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Renesas Electronics Corporation

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H8/300H Tiny Series

Uppercase-to-Lowercase Conversion of ASCII Codes for Alphabetic Characters

Introduction

The software TOLOWER converts the ASCII code for an uppercase alphabetic character to the code for the lowercase character. It processes ASCII code data.

Target Device

H8/300H Tiny Series

Contents

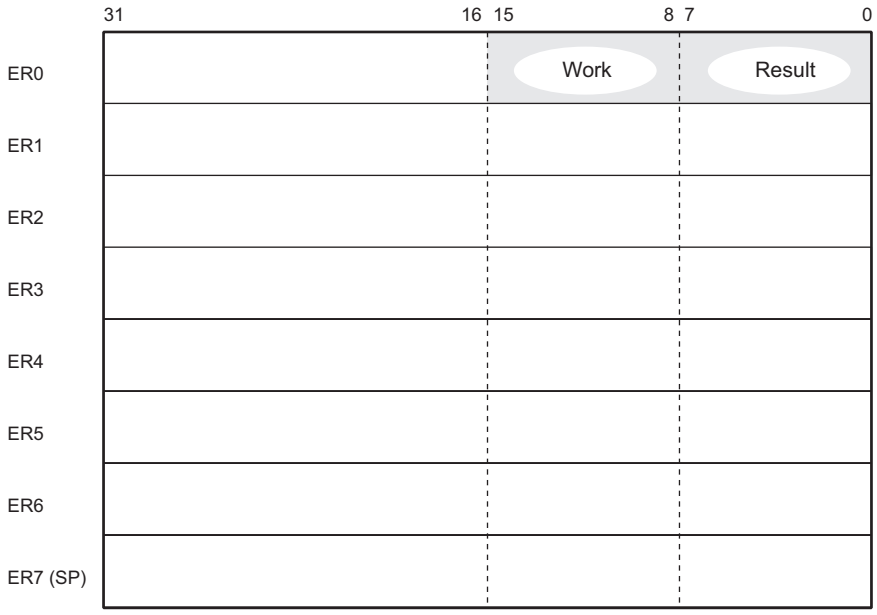
1. Functions

1. The software TOLOWER converts the ASCII code for an uppercase alphabetic character to the code for the lowercase character.
2. It processes ASCII code data.

2. Arguments

Contents		Storage Location	Data Length
Input	ASCII code of an uppercase alphabetic character	R0L	1 byte
Output	ASCII code of the lowercase alphabetic character	R0L	1 byte
	Occurrence of conversion	C flag (CCR)	1 bit

3. Changes to Internal Registers and Flags



4. Programming Specifications

Program memory (bytes)
14
Data memory (bytes)
0
Stack (bytes)
0
Number of cycles
68
Re-entrant
Yes
Relocatable
Yes
Interrupts during execution
Yes

5. Description

5.1 Description of Functions

1. The arguments are as follows.
   R0L: Set the ASCII code of an uppercase alphabetic character. The corresponding lowercase ASCII code is placed here by execution of the TOLOWER subroutine.
   C flag (CCR): Indicates the status after the execution of the TOLOWER subroutine.
   C flag = 1: No conversion was performed because the ASCII code other than 'A' to 'Z' was input.
   C flag = 0: Uppercase-to-lowercase conversion has been done.
2. The following figure illustrates the execution of the TOLOWER subroutine. When the ASCII code for the uppercase character 'A' (H'41) is set as the input argument as shown below, the code is converted to the ASCII code for 'a' (H'61), and the result is placed in R0L.

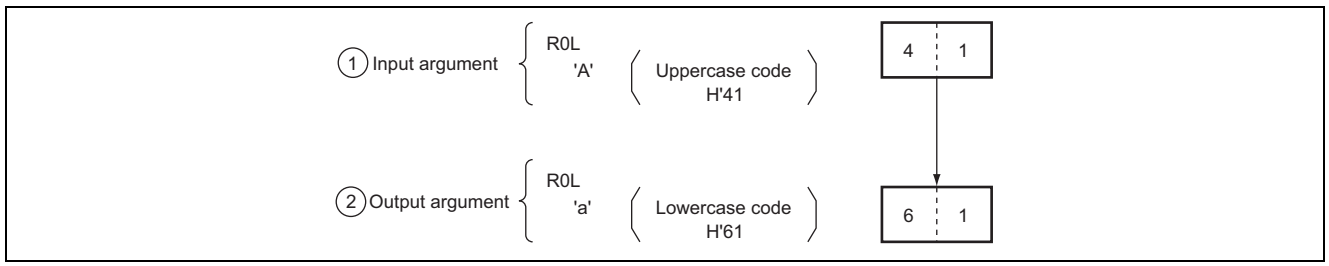


Figure 1 Example of TOLOWER Execution

5.2 Usage Notes

An ASCII code for an uppercase alphabetic character should be set in R0L. With other values, the input data in R0L will be left unchanged.

5.3 Description of Data Memory

No data memory is used by TOLOWER.

