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April 1st, 2010
Renesas Electronics Corporation

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M16C/80 Group

Operation of Timer A (timer mode)

1.0 Abstract

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

Table 1. Choosed functions

Item	Set-up	
Count source	**O**	Internal count source (f_1 / f_8 / f_{32} / fc_{32})
Pulse output function	**O**	No pulses output
		Pulses output
Gate function	**O**	No gate function
		Performs count only for the period in which the TAiIN pin is at "L" level
		Performs count only for the period in which the TAiIN pin is at "H" level

2.0 Introduction

Operation (1) Setting the count start flag to "1" causes the counter to perform a down count on the count source.
(2) If an underflow occurs, the content of the reload register is reloaded, and the count continues. At this time, the timer Ai interrupt request bit goes to "1".
(3) Setting the count start flag to "0" causes the counter to hold its value and to stop.

Note • When not using pulse output, do not select TAiOUT output function with the function select register A and B.

Figure 1 shows the operation timing

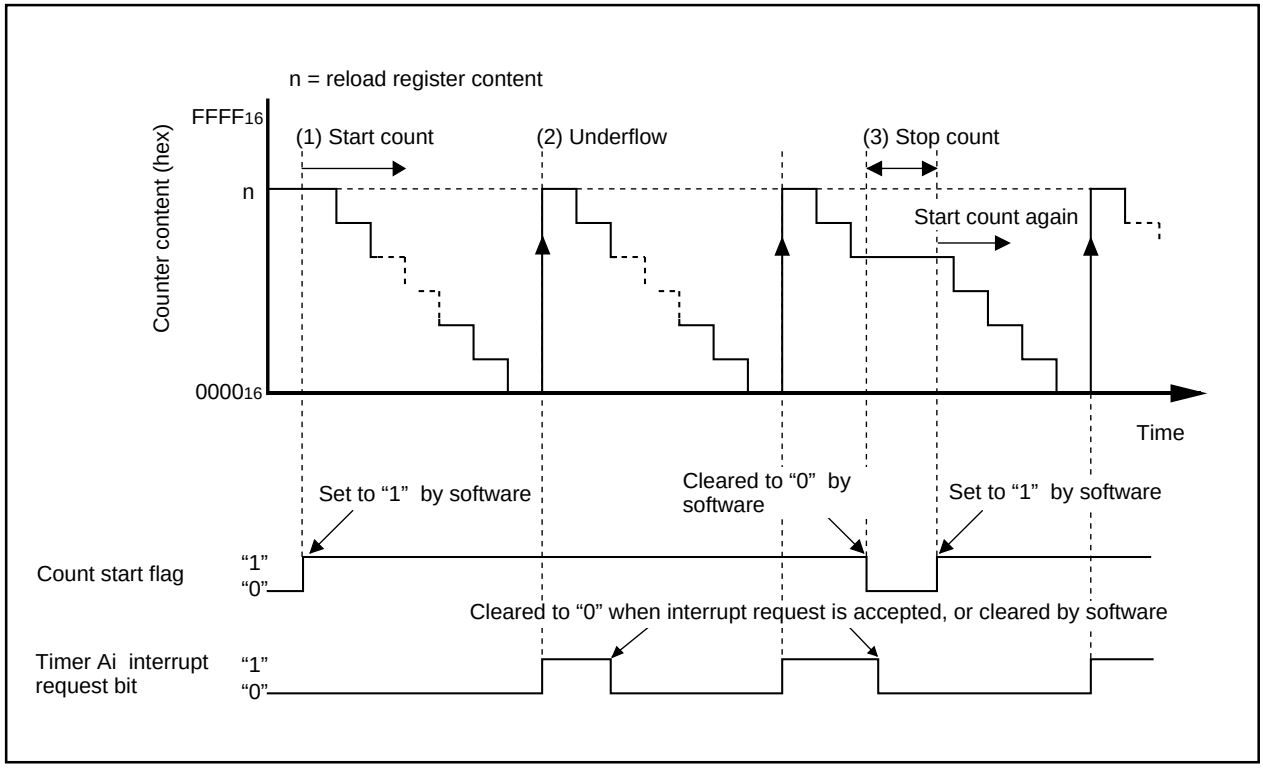
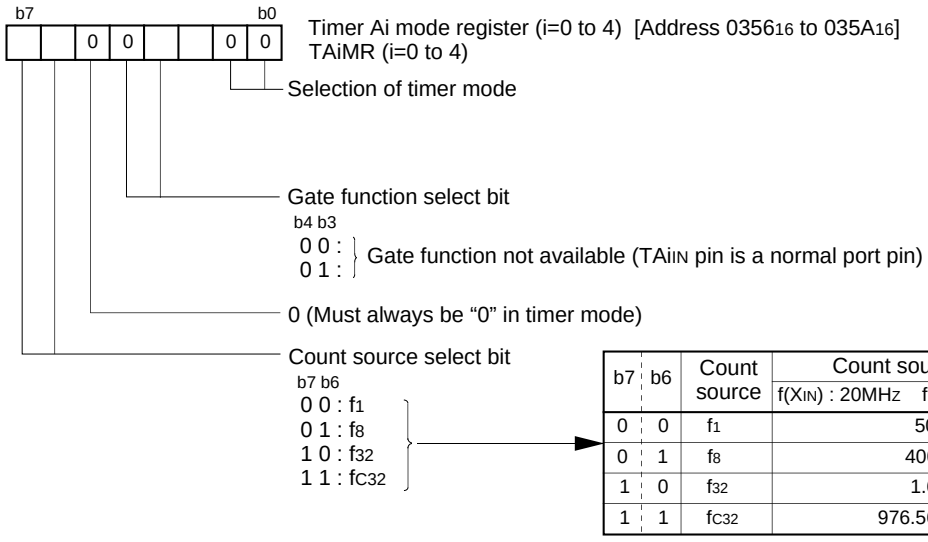


