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PICDEM™ PIC18 Explorer Demonstration Board User's Guide

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

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PICDEM™ PIC18 EXPLORER DEMONSTRATION BOARD USER'S GUIDE

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PICDEM™ PIC18 EXPLORER DEMONSTRATION BOARD USER'S GUIDE

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the PICDEM™ PIC18 Explorer Demonstration Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in This Guide
- Warranty Registration
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the PICDEM PIC18 Explorer Demonstration Board as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Introduction"** – Overview of the development board and kit
- **Chapter 2. "Getting Started"** – Description of the different ways to use the board
- **Chapter 3. "PICDEM™ PIC18 Explorer Demonstration Board Tutorial Program"** – Explanation of the tutorial preprogrammed on the sample devices
- **Appendix A. "Hardware Details"** – Description of the board's hardware elements, including layout and schematic drawings

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
	A button on board	Press **RB0**.
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip web site.

RECOMMENDED READING

This user's guide describes how to use the PICDEM PIC18 Explorer Demonstration Board. Other useful documents are listed below.

- On the board kit's CD-ROM:
  - Readme file
  - Other reference documents
- Other documents, available at http://microchip.com:
  - *"MPLAB® ICD 2 In-Circuit Debugger User's Guide"* (DS51331)
  - *"PICkit™ 2 Programmer/Debugger User's Guide"* (DS51553)
  - *"Microchip Development Systems Ordering Guide"* (DS30177)

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at http://microchip.com. This web site is used as a means to make files and information easily available to customers.

The web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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To register, access the Microchip web site at http://microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools. These include the MPLAB C18 and MPLAB C30 C compilers; MPASM™ and MPLAB ASM30 assemblers; MPLINK™ and MPLAB LINK30 object linkers; and MPLIB™ and MPLAB LIB30 object librarians.
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB ICE 2000 and MPLAB ICE 4000.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 2.
- **MPLAB® IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB SIM simulator, MPLAB IDE project manager and general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include the MPLAB PM3 and PRO MATE® II device programmers and the PICSTART® Plus and PICkit™ 1 development programmers.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com.

DOCUMENT REVISION HISTORY

Revision A (March 2008)

- Initial release of this document.

Revision B (May 2008)

- Name and title change.

Chapter 1. Introduction

1.1 INTRODUCTION

The PICDEM™ PIC18 Explorer Demonstration Board is the latest demonstration board for evaluating Microchip Technology's PIC18FXXXX and PIC18FXXJXX families of devices.

The board can be used as a stand-alone device or with an in-circuit debugger, such as the MPLAB® ICD 2, and host PC.

Sample programs are provided to demonstrate the unique features of the supported devices. Free software development tools are available for application development and debugging.

1.2 DEVELOPMENT KIT CONTENTS

The PICDEM PIC18 Explorer Demonstration Board Kit comes with the following:

- PICDEM™ PIC18 Explorer Demonstration Board (Figure 1-1)
- Board-mounted PIC18F8722 and an alternate PIC18F87J11 mounted on a Plug-In Module (PIM)
- CD-ROM that contains:
  - Sample programs, source code and Hex files
  - *"PICDEM™ PIC18 Explorer Demonstration Board User's Guide"*
  - Other referenced documents

If you are missing any part of the kit, contact your nearest Microchip sales office listed in the back of this publication.

The MPLAB® Integrated Development Environment (IDE) is a free, integrated software tool set for application development and debugging. Compilers and other board-compatible software and hardware tools can be purchased.

