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

April 1st, 2010
Renesas Electronics Corporation

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M16C/60 Series and M16C/20 Series

General-purpose Program for Adding 32 Bits

1. Abstract

This program performs a 32-bit unsigned addition using registers.

This program performs a 32-bit unsigned addition between memory locations.

2. Introduction

This program performs a 32-bit unsigned addition using registers. 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 and carry information to the C flag, respectively.

This program performs a 32-bit unsigned addition between memory locations. 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 and carry information to the C flag, respectively.

C	Meaning
0	Without carry
1	With carry

(1) 32-bit addition (register)

Subroutine name : ADDITION32	ROM capacity : 5 bytes
Interrupt during execution : Accepted	Number of stacks used : None

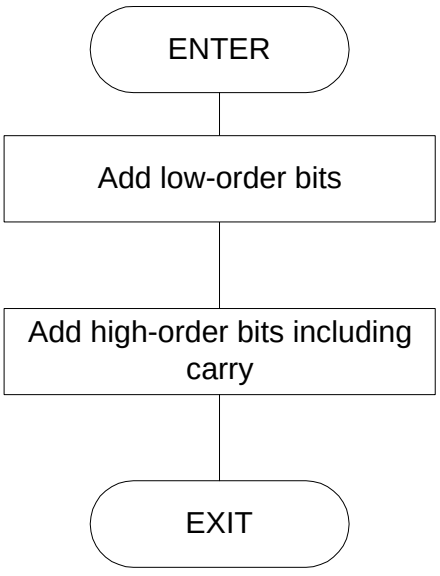
Register/memory	Input	Output	Usage condition
R0	Lower half of augend	Lower half of addition result	←
R1	Lower half of addend	Does not change	←
R2	Upper half of augend	Upper half of addition result	←
R3	Lower half of addend	Does not change	←
A0	-	-	Unused
A1	-	-	Unused
C flag	-	Carry information	←
Usage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

(2) 32-bit addition (memory)

Subroutine name : ADDITIONmemory32	ROM capacity : 7 bytes
Interrupt during execution : Accepted	Number of stacks used : None

Register/memory	Input	Output	Usage condition
R0	-	-	Unused
R1	-	-	Unused
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 32 bits
; Outline   : Adds 32-bit data 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 addend)          R3 (Does not change)
; A0 ( )                             A0 (Unused)
; A1 ( )                             A1 (Unused)
; Stack amount used: None
; Notes     : Carry information in C flag
;             R2R0 + R3R1
;=============================================================
            .SECTION    PROGRAM,CODE
            .ORG     VromTOP             ; ROM area
ADDITION32:                             ;
   ADD.W R1,R0                          ; Adds low-order bits
   ADC.W R3,R2                          ; Adds high-order bits
   RTS                                  ;
;                                       ;
;=============================================================
; Title     : Adding 32 bits
; Outline   : Adds 32-bit data between memory locations
; Input     : ------------------------------> Output:
; R0 ( )                           R0 (Unused)
; R1 ( )                           R1 (Unused)
; 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     : Carry information in C flag
;             (A0) + (A1)
;=============================================================
ADDITIONmemory32:                       ;
   ADD.W      [A1],[A0]                 ; Adds low-order bits
   ADC.W      2[A1],2[A0]               ; Adds high-order bits
   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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