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April 1st, 2010
Renesas Electronics Corporation

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M16C/80 Group

Operation of Timer A (one-shot timer mode, external trigger)

1.0 Abstract

In one-shot timer mode, choose functions from those listed in Table 1. Operations of the circled items are described below.

Table 1. Chosed functions

Item	Set-up
Count source	<input type="radio"/> Internal count source ($f_1 / f_8 / f_{32} / f_{c32}$)
Pulse output function	<input type="radio"/> No pulses output
	<input type="radio"/> Pulses output
Count start condition	<input type="radio"/> External trigger input (falling edge of input signal to the TAI _{IN} pin)
	<input type="radio"/> External trigger input (rising edge of input signal to the TAI _{IN} pin)
	<input type="radio"/> Timer overflow (TB2/TAj/TAK overflow)
	<input type="radio"/> Writing "1" to the one-shot start flag

Note: $j = i - 1$, but $j = 4$ when $i = 0$; $k = i + 1$, but $k = 0$ when $i = 4$.

2.0 Introduction

Operation (1) If the TAI_{IN} pin input level changes from "L" to "H" with the count start flag set to "1", the counter performs a down count on the count source. At this time, the TAI_{OUT} pin output level goes to "H" level.

(2) If the value of the counter becomes "0000₁₆", the TAI_{OUT} pin outputs an "L" level, and the counter reloads the content of the reload register and stops counting. At this time, the timer Ai interrupt request bit goes to "1".

(3) If a trigger occurs while a count is in progress, the counter reloads the value of the reload register again and continues counting. The reload timing is in step with the next count source input after the trigger.

(4) Setting the count start flag to "0" causes the counter to stop and to reload the content of the reload register. Also, the TAI_{OUT} pin outputs an "L" level. At this time, the timer Ai interrupt request bit goes to "1".

- Note
- Set TAI_{IN} pin's function select register A to I/O port and port direction register to "0".
 - When using pulse output, select TAI_{OUT} output function with the function select register A and B.
 - When setting the function select registers A, B, and C, sets the function select registers B and/or C first, and then sets the function select register A.

Figure 1 shows the operation timing

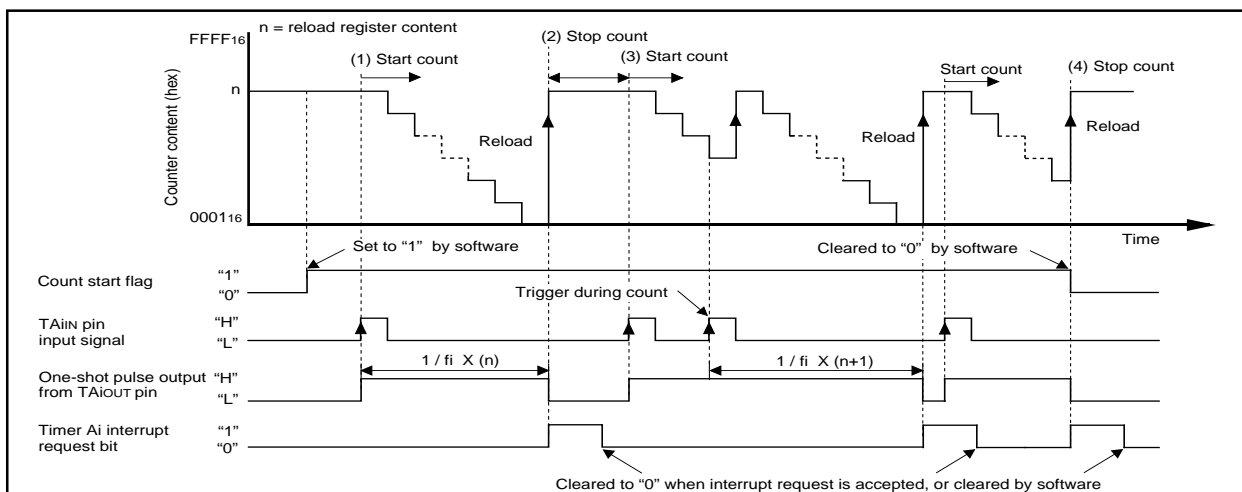


Figure 1. Operation timing of one-shot mode, external trigger

3.0 Set-up procedure

Selecting one-shot timer mode and functions

Timer Ai mode register (i=0 to 4) [Address 035616 to 035A16]
TAiMR (i=0 to 4)

Selection of one-shot timer mode
External trigger select bit
1 : Rising edge of TAiin pin's input signal (Note)
Trigger select bit
1 : Selected by event/trigger select bit
0 (Must always be "0" in one-shot timer mode)
Count source select bit

b7	b6	Count source	Count source period
		f(XIN):20MHz	f(XCIN):32.768kHz
0	0	f1	50ns
0	1	f8	400ns
1	0	f32	1.6μs
1	1	fc32	976.56μs

Note: Set the corresponding function select register A to I/O port and port direction register to "0".

