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**Date:** 09 Mar 2010

**Product Category:** 8-bit Microcontrollers

**Device Family:**  

**Notification subject:** ERRATA - Timer1 Module Data Sheet Errata

**Notification text:** SYST-09DDUJ756  
Microchip has released a new DeviceDoc for the Timer1 Module Data Sheet Errata of devices. If you are using one of these devices please read the document located at [Timer1 Module Data Sheet Errata](#).

**Attachment(s):** [Timer1 Module Data Sheet Errata](#)

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## Product Change Notification - SYST-09DDUJ756

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Parts Affected

PIC12F629  
PIC12F675  
PIC14000  
PIC16C62A  
PIC16C62B  
PIC16C63  
PIC16C63A  
PIC16C64A  
PIC16C65A  
PIC16C66  
PIC16C67  
PIC16C72  
PIC16C72A  
PIC16C73A  
PIC16C73B  
PIC16C745  
PIC16C74A  
PIC16C74B  
PIC16C76  
PIC16C765  
PIC16C77  
PIC16C773  
PIC16C774  
PIC16C923  
PIC16C924  
PIC16C925  
PIC16C926  
PIC16F676  
PIC16F72  
PIC16F73  
PIC16F74  
PIC16F76  
PIC16F77  
PIC16F818  
PIC16F819  
PIC16F870  
PIC16F871  
PIC16F872  
PIC16F873  
PIC16F873A  
PIC16F874  
PIC16F874A  
PIC16F876  
PIC16F876A

PIC16F877  
PIC16F877A  
PIC17C42A  
PIC17C43  
PIC17C44  
PIC17C752  
PIC17C756A  
PIC17C762  
PIC17C766  
PIC18C242  
PIC18C252  
PIC18C442  
PIC18C452  
PIC18C601  
PIC18C658  
PIC18C801  
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PIC18F4320  
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PIC18F6720  
PIC18F8620  
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PIC18F4455  
PIC18F4550  
PIC12F635  
PIC16F639  
PIC18F8390  
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PIC18F67J10

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PIC18F65J15  
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PIC18F4321  
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PIC18F96J60

PIC12F615  
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PIC16F884  
PIC16F886  
PIC16F887  
PIC18F4685  
PIC18F84J90  
PIC18F85J90  
PIC18F83J90  
PIC18F65J90  
PIC18F63J11  
PIC18F64J11  
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PIC18F66J16  
PIC18F66J11  
PIC18F85J50  
PIC18F67J50  
PIC18F66J55  
PIC18F66J50  
PIC18F65J50  
PIC18F87J50  
PIC12F609  
PIC16F610  
PIC16F882  
PIC12F617



# TIMER1 MODULE

## Timer1 Module Data Sheet Errata

### Clarifications/Corrections to the Data Sheet:

In the Device data sheets listed below, the following clarifications and corrections should be noted. Any silicon issues related to the Timer1 Module will be reported in a separate silicon errata. Please check the Microchip web site for any existing issues.

Device	Data Sheet	Device	Data Sheet	Device	Data Sheet	Device	Data Sheet
PIC12F609	DS41302	PIC16F716	DS41206	PIC18F2321	DS39689	PIC18F6585	DS30491
PIC12HV609		PIC16F737	DS30498	PIC18F4321		PIC18F6680	
PIC12F615		PIC16F747		PIC18F2331	PIC18F8585		
PIC12HV615		PIC16F767		PIC18F2431	PIC18F8680		
PIC12F617				PIC18F4331	PIC18F24J10		
PIC12F629	DS41190	PIC16F777	DS41249	PIC18F4431	PIC18F25J10	DS39682	
PIC12F675		PIC16F785		PIC18F2439	PIC18F44J10		
PIC12F635	DS41232	PIC16HV785	DS39598	PIC18F2539	PIC18F45J10	DS39774	
PIC16F636		PIC16F818		PIC18F4439	PIC18F63J11		
PIC16F639		PIC16F819		PIC18F4539	PIC18F64J11		
PIC12F683	DS41211	PIC16F870	DS30569	PIC18F2455	DS39632	DS39770	
PIC14000	DS40122	PIC16F871		PIC18F2550			PIC18F65J11
PIC16C62A	DS30234	PIC16F872	DS30221	PIC18F4455	PIC18F83J11		
PIC16C63		PIC16F873	DS30292	PIC18F4550	PIC18F84J11		
PIC16C64A		PIC16F874		PIC18F2480	PIC18F85J11		
PIC16C65A		PIC16F876		PIC18F4480	PIC18F63J90		
PIC16C66		PIC16F877		PIC18F4580	PIC18F64J90		
PIC16C67	PIC16F873A	PIC18F2510	DS39636	PIC18F65J90	DS39770		
PIC16C62B	DS35008	PIC16F874A		PIC18F2610		PIC18F83J90	
PIC16C72A		PIC16F876A		PIC18F4510		PIC18F84J90	
PIC16C63A	DS30605	PIC16F877A	DS41291	PIC18F4610	PIC18F85J90	DS39663	
PIC16C65B		PIC16F882		PIC18F2520	PIC18F65J10		
PIC16C73B		PIC16F883		PIC18F2585	PIC18F65J15		
PIC16C74B	DS30390	PIC16F884	DS41250	PIC18F4520	PIC18F66J10		
PIC16C72		PIC16F886		PIC18F2680	PIC18F66J15		
PIC16C73A		PIC16F887		PIC18F2585	PIC18F67J10		
PIC16C74A		PIC16F913		PIC18F2680	PIC18F67J10		
PIC16C76		PIC16F914		PIC18F4585	PIC18F85J10		
PIC16C77	DS41124	PIC16F916	DS39625	PIC18F4680	PIC18F85J15		
PIC16C745		PIC16F917		PIC18F2620	PIC18F86J10		
PIC16C765		PIC16F946		PIC18F4620	PIC18F85J15		
						PIC18F87J10	

