M16C/65 Group
Operation of key-input interrupt

1. Abstract
The following is an operation of key-input interrupt. Figure 1 shows an example of a circuit that uses the key-input interrupt. Figure 2 shows an example of operation of key-input interrupt.

2. Introduction
This application note is applied to the M16C/65 group microcomputers.

This application note can be used with other M16C Family MCUs which have the same special function registers (SFRs) as the above group. Check the manual for any modifications to functions. Careful evaluation is recommended before using the program described in this application note.
3. Specifications

Use the following peripheral functions:

- Key-input interrupts
- Stop mode
- Pull-up function

(1) Use P10_0 through P10_3 for the scan output pin pins of a key matrix. Use the input pins (K10 through K13) of the key-input interrupt function for the key-input reading pins. The pull-up function is also used.

(2) If a key-input interrupt request occurs, clear the stop mode and read a key.

4. Operation

(1) Set the direction register of the ports to be changed to key-input interrupt pins to input, and set the pull-up function.

(2) Setting the key-input interrupt control register and setting the interrupt enable flag makes the interrupt-enabled state ready.

(3) If a falling edge is input to either K10 through K13, the key-input interrupt request bit goes to “1”.

Figure 1. Example of circuit using the key-input interrupt
**Figure 2. Example of operation of key-input interrupt**

- **Key OFF**
- **Key ON**
- **Key matrix scan**

1. Enter to stop mode
2. Cancel stop mode
3. Key scan
4. Key handling
5. Enter to stop mode

- **P10_0 output**
  - "1"
  - "0"

- **P10_1 output**
  - "1"
  - "0"

- **P10_2 output**
  - "1"
  - "0"

- **P10_3 output**
  - "1"
  - "0"

- **P10_4 to P10_7 input**
  - "1"
  - "0"

- **Key input**
  - "1" Key OFF
  - "0" Key ON

- **Key input interrupt processing**
  - "1"
  - "0"
## 5. Set-up procedure

### Setting port P10 direction register

<table>
<thead>
<tr>
<th>b7</th>
<th>b6</th>
<th>b5</th>
<th>b4</th>
<th>b3</th>
<th>b2</th>
<th>b1</th>
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<td>PD10</td>
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<tr>
<td>Port P10 direction register [Address 03F6h]</td>
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Port direction bit
- 0 : Input mode (Functions as an input port)
- 1 : Output mode (Functions as an output port)

### Setting pull-up control register 2

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<tr>
<td>✗</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PUR2</td>
</tr>
<tr>
<td>Pull-up control register 2 [Address 0362h]</td>
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P10_4 to P10_7 pull up
- 1 : Pulled high (Note 1)

Note 1: To enable the pull-up registers, the corresponding bit in the register should be set to 1 (pulled high) and the respective bits in the direction register should be set to 0 (input mode).

### Setting interrupt control register (Note 1)

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<td>KUPIC</td>
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<tr>
<td>Key input interrupt control register [Address 004Dh]</td>
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Interrupt priority level select bit
- b2 b1 b0
  - 0 0 0 : Level 0 (interrupt disabled)
  - 0 0 1 : Level 1
  - 0 1 0 : Level 2
  - 0 1 1 : Level 3
  - 1 0 0 : Level 4
  - 1 0 1 : Level 5
  - 1 1 0 : Level 6
  - 1 1 1 : Level 7

Interrupt request bit (Note 2)
- 0 : Interrupt not requested
- 1 0 0 : Level 4
- 1 0 1 : Level 5
- 1 1 0 : Level 6
- 1 1 1 : Level 7

No register bits. If necessary, set to 0. Read as undefined value.

Note 1: To rewrite the interrupt control register, do so at a point that does not generate the interrupt request for that register. To use the key input interrupts, set the PCR7 bit in the PCR register to 0 (key input enabled).

Note 2: Interrupt request bit can only be reset by writing a 0. (Do not write a 1).

### Setting port control register

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<td>PCR</td>
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<tr>
<td>Port control register [Address 0366h]</td>
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No register bits. If necessary, set to 0. Read as undefined value.

Key input enable bit
- 0 : Enabled

Note 1: To enable the pull-up registers, the corresponding bit in the register should be set to 1 (pulled high) and the respective bits in the direction register should be set to 0 (input mode).
6. Reference

Hardware manual
    M16C/65 Group Hardware Manual
    (Use the most recent version of the document on the Renesas Technology Web site.)

Technical news/Technical update
    (Use the most recent version of the document on the Renesas Technology Web site.)

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    csc@renesas.com
## Revision

<table>
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<th>Revised Page</th>
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<td>1.00</td>
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<td>First edition issued</td>
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<tr>
<td>1.01</td>
<td>2009.11</td>
<td>3</td>
<td>Modified Figure 2: add “Key handling”</td>
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