PIC16F7X7

PIC16F7X7 Rev. A2 Silicon/Data Sheet Errata

The PIC16F7X7 Rev. A2 parts you have received conform functionally to the Device Data Sheet (DS30498**C**), except for the anomalies described below.

All of the issues listed here will be addressed in future revisions of the PIC16F7X7 silicon.

The following silicon errata apply only to PIC16F7X7 devices with these Device/Revision IDs:

Part Number	Device ID	Revision ID
PIC16F737	00 1011 101	00001
PIC16F747	00 1011 111	00001
PIC16F767	00 1101 111	00001
PIC16F777	00 1110 101	00001

1. Module: Internal RC Oscillator

A high Sleep current will exist when the following condition is met and procedures are followed:

CONDITION: FOSC<2:0> (Configuration Word Register 1) bits are configured for any oscillator selection other than the internal RC oscillator.

PROCEDURE:

1. Clock switch occurs anywhere in the application code where the internal RC oscillator is selected via the SCS bits ('10').
2. Sleep mode is entered while the SCS bits are configured for the internal RC oscillator ('10').

Work around

Before Sleep mode is entered, configure or clear the SCS bits ('00') to switch back to the primary clock source that is defined by FOSC<2:0> (Configuration Word Register 1).

Date Codes that pertain to this issue:

All date codes.

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2. Module: Internal RC Oscillator IOFS bit

The device data sheet states when an INTOSC frequency is selected (125, 250, 500 kHz, 1, 2, 4, 8 MHz), the frequency will be stable when the IOFS bit becomes set (IOFS = 1) at 4 ms. The following applies for applications relying on time dependent code.

Under the following conditions, any of the INTOSC frequencies may not be stable when IOFS becomes set (IOFS = 1). Devices may vary from one to the next and may take as long as 60 ms to become stable.

1. Wake from Sleep, internal RC oscillator is selected via the SCS bits or Configuration Word 1 and the IRCF bits are configured for an INTOSC frequency.
2. POR is executed, internal RC oscillator is selected via the SCS bits or Configuration Word 1 and the IRCF bits are configured for an INTOSC frequency.

3. The INTRC (31.25 kHz) is clocking the device and a switch to an INTOSC frequency is executed via modification of the IRCF bits.
4. An alternative oscillator selection is clocking the device (i.e., HS mode) and a clock switch to the internal RC oscillator is executed via the SCS bits with the IRCF bits configured for an INTOSC frequency.

Work around

Implement the following software delay shown in Example 1 after an INTOSC frequency has been enabled and before any frequency dependent application code is executed. This routine will delay application execution approximately 2K-150K TCY (instruction cycles are dependent upon the INTOSC frequency) to ensure a stable INTOSC frequency.

Date Codes that pertain to this issue:

All date codes.

EXAMPLE 1: DELAY ROUTINE

```
DlyVarH     equ     <define address based on application requirements>
DlyVarL     equ     <define address based on application requirements>

;Load the delay variable DlyVarH with the following value for the selected frequency:
    ;125kHz 0x0300
    ;250kHz 0x0600
    ;500kHz 0x0C00
    ;1MHz   0x1900
    ;2MHz   0x3100
    ;4MHz   0x6200

delay                           ;insure the correct data memory bank is selected
                                ; for access of data variables
    CLRF    DlyVarL             ;initialize low delay variable
    MOVLW   0x62                ;initialize high delay variable
    MOVWF   DlyVarH

dly_loop
    DECFSZ  DlyVarL,f           ;decrement low variable
    GOTO    dly_loop
    DECFSZ  DlyVarH,f           ;decrement high variable
    GOTO    dly_loop
RETURN                          ;delay done
```

3. Module: Internal RC Oscillator

When any one of the seven INTOSC frequencies is enabled by the following conditions, it is possible for the oscillator to overshoot the selected frequency:

1. A clock switch from INTRC (31 kHz) to an INTOSC (125 kHz-8 MHz) frequency via the IRCF bits (OSCCON register).
2. Exit from Sleep mode with the IRCF bits already configured for an INTOSC frequency.
3. Executing a clock source switch via the SCS bits (OSCCON register) to the internal RC oscillator with the IRCF bits already configured for an INTOSC frequency.