# TIMER1 MODULE

Device	Data Sheet	Device	Data Sheet	Device	Data Sheet	Device	Data Sheet
PIC16C773	DS30275	PIC17C42A	DS30412	PIC18F4685	DS39761	PIC18F65J50	DS39775
PIC16C774		PIC17C43		PIC18F6390	DS39629	PIC18F66J50	
PIC16C923	DS30444	PIC17C44	DS30289	PIC18F6490		PIC18F66J55	
PIC16C924		PIC17C752		PIC18F8390	PIC18F85J50		
PIC16C925	DS39544	PIC17C756A	DS39026	PIC18F8490	PIC18F85J55	PIC18F87J50	
PIC16C926		PIC17C762		PIC18F6520	DS39609		
PIC16F72	DS39597	PIC17C766	DS39026	PIC18F6620		PIC18F66J16	DS39778
PIC16F73	DS30325	PIC18C242		PIC18F6720	PIC18F67J11		
PIC16F74		PIC18C252		PIC18F8520	PIC18F86J11		
PIC16F76		PIC18C442		PIC18F8620	DS39612	PIC18F86J16	
PIC16F77		PIC18C452	PIC18F8720	PIC18F87J11			
PIC16F87	DS30487	PIC18C601	DS39541	PIC18F6525	PIC18F86J60	DS39762	
PIC16F88		PIC18C801		PIC18F6621	PIC18F66J65		
PIC16F610	DS41288	PIC18C658	DS30475	PIC18F8525	PIC18F66J60		
PIC16HV610		PIC18C858		PIC18F8621	PIC18F66J65		
PIC16F616		PIC18F242	DS39564	PIC18F6527	PIC18F67J60		
PIC16HV616	PIC18F252	PIC18F6622		PIC18F86J60			
PIC16F627A	DS40044	PIC18F442		PIC18F6627	PIC18F86J65		
PIC16F628A		PIC18F452		PIC18F6722	PIC18F87J60		
PIC16F648A		PIC18F248	PIC18F8527	PIC18F96J60			
PIC16F630	DS40039	PIC18F258	DS41159	PIC18F8622	PIC18F96J65		
PICF676		PIC18F458		PIC18F8627	PIC18F97J60		
PIC16F631	DS41262	PIC18F1220	DS39605	PIC18F8722			
PIC16F677		PIC18F1320					
PIC16F685		PIC18F1230	DS39758				
PIC16F687		PIC18F1330					
PIC16F689		PIC18F2220	DS39599				
PIC16F690		PIC18F2330					
PIC16F684	DS41202	PIC18F4220					
PIC16F688	DS41203	PIC18F4320					



# TIMER1 MODULE

## 1. Asynchronous Counter

When Timer1 is started or updated, the timer needs to see a falling edge from the external clock source before a rising edge can increment the counter. If writes to TMR1H and TMR1L are not completed while the external clock pulse is still high, Timer1 will miss counting the first clock pulse after the update.

When using an external crystal, the pulse width from rising to falling edge is temperature dependent and may decrease with temperature. As a result, the timer may require an additional oscillation to overflow.

