To our customers,

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Renesas Electronics website: http://www.renesas.com

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

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This manual explains the sample program functions of the interrupt functions for the V850E/IA4 microcontroller. The explanations are based on usage with the V850E/IA4 microcontroller. Refer to this manual when using the V850E/IA3, V850ES/IK1, and V850ES/IE2 microcontrollers.

Caution

This sample program is provided for reference purposes only and operations are therefore not subject to guarantee by NEC Electronics Corporation. When using this sample program, customers are kindly advised to sufficiently evaluate this product based on their system before usage.
1. **VOLTAGE APPLICATION WAVEFORM AT INPUT PIN**
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between $V_{IL}$ (MAX) and $V_{IH}$ (MIN) due to noise, etc., the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between $V_{IL}$ (MAX) and $V_{IH}$ (MIN).

2. **HANDLING OF UNUSED INPUT PINS**
   Unconnected CMOS device inputs can be cause of malfunction. If an input pin is unconnected, it is possible that an internal input level may be generated due to noise, etc., causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using pull-up or pull-down circuitry. Each unused pin should be connected to $V_{DD}$ or GND via a resistor if there is a possibility that it will be an output pin. All handling related to unused pins must be judged separately for each device and according to related specifications governing the device.

3. **PRECAUTION AGAINST ESD**
   A strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it when it has occurred. Environmental control must be adequate. When it is dry, a humidifier should be used. It is recommended to avoid using insulators that easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors should be grounded. The operator should be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with mounted semiconductor devices.

4. **STATUS BEFORE INITIALIZATION**
   Power-on does not necessarily define the initial status of a MOS device. Immediately after the power source is turned ON, devices with reset functions have not yet been initialized. Hence, power-on does not guarantee output pin levels, I/O settings or contents of registers. A device is not initialized until the reset signal is received. A reset operation must be executed immediately after power-on for devices with reset functions.

5. **POWER ON/OFF SEQUENCE**
   In the case of a device that uses different power supplies for the internal operation and external interface, as a rule, switch on the external power supply after switching on the internal power supply. When switching the power supply off, as a rule, switch off the external power supply and then the internal power supply. Use of the reverse power on/off sequences may result in the application of an overvoltage to the internal elements of the device, causing malfunction and degradation of internal elements due to the passage of an abnormal current. The correct power on/off sequence must be judged separately for each device and according to related specifications governing the device.

6. **INPUT OF SIGNAL DURING POWER OFF STATE**
   Do not input signals or an I/O pull-up power supply while the device is not powered. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Input of signals during the power off state must be judged separately for each device and according to related specifications governing the device.
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INTRODUCTION

Cautions 1. Download the program used in this manual from the NEC Electronics Website (http://www.necel.com/).
   2. When using this sample program, reference the following startup file and link directive file and adjust them if as necessary.
      • Startup file: IA4_start.s
      • Link directive file: IA4_link.dir

Conventions

The function lists are structured as follows.

### Hardware name

<table>
<thead>
<tr>
<th>[Function]</th>
<th>Function description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Function name]</td>
<td>Name of sample function</td>
</tr>
<tr>
<td>[Argument]</td>
<td>Type and overview of argument</td>
</tr>
<tr>
<td>[Processing content]</td>
<td>Processing content of sample function</td>
</tr>
<tr>
<td>[SFR(s) used]</td>
<td>Register name and setting content</td>
</tr>
<tr>
<td>[call function(s)]</td>
<td>Name and function of call function(s)</td>
</tr>
<tr>
<td>[Variable(s)]</td>
<td>Type, name, and overview of variable(s) used in sample function</td>
</tr>
<tr>
<td>[Interrupt(s)]</td>
<td>Name of function</td>
</tr>
<tr>
<td>[Interrupt source(s)]</td>
<td>Name</td>
</tr>
<tr>
<td>[File name]</td>
<td>Name of corresponding sample program file</td>
</tr>
<tr>
<td>[Caution(s)]</td>
<td>Caution(s) upon function usage</td>
</tr>
</tbody>
</table>

### Interrupt function

| [Function name] | Name of interrupt function |
| [Processing content] | Processing content of interrupt function |
| [SFR(s) used] | Register name and setting content |
| [call function(s)] | None |
| [Variable(s)] | Name of variable, function |
| [File name] | Name of corresponding sample program file |
| [Caution(s)] | None |
The differences between the V850E/IA4 and the V850E/IA3, V850ES/IK1, and V850ES/IE2 related to the interrupt functions are shown below.