Figure 1. Operation timing of timer mode

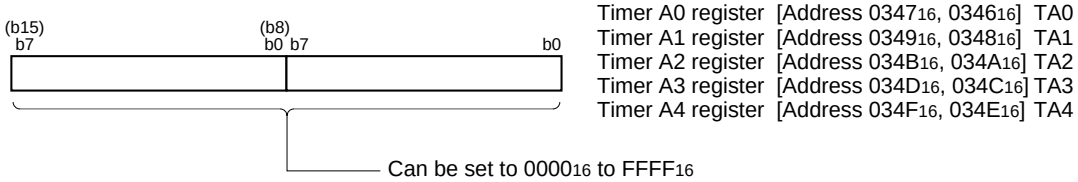
3.0 Set-up procedure

Selecting timer mode and functions



b7	b6	Count source	Count source period f(XIN) : 20MHz	Count source period f(XCIN) : 32.768kHz
0	0	f1	50ns	
0	1	f8	400ns	
1	0	f32	1.6µs	
1	1	fC32	976.56µs	

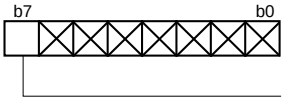
Setting divide ratio



Timer A0 register [Address 0347₁₆, 0346₁₆] TA0
Timer A1 register [Address 0349₁₆, 0348₁₆] TA1
Timer A2 register [Address 034B₁₆, 034A₁₆] TA2
Timer A3 register [Address 034D₁₆, 034C₁₆] TA3
Timer A4 register [Address 034F₁₆, 034E₁₆] TA4

Setting clock prescaler reset flag

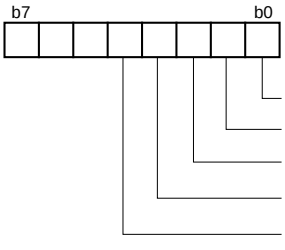
(This function is effective when fC32 is selected as the count source. Reset the prescaler for generating fC32 by dividing the XCIN by 32.)



Clock prescaler reset flag [Address 0341₁₆]
CPSRF

Clock prescaler reset flag
0 : No effect
1 : Prescaler is reset (When read, the value is "0")

Setting count start flag



Count start flag [Address 0340₁₆]
TABSR

Start count

4.0 Programming Code

```
;******************************************************************************
;
;   M16C/80 Program Collection
;
;   FILE NAME : rjj05b0122_src.a30
;   CPU       : M16C/80 Group
;   FUNCTION  : Operation of Timer A
;               (timer mode)
;   HISTORY   : 2003.06.16  Ver 1.00
;
;   Copyright(C)2003, Renesas Technology Corp.
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;
;******************************************************************************
;******************************************************************************
;       Include
;******************************************************************************
        .LIST       OFF             ;Stops outputting lines to the assembler list file
        .INCLUDE    sfr80100.inc    ;Reads the file that defined SFR
        .LIST       ON              ;Starts outputting lines to the assembler list file
;
;******************************************************************************
;       Symbol definition
;******************************************************************************
ROM_TOP         .EQU    0FFC000H    ;Start address of ROM
FIXED_VECT_TOP  .EQU    0FFFFDCH    ;Start address of fixed vector
;
;******************************************************************************
;       Program area
;******************************************************************************
;==============================================================================
;       Start up
;==============================================================================
        .SECTION    PROGRAM, CODE  ;Declares section name and section type
        .ORG        ROM_TOP        ;Declares start address
RESET:
        ; Sets Processor mode, System clock and Main clock division
        MOV.B    #03H, prcr        ;Removes protect
        MOV.B    #10000000B, pm0   ; Single-chip mode
        MOV.B    #11000000B, pm1   ; Flash memory version
        MOV.B    #00001000B, cm0   ; Xcin-Xcout High
        MOV.B    #00100000B, cm1   ; Xin-Xout High
        MOV.B    #00010010B, mcd   ; No division mode
        MOV.B    #00H, prcr        ;Protects all registers
;
```

```
;======================================================================
;       TimerA (timer mode)
;======================================================================
        ; Selecting timer mode and functions
        MOV.B    #01000000B, ta1mr
;                 ||||||++---------;Selection of timer mode
;                 |||||+-----------;This bit is invalid in M16C/80 series
;                 |||++------------;Gate function select bit
;                 |||               (00 or 01:Gate function not available)
;                 ||+--------------;Must always be "0" in timer mode
;                 ++---------------;Count source select bit (01:f8)
        ; Setting divide ratio
        MOV.W    #2500-1, ta1      ;(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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