

## 7544 Group

### Timer X Operation (Timer Mode)

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#### **1. Abstract**

The following article introduces and shows an application example of timer mode of timer X.

#### **2. Introduction**

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

Applicable MCU: 7544 Group

### 3. Contents

**Outline:** The input clock is divided by the timer so that the clock is counted up every 250 ms intervals.

- Specifications:**
- The  $f(X_{IN}) = 4.19 \text{ MHz}$  ( $2^{22} \text{ Hz}$ ) is divided by timer X.
  - The clock is counted up in the timer X interrupt processing routine (timer X interrupt occurs every 250 ms).
  - Operation clock:  $f(X_{IN}) = 4.19 \text{ MHz}$ , high-speed mode

### 3.1 Connection of Timer and Setting of Division Ratio

Figure 1 shows the connection of timer and setting of division ratio.

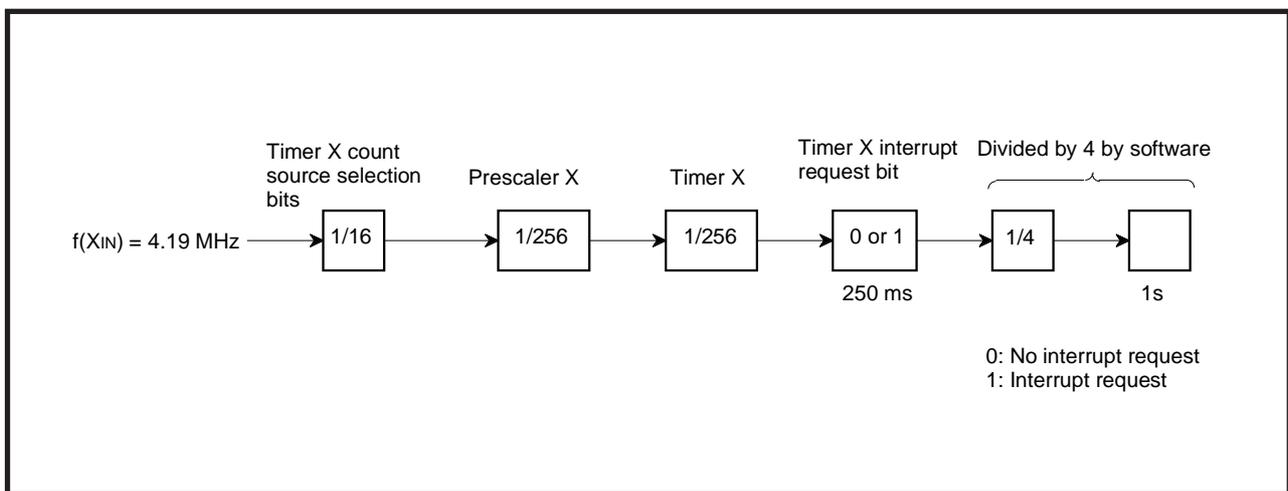


Figure 1 Connection of timer and setting of division ratio

### 3.2 Example of Control Procedure

Figure 2 shows an example of control procedure.