<table>
<thead>
<tr>
<th>Item</th>
<th>V850E/IA4</th>
<th>V850E/IA3</th>
<th>V850ES/IK1</th>
<th>V850ES/IE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTP1</td>
<td>Provided</td>
<td>Not provided</td>
<td>Provided</td>
<td></td>
</tr>
<tr>
<td>INTP7</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTLVI</td>
<td>Not provided</td>
<td>Not provided</td>
<td>Provided</td>
<td></td>
</tr>
<tr>
<td>INTCMP0</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCMP1</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCC00</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCC01</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCM00</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCM01</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCC10</td>
<td>Provided</td>
<td>Not provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCC11</td>
<td>Provided</td>
<td>Not provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCM10</td>
<td>Provided</td>
<td>Not provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCM11</td>
<td>Provided</td>
<td>Not provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTDMA0</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTDMA1</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTDMA2</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTDMA3</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCB1RE</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCB1R</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTCB1T</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
<tr>
<td>INTAD2</td>
<td>Provided</td>
<td>Provided</td>
<td>Not provided</td>
<td></td>
</tr>
</tbody>
</table>
Related Documents

The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

Documents related to V850E/IA3, V850E/IA4, V850ES/IK1, and V850ES/E2

<table>
<thead>
<tr>
<th>Document Name</th>
<th>Document No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>V850E1 Architecture User’s Manual</td>
<td>U14559E</td>
</tr>
<tr>
<td>V850E/IA3, V850E/IA4 Hardware User’s Manual</td>
<td>U16543E</td>
</tr>
<tr>
<td>V850ES Architecture User’s Manual</td>
<td>U15943E</td>
</tr>
<tr>
<td>V850ES/IK1 Hardware User’s Manual</td>
<td>U16910E</td>
</tr>
<tr>
<td>V850ES/E2 Hardware User’s Manual</td>
<td>U17716E</td>
</tr>
<tr>
<td>Inverter Control by V850 Series Vector Control by Hole Sensor Application Note</td>
<td>U17338E</td>
</tr>
<tr>
<td>Inverter Control by V850 Series Vector Control by Encoder Application Note</td>
<td>U17324E</td>
</tr>
<tr>
<td>Inverter Control by V850 Series 120° Excitation Method Control by Zero-Cross Detection Application Note</td>
<td>U17209E</td>
</tr>
<tr>
<td>Manual for Using Sample Program Functions DMA Functions (V850E/IA3, V850E/IA4) Application Note</td>
<td>U18235E</td>
</tr>
<tr>
<td>Manual for Using Sample Program Functions Timer ENC (V850E/IA3, V850E/IA4) Application Note</td>
<td>U18240E</td>
</tr>
<tr>
<td>Manual for Using Sample Program Functions Clock Generator (V850E/IA3, V850E/IA4, V850ES/IK1, V850ES/E2) Application Note</td>
<td>U18242E</td>
</tr>
<tr>
<td>Manual for Using Sample Program Functions Interrupt Functions (V850E/IA3, V850E/IA4, V850ES/IK1, V850ES/E2) Application Note</td>
<td>This document</td>
</tr>
</tbody>
</table>
### Interrupt functions