Code examples are given for the affected devices:

- PIC12/14/16/17 devices – Example 1 and Example 2
- PIC18 devices – Example 3

Both examples include code to wait for Timer1 to increment twice between the `RTCisr` and `Update` labels.

In PIC18 devices, it is not possible to reliably update Timer1 in a *low-priority* interrupt. A high-priority interrupt could occur at any time and unexpectedly delay the TMR1 update.

PIC18 devices also include Timer3 which is functionally identical to Timer1.

### Work around

Switching Timer1 to the main system oscillator after reloading, the timer ensures the timer will see a falling edge before switching back to the external clock source.

Due to the time from Timer1 overflow to the reload being application specific, wait for the timer to increment before beginning the reload sequence. This ensures the timer does not miss a rising edge during reload. The timing of the clock source changing is critical and is detailed in Example 1 and Example 2.

### EXAMPLE 1: PIC12/14/16/17 CODE EXAMPLE FOR 1 SECOND OVERFLOW PERIOD WITH 32.786 KHZ OSCILLATOR

```
BTFSC    TMR1L,0
GOTO     $-1
BTFSS    TMR1L,0
GOTO     $-1           ;Timer has just incremented, 31 µs before next rising edge to
                       ;complete reload

Update:

    BCF    T1CON,TMR1CS ;Select system clock for Timer1
    BSF    TMR1H,7      ;Timer1 high byte 0x80
    BCF    T1CON,TMR1ON ;Timer1 off
    BSF    T1CON,TMR1C  ;Select external crystal
    BSF    T1CON,TMR1ON ;Timer1 on

Critical Timing of code sequence for instructions following last write to TMR1L or TMR1H.
```

# TIMER1 MODULE

## EXAMPLE 2: PIC12/14/16/17 CODE EXAMPLE FOR OVERFLOW PERIODS OTHER THAN 1 SECOND OR USING AN OSCILLATOR OTHER THAN 32.768 KHZ

```
BTFSCL    TMR1L, 0
GOTO      $-1
BTFSCL    TMR1L, 0
GOTO      $-1                ;Timer has just incremented, 31µs before next rising
                                edge to complete reload.

BCF       T1CON, TMR1CS      ;Select system clock for Timer1.
MOVWF    TMR1, W             ;Sample low byte of Timer1 before increments.
ADDWF    TMR1_Reload_lo, F   ;Add reload value for low byte
BTFSCL    STATUS, C          ;if this generates a carry then
INCF     TMR1_Reload_hi, F   ;modify the reload value for the high byte.

MOVWF    TMR1_Reload_hi, W   ;Reload Timer1 high byte.
MOVWF    TMR1H

MOVWF    TMR1_Reload_lo, W   ;Reload Timer1 low byte.
MOVWF    TMR1L

BCF       T1CON, TMR1ON      ;Timer1 off.
BSF       T1CON, TMR1CS      ;Select external crystal.
BSF       T1CON, TMR1ON      ;Timer1 on.
```

Critical Timing of code sequence for instructions.

## EXAMPLE 3: PIC18 HIGH-PRIORITY INTERRUPT SERVICE ROUTINE

```
HIntVector code 0x0008      ; (3-4Tcy), fixed interrupt latency
goto      HighISR          ; (3Tcy) jump to high priority ISR code

                                code          ; unprotected code space
HighISR:
    btfss  PIR1,TMR1IF      ; (1Tcy) TMR1 overflow?
    goto   NextISR          ; (2Tcy) No, check another interrupt source

; Insert the next 4 lines of code when TMR1 can not
; be reliably updated before clock pulse goes low
RTCisr:
    btfsc  TMR1L,0          ; wait for TMR1L<0> to become clear
    bra    $-2              ; may already be clear (loops for 0 to 30.5us)
    btfss  TMR1L,0          ; wait for TMR1L<0> to become set
    bra    $-2              ; (loops for 30.5us)

; If TMR1 update can be completed before clock pulse
; goes low, start update here
Update:
    bsf    TMR1H,7          ; reload for next 1 second overflow
    bcf    PIR1,TMR1IF      ; clear flag
    incf   Seconds,F        ; record second
    retfie FAST

NextISR:
                                ; Another interrupt source...
    ....                    ; code for other interrupts, if needed

retfieFAST
```

## REVISION HISTORY

Rev A Document (7/2007)

Initial release of this errata.

Rev B Document (03/2010)

Added PIC12F617 device to the Clarifications/  
Corrections to the Data Sheet section.

# TIMER1 MODULE

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NOTES:

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