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RENESAS TECHNICAL NEWS

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M32C/80 series and M16C/80 group

Precaution on Stop Mode

<p>Classification</p> <p>Corrections and supplementary explanation of document</p> <p>√ Notes</p> <p>Knowhow</p> <p>Others</p>	<p>Concerned Products</p> <p>M32C/80 series</p> <p>M16C/80 group</p>
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1. Precautionary Note

If the CM10 bit (all-clock stop bit) in the CM1 register is set (to enter stop mode) after meeting one of the following conditions, condition 1 or 2, the microcomputer may not enter stop mode. Figure 1 shows a flowchart to enter stop mode.

Condition 1:

The following conditions must be all met.

- I flag is set to 0 (interrupt disabled)
- The Interrupt Priority Level⁽¹⁾ of an interrupt, Interrupt A, is higher than the Recovery Priority Level⁽²⁾
- An interrupt request for Interrupt A occurred.

Condition 2:

The following conditions must be all met.

- $IPL \geq$ The Interrupt Priority Level of Interrupt A $>$ The Recovery Priority Level
- An interrupt request for Interrupt A occurred.

After meeting one of the conditions above and once the MCU did not enter stop mode, it will not enter stop mode even after setting the CM10 bit to "1" again.

However, the microcomputer can enter stop mode if one of the following events occur between the above condition, conditions 1 or 2, and the instruction that sets the CM10 bit to "1".

- An interrupt request (including Interrupt A) can be generated/acknowledged.
- The interrupt priority level for Interrupt A⁽³⁾ is higher than the IPL and the I flag is set to "1" at that time the condition 1 or 2 occurs.
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NOTES:

1. The Interrupt Priority Level is determined by ILVL2 to ILVL0 (interrupt priority level select bit).
2. The Recovery Priority Level is determined by RLVL2 to RLVL0 (interrupt priority set bit to exit from stop/wait mode).
3. Changing the interrupt priority level of Interrupt A is not effective (the interrupt priority level remains unchanged) if the interrupt priority level is changed after the condition 1 or 2 occurred.

