To our customers,

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April 1st, 2010
Renesas Electronics Corporation

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

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1. Abstract

This program searches for specified data from a two-dimensional array of a given size (maximum 255 x 255 bytes).

2. Introduction

This program searches for specified data from a two-dimensional array of a given size (maximum 255 x 255 bytes). Set the start address of the array in A0, the row size of the array in R0L, the column size of the array in R0H, and the search data in R1L. The address, the row element, and the column element of the coincidence data are output to A0, R0L, and R0H, respectively. Information on whether the search has succeeded or failed is output to the Z flag.

In this program, the overall size of the array is calculated, the specified data is searched from the entire array region, and a difference from the start address to the search address is obtained before decomposing the coincidence data into row and column elements.

<table>
<thead>
<tr>
<th>Z</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Search succeeded</td>
</tr>
<tr>
<td>1</td>
<td>Search failed (no coincidence data found, row setting of array = 0, or column setting of array = 0)</td>
</tr>
</tbody>
</table>

Subroutine name : ARRANGE  
ROM capacity : 37 bytes  
Interrupt during execution : Accepted  
Number of stacks used : 2 bytes  

<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>Row size of array</td>
<td>Row element of coincidence data</td>
<td>←</td>
</tr>
<tr>
<td>R0H</td>
<td>Column size of array</td>
<td>Column element of coincidence data</td>
<td>←</td>
</tr>
<tr>
<td>R1L</td>
<td>Search data</td>
<td>Does not change</td>
<td>←</td>
</tr>
<tr>
<td>R1H</td>
<td>-</td>
<td>Indeterminate</td>
<td>Used to save column size</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>Start address of array</td>
<td>Address of coincidence data</td>
<td>←</td>
</tr>
<tr>
<td>A1</td>
<td>-</td>
<td>Indeterminate</td>
<td>Used to save start address</td>
</tr>
<tr>
<td>Z flag</td>
<td>-</td>
<td>Search succeeded/failed</td>
<td>←</td>
</tr>
</tbody>
</table>

Usage precautions
3. Flowchart

![Flowchart Diagram]

- **ENTER**
  - Row setting of array = 0? (Yes)
  - Column setting of array = 0? (Yes)
  - Calculate entire area of array
  - **EXIT**
  - **EXIT**

- Row setting of array = 0? (No)
  - **EXIT**

- Column setting of array = 0? (No)
  - Calculate entire area of array
  - Coincidence data? (No)
    - Move to next data
    - **EXIT**
  - Coincidence data? (Yes)
    - Set address difference from start to coincidence data
    - Decompose coincidence data into row and column elements
    - Search succeeded Clear Z flag
    - **EXIT**

- Search finished? (No)
  - **EXIT**

- Search finished? (Yes)
  - Search failed Set Z flag
  - **EXIT**

- Move to next data
  - **EXIT**
4. The example of a reference program

;********************************************************************************
; * M16C General-purpose Programs *
; CPU : M16C *
;********************************************************************************
VromTOP .EQU 0F0000H ; Declares start address of ROM
;
Title : Searching array
Outline : Searches for data from two-dimensional array of given size
          (within 255 x 255 bytes)
Input:
       ------------------------------ Output:
       R0L (Row size of array) R0L (Row element of coincidence data)
       R0H (Column size of array) R0H (Column element of coincidence data)
       R1L (Search data) R1L (Does not change)
       R1H ( ) R1H (Indeterminate)
       R2 ( ) R2 (Unused)
       R3 ( ) R3 (Unused)
       A0 (Start address of array) A0 (Address of coincidence data)
       A1 ( ) A1 (Indeterminate)
;
Stack amount used: 2 bytes
Notes: Success or failure of search is returned by Z flag
;
.SECTION PROGRAM,CODE
.ORG VromTOP ; ROM area
ARRANGE:
       CMP.B #0,R0L
       JEQ ARRANGE_NG ; --> No rows of array are set
       MOV.B R0H,R1H
       JEQ ARRANGE_NG ; --> No columns of array are set
       MOV.W A0,A1
       MULU.B R0H,R0L
       ; Calculates array size
ARRANGE_10:
       CMP.B R1L,[A0]
       JEQ ARRANGE_20 ; --> Coincidence data found
       INC.W A0
       ADJNZ.W #~1,R0,ARRANGE_10 ; --> Checks next data
ARRANGE_NG:
       FSET Z ; Search failed
       JMP ARRANGE_EXIT ;
ARRANGE_20:
       PUSH.W A0 ; Saves address of coincidence data
       SUB.W A1,A0 ; Creates address difference from start
                   to coincidence data
       MOV.W A0,R0
       DIVU.B R1H ; Decomposes coincidence data into
                   row and column elements
       INC.B R0L ; Corrects rows
       INC.B R0H ; Corrects columns
       POP.W A0 ; Restores address of coincidence data
       FCLR Z ; Search succeeded
ARRANGE_EXIT:
       RTS
;
.END

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M16C/60 Series and M16C/20 Series
General-purpose Program for Searching Array

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>
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<tbody>
<tr>
<td>1.00</td>
<td>Jul 08, 2002</td>
<td>- First edition issued</td>
</tr>
</tbody>
</table>
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