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April 1st, 2010
Renesas Electronics Corporation

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M16C/80 Group

Operation of Timer B (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})

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 counter continues counting. At this time, the timer Bi interrupt request bit goes to “1”.

(3) Setting the count start flag to “0” causes the counter to hold its value and to stop.

Figure 1 shows the operation timing

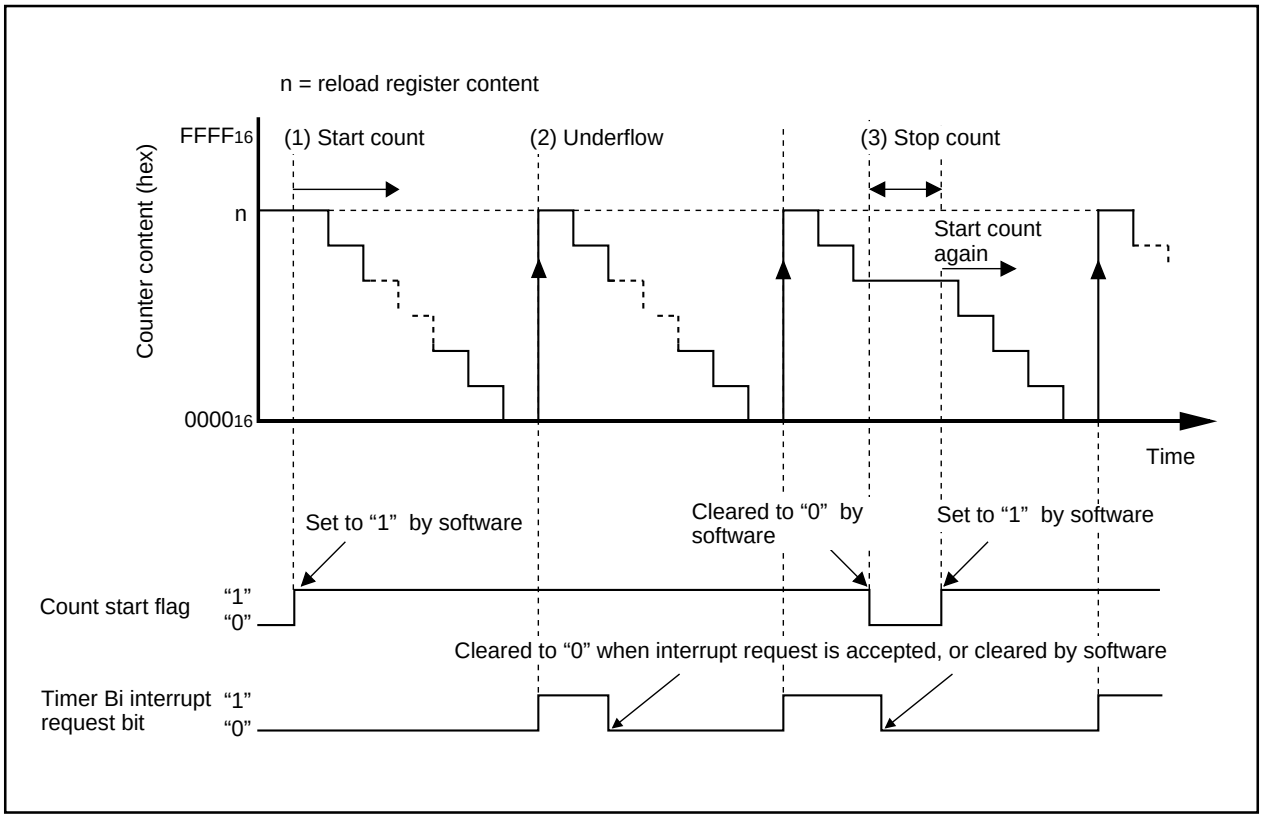
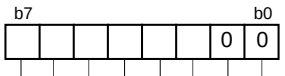


Figure 1. Operation timing of timer mode

3.0 Set-up procedure

Selecting timer mode and functions



Timer Bi mode register (i=0 to 5) [Address 035B16 to 035D16, 031B16 to 031D16]
TBiMR (i=0 to 5)

Selection of timer mode

Invalid in timer mode
Can be “0” or “1”

Fixed to “0” in timer mode (i = 0, 3)
In an attempt to write to this bit, write “0” (i = 1, 2, 4, 5)

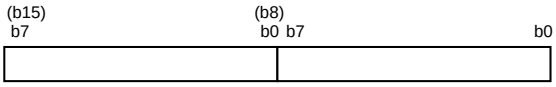
Invalid in timer mode

Count source select bit

b7 b6
0 0 : f_1
0 1 : f_8
1 0 : f_{32}
1 1 : f_{C32}

b7	b6	Count source	Count source period
			f(XIN) : 20MHz f(XCIN) : 32.768kHz
0	0	f_1	50ns
0	1	f_8	400ns
1	0	f_{32}	1.6µs
1	1	f_{C32}	976.56µs

Setting divide ratio

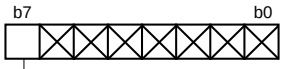


Timer B0 register [Address 035116, 035016] TB0
Timer B1 register [Address 035316, 035216] TB1
Timer B2 register [Address 035516, 035416] TB2
Timer B3 register [Address 031116, 031016] TB3
Timer B4 register [Address 031316, 031216] TB4
Timer B5 register [Address 031516, 031416] TB5

Can be set to 000016 to FFFF16

Setting clock prescaler reset flag

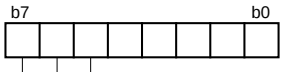
(This function is effective when f_{C32} is selected as the count source. Reset the prescaler for generating f_{C32} by dividing the XCIN by 32.)



Clock prescaler reset flag [Address 034116]
CPSRF

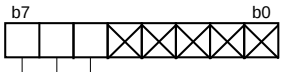
Clock prescaler reset flag
0 : No effect
1 : Prescaler is reset (When read, the value is “0”)

Setting count start flag



Count start flag
[Address 034016]
TABSR

Timer B0 count start flag
Timer B1 count start flag
Timer B2 count start flag



Timer B3,4,5 count start flag
[Address 030016]
TBSR

Timer B3 count start flag
Timer B4 count start flag
Timer B5 count start flag

Start count

4.0 Programming Code

```
;***************************************************************************************
;
;   M16C/80 Program Collection
;
;   FILE NAME : rjj05b0134_src.a30
;   CPU       : M16C/80 Group
;   FUNCTION  : Operation of Timer B
;               (timer mode)
;   HISTORY   : 2003.06.16  Ver 1.00
;
;   Copyright(C)2003, Renesas Technology Corp.
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;   All rights reserved.
;
;***************************************************************************************
;***************************************************************************************
;       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
;
```

```
;===============================================================================
;       TimerB (timer mode)
;===============================================================================
        ; Selecting timer mode and functions
        MOV.B    #01000000B, tb0mr
;                 ||||||++---------;Selection of timer mode
;                 ||||++-----------;Invalid in timer mode
;                 |||+-------------;Fixed to "0" in timer mode
;                 ||+--------------;Invalid in timer mode
;                 ++---------------;Count source (01:f8)
        ; Setting divide ratio
        MOV.W    #2500-1, tb0      ;(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    #00100000B, tabsr
;                   +-------------;Timer B0 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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