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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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M16C/60 Series and M16C/20 Series

General-purpose Program for Adding BCD

1. Abstract

This program adds 8 digits of BCD data together by using registers.

This program adds 8 digits of BCD data together between memory locations.

2. Introduction

This program adds 8 digits of BCD data between registers by using a decimal add instruction (DADD). Set the augend in R2 and R0 and the addend in R3 and R1 beginning with the upper half, respectively. The addition result is output to R2 and R0 beginning with the upper half. The carry information is output to the C flag.

This program adds 8 digits of BCD data between memory locations by using a decimal add instruction (DADD). Set the least significant memory address of the augend and that of the addend in the address registers. The addition result is output to the augend's memory location. The carry information is output to the C flag.

C	Meaning
0	Without carry
1	With carry

(1) BCD addition (register)

Subroutine name : BCD_ADDITION8	ROM capacity : 13 bytes
Interrupt during execution : Accepted	Number of stacks used : None

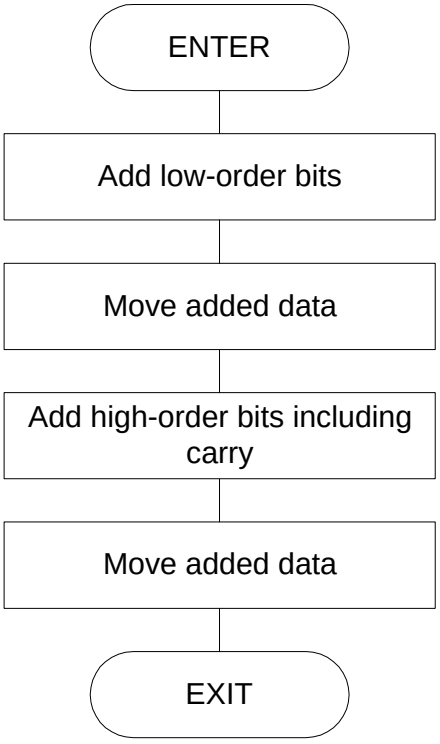
Register/memory	Input	Output	Usage condition
R0	Lower half of augend	Lower half of addition result	←
R1	Lower half of addend	Does not change	←
R2	Upper half of augend	Upper half of addition result	←
R3	Upper half of addend	Does not change	←
A0	-	-	Unused
A1	-	-	Unused
C flag	-	Carry information	←
Usage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

(2) BCD addition (memory)

Subroutine name : BCD_ADDITIONmemory8	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	Augend address	Does not change	←
A1	Addend address	Does not change	←
Memory indicated by A0	Augend	Result of addition	←
Memory indicated by A1	Addend	Does not change	←
C flag	-	Carry information	←
Usage precautions	The augend is destroyed as a result of program execution.		

3. Flowchart



4. The example of a reference program

```
;***********************************************************************
; *
; M16C General-purpose Programs *
; CPU : M16C *
; *
;***********************************************************************
VromTOP     .EQU     0F0000H             ; Declares start address of ROM
;                                        ;
;=============================================================
; Title     : Adding 8-digit BCD.
; Outline   : Adds 8-digit BCD together using registers.
; Input     : ------------------------------> Output:
; R0 (Lower half of augend)          R0 (Lower half of addition result)
; R1 (Lower half of addend)          R1 (Does not change)
; R2 (Upper half of augend)          R2 (Upper half of addition result)
; R3 (Upper half of augend)          R3 (Does not change)
; A0 ( )                             A0 (Unused)
; A1 ( )                             A1 (Unused)
; Stack amount used: None
; Notes     : Result is returned by C flag
;=============================================================
            .SECTION    PROGRAM,CODE
            .ORG     VromTOP        ; ROM area
BCD_ADDITION8:                       ;
   DADD.W      R1,R0                 ; Adds low-order bits
   XCHG.W      R2,R0                 ; Moves added data
   XCHG.W      R3,R1                 ;
   DADC.W      R1,R0                 ; Adds high-order bits
   XCHG.W      R2,R0                 ; Moves added data
   XCHG.W      R3,R1                 ;
   RTS                               ;
;                                    ;
;=============================================================
; Title     : Adding 8-bit BCD
; Outline   : Adds 8-bit BCD between memory locations
; Input     : ------------------------------> Output:
; R0 ( )                             R0 (Indeterminate)
; R1 ( )                             R1 (Indeterminate)
; R2 ( )                             R2 (Unused)
; R3 ( )                             R3 (Unused)
; A0 (Augend address)                A0 (Does not change)
; A1 (Addend address)                A1 (Does not change)
; Stack amount used: None
; Notes     : Result is returned by C flag
;=============================================================
BCD_ADDITIONmemory8:                 ;
   MOV.W       [A0],R0               ;
   MOV.W       [A1],R1               ;
   DADD.W      R1,R0                 ; Adds low-order bits
   MOV.W       R0,[A0]               ;
   MOV.W       2[A0],R0              ;
   MOV.W       2[A1],R1              ;
   DADC.W      R1,R0                 ; Adds high-order bits
   MOV.W       R0,2[A0]              ;
   RTS                               ;
;                                    ;
   .END                              ;
```

5. Reference

SOFTWARE MANUAL
M16C/60 M16C/20 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	Jul 08, 2002	-	First edition issued

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