To our customers,

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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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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

M16C/80 Series

Adding BCD

1.0 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.

2.0 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 : 15byte
Interrupt during execution:Accepted	Number of stacks used : None

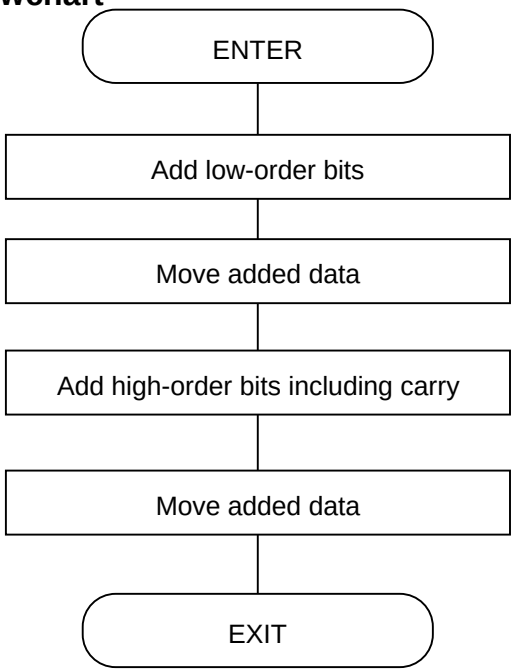
Register/memory	Input	Output	Usage condition
R0	Lower half of augend	Lower half of addition result	←
R1	Lower half of addend	Does not change	←
R2	Upper half of augend	Upper half of addition result	←
R3	Upper half of addend	Does not change	←
A0	-	-	Unused
A1	-	-	Unused
Z flag	-	Carry information	←
Usage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

(2) BCD addition (memory)

Subroutine name : BCD_ADDITIONmemory8	ROM capacity : 22byte
Interrupt during execution:Accepted	Number of stacks used : None

Register/memory	Input	Output	Usage condition
R0	-	Indeterminate	←
R1	-	Indeterminate	←
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.		

3.0 Flowchart



4.0 Programming Code

```
;*****************************************************************
; *
;       M16C Program Collection
;       CPU : M16C/80 series
; *
;*****************************************************************
VromTOP     .EQU            0FE0000H                ; 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-digit 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 ;
```

5.0 Reference

MCU Technical Information Homepage

http://www.infomicom.maec.co.jp/indexe.htm
(or http://www.mdece.com/ , http://www.mitsubishichips.com/products/mcu/index.html or your local Web Site.)

Technical Support

E-mail: support@apl.maec.co.jp
(or your local support E-mail address. A private e-mail address should NOT be used.)

Data Sheet

M16C/80 group
(Use the latest version on the Homepage: http://www.infomicom.maec.co.jp/indexe.htm)

User's Manual

M16C/80 group
(Use the latest version on the Homepage: http://www.infomicom.maec.co.jp/indexe.htm)

RENESAS
Renesas Technology Corp.

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