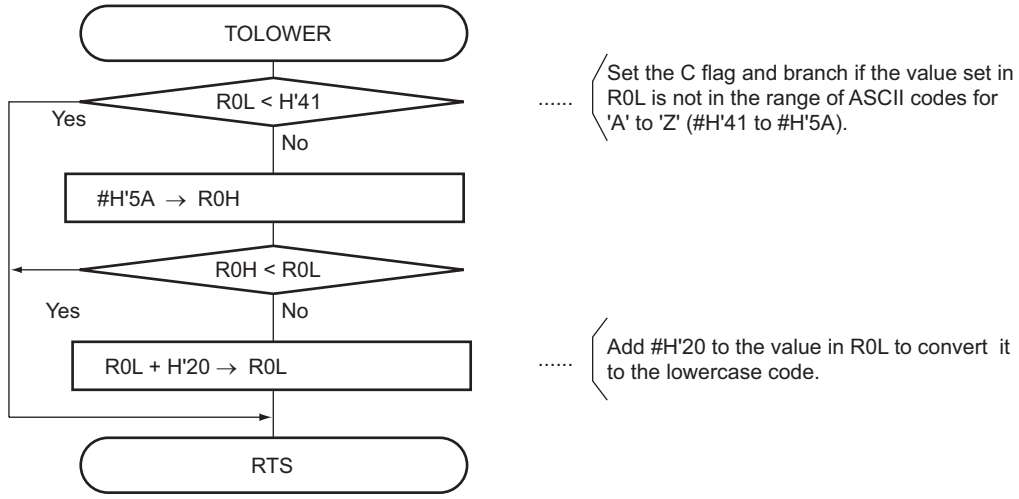
5.4 Example of Usage

```
WORK1   . RES. B 1          ..... Reservation of the data memory area for setting of the ASCII code
                                  of an uppercase character in the user program.
WORK2   . RES. B 1          ..... Reservation of the data memory area for setting of the ASCII code
                                  of a lowercase character in the user program.
            .
            .
            .
        MOV. B @WORK1, R0L  ..... Sets, as the input argument, the ASCII code of an uppercase character
                                  specified by the user program.
        JSR   @TOLOWER      ..... Subroutine call of TOLOWER.

        BCS     SKIP        ..... Branches to the required routine if the input data is not an uppercase code.

        MOV. B E0L, @WORK2  ..... Transfers the lowercase ASCII code from the output argument to the data-
                                  memory area of the user program.
            .
            .
            .
SKIP    Processing routine for other
        than uppercase codes
            .
            .
            .
```

5.5 Principles of Operation

1. The comparison instruction (CMP.B) is used to check that the input data in R0L is in the range of ASCII codes for uppercase characters.
2. When the code is for an uppercase character, #H'20 is added to the code to obtain the lowercase code.
3. If the input data is not an ASCII code for an uppercase character, the C flag of the CCR is set to 1.

6. Flowchart


TOLOWER
R0L < H'41
Yes
No
#H'5A → R0H
R0H < R0L
Yes
No
R0L + H'20 → R0L
RTS
.....
Set the C flag and branch if the value set in R0L is not in the range of ASCII codes for 'A' to 'Z' (#H'41 to #H'5A).
.....
Add #H'20 to the value in R0L to convert it to the lowercase code.

7. Program Listing

```
  1                1  ;*************************************************************************
  2                2  ;*                                                                       *
  3                3  ;*         NAME   :   CHANGE ASCII CODE UPPERCASE                        *
  4                4  ;*                    TO LOWERCASE (TOLOWER)                             *
  5                5  ;*                                                                       *
  6                6  ;*************************************************************************
  7                7  ;*                                                                       *
  8                8  ;*         ENTRY  :   R0L     (ASCII CODE UPPERCASE)                     *
  9                9  ;*                                                                       *
 10               10  ;*         RETURN :   R0L     (ASCII CODE LOWERCASE)                     *
 11               11  ;*                                                                       *
 12               12  ;*************************************************************************
 13               13  ;
 14               14             .CPU              300HN
 15 0000          15             .SECTION          TOLOWER_code,CODE,ALIGN=2
 16               16             .EXPORT           TOLOWER
 17               17  ;
 18       00000000  18  TOLOWER    .EQU              $             ;Entry point
 19 0000    A841    19             CMP.B             #H'41,R0L
 20 0002    4508    20             BCS               EXIT          ;Branch if R0L < #H'40
 21 0004    F05A    21             MOV.B             #H'5A,R0H
 22 0006    1C80    22             CMP.B             R0L,R0H
 23 0008    4502    23             BCS               EXIT          ;Branch if R0L > #H'5B
 24 000A    8820    24             ADD.B             #H'20,R0L     ;Uppercase + #H'20 -> Lowercase
 25               25  ;
 26 000C          26  EXIT
 27 000C    5470    27             RTS
 28               28  ;
 29               29             .END
*****TOTAL ERRORS   0
*****TOTAL WARNINGS    0
```

Revision Record

Rev.	Date	Description	
		Page	Summary
2.00	Feb.28.06	—	Format has been changed from Hitachi version to Renesas version.

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