To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: \url{http://www.renesas.com}

April 1\textsuperscript{st}, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (\url{http://www.renesas.com})
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M16C/60 Series and M16C/20 Series
General-purpose Program for Compressing BCD

1. Abstract
This program converts 2-digit unpacked BCD data into 1-digit packed BCD.

2. Introduction
This program converts 2-digit unpacked BCD data into 1-digit packed BCD. Set the 2-digit unpacked BCD data in a variable area (UNPACK_BCDhi, UNPACK_BCDlow). When the program is executed, 1-digit packed BCD data is output to a variable area (PACK_BCD).
The program transfers the low-order 4 bits of the upper digit and the low-order 4 bits of the lower digit of the unpacked BCD in the high-order and the low-order bits of a data creation register by using a 4-bit manipulating instruction as it creates packed BCD.

<table>
<thead>
<tr>
<th>Subroutine name</th>
<th>ROM capacity : 8 bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupt during execution</td>
<td>Accepted</td>
</tr>
<tr>
<td>Number of stacks used</td>
<td>None</td>
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</table>

<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>-</td>
<td>Packed BCD</td>
<td>Used to create data</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>UNPACK_BCDhi</td>
<td>Upper half of unpacked BCD</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>UNPACK_BCDlow</td>
<td>Lower half of unpacked BCD</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>PACK_BCD</td>
<td>-</td>
<td>Packed BCD</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions
3. Flowchart

ENTER

Transfer low-order 4 bits of the upper digit of unpacked BCD in high-order bits of register

Transfer low-order 4 bits of the lower digit of unpacked BCD in low-order bits of register

Transfer the result to packed BCD area

EXIT
4. The example of a reference program

;******************************************************************************
; * M16C General-purpose Programs *
; CPU : M16C *
; *
;******************************************************************************
VramTOP .EQU 000400H ; Declares start address of RAM
VromTOP .EQU 0F0000H ; Declares start address of ROM
Vsb .EQU 0400H ; Sets SB
;
.SECTION RAM,DATA
.ORG VramTOP ; RAM area
UNPACK_BCDhi: .BLKB 1 ; Upper digit of unpacked BCD
UNPACK_BCDlow: .BLKB 1 ; Lower digit of unpacked BCD
PACK_BCD: .BLKB 1 ; Packed BCD
;
;============================================================================
; Title : Compressing BCD
; Outline : Converts 2-digit unpacked BCD to 1-digit packed BCD.
; Input : ------------------------------> Output:
; R0L ( ) R0L (Packed BCD)
; R0H ( ) R0H (Unused)
; R1L ( ) R1L (Unused)
; R1H ( ) R1H (Unused)
; R2 ( ) R2 (Unused)
; R3 ( ) R3 (Unused)
; A0 ( ) A0 (Unused)
; A1 ( ) A1 (Unused)
; Stack amount used: None
; Notes:
;============================================================================

;SECTION PROGRAM,CODE
.ORG VromTOP ; ROM area
.SB Vsb ; Declares SB register value
.SBSYM UNPACK_BCDhi ;
.SBSYM UNPACK_BCDlow ;
.SBSYM PACK_BCD ;

LDC #Vsb,SB ; Sets initial values for SB register
MOVIL UNPACK_BCDhi,R0L ;
MOVIL UNPACK_BCDlow,R0L ;
MOV.B R0L,PACK_BCD ;

;
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>
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<tr>
<th>Rev.</th>
<th>Date</th>
<th>Description</th>
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<tr>
<td>1.00</td>
<td>Jul 08, 2002</td>
<td>First edition issued</td>
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### Summary

- **Page**: Summary
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