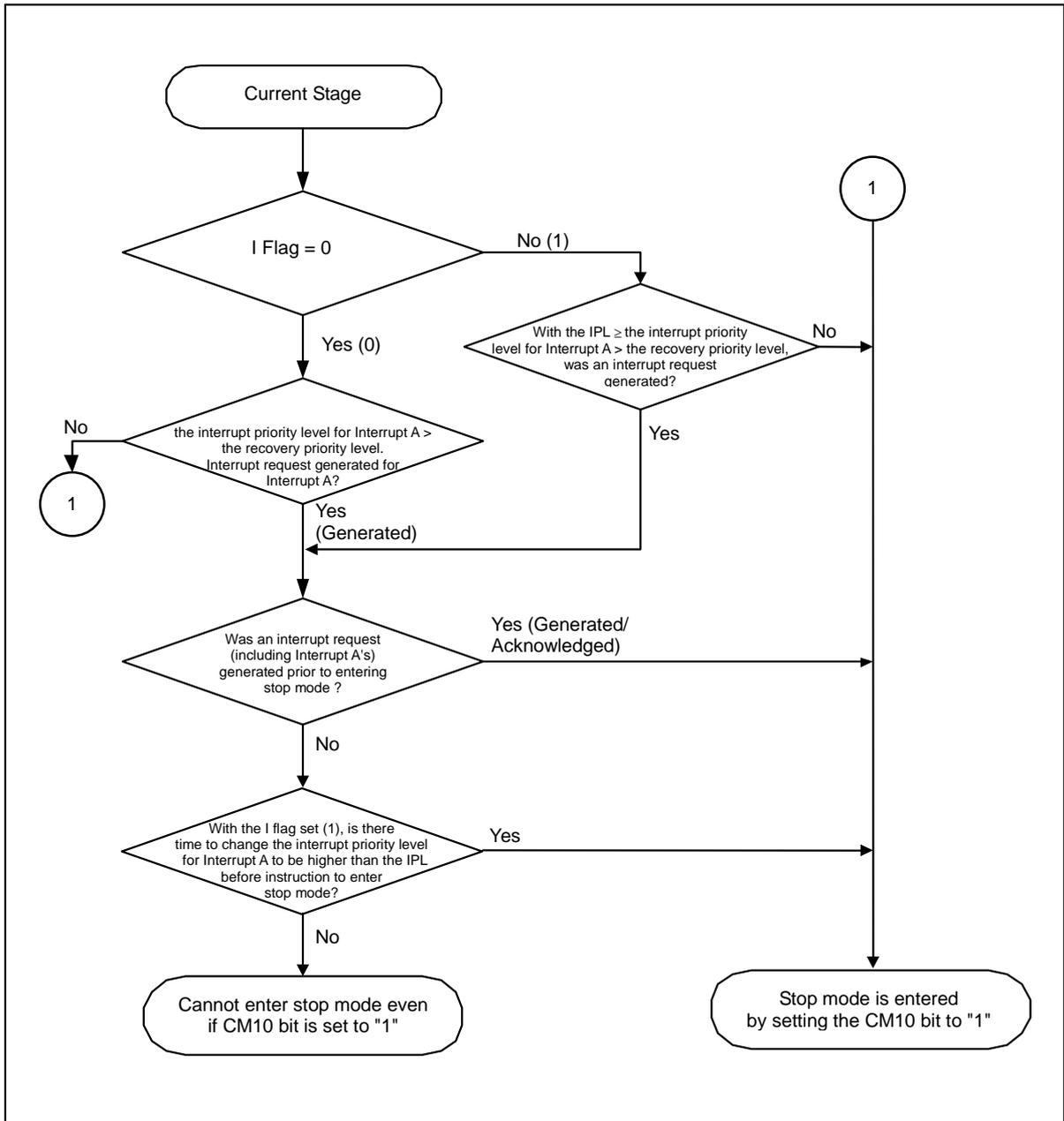


Figure 1. Flowchart to Enter Stop Mode

2. Countermeasure

To solve this issue, use one of the methods described below.

2.1. During initialization, set the Recovery Priority Level to 7 Method

- During initialization

Set the interrupt priority level for each interrupt after setting the recovery priority level to 7.

- Before entering Stop mode

Set the IPL and the recovery priority level after setting the interrupt priority level of an interrupt that will cause the microcomputer to exit from stop mode.

- After exiting Stop mode

Set the recovery priority level back to 7 right after exiting stop mode.

Initial setting

```
;Set the interrupt priority level for each interrupt after setting the recovery priority level to 7
mov.b #7,RLVL      ;Set the recovery priority level to 7
mov.b #1,TA0IC     ;Set the interrupt priority level of an interrupt to be used
mov.b #3,TB0IC     ;
.....
```

Setting before entering stop mode

```
mov.b #5,INT0IC    ;Set the interrupt priority level of an interrupt causing the microcomputer to exit stop mode
ldipl #3          ;Set the IPL
mov.b #3,RLVL     ;Set the recovery priority level
fest I           ;Set the I flag to "1" (interrupt enabled)
bset PRC0        ;Remove protection
bset CM10        ;Stop all clocks (stop mode)
nop
nop
nop
nop
.....
```

Setting after exiting stop mode

```
INT0_interrupt:   ;An interrupt routine of an interrupt causing the microcomputer to exit stop mode
mov.b #7,RLVL    ;Set the recovery priority level back to 7
pushm R0,R1,R2,R3,A0,A1 ;
.....
```

List 1. Programming Example for setting the Recovery Priority Level to 7 method

2.2. Before entering stop mode, set IPL to “0” and set I Flag to “1” Method

- Processing before entering stop mode

Use the procedure below to set the Interrupt Priority Level, IPL, and the I flag.

- 1) Set the interrupt priority level of the interrupt that will cause the microcomputer to exit from stop mode.
- 2) Set the IPL to “0”.
- 3) Set the recovery priority level.
- 4) Set the I flag to “1”.
- 5) Set the IPL to same value as the recovery priority level .

Enter stop mode by setting CM10 bit to “1”.

Processing before entering Stop mode

```
mov.b #5,INT0IC      ;Set the interrupt priority level of an interrupt causing the microcomputer to exit from stop mode
ldipl #0             ;Set the IPL to “0”
mov.b #3,RLVL        ;Set the recovery priority level
fest I              ;Set the I flag to “1” (interrupt enabled)
ldipl #3             ;Set the IPL
bset PRC0            ;Remove a protection
bset CM10            ;Stop all clocks (stop mode)
nop
nop
nop
nop
.....
```

List 2. Programming Example for set IPL to 0 and set I flag to 1 Method