If the selected frequency is 8 MHz, then the Voltage versus Frequency specification of the device may be violated.

Work around

When it is required for the application to run at 8 MHz, it is recommended that the application does not start executing code at 8 MHz until the 60 ms firmware delay (see issue 2) has completed. During the 60 ms settling period, the application can execute code up to 4 MHz. Upon completion of the 60 ms firmware delay, the 8 MHz can be selected via the IRCF bits.

Date Codes that pertain to this issue:

All date codes.

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Clarifications/Corrections to the Data Sheet:

In the Device Data Sheet (DS30498**C**), the following clarifications and corrections should be noted.

1. Module: DC Characteristics (BOR Specifications)

The specifications and parameter numbers for the Brown-out Voltage limits (V_{BOR}, originally parameter D005) in **Section 18.1 "DC Characteristics: Supply Voltage"** of the Device Data Sheet have been changed.

The new information is shown in **bold** text.

18.1   DC Characteristics: Supply Voltage
PIC16F737/747/767/777 (Industrial)
PIC16LF737/747/767/777 (Industrial)

PIC16LF7X7 (Industrial)			Standard Operating Conditions (unless otherwise stated) Operating temperature -40°C ≤ T$_A$ ≤ +85°C for industrial				
PIC16F7X7 (Industrial, Extended)			**Standard Operating Conditions (unless otherwise stated)** Operating temperature -40°C ≤ T$_A$ ≤ +85°C for industrial -40°C ≤ T$_A$ ≤ +125°C for extended				
Param No.	**Symbol**	**Characteristic**	**Min**	**Typ**	**Max**	**Units**	**Conditions**
	V$_{BOR}$	**Brown-out Reset Voltage**					
D005D		PIC16LF7X7	Industrial Low Voltage **(-10°C to +85°C)**				
		BORV1:BORV0 = 11	**N/A**	**N/A**	**N/A**	V	**Reserved**
		BORV1:BORV0 = 10	**2.50**	**2.72**	**2.94**	V	
		BORV1:BORV0 = 01	**3.88**	**4.22**	**4.56**	V	
		BORV1:BORV0 = 00	**4.18**	**4.54**	**4.90**	V	
D005F		PIC16LF7X7	Industrial Low Voltage **(-40°C to -10°C)**				
		BORV1:BORV0 = 11	**N/A**	**N/A**	**N/A**	V	**Reserved**
		BORV1:BORV0 = 10	**2.34**	**2.72**	**3.10**	V	
		BORV1:BORV0 = 01	**3.63**	**4.22**	**4.81**	V	
		BORV1:BORV0 = 00	**3.90**	**4.54**	**5.18**	V	
D005G		PIC16F7X7	Industrial **(-10°C to +85°C)**				
		BORV1:BORV0 = 1x	**N/A**	**N/A**	**N/A**	V	**Reserved**
		BORV1:BORV0 = 01	**3.88**	**4.22**	**4.56**	V	**(Note 2)**
		BORV1:BORV0 = 00	**4.18**	**4.54**	**4.90**	V	
D005H		PIC16F7X7	Industrial **(-40°C to -10°C)**				
		BORV1:BORV0 = 1x	**N/A**	**N/A**	**N/A**	V	**Reserved**
		BORV1:BORV0 = 01	**3.63**	**4.22**	**4.81**	V	**F$_{MAX}$ = 16 MHz**
		BORV1:BORV0 = 00	**3.90**	**4.54**	**5.18**	V	**(Note 2)**
D005J		PIC16F7X7	Extended **(-10°C to +85°C)**				
		BORV1:BORV0 = 1x	**N/A**	**N/A**	**N/A**	V	**Reserved**
		BORV1:BORV0 = 01	**3.88**	**4.22**	**4.56**	V	**(Note 2)**
		BORV1:BORV0 = 00	**4.18**	**4.54**	**4.90**	V	
D005K		PIC16F7X7	Extended **(-40°C to -10°C, +85°C to +125°C)**				
		BORV1:BORV0 = 1x	**N/A**	**N/A**	**N/A**	V	**Reserved**
		BORV1:BORV0 = 01	**3.63**	**4.22**	**4.81**	V	**F$_{MAX}$ = 16 MHz**
		BORV1:BORV0 = 00	**3.90**	**4.54**	**5.18**	V	**(Note 2)**

Legend: Shading of rows is to assist in readability of the table.