### Interrupts

<table>
<thead>
<tr>
<th>[Function]</th>
<th>Implements multiple interrupt servicing by acknowledging processing of timer M that has a higher priority level during A/D interrupt servicing via using A/D converter 0.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Function name]</td>
<td>int_main</td>
</tr>
<tr>
<td>[Argument]</td>
<td>None</td>
</tr>
</tbody>
</table>
| [Processing content] | • Performs each interrupt setting by calling the initial setting function.  
  • Enables interrupts. |
| [SFR used] | None |
| [call function] | int_init |
| [Variable] | None |
| [Interrupts] | int_ad, int_time |
| [Interrupt sources] | INTAD0, INTTM0EQ0 |
| [File name] | interrupt.c |
| [Caution] | None |

| [Function name] | int_init |
| [Processing content] | Performs initial setting of multiple interrupt servicing. |
| [SFR used] | None |
| [call functions] | int_ad0_init, int_tmp_init, int_tmq_init, int_tmq_op_init, int_tmm_init, int_interrupt_init, int_start_init |
| [Variable] | None |
| [File name] | interrupt.c |
| [Caution] | None |
[Function name] int_ad0_init

[Processing content] Performs initial setting of A/D converter 0.

[SFRs used] ADA0M0: 0x02 (Sets trigger mode.)
ADA0M1: 0x01 (Sets conversion clock number to 124 (1.94 μs).)
ADA0S: 0x00 (Sets to ANI00.)
ADA0M2: 0x01 (Sets to timer trigger mode 0, 1-buffer mode.)

[call function] None

[Variable] None

[File name] interrupt.c

[Caution] None

---

[Function name] int_tmp_init

[Processing content] Performs initial setting of timer P (TMP0).

[SFRs used] TP0CTL0: 0x05 (Disables TMP0 operation, sets internal count clock to fXX/64.)
TP0CTL1: 0x85 (Sets to tuning operation mode, free-running timer mode.)
TP0IOC0: 0x00 (Disables timer output.)
TP0IOC1: 0x00 (No edge detection)
TP0IOC2: 0x00 (No edge detection)
TP0OPT0: 0x00 (Sets to compare register.)
TP0CCR0: 9800 (Sets compare value to 9,800 (every 9.8 ms).)

[call function] None

[Variable] None

[File name] interrupt.c

[Caution] None
Function name: int_tmq_init

Processing content: Performs initial setting of timer Q (TMQ0).

SFRs used:
- TQ0CTL1: 0x07 (Sets to 6-phase PWM output mode.)
- TQ0IOC0: 0x01 (Enables timer output.)
- TQ0IOC1: 0x00 (Not used)
- TQ0IOC2: 0x00 (Not used)
- TQ0OPT0: 0x00 (Sets compare register.)
- TQ0CCR0: 10000 (Sets compare value to 10,000 (every 10 ms).)
- TQ0CTL0: 0x05 (Disables TMQ0 operation, sets internal count clock as fX/64.)

Call function: None

Variable: None

File name: interrupt.c

Caution: None

Function name: int_tmq_op_init

Processing content: Performs initial setting of TMQ0 option (TMQ0P0).

SFRs used:
- TQ0OPT0: 0x00 (Performs up count.)
- TQ0OPT1: 0x80 (Enables crest interrupt (INTTQ0CC0 signal).)
- TQ0OPT2: 0x82 (Enables A/D trigger signal (TQTADT00) output of crest interrupt
  (INTTQ0CC0 signal).)
- TQ0OPT3: 0x02 (Enables A/D trigger signal (TQTADT01) output of crest interrupt
  (INTTQ0CC0 signal).)
- TQ0DTC: 0x000 (Sets dead time.)

Call function: None

Variable: None

File name: interrupt.c

Caution: None
## int_tmm_init

**Processing content**: Performs initial setting of timer M (TMM0).

**SFRs used**:
- **TM0CTL0**: 0x06 (Disables TMM0 operation, sets internal count clock as fXX/128.)
- **TM0CMP0**: 50000 (Sets compare value to 50,000 (every 100 ms.).)

**call function**: None

**Variable**: None

**File name**: interrupt.c

**Caution**: None

## int_interrupt_init

**Processing content**: Performs initial setting of each interrupt.

**SFRs used**:
- **AD0IC**: 0x47 (Sets priority level of A/D0 conversion end interrupt request signal (INTAD0) to level 7.)
- **TM0EQIC0**: 0x46 (Sets priority level of compare match interrupt request signal (INTTM0EQ0) of timer M to level 6.)
- **IMR3**: 0xFFFF (Masks unused interrupt.)
- **IMR2**: 0xFFFF (Masks unused interrupt.)
- **IMR1**: 0xFFFF (Masks unused interrupt.)
- **IMR0**: 0xFFFF (Masks unused interrupt.)
- **AD0IC.AD0MK**: 0 (Enables INTAD0 interrupt servicing.)
- **TM0EQIC0.TM0EQMK0**: 0 (Enables INTTM0EQ0 interrupt servicing.)