Setting function select register A and B

Function select register A1 [Address 03B116]
PS1

- Port 70 output function select bit
0 : I/O port
1 : Peripheral function output (PSL1_0 enabled)
- Port P72 output function select bit
0 : I/O port
1 : Peripheral function output (PSL1_2, PSC_0 enabled)
- Port P74 function select bit
0 : I/O port
1 : Peripheral function output (PSL1_4 enabled)
- Port P76 output function select bit
0 : I/O port
1 : TA3OUT output

Function select register A2 [Address 03B416]
PS2

- Port 80 output function select bit
0 : I/O port
1 : Peripheral function output (PSL2_0 enabled)

Function select register B1 [Address 03B316]
PSL1

- Port P70 output peripheral function select bit
0 : TxD2(SDA2) port
1 : TA0OUT output
- Port P72 output peripheral function select bit
0 : Port P72 output peripheral subfunction select bit
1 : TA1OUT output
- Port P74 output peripheral function select bit
0 : TA2OUT port
1 : W phase output

Function select register B2 [Address 03B616]
PSL2

- Port P80 output peripheral function select bit
0 : TA4OUT output
1 : U phase output

Function select register C [Address 03AF16]
PSC

- Port P72 output peripheral subfunction select bit
0 : Must set "0" in selecting TA1OUT output

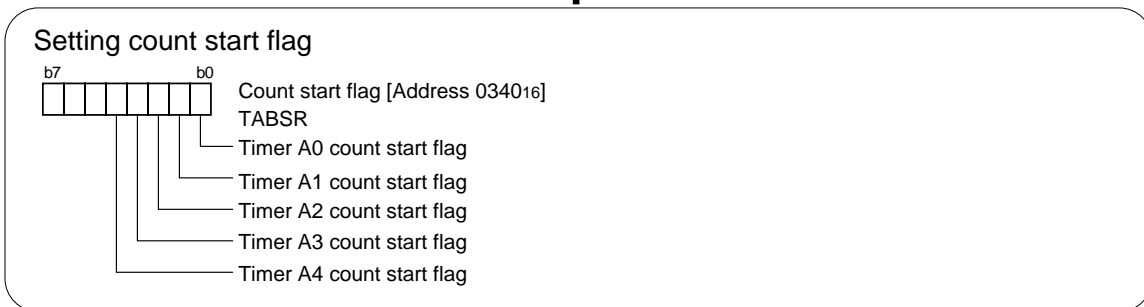
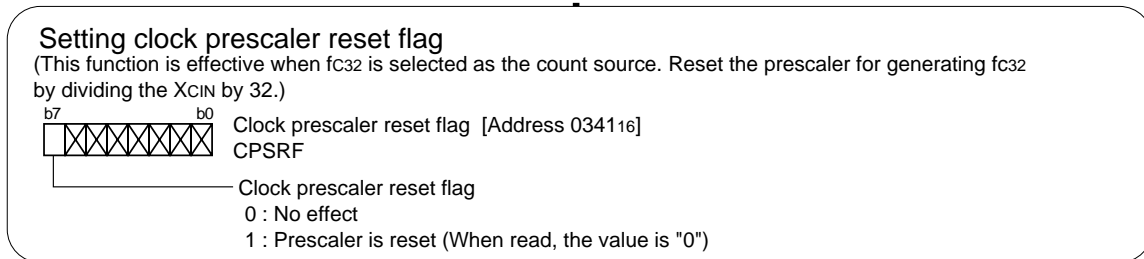
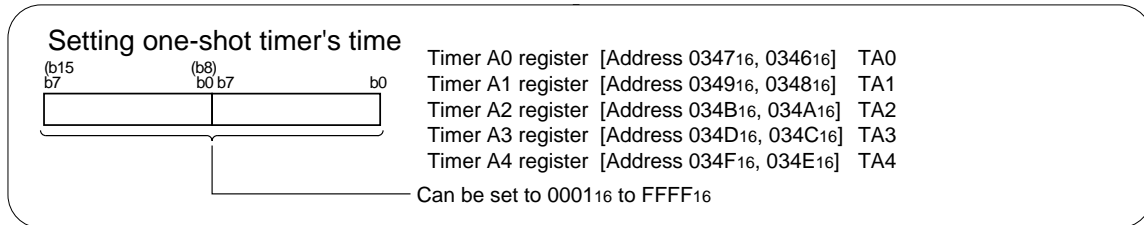
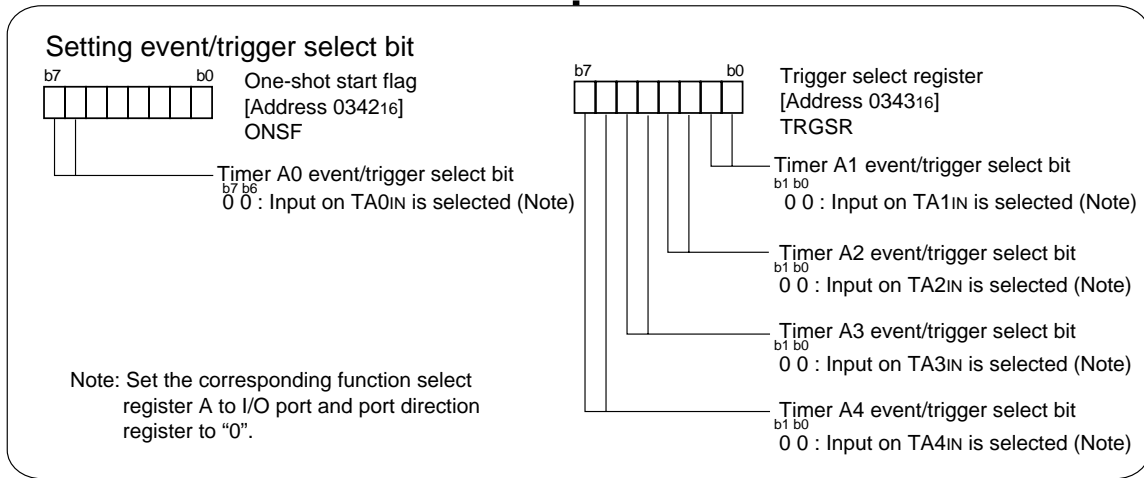
Clearing timer Ai interrupt request bit (Please refer to the notes on the one-shot timer mode of Timer A in the User's manual.)

