Timer

Networked Embedded Applications and Technologies Lab

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Lab8

- 利用RDx接四個LEDx，並利用Timer2和interrupt讓LED1點亮2秒後LED2點亮，再2秒後LED3點亮，再2秒後LED4點亮。當LED通通點亮後則全部熄滅1秒。

- 可以用 C 或是 Assembly 來寫。

- 可自由選用頻率(1M、2M、4M、8M)和預除器/後除器，並將如何計算出是1s和2s講解給助教聽。

- 請列出算式。

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❑ ## Hint:

13.1 Timer2 Operation

In normal operation, TMR2 is incremented from 00h on each clock (FOSC/4). A 4-bit counter/prescaler on the clock input gives direct input, divide-by-4 and divide-by-16 prescale options; these are selected by the prescaler control bits, T2CKPS<1:0> (T2CON<1:0>). The value of TMR2 is compared to that of the Period register, PR2, on each clock cycle. When the two values match, the comparator generates a match signal as the timer output. This signal also resets the value of TMR2 to 00h on the next cycle and drives the output counter/postscaler (see **Section 13.2 "Timer2 Interrupt"**).

13.2 Timer2 Interrupt

Timer2 also can generate an optional device interrupt. The Timer2 output signal (TMR2 to PR2 match) provides the input for the 4-bit output counter/postscaler. This counter generates the TMR2 match interrupt flag which is latched in TMR2IF (PIR1<1>). The interrupt is enabled by setting the TMR2 Match Interrupt Enable bit, TMR2IE (PIE1<1>).

A range of 16 postscale options (from 1:1 through 1:16 inclusive) can be selected with the postscaler control bits, T2OUTPS<3:0> (T2CON<6:3>).

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REGISTER 13-1: T2CON: TIMER2 CONTROL REGISTER

U-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
—	T2OUTPS3	T2OUTPS2	T2OUTPS1	T2OUTPS0	TMR2ON	T2CKPS1	T2CKPS0
bit 7							bit 0

Legend:			
R = Readable bit	W = Writable bit	U = Unimplemented bit, read as '0'	
-n = Value at POR	'1' = Bit is set	'0' = Bit is cleared	x = Bit is unknown

bit 7   **Unimplemented:** Read as '0'

bit 6-3   **T2OUTPS<3:0>:** Timer2 Output Postscale Select bits

         0000 = 1:1 Postscale
         0001 = 1:2 Postscale
         •
         •
         •
         1111 = 1:16 Postscale

bit 2   **TMR2ON:** Timer2 On bit

         1 = Timer2 is on
         0 = Timer2 is off

bit 1-0   **T2CKPS<1:0>:** Timer2 Clock Prescale Select bits

         00 = Prescaler is 1
         01 = Prescaler is 4
         1x = Prescaler is 16

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TABLE 13-1:   REGISTERS ASSOCIATED WITH TIMER2 AS A TIMER/COUNTER

Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Reset Values on page
INTCON	GIE/GIEH	PEIE/GIEL	TMR0IE	INT0IE	RBIE	TMR0IF	INT0IF	RBIF	49
PIR1	PSPIF[1]	ADIF	RCIF	TXIF	SSPIF	CCP1IF	TMR2IF	TMR1IF	52
PIE1	PSPIE[1]	ADIE	RCIE	TXIE	SSPIE	CCP1IE	TMR2IE	TMR1IE	52
IPR1	PSPIP[1]	ADIP	RCIP	TXIP	SSPIP	CCP1IP	TMR2IP	TMR1IP	52
TMR2	Timer2 Register								50
T2CON	—	T2OUTPS3	T2OUTPS2	T2OUTPS1	T2OUTPS0	TMR2ON	T2CKPS1	T2CKPS0	50
PR2	Timer2 Period Register								50