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April 1st, 2010
Renesas Electronics Corporation

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

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R8C/Tiny Series
General-purpose Program for Converting from 4-byte BCD Code to HEX Code

1. Abstract
This program converts 4-byte BCD code into 4-byte HEX code.

2. Introduction
This program converts 4-byte BCD code into 4-byte HEX code. Set the BCD code in R2 and R0 beginning with the upper half. The HEX code is output to R3 and R1 beginning with the upper half.

In this program, the BCD code is divided by 2 (shifted right) and the remainder is loaded into the register as HEX code. If a significant bit is transferred from the BCD’s high-order digit to the low-order digit, numeric correction is applied.

Subroutine name : BCDtoHEX_4byte  ROM capacity : 42 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 BCD code</td>
<td>Indeterminate</td>
<td>←</td>
</tr>
<tr>
<td>R1</td>
<td>-</td>
<td>Lower part of HEX code</td>
<td>←</td>
</tr>
<tr>
<td>R2</td>
<td>Upper half of BCD code</td>
<td>Indeterminate</td>
<td>←</td>
</tr>
<tr>
<td>R3</td>
<td>-</td>
<td>Upper part of HEX code</td>
<td>←</td>
</tr>
<tr>
<td>A0</td>
<td>-</td>
<td>0000₁₆</td>
<td>Loop count</td>
</tr>
<tr>
<td>A1</td>
<td>-</td>
<td>0000₁₆</td>
<td>Number of digits counter</td>
</tr>
</tbody>
</table>

Usage precautions: The BCD code is destroyed as a result of program execution.
3. Flowchart

ENTER

Initialize HEX area

Set loop count (bit)

Set remainder of BCD code vid. 2 to MSB of HEX data

Set loop count (digit)

Change upper and lower halves for each other

Execute 1-digit correction processing

Change digits

4th digit finished?

Yes

Change upper and lower halves for each other

All digits finished?

Yes

Conversion of all digits finished?

Yes

EXIT
4. The example of a reference program

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

; R8C Program Collection No. 21
; CPU : R8C/Tiny

VromTOP .EQU 00D000H ; 12Kbyte Flash version

Title: Converting from BCD code to HEX code
Outline: Converts 4-byte BCD code into 4-byte HEX code
Input:  ------------------> Output:
R0 (Lower half of BCD code)   R0 (Indeterminate)
R1 ( )                       R1 (Lower part of HEX)
R2 (Upper half of HEX code)  R2 (Indeterminate)
R3 ( )                       R3 (Upper part of HEX)
A0 ( )                       A0 (Indeterminate)
A1 ( )                       A1 (Indeterminate)
Stack amount used: None
Notes:

.SECTION PROGRAM, CODE ;
.ORG VromTOP ; ROM area

BCDtoHE_1byte: ;
  MOV.W #0,R1 ; Initializes HEX area
  MOV.W #0,R3
  MOV.B #32,A0 ; Sets loop count

BCDtoHE_1byte_10: ;
  SHL.W #-1,R2 ; Shifts most significant bit
  RORC.W R0
  RORC.W R3
  RORC.W R1
  MOV.B #8,A1 ; Sets loop count
  XCHG.W R2,R0 ; Changes upper/lower halves for each other

BCDtoHE_1byte_20: ;
  BTST 3,R0
  JEQ BCDtoHE_1byte_30 ;--> Correction not required
  SUB.W #3,R0 ; Executes correction

BCDtoHE_1byte_30: ;
  ROT.W #-4,R0 ; Changes digits
  CMP.B #5,A1 ; Determines whether high-order correction is completed
  JNE BCDtoHE_1byte_40 ;--> Change of upper/lower halves not required
  XCHG.W R2,R0 ; Changes upper/lower halves for each other

BCDtoHE_1byte_40: ;
  ADJNZ.W #1,A1,BCDtoHE_1byte_20 ;--> Processes next digit correction
  ADJNZ.W #1,A0,BCDtoHE_1byte_10 ;--> Executes next digit
  RTS

.END
```

Input:

```
---010
```

Output:

```
---00D
```
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>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>Dec 24, 2003</td>
<td>First edition issued</td>
</tr>
</tbody>
</table>
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