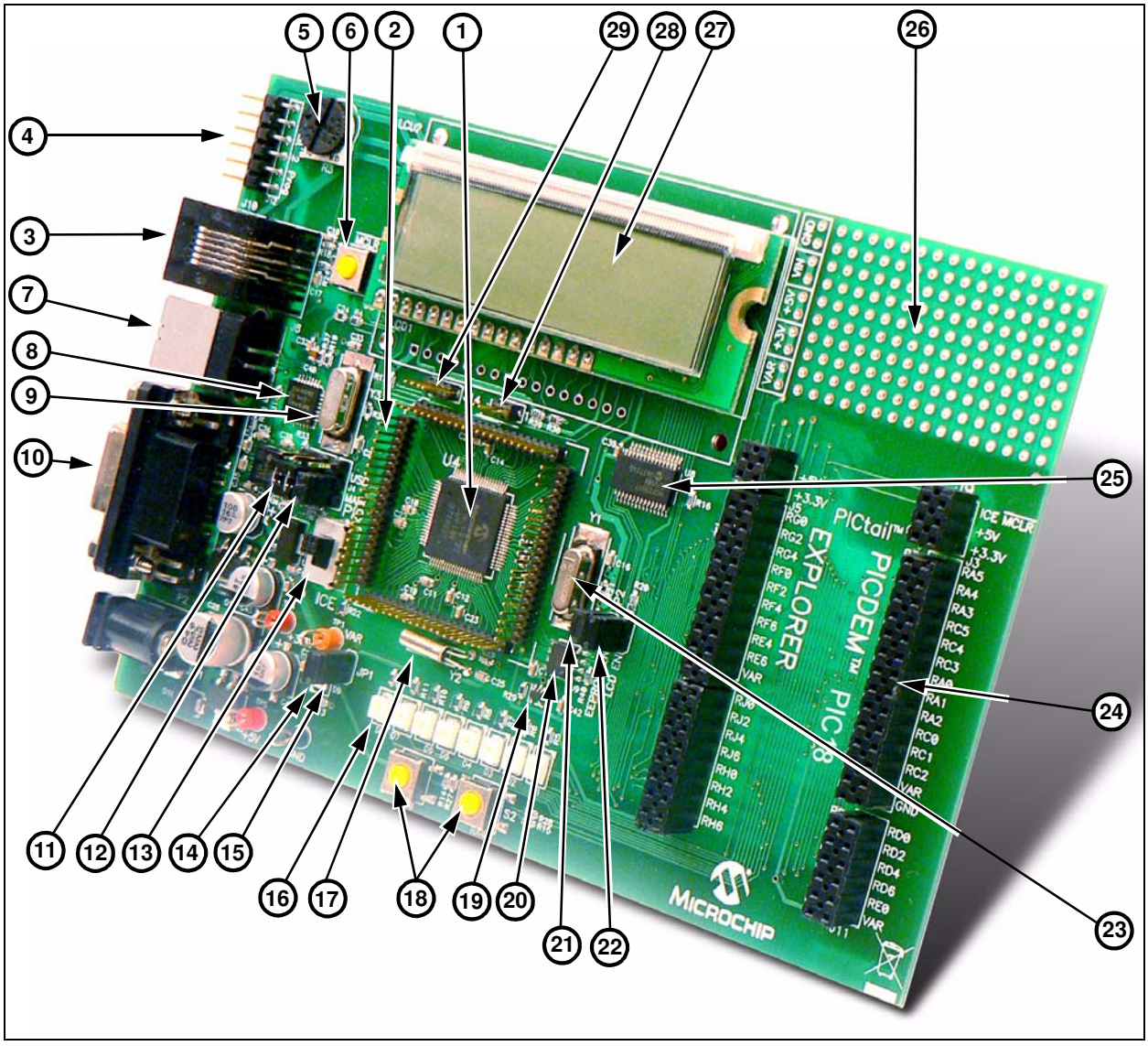
To download the MPLAB IDE software and documentation, or get information on the other tools, visit http://microchip.com.

1.3 PICDEM™ PIC18 EXPLORER DEMONSTRATION BOARD

The PICDEM PIC18 Explorer Demonstration Board has the following hardware features with each feature's number corresponding to the number in Figure 1-1 that shows the feature's location on the board:

1. PIC18F8722 microcontroller – The sample, primary microcontroller mounted on the board.
2. Male header pins for connecting Plug-In Modules (PIMs). A PIM enables an alternate PIC18 device to be connected to the board, as the primary microcontroller.
3. In-Circuit Debugger (ICD) connector.
4. Six-pin, PICkit™ 2 connector.
5. 10 kΩ potentiometer for analog inputs.
6. Push button switch – For external Reset.
7. USB connector – For RS-232 communication.
8. PIC18LF2450 microcontroller – For converting RS-232 communication to USB protocol for attachment of a host PC.
9. 12 MHz crystal – For the PIC18LF2450 microcontroller.
10. RS-232 DB9 socket and associated hardware – For direct connection to an RS-232 interface.
11. Jumper J13 for routing RS-232 communication through either the USB port or the RS-232 socket.
12. Jumper J4 – For selecting between programming the main PIC® device or the PIC18LF2450, used for USB to RS-232 communication.
13. Switch S4 – For designating the main microcontroller as either the board-mounted PIC18F8722 or a PIM-mounted microcontroller.
14. LED – For power-on indication.
15. JP1 – For disconnecting the eight display LEDs.
16. Eight LEDs.
17. 32.768 kHz crystal – For Timer1 clock operation.
18. Two push button switches – For external stimulus.
19. Analog temperature sensor, MPC9701A.
20. 25LC256 SPI EEPROM.
21. JP2 – To enable/disable EEPROM.
22. JP3 – To enable/disable LCD.
23. 10 MHz crystal – For the main microcontroller.
24. PICtail™ daughter board connector socket.
25. SPI I/O expander – For LCD display, MCP23S17.
26. Prototype area – For user hardware.
27. LCD display.
28. J2 three-pin, male header – For selecting between a voltage of 3.3V or 5V.
29. J14 four-pin, male header – For use with a PIM, if required, to connect 3.3V or 5V, V_{IN} and ICE $\overline{MCLR}$.