**call function**: None

**Variable**: None

**File name**: interrupt.c

**Caution**: Set so that the priority level of the multiplying interrupt (_multi_interrupt) is higher than the multiplied interrupt (_multi_multi_interrupt) when generating a multiple interrupt.
[Function name] int_start_init
[Processing content] Starts operation of timer P (TMP0), timer Q (TMQ0), timer M (TMM0), and A/D converter 0.
[SFRs used] TP0CTL0.TP0CE: 1 (Enables TMP0 operation.)
TQ0CTL0.TQ0CE: 1 (Enables TMQ0 operation.)
TM0CTL0.TM0CE: 1 (Enables TMM0 operation.)
ADA0M0.ADA0CE: 1 (Enables A/D converter 0 operation.)
[call function] None
[Variable] None
[File name] interrupt.c
[Caution] None

Interrupt functions

[Function name] int_ad
[Processing content] There is no particular processing because this is used for confirmation of interrupt occurrence.
[SFR used] None
[call function] None
[Variable] None
[File name] interrupt.c
[Caution] None

[Function name] int_time
[Processing content] There is no particular processing because this is used for confirmation of interrupt occurrence.
[SFR used] None
[call function] None
[Variable] None
[File name] interrupt.c
[Caution] None
Interrupt functions

Interruption (1/3)

Interrupt initial setting

DI

Enables interrupt request

EI

Disables interrupt request

int_init

int_ad

int_main

INTAD0 interrupt

INTAD0 interrupt function

EI

Enables interrupt request

DI

Disables interrupt request

reti

A/D converter 0/interrupt/timer setting function

int_init

int_ad0_init

A/D converter 0 initial setting function

int_tmp_init

Timer P (TMP0) initial setting function

int_tmq_init

Timer Q (TMQ0) initial setting function

int_tmq_op_init

TMQ0 option (TMQOP0) setting function

int_tmm_init

Timer M (TMM0) initial setting function

int_interrupt_init

Interrupt initial setting function

int_start_init

Timer/A/D operation enable function

ret

INTTM0EQ0 interrupt

INTTM0EQ0 interrupt function

int_time

reti
Interrupt functions

**A/D converter 0 initial setting function**

```
int_ad0_init
```
- **ADA0M0** = 0x02
- **ADA0M1** = 0x01
- **ADA0S** = 0x00
- **ADA0M2** = 0x01

```
ret
```

Sets A/D converter 0 to hardware trigger mode

**Sets conversion clock number to 124 (1.94 μs)**

Sets analog input pin to ANI00

Specifies 1-buffer mode and timer trigger mode 0

**TMQ initial setting function**

```
int_tmq_init
```
- **TQ0CTRL1** = 0x07
- **TQ0IOC0** = 0x01
- **TQ0IOC1** = 0x00
- **TQ0IOC2** = 0x00
- **TQ0OPT0** = 0x00
- **TQ0OPT1** = 0x07
- **TQ0OPT2** = 0x82
- **TQ0OPT3** = 0x02
- **TQ0CCR0** = 9800
- **TQ0DTC** = 0x00

Sets to 6-phase PWM output mode

Enables timer output

Not used

Sets internal count clock as fXX/64

Sets up count

Sets to crest interrupt

Sets compare value to 9,800 (9.8 ms)

No dead-time setting

**TMP initial setting function**

```
int_tmp_init
```
- **TP0CTRL0** = 0x05
- **TP0CTRL1** = 0x85
- **TP0IOC0** = 0x00
- **TP0IOC1** = 0x00
- **TP0IOC2** = 0x00
- **TP0OPT0** = 0x00
- **TP0CCR0** = 9800

Sets internal count clock as fXX/64

Sets to tuning operation mode, free-running timer mode

No edge detection

No edge detection

Sets to compare register

Sets compare value to 9,800 (9.8 ms)

