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## 7544 Group

### Timer A Operation (Event Counter Mode)

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#### 1. Abstract

The following article introduces and shows an application example of event counter mode of timer A.

#### 2. Introduction

The explanation of this issue is applied to the following condition:

Applicable MCU: 7544 Group

### 3. Contents

**Outline:** The frequency of the pulse which is input to the P0<sub>0</sub>/CNTR<sub>1</sub> pin ("H" active) is measured by the number of events in a certain period.

**Specifications:** The count source of timer A is input from the P0<sub>0</sub>/CNTR<sub>1</sub> pin, and the timer A starts counting the count source. Clock ( $f(X_{IN}) = 8 \text{ MHz}$ ) is divided by timer X to detect 1 ms. The frequency of the pulse input to the P0<sub>0</sub>/CNTR<sub>1</sub> pin is calculated by the number of events counted within 1 ms.  
Operation clock:  $f(X_{IN}) = 8 \text{ MHz}$ , high-speed mode

#### 3.1 Example of Measurement Method of Frequency

Figure 1 shows an example of measurement method of frequency.

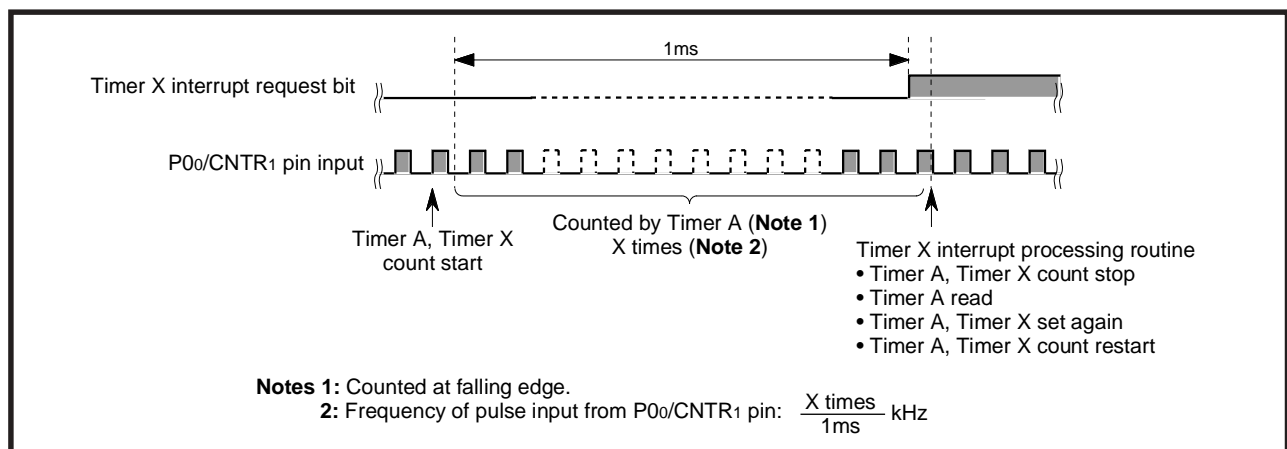


Figure 1 Example of measurement method of frequency

#### 3.2 Example of Control Procedure

Figure 2 shows an example of control procedure.

