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April 1st, 2010
Renesas Electronics Corporation

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April 1, 2003

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APPLICATION NOTE

Lowercase-to-Uppercase Conversion of ASCII Codes for Alphabetic Characters (TPR)

Introduction

Converts the ASCII code for a lowercase alphabetic character to the code for the uppercase character.

Target Devices

H8/300H Tiny Series

Contents

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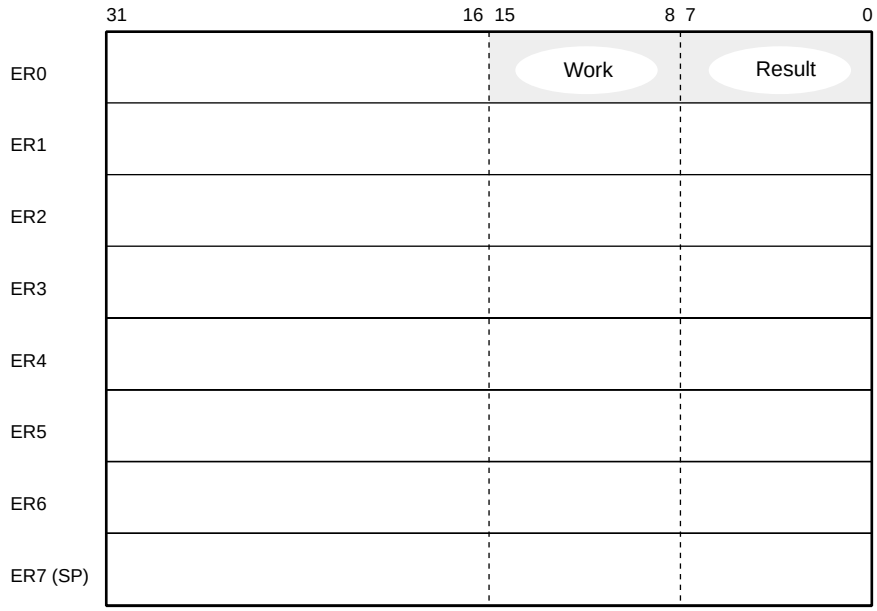
1. Arguments

Contents		Storage Location	Data Length (Bytes)
Input	ASCII code of a lowercase alphabetic character	R0L	1
Output	ASCII code of the uppercase alphabetic character	R0L	1

2. Changes to Internal Registers and Flags



I	UI	H	U	N	Z	V	C
–	–	↕	–	↕	↕	↕	↕

– : No change
↕ : Varies
0 : Fixed to 0
1 : Fixed to 1

3. Programming Specifications

Program memory (bytes)
14
Data memory (bytes)
0
Stack (bytes)
0
Number of cycles
24
Re-entrant
Yes
Relocatable
Yes
Interrupts during execution
Yes

4. Description

4.1 Description of Functions

1. The arguments are as follows.

   R0L: Set the ASCII code of a lowercase alphabetic character here. The corresponding uppercase ASCII code is placed here by execution of the TPR subroutine.

2. The following figure illustrates the execution of the TPR subroutine. When the ASCII code for the lowercase character 'a' (H'61) is set as the input argument as shown below, the code is converted to the ASCII code for 'A' (H'41), and the result is placed in R0L.

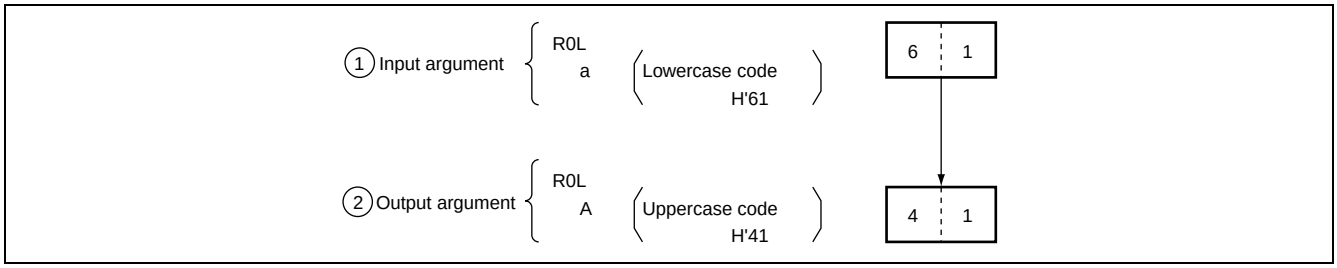


Figure 4.1 Example of TPR Execution

4.2 Usage Note

The ASCII code for a lowercase alphabetic character should be set in R0L. With other values, the input data in R0L will be left unchanged.

4.3 Description of Data Memory

No data memory is used by TPR.