Note   1:   This is the limit to which V$_{DD}$ can be lowered in Sleep mode, or during a device Reset, without losing RAM data.

2:   **When BOR is on and BORV<1:0> = 0x, the device will operate correctly at 20 MHz for any V$_{DD}$ at which the BOR allows execution.**

2. Module: LVD Characteristics

The specifications and parameter numbers for the Low-Voltage Detect thresholds (V$_{LVD}$, originally parameter D420) in Table 18-3 of the Device Data Sheet have been changed.

The new information is shown in **bold** text.

TABLE 18-3: LOW-VOLTAGE DETECT CHARACTERISTICS

PIC16LF7X7 (Industrial)				Standard Operating Conditions (unless otherwise stated) Operating temperature -40°C ≤ T$_A$ ≤ +85°C for industrial				
PIC16F7X7 (Industrial, Extended)				**Standard Operating Conditions (unless otherwise stated)** Operating temperature -40°C ≤ T$_A$ ≤ +85°C for industrial -40°C ≤ T$_A$ ≤ +125°C for extended				
Param No.	**Symbol**	**Characteristic**		**Min**	**Typ†**	**Max**	**Units**	**Conditions**
D420D	V$_{LVD}$	LVD Voltage on V$_{DD}$ Transition High-to-Low		Industrial Low Voltage **(-10°C to +85°C)**				
		PIC16LF7X7	LVDL<3:0> = `0000`	**N/A**	**N/A**	**N/A**	V	Reserved
			LVDL<3:0> = `0001`	**N/A**	**N/A**	**N/A**	V	Reserved
			LVDL<3:0> = `0010`	**2.08**	**2.26**	**2.44**	V	
			LVDL<3:0> = `0011`	**2.26**	**2.45**	**2.65**	V	
			LVDL<3:0> = `0100`	**2.35**	**2.55**	**2.76**	V	
			LVDL<3:0> = `0101`	**2.55**	**2.77**	**2.99**	V	
			LVDL<3:0> = `0110`	**2.64**	**2.87**	**3.10**	V	
			LVDL<3:0> = `0111`	**2.82**	**3.07**	**3.31**	V	
			LVDL<3:0> = `1000`	**3.09**	**3.36**	**3.63**	V	
			LVDL<3:0> = `1001`	**3.29**	**3.57**	**3.86**	V	
			LVDL<3:0> = `1010`	**3.38**	**3.67**	**3.96**	V	
			LVDL<3:0> = `1011`	**3.56**	**3.87**	**4.18**	V	
			LVDL<3:0> = `1100`	**3.75**	**4.07**	**4.40**	V	
			LVDL<3:0> = `1101`	**3.93**	**4.28**	**4.62**	V	
			LVDL<3:0> = `1110`	**4.23**	**4.60**	**4.96**	V	
D420F		LVD Voltage on V$_{DD}$ Transition High-to-Low		Industrial Low Voltage **(-40°C to -10°C)**				
		PIC16LF7X7	LVDL<3:0> = `0000`	**N/A**	**N/A**	**N/A**	V	Reserved
			LVDL<3:0> = `0001`	**N/A**	**N/A**	**N/A**	V	Reserved
			LVDL<3:0> = `0010`	**1.99**	**2.26**	**2.53**	V	
			LVDL<3:0> = `0011`	**2.16**	**2.45**	**2.75**	V	
			LVDL<3:0> = `0100`	**2.25**	**2.55**	**2.86**	V	
			LVDL<3:0> = `0101`	**2.43**	**2.77**	**3.10**	V	
			LVDL<3:0> = `0110`	**2.53**	**2.87**	**3.21**	V	
			LVDL<3:0> = `0111`	**2.70**	**3.07**	**3.43**	V	
			LVDL<3:0> = `1000`	**2.96**	**3.36**	**3.77**	V	
			LVDL<3:0> = `1001`	**3.14**	**3.57**	**4.00**	V	
			LVDL<3:0> = `1010`	**3.23**	**3.67**	**4.11**	V	
			LVDL<3:0> = `1011`	**3.41**	**3.87**	**4.34**	V	
			LVDL<3:0> = `1100`	**3.58**	**4.07**	**4.56**	V	
			LVDL<3:0> = `1101`	**3.76**	**4.28**	**4.79**	V	
			LVDL<3:0> = `1110`	**4.04**	**4.60**	**5.15**	V	
D420G	V$_{LVD}$	LVD Voltage on V$_{DD}$ Transition High-to-Low		Industrial **(-10°C to +85°C)**				