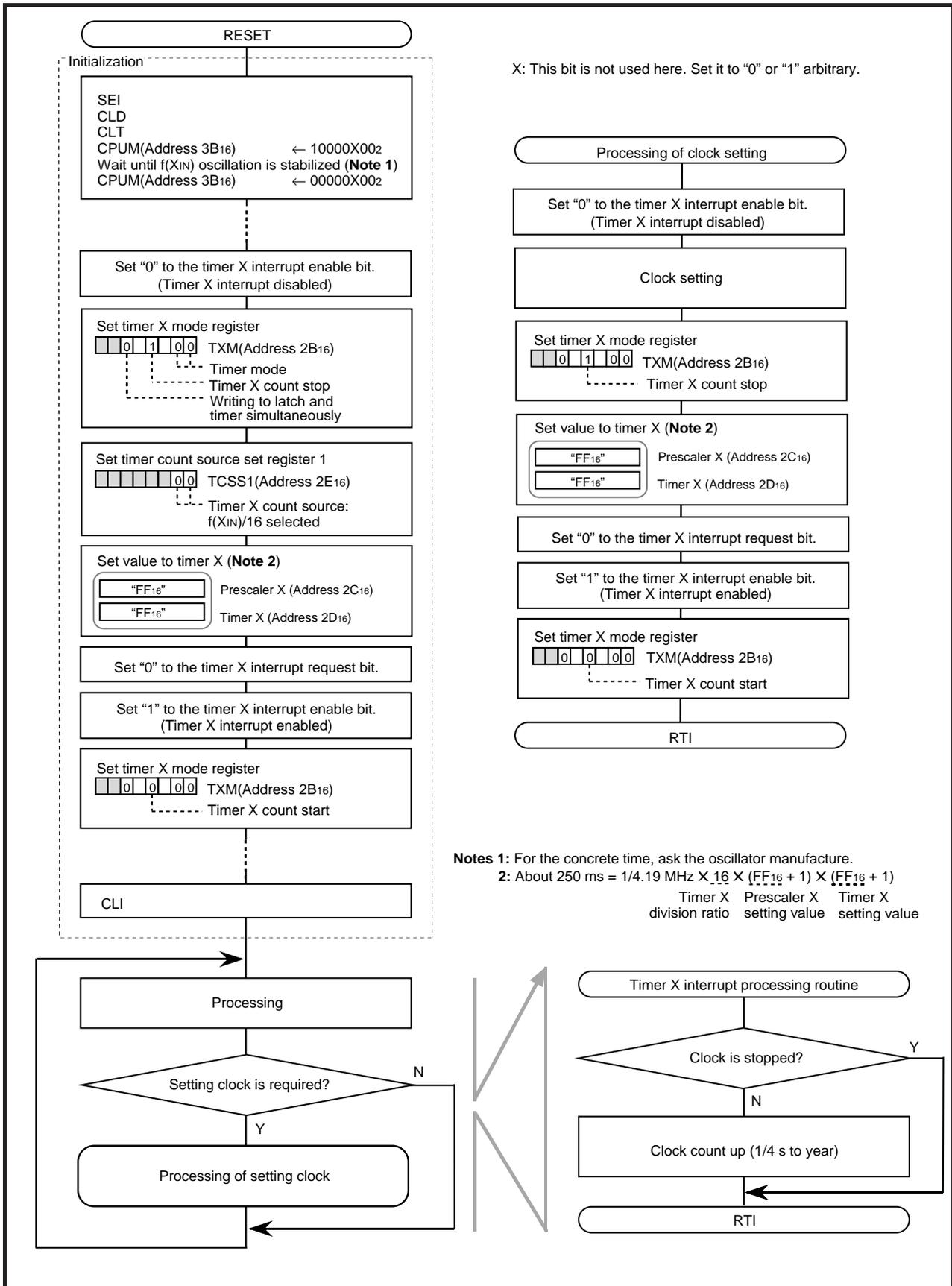


Figure 2 Example of control procedure

#### 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 $00,X
    INX
    BNE RAM_clear
;
    CLB 7,ICON1           ; TimerX interrupt disable
;
    LDM #%00001000,TXM    ; Set Timer X mode register
;
    LDM #%00000000,TCSS1  ; Set Timer count source set register 1
;
    LDM #$FF,PREX         ; Set Prescaler X
    LDM #$FF,TX           ; Set Timer X
;
    CLB 7,IREQ1           ; TimerX interrupt request clear
;
    SEB 7,ICON1           ; TimerX interrupt control enable
;
    CLB 3,TXM             ; start timer X count
;
    SEB f_REQ_SET
    SEB f_STOP_CLOCK
;
    CLI
;
__MAIN:
    BBC f_REQ_SET,__MAIN
;
    JSR SET_CLOCK
;
    BRA __MAIN
;
```

Figure 3 Sample Programming Code (1)

**[Clock Setting Process]**

```

SET_CLOCK:
    CLB  7,ICON1           ; TimerX interrupt disable
;
    LDM  #0,hour          ; set clock [0:00]
    LDM  #0,minute
    LDM  #0,second
    LDM  #0,BASE_250ms
;
    CLB  f_REQ_SET
    CLB  f_STOP_CLOCK
;
    SEB  3,TXM           ; stop timer X count
;
    LDM  #$FF,PREX       ; Set Prescaler X
    LDM  #$FF,TX        ; Set Timer X
;
    CLB  7,IREQ1         ; TimerX interrupt request clear
    SEB  7,ICON1         ; TimerX interrupt control enable
;
    CLB  3,TXM           ; start timer X count
;
    RTS
;

```

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

[Timer X Interrupt Process]

```

__int_TimerX:
    CLD
    CLT
    PHA
;
    BBS f_STOP_CLOCK, __int_TimerX_RT
;
    CLC                                ;Base timer countup
    LDA BASE_250ms
    ADC #1
    STA BASE_250ms
    CMP #4
    BCC __int_TimerX_RT
    LDM #0, BASE_250ms
;
    CLC                                ;Sec timer countup
    LDA second
    ADC #1
    STA second
    CMP #60
    BCC __int_TimerX_RT
    LDM #0, second
;
    CLC                                ;Min timer countup
    LDA minute
    ADC #1
    STA minute
    CMP #60
    BCC __int_TimerX_RT
    LDM #0, minute
;
    CLC                                ;Hour timer countup
    LDA hour
    ADC #1
    STA hour
    CMP #24
    BCC __int_TimerX_RT
    LDM #0, hour
;
__int_TimerX_RT:
    PLA
    RTI
;

```

Figure 5 Sample Programming Code (3)

## 5. Reference

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

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		Page	Summary
1.00	Apr 01, 2003	-	First Edition issued
2.00	Nov 12, 2004	4-6	Sample Programming Code added.

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