FIGURE 1-1: PICDEM™ PIC18 EXPLORER DEMONSTRATION BOARD



1.4 SAMPLE DEVICES

The PICDEM PIC18 Explorer Demonstration Board comes with two sample devices that alternately can be used as the main microcontroller:

- An 18-pin, 5V PIC microcontroller (the PIC18F8722) mounted on the board
- A 3.3V PIC18 device (PIC18F87J11) mounted on an 80-pin PIM that connects to the demo board via an 80-pin male

1.5 SAMPLE PROGRAMS

The PICDEM PIC18 Explorer Demonstration Board Kit includes a CD-ROM with sample demonstration programs. These programs may be used with the included sample devices and with an In-Circuit Debugger (ICD).

Also provided on the disc is demonstration source code that includes several assembly source code (ASM) files and one Hex compiled code file.

NOTES:

Chapter 2. Getting Started

The PICDEM™ PIC18 Explorer Demonstration Board may be used in a variety of ways. Table 2-1 lists the three primary configurations and the required equipment and capabilities of each.

TABLE 2-1: PICDEM™ PIC18 EXPLORER DEMONSTRATION BOARD CONFIGURATIONS

Configuration	Board Connections	Board Capabilities
Stand-alone board	Power supply	• Access board's full functionality • Demonstrate sample code • Display functionality with LCD or LEDs • Connect ICD/programmer for debugging or programming • Connect PICtail™ daughter cards
Board with in-circuit debugger/programmer	• Power supply • In-Circuit Debugger (ICD) that also can be used as a programmer	• Access board's full functionality • Demonstrate sample code • Develop and debug code • Reprogram microcontrollers • Connect PICtail daughter cards
Board with alternate microcontroller, attached through a Plug-In Module (PIM)	• Power supply • ICD that also can be used as a programmer • PIM with mounted microcontroller	• Substitute PIM-mounted device as main microcontroller† • Use 3.3V or 5V devices as main microcontroller • Demonstrate sample code • Develop and debug code • Reprogram microcontrollers • Connect PICtail daughter cards

† PIM enables 80, 64, 44 and 28-pin devices to be used as the main microcontroller. For information on the available PIMs, go to http://microchip.com.

This chapter describes:

- How to implement each of the uses described in Table 2-1
- How to reprogram the main and RS-232 to USB microcontrollers
- How to connect the demonstration board to a host PC for RS-232 communication

2.1 BOARD AS STAND-ALONE DEVICE

In using the PICDEM PIC18 Explorer Demonstration Board as a stand-alone device, an implementation can:

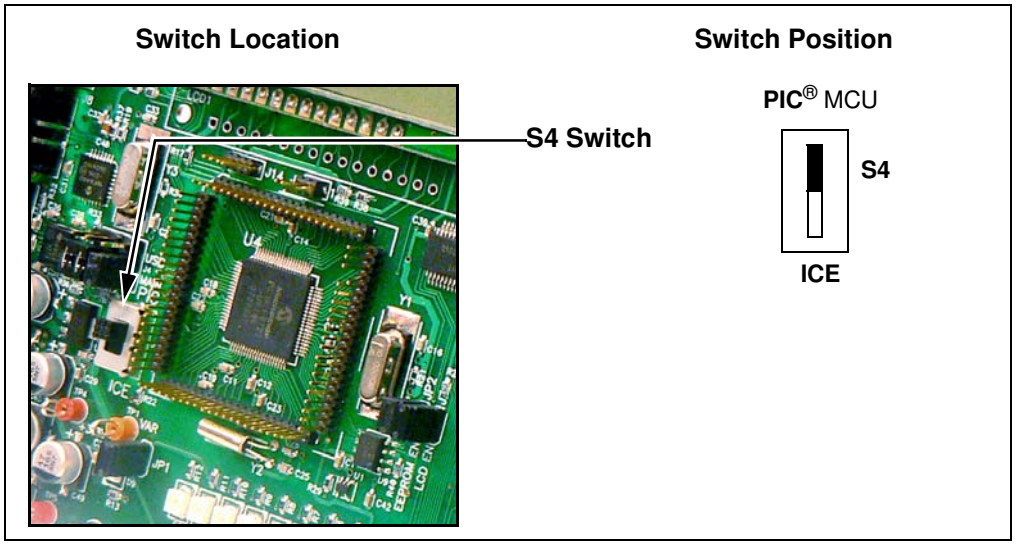
- Use the board as is, utilizing the firmware loaded on the main, PIC18F8722 microcontroller and RS-232 to USB PIC18LF2450 microcontroller
- Reprogram the main, PIC18F8722 microcontroller or the RS-232 to USB, PIC18LF2450 microcontroller and demonstrate user programs

2.1.1 Using the Board As Is

To immediately implement the PICDEM PIC18 Explorer Demonstration Board to demonstrate the PIC18F8722 microcontroller:

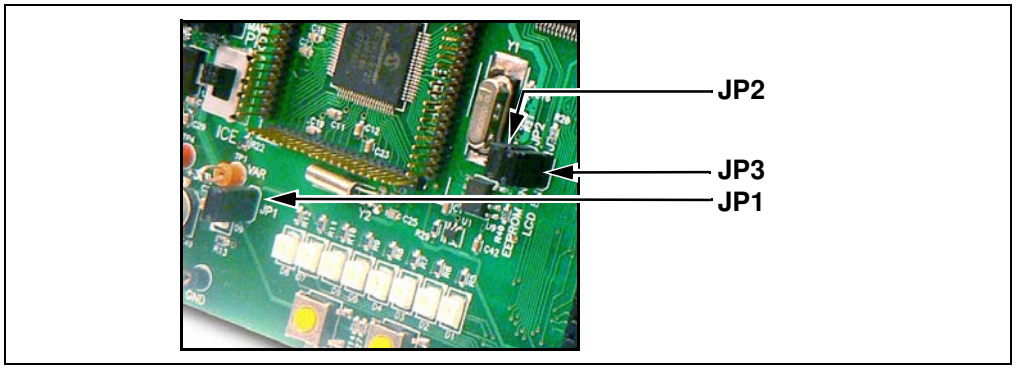
1. Designate the mounted, PIC18F8722 device as the board's main microcontroller by moving Switch S4 to **PIC** MCU, as shown in Figure 2-1.

FIGURE 2-1: S4 SWITCH – SETTING FOR DEFAULT MAIN MICROCONTROLLER



2. Enable the LEDs by placing a jumper on JP1, as shown in Figure 2-2.

FIGURE 2-2: JP1, JP2 AND JP3 JUMPERS



3. Enable the EEPROM and the LCD by placing a jumper on JP2 and JP3, as shown in Figure 2-2.
4. Apply power to the board.

   For information on acceptable power sources, see **Appendix A. "Hardware Details".**

The device now can be demonstrated using the tutorial program. (See **Section 3.1 "Tutorial Program Operation"**.)

2.1.2 Reprogramming the Microcontroller

Either or both the main PIC18F8722 microcontroller and RS-232-USB, or the PIC18LF2450 microcontroller, can be reprogrammed for running the board as a stand-alone device.

To implement this usage:

1. Reprogram either or both devices, as described in **Section 2.4 "Programming the Microcontrollers"**.
2. Disconnect the programming devices.
3. Follow the procedure given in **Section 2.1.1 "Using the Board As Is"**.

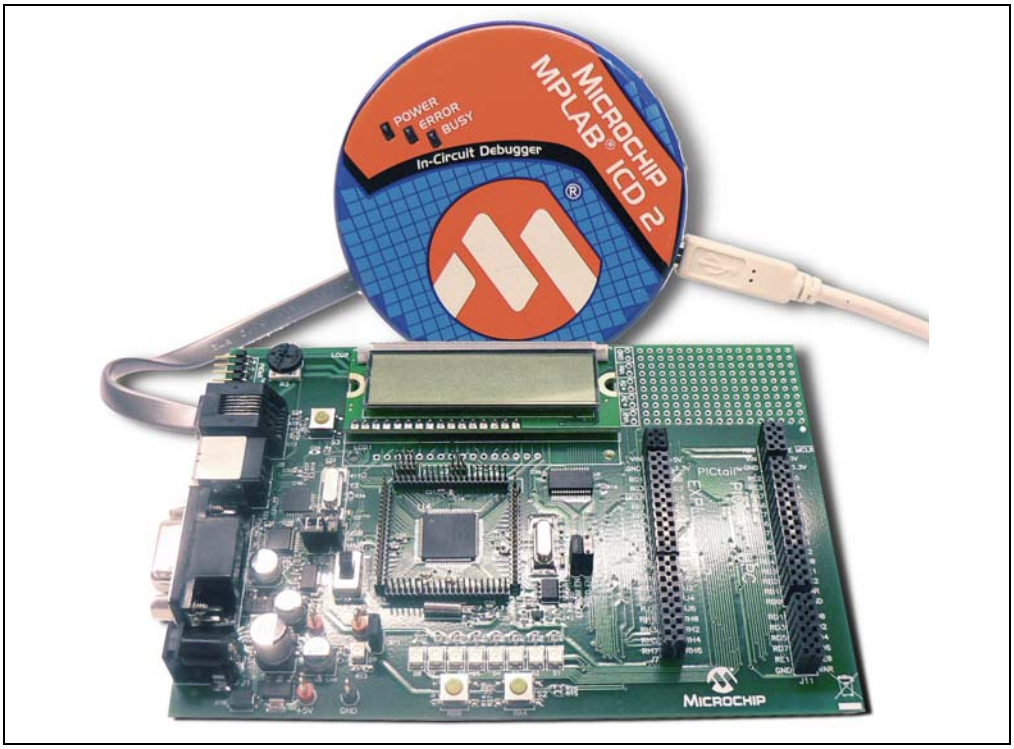
2.2 BOARD WITH IN-CIRCUIT DEBUGGER

The PICDEM PIC18 Explorer Demonstration Board can also be connected to an In-Circuit Debugger (ICD) that is connected to a host PC. This can be done with the board's main microcontroller configured as either the mounted PIC18F8722 device or an alternate device mounted to a PIM that is plugged into the board. (For information on PIM attached devices, see **Section 2.3 "Board with PIM Attached Devices"**.)

