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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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R8C/Tiny Series

General-purpose Program for Subtracting BCD

1. Abstract

This program subtracts 8-digit BCD data using registers.

This program subtracts 8-digit BCD data between memory locations.

2. Introduction

This program subtracts 8-digit BCD data between registers by using a decimal subtract instruction (DSUB). Set the minuend in R2 and R0 and the subtrahend in R3 and R1 beginning with the upper half, respectively. The subtraction result is output to R2 and R0 beginning with the upper half. The borrow information is output to the C flag.

This program subtracts 8-digit BCD data between memory locations by using a decimal subtract instruction (DSUB). Set the least significant memory address of the minuend and that of the subtrahend in the address registers. The subtraction result is output to the minuend's memory location. The borrow information is output to the C flag.

C	Meaning
0	With borrow
1	Without borrow

(1) BCD subtraction (register)

Subroutine name : BCD_SUBTRACT8	ROM capacity : 13 bytes
Interrupt during execution : Accepted	Number of stacks used : None

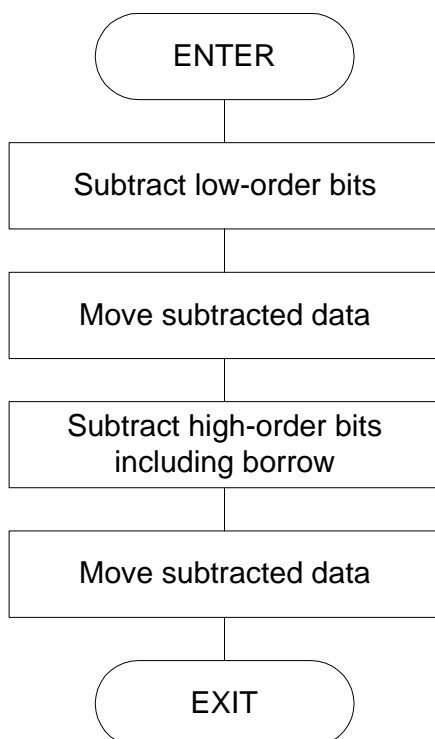
Register/memory	Input	Output	Usage condition
R0	Lower half of minuend	Lower half of subtraction result	←
R1	Lower half of subtrahend	Does not change	←
R2	Upper half of minuend	Upper half of subtraction result	←
R3	Upper half of subtrahend	Does not change	←
A0	-	-	Unused
A1	-	-	Unused
C flag	-	Borrow information	←
Usage precautions	The minuend is destroyed as a result of program execution.		

(2) BCD subtraction (memory)

Subroutine name : BCD_SUBTRACTmemory8	ROM capacity : 20 bytes
Interrupt during execution : Accepted	Number of stacks used : None

Register/memory	Input	Output	Usage condition
R0	-	Indeterminate	Used for calculation
R1	-	Indeterminate	Used for calculation
R2	-	-	Unused
R3	-	-	Unused
A0	Minuend address	Does not change	←
A1	Subtrahend address	Does not change	←
Memory indicated by A0	Minuend data	Subtraction result	←
Memory indicated by A1	Subtrahend data	Does not change	←
C flag	-	Borrow information	←
Usage precautions	The minuend is destroyed as a result of program execution.		

3. Flowchart



4. The example of a reference program

```

        .include apl.inc                ; special page include file
;*****
;
;
;   R8C Program Collection No. 15      *
;   CPU      : R8C/Tiny                *
;
;*****
VromTOP   .EQU    00D000H              ; 12Kbyte Flash version
;=====
;   Title: Subtracting 8-digit BCD
;   Outline: Subtracts 8-digit BCD using registers
;   Input:  ----->   Output:
;   R0 (Lower half of minuend)        R0 (Lower half of subtraction result)
;   R1 (Lower half of subtrahend)     R1 (Does not change)
;   R2 (Upper half of minuend)       R2 (Upper half of addition result)
;   R3 (Upper half of subtrahend)    R3 (Does not change)
;   A0 ( )                            A0 (Unused)
;   A1 ( )                            A1 (Unused)
;   Stack amount used: None
;   Notes: Borrow information in C flag
;=====
        .SECTION PROGRAM,CODE          ;
        .ORG      VromTOP              ; ROM area
BCD_SUBTRACT8:
        DSUB.W   R1,R0                ; Subtracts low-order bits
        XCHG.W   R2,R0                ; Moves subtracted data
        XCHG.W   R3,R1                ;
        DSBB.W   R1,R0                ; Subtracts high-order bits
        XCHG.W   R2,R0                ; Moves subtracted data
        XCHG.W   R3,R1                ;
        RTS
;
;=====
;   Title: Subtracting 8-digit BCD
;   Outline: Subtracts 8-digit BCD between memory locations
;   Input:  ----->   Output:
;   R0 ( )                            R0 (Indeterminate)
;   R1 ( )                            R1 (Indeterminate)
;   R2 ( )                            R2 (Unused)
;   R3 ( )                            R3 (Unused)
;   A0 (Minuend address)              A0 (Does not change)
;   A1 (Subtrahend address)          A1 (Does not change)
;   Stack amount used: None
;   Notes: Borrow information in C flag
;=====
BCD_SUBTRACTmemory8:
        MOV.W    [A0],R0              ;
        MOV.W    [A1],R1              ;

```

```
DSUB.W    R1,R0                ; Subtracts low-order bits
MOV.W     R0,[A0]              ;
MOV.W     2[A0],R0            ;
MOV.W     2[A1],R1            ;
DSBB.W    R1,R0                ; Subtracts high-order bits
MOV.W     R0,2[A0]            ;
RTS                          ;
;                               ;
        .END                   ;
```

5. Reference

SOFTWARE MANUAL

R8C/Tiny Series SOFTWARE MANUAL

(Acquire the most current version from Renesas web-site)

6. Web-site and contact for support

Renesas Web-site

<http://www.renesas.com>

Contact for Renesas technical support

Mail to : support_apl@renesas.com

REVISION HISTORY

Rev.	Date	Description	
		Page	Summary
1.00	Dec 24, 2003	-	First edition issued

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