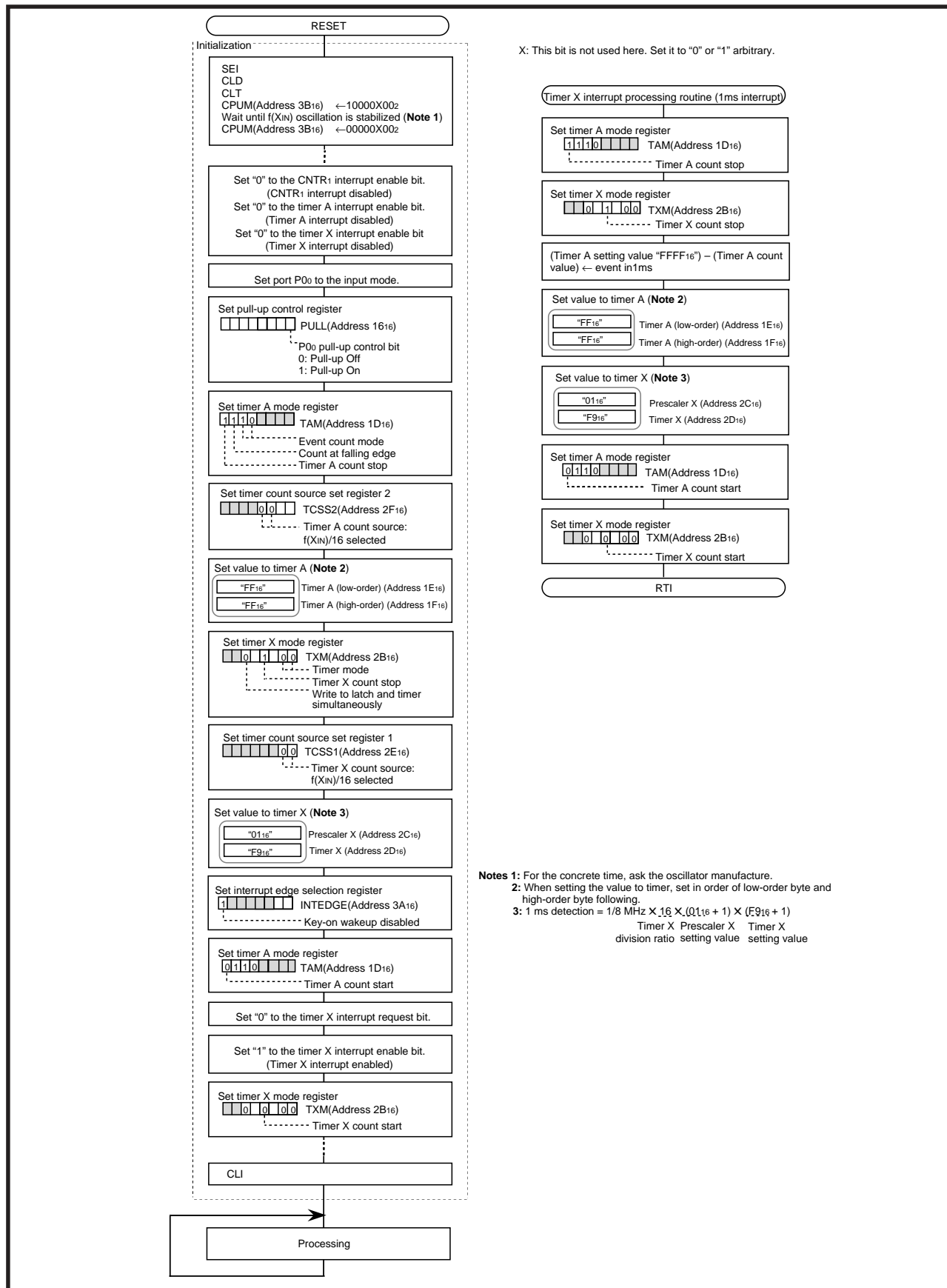


Figure 2 Example of control procedure

## 4. Sample Programming Code

[Reset Start •• Main Routine Process]

```

RESET:
    SEI                      ; Interrupt disable
    CLD
    CLT
;
    LDX  #$FF                ; Set stack bottom
    TXS
;
    LDM  #%10000000,CPUM     ; Set CPU mode register
;
; Wait f(XIN) oscillation stabilizing time
;
    LDM  #%00000000,CPUM     ; Set CPU mode register
;
    LDA  #0
    LDX  #>RAM_top
RAM_clear:
    STA  $00,X
    INX
    BNE  RAM_clear
;
    CLB  6,ICON1             ; CNTR1 interrupt control disable
    CLB  2,ICON2             ; TimerA interrupt control disable
    CLB  7,ICON1             ; TimerX interrupt control disable
;
    LDM  #%00000000,P0D      ; Set Port P0 direction register
;
    CLB  0,PULL              ; Port P00 Pull_up off
;
    LDM  #%11100000,TAM      ; Set Timer A mode register
;
    LDM  #%00000000,TCSS2    ; Set Timer count source set register 2
;
    LDM  #$FF,TAL            ; Set Timer A (low-order)
    LDM  #$FF,TAH            ; Set Timer A (high-order)
;
    LDM  #%00001000,TXM      ; set timer X mode register
    LDM  #%00000000,TCSS1    ; Set Timer count source set register 1
;
    LDM  #$01,PREX           ; Set Prescaler X
    LDM  #$F9,TX             ; Set Timer X
;
    LDM  #%10000000,INTEDGE  ; Set Interrupt edge selection register
;
    LDM  #%01100000,TAM      ; Set Timer A mode register
;
    CLB  7,IREQ1             ; TimerX interrupt request clear
;
    SEB  7,ICON1             ; TimerX interrupt enable
;
    LDM  #%00000000,TXM      ; Set Timer X mode register
;
    CLI
;
__MAIN:
    BRA  __MAIN
;

```

Figure 3 Sample Programming Code (1)

**[Timer X Interrupt Process]**

```

__int_TimerX:
    CLD
    CLT
    PHA
;
    SEB 7,TAM           ; stop timer A count
    SEB 3,TXM           ; stop timer X count
;
    SEC
    LDA #$FF
    SBC TAL
    STA RESULT+0
    LDA #$FF
    SBC TAH
    STA RESULT+1
;
    LDM #$FF,TAL
    LDM #$FF,TAH
;
    LDM #$01,PREX       ; Set Prescaler X
    LDM #$F9,TX         ; Set Timer X
;
    CLB 7,TAM           ; start timer A count
    CLB 3,TXM           ; start timer X count
;
    PLA
    RTI
;

```

**Figure 4 Sample Programming Code (2)**

## 5. Reference

Data Sheet  
7544 Group Data sheet  
7544 Group Data sheet (QzROM Version)

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REVISION HISTORY	7544 Group Timer A Operation (Event Counter Mode)
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Rev.	Date	Description	
		Page	Summary
1.00	Apr 01, 2003	-	First Edition issued
2.00	Nov 12, 2004	4-5	Sample Programming Code added.

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