The MPLAB® ICD 2 In-Circuit Debugger is an inexpensive ICD that could be used. (For more information, see **Section 2.4.1 "Programming Requirements"**.) The ICD is connected, as shown in Figure 2-3, to the ICD connector. For operational information, see "*MPLAB® ICD 2 In-Circuit Debugger User's Guide"* (DS51331).

The PICDEM™ PIC18 Explorer Demonstration Board can alternately use the MPLAB® REAL ICE™ Emulator as a debugger. For more information, see the "*Microchip Development Systems Ordering Guide"* (DS30177).

FIGURE 2-3: BOARD WITH MPLAB® ICD 2 IN-CIRCUIT DEBUGGER ATTACHED



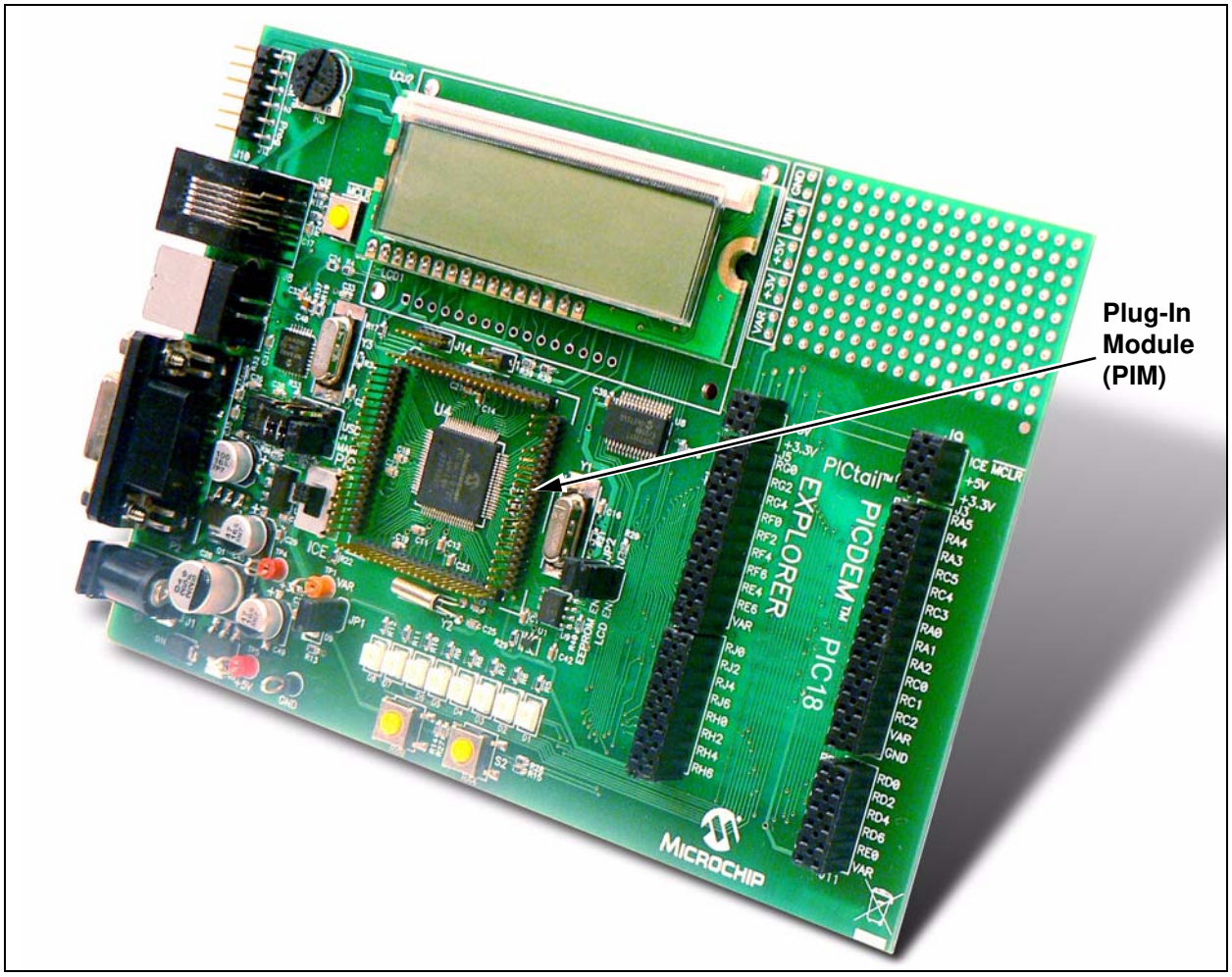
For information on other microcontroller compatible ICD or ICE devices, see the "*Microchip Development Systems Ordering Guide"* or the Microchip web site at http://microchip.com.

