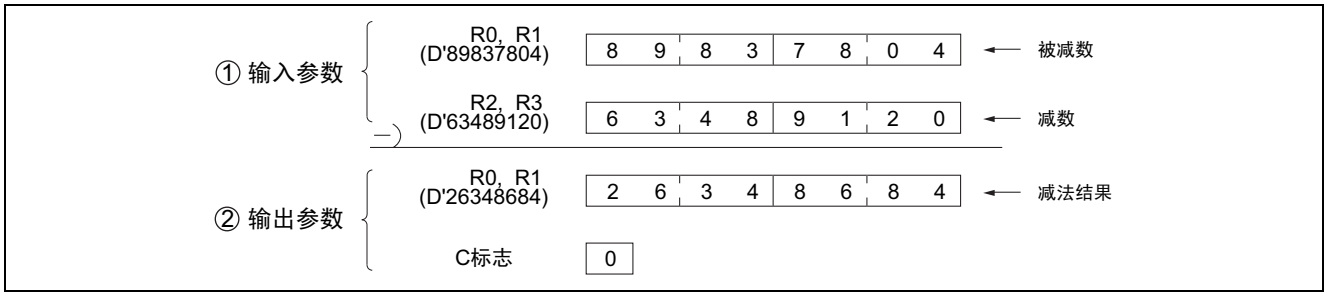


图 20-2 软件 SUBD1 的执行例子

4.2 使用时的注意

(1) 如图 20-3，如果不使用高位，就必须将它置“0”。如果不置“0”，因为进行含有被设定在高位的不定数据的减法运算，所以就得不到正确的减法结果。

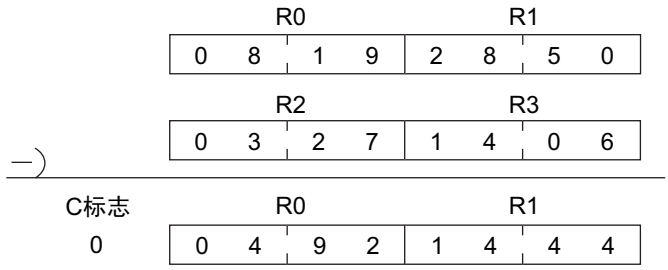


图 20-3 不使用高位的减法例子

(2) 因为执行软件 SUBD1 后减法结果被设定到 R0、R1，所以将破坏被减数。如果执行后还需要被减数，就必须预先保存到储存器。

4.3 数据存储器的说明

软件 SUBD1 不使用数据存储器。

4.4 使用例

设定被减数和减数，子程序调用软件 SUBD1。

```
WORK1    .RES. W   2          ……  确保用户程序设定8位BCD被减数的
                                   数据存储区。
WORK2    .RES. W   2          ……  确保用户程序设定8位BCD减数的
                                   数据存储区。
WORK3    .RES. W   2          ……  确保将8位BCD减法结果设定到
                                   用户程序的数据存储区。
         MOV. W  @WORK1, R0
         MOV. W  @WORK1+2, R1 ……  将用户程序设定的8位BCD被减数
                                   设定到输入参数。
         MOV. W  @WORK2, R2
         MOV. W  @WORK2+2, R3 ……  将用户程序设定的8位BCD减数
                                   设定到输入参数。
         JSR     @SUBD1       ……  子程序调用软件SUBD1。
         BCS     OVER         ……  减法结果发生借位时，向处理程序转移。
         MOV. W  R0, @WORK3
         MOV. W  R1, @WORK3+2 ……  将设定在输出参数中的减法结果保存到
                                   用户程序的数据存储器。
OVER     借位处理程序
```

4.5 工作原理

(1) 进行 2 个字节以上的 BCD 减法运算时，能通过重复 1 个字节的减法运算和 10 进制校正来实现。

(2) 使用不考虑 C 标志的 1 个字节的减法指令（SUB.B 指令），进行如（式 1）所示的最低位字节的减法运算。
执行（式 1）后，如果有借位就置 C 标志。然后使用 10 进制校正指令（DAS 指令）。

