To our customers,

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April 1st, 2010
Renesas Electronics Corporation

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R8C/Tiny Series

General-purpose Program for Converting from Lowercase Alphabet to Uppercase Alphabet

1. Abstract

This program converts a lowercase English alphabet in ASCII code into an uppercase English alphabet in ASCII code.

2. Introduction

This program converts a lowercase English alphabet in ASCII code into an uppercase English alphabet in ASCII code. Set the lowercase English alphabet in ASCII code in R0L. The converted uppercase English alphabet in ASCII code is output to R0L. Conversion information is output to the C flag.

<table>
<thead>
<tr>
<th>C</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Lowercase alphabet converted into uppercase alphabet</td>
</tr>
<tr>
<td>1</td>
<td>No converted because inconvertible code was input</td>
</tr>
</tbody>
</table>

Subroutine name : TOUPPER  ROM capacity : 16 bytes
Interrupt during execution : Accepted  Number of stacks used : None

### Register/memory

<table>
<thead>
<tr>
<th>Register/memory</th>
<th>Input</th>
<th>Output</th>
<th>Usage condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>R0L</td>
<td>Lowercase alphabet (ASCII)</td>
<td>Uppercase alphabet (ASCII)</td>
<td>←</td>
</tr>
<tr>
<td>R0H</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>-</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>Conversion information</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions

---

REV05B0387-0100Z/Rev.1.00  December 2003  Page 1 of 6
3. Flowchart

```
3. Flowchart

ENTER

R0L ≥ 'a' ?
  Yes
  No

R0L ≤ 'z' ?
  Yes
  No

R0L - 20H -> R0L

Conversion succeeded
  Clear C flag

Conversion failed
  Set C flag

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

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

; R8C Program Collection No. 26
; CPU : R8C/Tiny

;******************************************************************************

VromTOP .EQU 00D000H ; 12Kbyte Flash version

;******************************************************************************

; Title: Converting ASCII code lowercase alphabet into uppercase alphabet
; Contents of processing:
; The ASCII code input in R0L is converted from a lowercase English alphabet into
; an uppercase English alphabet and the result is returned to R0L. No conversion is
; performed if any code is input in R0L that is not a lowercase English alphabet.
; Procedure: (1) Input ASCII code in R0L.
; (2) Call the subroutine.
; (3) Converted ASCII code is loaded into R0L.
; Result: The C flag is cleared to 0 when the code was converted from a lowercase alphabet
; into an uppercase alphabet. The C flag is set to 1 when the code was not converted.
; Input: ------------------------> Output:
; R0L (ASCII code) R0L (ASCII code)
; R0H () R0H (Unused)
; R1 () R1 (Unused)
; R2 () R2 (Unused)
; R3 () R3 (Unused)
; A0 () A0 (Unused)
; A1 () A1 (Unused)
; Stack amount used: None

;******************************************************************************

.SECTION PROGRAM,CODE

.ORG VromTOP ; ROM area

TOUPPER:

CMP.B #'a',R0L ; Lowercase alphabet 'a' or above?
JLTU TOUPNON ; --> No (not converted)
CMP.B #'z',R0L ; Lowercase alphabet 'z' or below?
JGTU TOUPNON ; --> No (not converted)
SUB.B #20H,R0L ; Converts from lowercase alphabet into uppercase alphabet
FCLR C ; Sets "converted" information
RTS

TOUPNON:

FSET C ; Sets "not-converted" information
RTS

.END
```

Remarks:

- The example of a reference program is provided to demonstrate how to convert lowercase ASCII code to uppercase ASCII code using Assembly language for the R8C/Tiny microcontroller.
- The program includes comments explaining the process and the purpose of each step.
- The program sets the C flag according to whether the input is a lowercase or uppercase ASCII code.
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>
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</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Dec 24, 2003</td>
<td>First edition issued</td>
</tr>
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</table>
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