2.3 BOARD WITH PIM ATTACHED DEVICES

The PICDEM PIC18 Explorer Demonstration Board also can be used to demonstrate other PIC18 devices – having them replace the PIC18F8722 mounted on the board as the board's main microcontroller. This is done by attaching a Plug-In Module (PIM) that has the other microcontroller mounted to it.

The PICDEM PIC18 Explorer Demonstration Board comes with the PIC18F87J11 PIM representing the super set device for the PIC18 J-series of products.

FIGURE 2-4: PICDEM™ PIC18 EXPLORER DEMONSTRATION BOARD WITH PIM



The PIM enables the attachment of 80, 64, 44 or 28-pin devices. Some PIMs also enable the board's 5V output to be automatically reset to 3.3V.

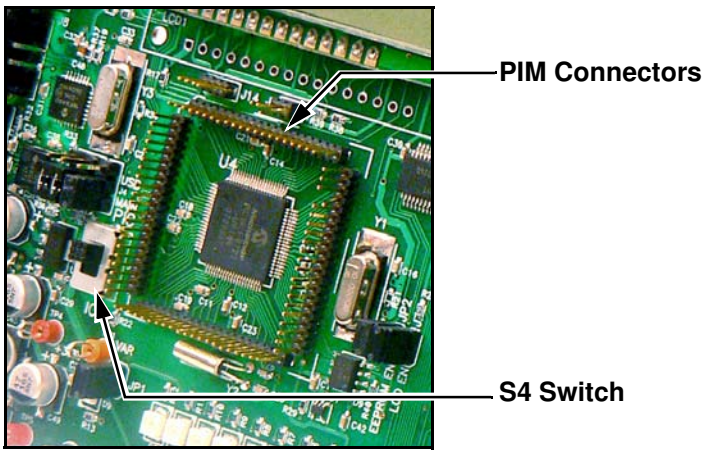
For a list of microcontroller-compatible PIMs, see the "*Microchip Development Systems Ordering Guide"* (DS30177) or go to http://microchip.com.

2.3.1 Attaching the PIM

To attach the PIM:

1. Seat the PIM in the 80-pin, elevated, male connectors that encircle the PIC18F8722 (see Figure 2-5).

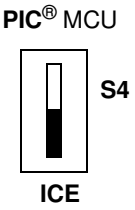
FIGURE 2-5: PIM CONNECTORS AND S4 SWITCH



Alternately, an In-Circuit Emulator (ICE) can be attached to the male connectors. This enables in-circuit emulation and user development and debugging of code. For information on this use, see the Microchip web site (http://microchip.com).

2. To designate the PIM-mounted device as the main microcontroller, set Switch S4 (shown in Figure 2-5) to **ICE** (see Figure 2-6).

FIGURE 2-6: S4 SWITCH – SETTING FOR PIM-MOUNTED DEVICES



3. If you are converting from the board's default V_{DD} of 5V, see **"Varying the Device Voltage (5V/3.3V)" on page 14**.

2.3.2 Varying the Device Voltage (5V/3.3V)

By default, the PICDEM PIC18 Explorer Demonstration Board's V_{DD} supply is 5V. The V_{DD} can be varied, for PIM-mounted microcontrollers, from 5 to 3.3V to accommodate devices running at 5 or 3.3V. This V_{DD} is named VAR.

The PICDEM PIC18 Explorer Demonstration Board enables the voltage change with PIM connection headers and a variable voltage regulator. PIMs mounted with 3.3V devices implement the voltage change through two resistors with values that produce the desired voltage. (See **"Calculating Other V_{DD} Values" on page 15**.)

The voltage varying hardware includes:

- An adjustable voltage regulator, the LM317 – Located on the board, left of the PIM connectors and marked as **U2** (recognizable by the TO-220 package commonly used for transistors)
- Header J2 – Located above the PIM connectors
- Resistors R25 and R26 – Located below jumper J13
- Resistors R101 and R102 – Located on the PIM board

In setting the board's voltage:

- For the default, 5V voltage –
  - For board-mounted PIC18F8722 device:
    - Board resistor R25 = 1 kΩ
    - Board resistor R26 = 330Ω
  - For a PIM-mounted, 5V microcontroller:
    - Board resistors R25 and R26 – Same values of 1 kΩ and 330Ω, respectively
    - PIM-mounted resistors R101 and R102 – Unpopulated
- For 3.3V V_{DD} (achieved only with a PIM with a mounted 3.3V device, such as the PIC18F87J11) –
  - Header J2 goes into the PIM board where resistors R101 and R102 are inserted in parallel to the board resistors R25 and R26
  - PIM board resistor R101 can be unpopulated
  - PIM board resistor R102 can be 1.18 kΩ.

Note:	For precise adjustment of V_{DD}, 1% resistors are recommended.

