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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 Converting from Uppercase Alphabet to Lowercase Alphabet

1. Abstract

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

2. Introduction

This program converts an uppercase English alphabet in ASCII code into a lowercase English alphabet in ASCII code. Set the uppercase English alphabet in ASCII code in R0L. The converted lowercase 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>Uppercase alphabet converted into lowercase alphabet</td>
</tr>
<tr>
<td>1</td>
<td>No converted because inconvertible code was input</td>
</tr>
</tbody>
</table>

Subroutine name : TOLOWER

ROM capacity : 16 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>R0L</td>
<td>Uppercase alphabet (ASCII)</td>
<td>Lowercase 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
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

;************************************************************************
; * M16C General-purpose Programs *
; CPU : M16C *
;************************************************************************
VromTOP .EQU 0F0000H ; Declares start address of ROM

; Title : Converting ASCII code uppercase alphabet into lowercase alphabet
; Contents of processing:
; The ASCII code input in R0L is converted from an uppercase English alphabet
; into a lowercase English alphabet and the result is returned to R0L.
; No conversion is performed if any code is input in R0L that is not an
; uppercase 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 an uppercase
; alphabet into a lowercase 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

TOLOWER:
CMP.B #'A',R0L ; Uppercase alphabet ‘A’ or above?
JLTU TOLOWNON ; -- no (not converted)
CMP.B #'Z',R0L ; Uppercase alphabet ‘Z’ or below?
JGTU TOLOWNON ; -- no (not converted)
ADD.B #20H,R0L ; Converts from uppercase alphabet
                 ; into lowercase alphabet
FCLR C ; Sets “converted” information
RTS ;

TOLOWNON:
FSET C ; Sets “not-converted” information
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

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Jul 08, 2002</td>
<td>First edition issued</td>
</tr>
</tbody>
</table>

This table lists the revision history of the document. The first revision (Rev. 1.00) was issued on Jul 08, 2002, with the description specifying that it is the first edition.
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