Legend: Shading of rows is to assist in readability of the table.

      †   Production tested at T$_{AMB}$ = 25°C. Specifications over temperature limits ensured by characterization.

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TABLE 18-3: LOW-VOLTAGE DETECT CHARACTERISTICS (CONTINUED)

PIC16LF7X7 (Industrial)			Standard Operating Conditions (unless otherwise stated) Operating temperature -40°C ≤ TA ≤ +85°C for industrial				
PIC16F7X7 (Industrial, Extended)			**Standard Operating Conditions (unless otherwise stated)** Operating temperature -40°C ≤ TA ≤ +85°C for industrial -40°C ≤ TA ≤ +125°C for extended				
Param No.	**Symbol**	**Characteristic**	**Min**	**Typ†**	**Max**	**Units**	**Conditions**
		PIC16F7X7 LVDL<3:0> = `1101`	3.93	4.28	4.62	V	
		LVDL<3:0> = `1110`	4.23	4.60	4.96	V	
D420H		LVD Voltage on VDD Transition High-to-Low	Industrial **(-40°C to -10°C)**				
		PIC16F7X7 LVDL<3:0> = `1101`	3.76	4.28	4.79	V	
		LVDL<3:0> = `1110`	4.04	4.60	5.15	V	
D420J		LVD Voltage on VDD Transition High-to-Low	Extended **(-10°C to +85°C)**				
		PIC16F7X7 LVDL<3:0> = `1101`	3.94	4.28	4.62	V	
		LVDL<3:0> = `1110`	4.23	4.60	4.96	V	
D420K		LVD Voltage on VDD Transition High-to-Low	Extended **(-40°C to -10°C, +85°C to +125°C)**				
		PIC16F7X7 LVDL<3:0> = `1101`	3.77	4.28	4.79	V	
		LVDL<3:0> = `1110`	4.05	4.60	5.15	V	

Legend: Shading of rows is to assist in readability of the table.

　　　 †   Production tested at TAMB = 25°C. Specifications over temperature limits ensured by characterization.

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REVISION HISTORY

Rev A Document (1/2004)
Original version of this document. Data Sheet Clarification issues 1 (DC Characteristics – BOR Specifications), 2 (LVD Specifications) and 3 (LVDCON Register).

Rev B Document (6/2004)
Added silicon issue 1 (Internal RC Oscillator).

Rev C Document (9/2004)
Added silicon issue 2 (Internal RC Oscillator IOFS bit), and updated Data Sheet Clarification issues 1 (DC Characteristics – BOR Specifications), 2 (LVD Characteristics) and 3 (LVDCON Register).

Rev D Document (10/2004)
Amended silicon issue 1 (Internal RC Oscillator) and 2 (Internal RC Oscillator IOFS bit) and added issue 3 (Internal RC Oscillator).

Rev E Document (11/2004)
Removed Data Sheet Clarification issue 3. Updated Data Sheet revision to DS30498**C**.

NOTES:

Note the following details of the code protection feature on Microchip devices:

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• Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.

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