2.3.3 Calculating Other VDD Values

Other VDD values can be produced by the LM317 adjustable voltage regulator by populating the PIM board's R101 and R102 with different value resistors.

A brief overview follows, on how to calculate alternate values for these resistors. For detailed information, see the LM317 data sheet.

EQUATION 2-1: REGULATOR VOLTAGE OUTPUT

$$V_{OUT} = V_{REF}\left(1 + \frac{R2}{R1}\right) + I_{ADJ} \cdot R2$$

IADJ is minimized by the LM317, so it can be assumed to be zero, or very small. VREF is the reference voltage developed by the LM317 between the output and adjustment terminal and equals 1.25V.

That produces the equations shown in Equation 2-2.

EQUATION 2-2: CALCULATING OUTPUT VOLTAGE

$$V_{OUT} = 1.25V\left(1 + \frac{R2}{R1}\right)$$

$$R2 = R25 \parallel R102 = \frac{(R25 \cdot R102)}{(R25 + R102)}$$

$$R1 = R26 \parallel R101 = \frac{(R26 \cdot R101)}{(R26 + R101)}$$

As stated previously, R25 = 1 kΩ, and R26 = 330Ω. Without R102 and R101 being inserted in parallel on the PIM board, VOUT =1.25V(1+ 1 kΩ/330Ω) = 5.04V.

To calculate a desired VOUT:

1. Solve for R2, given R1 = R26 = 330Ω.
2. Now knowing R2 and R25, solve for R102.
3. Determine the nearest available resistor value for R102 and recalculate the resulting VDD to make sure it does not exceed the maximum VDD for the part you will be using.

Table 2-2 shows the R101 and R102 resistor values to use for different VDD values. The table assumes that the PICDEM PIC18 Explorer Demonstration Board's R25 and R26 resistors are left at their default values of 1KΩ and 330Ω, respectively.

TABLE 2-2: CALCULATING R101, R102 VALUES FOR VDD OUTPUTS†

VDD	R101 Value	R102 Value
5V	Open	Open
3.6V	Open	1.62 kΩ
3.3V	Open	1.18 kΩ
3.0V	Open	866 RΩ

† This table assumes that the PICDEM PIC18 Explorer Demonstration Board's R25 and R26 resistors are left at their default values of 1 kΩ and 330Ω, respectively.

2.4 PROGRAMMING THE MICROCONTROLLERS

Either or both the main microcontroller (PIC18F8722) and the RS-232 to USB, or the PIC18LF2450 microcontroller, can be reprogrammed. The main microcontroller that is reprogrammed can either be the board-mounted PIC18F8722 device or an alternate main microcontroller, mounted on a PIM attached to the board.

This section discusses:

- Programming Requirements
- Loading the Program

2.4.1 Programming Requirements

To reprogram a sample device, the following is required:

- Program source code – Sample code is preloaded on the device, but user source code can be substituted.

  If this is done, the sample program can be restored using the file on the board kit's CD-ROM.
- An assembler or compiler – Source code must be assembled or compiled into a Hex file before it can be programmed into the device.
- A programmer – Once the code is in the Hex file format, this device programs the microcontroller's Flash memory.

  If the code protection bit(s) have not been programmed, the on-chip program memory can be read out for verification purposes.

In meeting these requirements:

- Code development and debugging –

  The free MPLAB® IDE software development tool includes a debugger and several other software tools as well as a unified graphical user interface for working with other Microchip and third-party software and hardware tools.
- Assembler –

  The free MPLAB IDE tool includes the MPASM™ assembler.
- Compiler –

  Microchip's MPLAB® C18 is a C compiler for PIC18 microcontrollers and is fully integrated for the MPLAB IDE environment.
- Programmer –

  Microchip's MPLAB® In-Circuit Debugger (ICD) 2 or PICkit™ Starter Kit can be used to program the device and both are fully integrated for the MPLAB IDE environment.

The free MPLAB IDE tool set and its documentation can be downloaded at http://microchip.com.

For a list of the other mentioned devices' documentation, see **"Recommended Reading" on page 3**.

Other assemblers/compilers can be used. For a list of tools compatible with PIC microcontrollers, see the Microchip web site (http://microchip.com).