No dead-time setting

**TMQ option setting function**

```
int_tmq_op_init
```
- **TQOCCR0** = 10000
- **TQ0CTLO** = 0x05
- **TP0OCCR0** = 9800

Sets compare value to 10,000 (10 ms)

Sets internal count clock as fXX/64

```
ret
```

Sets A/D converter 0 to hardware trigger mode

Sets conversion clock number to 124 (1.94 μs)

Sets analog input pin to ANI00

Specifies 1-buffer mode and timer trigger mode 0

Sets internal count clock as fXX/64

Sets to tuning operation mode, free-running timer mode

Disables timer output

No edge detection

No edge detection

Sets to compare register

Sets compare value to 9,800 (9.8 ms)

No dead-time setting

Sets A/D converter 0 to hardware trigger mode

Sets conversion clock number to 124 (1.94 μs)

Sets analog input pin to ANI00

Specifies 1-buffer mode and timer trigger mode 0

Sets internal count clock as fXX/64

Sets to tuning operation mode, free-running timer mode

Disables timer output

No edge detection

No edge detection

Sets to compare register

Sets compare value to 9,800 (9.8 ms)

No dead-time setting

Sets A/D converter 0 to hardware trigger mode

Sets conversion clock number to 124 (1.94 μs)

Sets analog input pin to ANI00

Specifies 1-buffer mode and timer trigger mode 0

Sets internal count clock as fXX/64

Sets to tuning operation mode, free-running timer mode

Disables timer output

No edge detection

No edge detection

Sets to compare register

Sets compare value to 9,800 (9.8 ms)

No dead-time setting
Interrupt functions

Interruption (3/3)

TM0CTL0 = 0x06
Sets internal count clock as fXX/128

TM0CMP0 = 50000
Sets compare value to 50,000 (100 ms)

TP0CE = 1
Enables TMP0 operation

TQ0CE = 1
Enables TMQ0 operation

TM0CE = 1
Enables TMM0 operation

ADA0CE = 1
Enables A/D converter 0 operation

ret

ADA0IC = 0x47
Sets priority level of INTAD0 interrupt to level 7

TM0EQIC0 = 0x46
Sets priority level of INTTM0EQ0 interrupt to level 6

IMR3 = 0xFFFF
Masks all maskable interrupts not to be used

IMR2 = 0xFFFF

IMR1 = 0xFFFF

IMR0 = 0xFFFF

AD0MK = 0
Enables INTAD0 interrupt servicing

TM0EQMK0 = 0
Enables INTTM0EQ0 interrupt servicing

ret

TMM initial setting function
int_tmm_init

Interrupt initial setting function
int_interrupt_init

Timer/A/D operation enable function
int_start_init
## Interrupt functions
### External interrupts

<table>
<thead>
<tr>
<th>Function</th>
<th>Implements an external interrupt by using INTP6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function name</td>
<td>ex_int_main</td>
</tr>
<tr>
<td>Argument</td>
<td>None</td>
</tr>
</tbody>
</table>
| Processing content | • Performs each interrupt setting by calling the initial setting function.  
  • Enables interrupts. |
| SFR used | None |
| Call functions | ex_int_init, ex_int_end |
| Variable | unsigned char flag |
| Interrupt | ex_int_p6_handler |
| Interrupt source | INTP6 |
| File name | ex_interrupt.c |
| Caution | None |

<table>
<thead>
<tr>
<th>Function name</th>
<th>ex_int_init</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing content</td>
<td>Performs initial setting of external interrupt.</td>
</tr>
<tr>
<td>SFR used</td>
<td>None</td>
</tr>
<tr>
<td>Call functions</td>
<td>ex_int_p6_init, ex_int_interrupt_init</td>
</tr>
<tr>
<td>Variable</td>
<td>None</td>
</tr>
<tr>
<td>File name</td>
<td>ex_interrupt.c</td>
</tr>
<tr>
<td>Caution</td>
<td>None</td>
</tr>
</tbody>
</table>
**Function name**: ex_int_p6_init

**Processing content**: Performs settings of edge detection and noise elimination by setting the P06 pin to the external maskable interrupt request input.