R1L – R3L→ R1L … … …（式1）

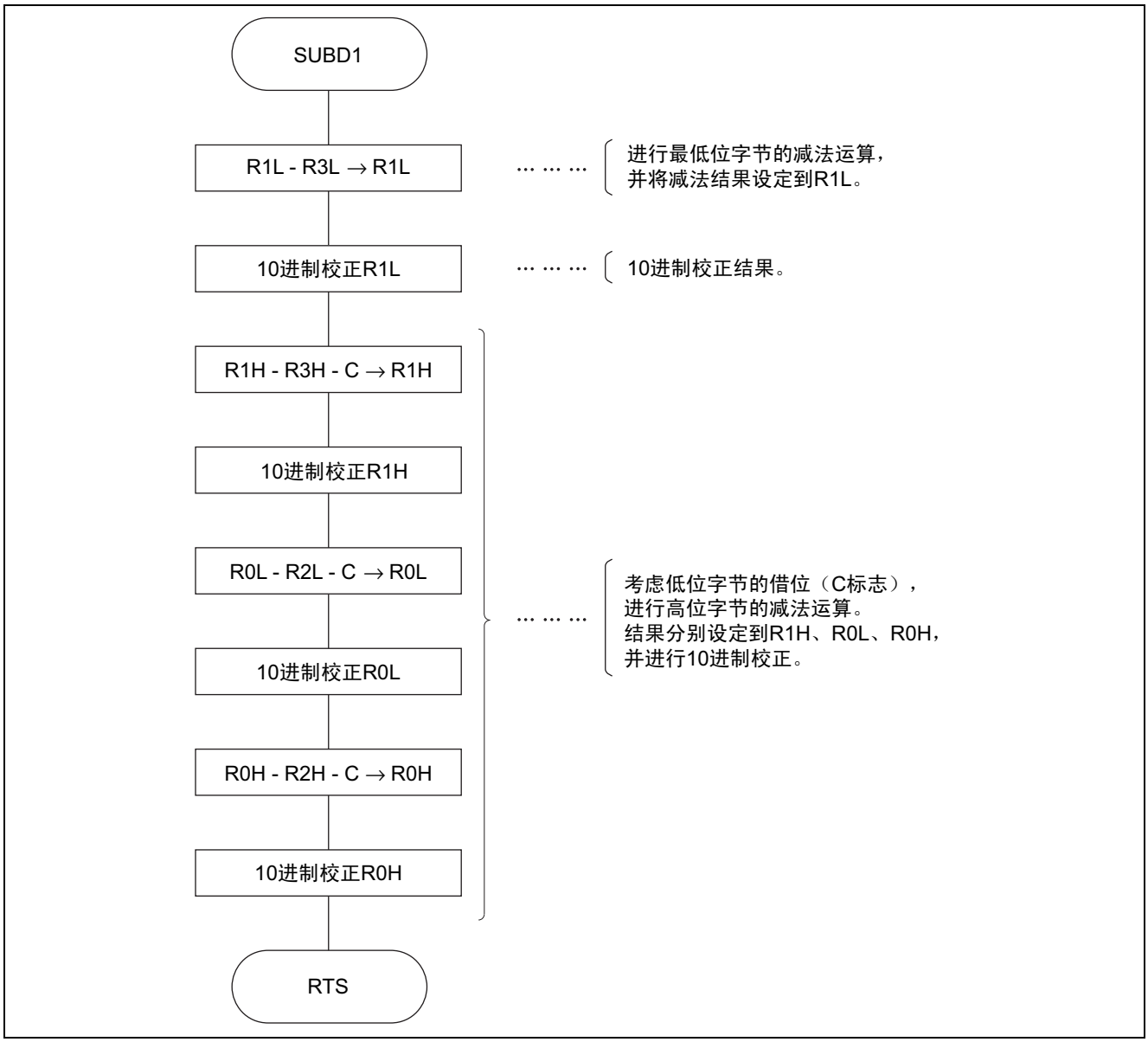
10进制校正R1L→ R1L

(3) 重复 3 次考虑 C 标志的 1 个字节的减法指令（SUBX.B 指令）和 10 进制校正指令（DAS 指令），进行如（式 2）所示的高位字节的减法运算。

R1H – R3H – C→ R1H　10进制校正R1H　→ R1H
R0L – R2L – C→ R0L　10进制校正R0L　→ R0L
R0H – R2H – C→ R0H　10进制校正R0H　→ R0H
} … … …　（式2）

在此，C 标志是在(2)中由最低位字节、低位字的高位字节、高位字的低位字节的减法结果所产生的借位。

5. 流程图



6. 程序清单

```
*** H8/300 ASSEMBLER    VER 1.0B **  08/18/92 10:01:03
PROGRAM NAME =
1                           ;*********************************************************************
2                           ;*
3                           ;*  00 – NAME                      :DECIMAL SUBTRUCTION (SUBD1)
4                           ;*
5                           ;*********************************************************************
6                           ;*
7                           ;*  ENTRY              :R0       (UPPER WORD MINUEND)
8                           ;*                      R1       (LOWER WORD MINUEND)
9                           ;*                      R2       (UPPER WORD SUBTRAHEND)
10                          ;*                      R3       (LOWER WORD SUBTRAHEND)
11                          ;*
12                          ;*  RETURNS            :R0       (UPPER WORD RESULT)
13                          ;*                      R1       (LOWER WORD RESULT)
14                          ;*                      C flag OF CCR (C=0;TRUE,C=1;UNDER FLOW)
15                          ;*
16                          ;*********************************************************************
17                          ;
18 SUBD1_co C 0000              .SECTION            SUBD1_code,CODE,ALIGN=2
19                              .EXPORT             SUBD1
20                          ;
21 SUBD1_co C      00000000 SUBD1         .EQU     $          ;Entry point
22 SUBD1_co C 0000 18B9         SUB.B     R3L,R1L             ;R1L - R3L -> R1L
23 SUBD1_co C 0002 1F09         DAS       R1L                 ;Decimal adjust R1L
24 SUBD1_co C 0004 1E31         SUBX.B    R3H,R1H             ;R1H - R3H - C -> R1H
25 SUBD1_co C 0006 1F01         DAS       R1H                 ;Decimal adjust R1H
26 SUBD1_co C 0008 1EA8         SUBX.B    R2L,R0L             ;R0L - R2L - C -> R0L
27 SUBD1_co C 000A 1F08         DAS       R0L                 ;Decimal adjust R0L
28 SUBD1_co C 000C 1E20         SUBX.B    R2H,R0H             ;R0H - R2H - C -> R0H
29 SUBD1_co C 000E 1F00         DAS       R0H                 ;Decimal adjust R0H
30 SUBD1_co C 0010 5470         RTS
31                          ;
32                              .END
*****TOTAL ERRORS       0
*****TOTAL WARNINGS     0
```

修订记录

Rev.	发行日	修订内容	
		页	修订要点
1.00	2005.07.29	—	初版发行

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