4.4 Example of Usage

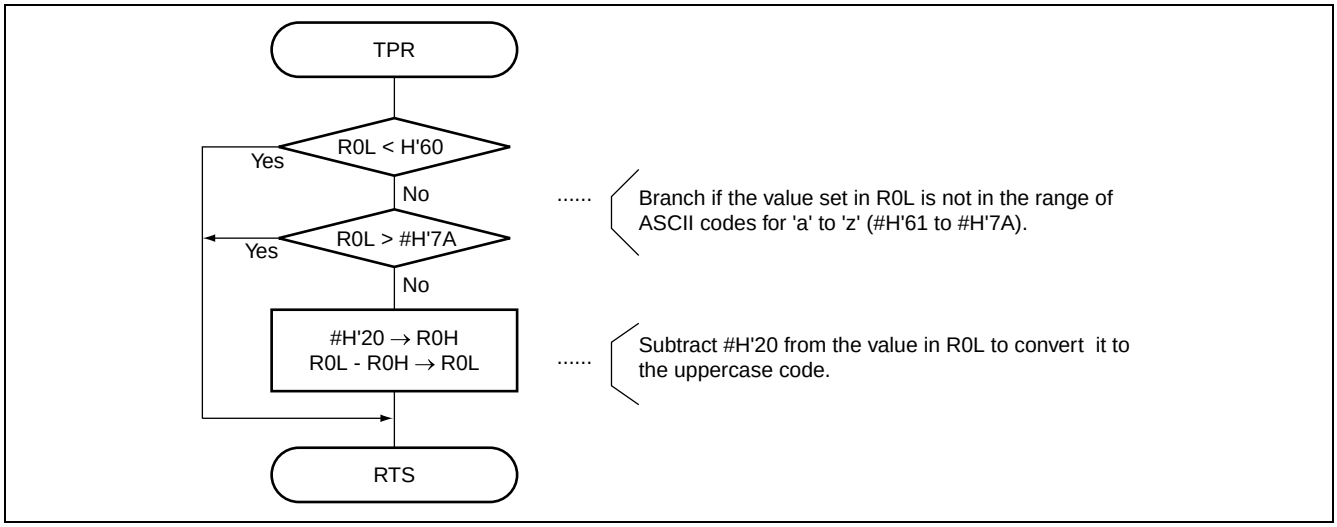
After setting an ASCII code of a lowercase alphabetic character, call the TPR subroutine.

```
WORK1   . RES. B 1          ..... Reservation of the data memory area for setting of the ASCII code of a lowercase character in the user program.
WORK2   . RES. B 1          ..... Reservation of the data memory area for setting of the ASCII code of a uppercase character in the user program.
          .
          .
          .
        MOV. B @WORK1, R0L  ..... Sets, as the input argument, the ASCII code of a lowercase character specified by the user program.
        JSR    @TPR         ..... Subroutine call of TPR.
        MOV. B E0L, @WORK2  ..... Transfers the uppercase ASCII code from the output argument to the data-memory area of the user program.
```

4.5 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 lowercase characters.
2. When the code is for a lowercase character, #H'20 is subtracted from the code to obtain the uppercase code.
3. If the input data is not the ASCII code for a lowercase character, the process ends with the input data left unchanged.

5. Flowchart



6. Program Listing

```
1                       1    ;*********************************************************
2                       2    ;*                                                       *
3                       3    ;*       NAME : CHANGE ASCII CODE, LOWERCASE             *
4                       4    ;*       TO UPPERCASE (TPR)                              *
5                       5    ;*                                                       *
6                       6    ;*********************************************************
7                       7    ;*                                                       *
8                       8    ;*       ENTRY : R0L       (ASCII CODE: LOWERCASE)       *
9                       9    ;*                                                       *
10                      10   ;*       RETURN : R0L      (ASCII CODE: UPPERCASE)       *
11                      11   ;*                                                       *
12                      12   ;*********************************************************
13                      13   ;
14                      14           .CPU        300HN
15  0000                15           .SECTION    TPR_code,CODE,ALIGN=2
16                      16           .EXPORT     TPR
17                      17   ;
18  00000000            18   TPR     .EQU        $     ;Entry point
19  0000 A861           19   CMP.B   #H'61,R0L
20  0002 4508           20   BCS     EXIT        ;Branch if R0L < #H'60
21  0004 A87A           21   CMP.B   #H'7A,R0L
22  0006 4204           22   BHI     EXIT        ;Branch if R0L > #H'7B
23  0008 F020           23   MOV.B   #H'20,R0H
24  000A 1808           24   SUB.B   R0H,R0L     ;Lowercase - #H'20 -> Uppercase
25                      25   ;
26  000C                26   EXIT
27  000C 5470           27   RTS
28                      28   ;
29                      29   .END
*****TOTAL ERRORS       0
*****TOTAL WARNINGS     0
```