Timer Ai interrupt control register [Addresses 006C16, 008C16, 006E16, 008E16, 007016]
TAiIC (i=0 to 4)

Interrupt request bit

Continued to the next page

Continued from the previous page



Start count


```

=====
;
;   TimerA (one-shot timer mode,external trigger selected)
;=====
;
;   ; Selecting one-shot timer mode and functions
MOV.B   #01011010B, talmr
;
;       ||| ||| |++-----;Selection of one-shot timer mode
;       ||| ||| |+-----;This bit is invalid in M16C/80 series
;       ||| ||| +-----;External trigger select bit
;       ||| |||                (1:Rising edge of TAlIN pin's input signal) (Note)
;       ||| ||| +-----;Trigger select bit
;       ||| |||                (1:Selected by event/trigger select register)
;       ||| ||| +-----;Must always be "0" in one-shot timer mode
;       ||| ||| +-----;Count source (01:f8)
;
;   ; Clearing timer A1 interrupt request bit
MOV.B   #00000000B, talic
;
;       +-----;Interrupt request bit
;
;   ; Setting function select register A and B (Setting pulse output function)
BSET    ps11_2                ;Port P72 peripheral function select bit (TAlOUT output)
BCLR    psc_0                 ;Must set "0" in selecting TAlOUT output
BSET    ps1_2                 ;Port P72 function select bit (peripheral function output)
;
;   ; Setting event/trigger select bit
MOV.B   #00000000B, trgsr
;
;       ++-----;(00:Input on TAlIN is selected) (Note)
;
;   ; (Note) Sets the corresponding function select register A to I/O port and
;   ; port direction register to "0"
BCLR    pd7_3                 ;Port P73 direction register
BCLR    ps1_3                 ;Port P73 is I/O port
;
;   ; Setting one-shot timer's time
MOV.W   #2500, tal            ;(1msec @20MHz, f8)
;
;   ; Setting clock prescaler reset flag
;   ; (This function is effective when fC32 is selected as the count source)
MOV.B   #00000000B, cpsrf
;
;       +-----;Clock prescaler reset flag (0:No effect)
;
;   ; Setting count start flag
MOV.B   #00000010B, tabsr
;
;       +-----;Timer A1 count start flag
;
MAIN:
    JMP     MAIN
;
;=====
;
;   Dummy interrupt processing program
;=====
dummy:
    REIT
;
;*****
;
;   Setting of fixed vector
;*****
.SECTION    F_VECT, ROMDATA
.ORG        FIXED_VECT_TOP
;
.LWORD     dummy    ;Undefined instruction
.LWORD     dummy    ;Overflow
.LWORD     dummy    ;BRK instruction execution
.LWORD     dummy    ;Address match
.LWORD     dummy    ;
.LWORD     dummy    ;Watchdog timer
.LWORD     dummy    ;
.LWORD     dummy    ;NMI
.LWORD     RESET    ;Reset
;
.END

```

5.0 Reference

Renesas Technology Corporation Semiconductor Home page

<http://www.renesas.com/>

Technical Support

E-mail: support_apl@renesas.com

Data Sheet

M16C/80 group Rev. E3

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User's Manual

M16C/80 group Rev. B

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