To our customers,

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Renesas Electronics website: [http://www.renesas.com](http://www.renesas.com)

April 1st, 2010
Renesas Electronics Corporation

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Issued by: Renesas Electronics Corporation ([http://www.renesas.com](http://www.renesas.com))

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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.

<table>
<thead>
<tr>
<th>C</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Without carry</td>
</tr>
<tr>
<td>1</td>
<td>With carry</td>
</tr>
</tbody>
</table>

(1) 32-bit addition (register)

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

<table>
<thead>
<tr>
<th>Register/memory</th>
<th>Input</th>
<th>Output</th>
<th>Usage condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>Lower half of augend</td>
<td>Lower half of addition result</td>
<td>←</td>
</tr>
<tr>
<td>R1</td>
<td>Lower half of addend</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>R2</td>
<td>Upper half of augend</td>
<td>Upper half of addition result</td>
<td>←</td>
</tr>
<tr>
<td>R3</td>
<td>Lower half of addend</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>A0</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>A1</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>C flag</td>
<td>-</td>
<td>Carry information</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions

The augend is destroyed as a result of program execution.
(2) 32-bit addition (memory)

<table>
<thead>
<tr>
<th>Subroutine name</th>
<th>ADDITIONmemory32</th>
<th>ROM capacity : 7 bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupt during execution</td>
<td>Accepted</td>
<td>Number of stacks used : None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Register/memory</th>
<th>Input</th>
<th>Output</th>
<th>Usage condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>R1</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>R2</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>R3</td>
<td>-</td>
<td>-</td>
<td>Unused</td>
</tr>
<tr>
<td>A0</td>
<td>Augend address</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>A1</td>
<td>Addend address</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>Memory indicated by A0</td>
<td>Augend</td>
<td>Result of addition</td>
<td>←</td>
</tr>
<tr>
<td>Memory indicated by A1</td>
<td>Addend</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>C flag</td>
<td>-</td>
<td>Carry information</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions: The augend is destroyed as a result of program execution.

3. Flowchart

```
ENTER

Add low-order bits

Add high-order bits including carry

EXIT
```
4. The example of a reference program

```asm
.include apl.inc ; special page include file

; R8C Program Collection No. 9
; CPU : R8C/Tiny

VromTOP .EQU 00D000H ; 12Kbyte Flash version

; Title: Adding 32 bits
; Outline: Adds 32-bit data using registers.
; 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
; 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
```

The example of a reference program
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

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Description</th>
<th>Page</th>
<th>Summary</th>
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<tbody>
<tr>
<td>1.00</td>
<td>Dec 24, 2003</td>
<td>First edition issued</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
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