**SFRs used**
- **PMCO**: 0x40 (Sets P06 pin to external maskable interrupt request input (INTP6).)
- **INTR0**: 0x40 (Sets valid edge to rising edge.)
- **INTF0**: 0x00 (Sets valid edge to rising edge.)
- **INTPNRC**: 0x00 (Sets sampling clock as fXX/32.)

**Call function**: None

**Variable**: None

**File name**: ex_interrupt.c

**Caution**: None

---

**Function name**: ex_int_interrupt_init

**Processing content**: Performs initial setting of interrupt.

**SFRs used**
- **PIC6**: 0x45 (Sets priority level of INTP6 interrupt request signal to level 5.)
- **IMR3**: 0xFFFF (Masks unused interrupts.)
- **IMR2**: 0xFFFF (Masks unused interrupts.)
- **IMR1**: 0xFFFF (Masks unused interrupts.)
- **IMR0**: 0xFFFF (Masks unused interrupts.)
- **PIC6.PMK6**: 0 (Enables INTP6 interrupt servicing.)

**Call function**: None

**Variable**: None

**File name**: ex_interrupt.c

**Caution**: None

---

**Function name**: ex_in_end

**Processing content**: Sets pin to port mode and edge specification to “No edge detection” after external interrupt occurrence.

**SFRs used**
- **INTR0**: 0x00 (Sets to “No edge detection”.)
- **INTF0**: 0x00 (Sets to “No edge detection”.)
- **PMCO**: 0x00 (Sets P06 pin to port mode.)

**Call function**: None

**Variable**: unsigned char flag

**File name**: ex_interrupt.c

**Caution**: None
## Interrupt function

<table>
<thead>
<tr>
<th>Interrupt function</th>
<th>ex_int_p6_handler</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Function name]</td>
<td>There is no particular processing because this is used for confirmation of interrupt occurrence.</td>
</tr>
<tr>
<td>[SFR used]</td>
<td>None</td>
</tr>
<tr>
<td>[call function]</td>
<td>None</td>
</tr>
<tr>
<td>[Variable]</td>
<td>unsigned char flag</td>
</tr>
<tr>
<td>[File name]</td>
<td>ex_interrupt.c</td>
</tr>
<tr>
<td>[Caution]</td>
<td>None</td>
</tr>
</tbody>
</table>
Interrupt functions
External interruption (1/2)

INTERRUPTS

- **INTP6 interrupt**: 
  - **Ex_int_main**
  - DI
  - int_init
  - EI
  - Flag != 1
  - **Ex_int_end**
  - **Ex_int_p6_handler**
  - **Ex_int_p6_init**
  - **Ex_int_interrupt_init**
  - **Ex_int_init**

- **Port 0/external interrupt setting function**
  - **Ex_int_init**
  - **Ex_int_p6_init**
  - **Ex_int_interrupt_init**
  - **EI**
  - **DI**
  - **Int_init**
  - **Ret**
  - **Reti**

- **External interrupt initial setting**

- **External interrupt end function**

- **External interrupt initial setting**

- **P06 initial setting function**
  - **PMCO = 0x40**
  - **INTR0 = 0x40**
  - **INTF0 = 0x00**
  - **INTPNRC = 0x00**
  - **Ret**
Interrupt functions
External interruption (2/2)

Interrupt initial setting function

- \text{ex\_int\_interrupt\_init}
  - \text{PIC6} = 0x45
    - Sets priority level of INTP6 interrupt request signal to level 5
  - \text{IMR3} = 0xFFFF
    - Masks all maskable interrupts not to be used
  - \text{IMR2} = 0xFFFF
  - \text{IMR1} = 0xFFFF
  - \text{IMR0} = 0xFFFF
  - \text{PMK6} = 0
    - Enables INTP6 interrupt servicing

- \text{ret}

External interrupt end servicing function

- \text{ex\_int\_end}
  - \text{INTR0} = 0x00
    - Sets valid edge to “No edge detection”
  - \text{INTF0} = 0x00
  - \text{PMC0} = 0x00
  - \text{ret}

Sets P06 pin to port mode
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