2.4.2 Loading the Program

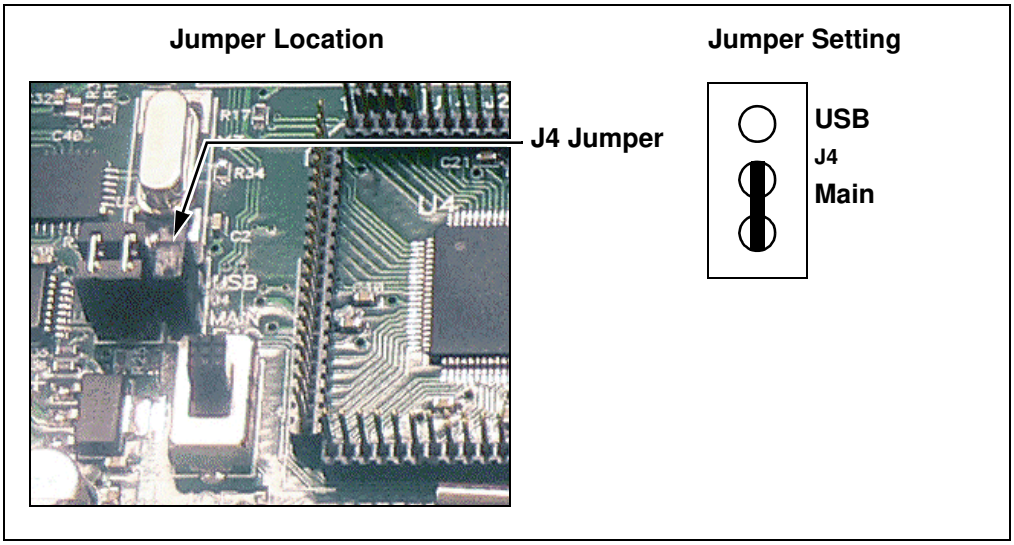
This section describes how to program the PICDEM PIC18 Explorer Demonstration Board using the MPLAB® Integrated Development Environment (IDE) and the sample Hex code on the compact disc in the PICDEM PIC18 Explorer Demonstration Board's Kit.

2.4.2.1 REPROGRAMMING WITH THE COMPACT DISC SAMPLE CODE

To program the PIC18F8722:

1. Launch the MPLAB IDE application and select *Configure>Select Device>18F8722*.
2. To start the programmer, select *Programmer>Select Programmer> ICD2*.
3. To open the Hex code file, select *File>Import>Open* and select `CD/Hex/18F8722/Demo8722.hex`.
4. Connect the J4 jumper to **Main** (main controller), as shown in Figure 2-7.

FIGURE 2-7: J4 JUMPER AND 'MAIN' SETTING



5. Move the S4 switch to **PIC** MCU, as described in **"Using the Board As Is" on page 10**.

To program the PIC18F87J11 on the PIM:

1. Attach the PIM to the demonstration board.
2. Move the S4 switch to **ICE**.

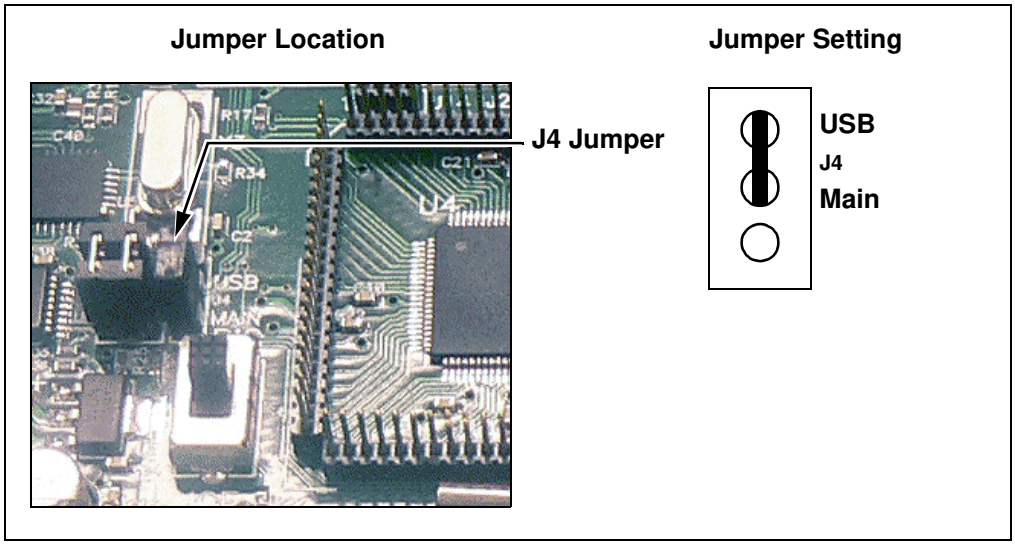
> **Note:** Both steps 1 and 2 are described in **"Attaching the PIM" on page 13**.

3. Launch the MPLAB IDE application and select *Configure>Select Device>18F87J11*.
4. To start the programmer, select *Programmer>Select Programmer>ICD2*.
5. To open the Hex code file, select *File>Import>Open* and select `CD/Hex/18F87J11/Demo87J11.hex`.
6. Connect the J4 jumper to **Main** (main controller), as shown in Figure 2-7.

To program the PIC18LF2450 for RS-232 UART communication:

1. Launch the MPLAB IDE application and select *Configure>Select Device>18F2450*.
2. To start the programmer, select *Programmer>Select Programmer>ICD2*.
3. To open the Hex code file, select *File>Import>Open* and select `CD/Hex/RS232_USB_18F2450/Demo2450.hex`.
4. Connect the J4 jumper to **USB**, as shown in Figure 2-8.

FIGURE 2-8: J4 JUMPER AND 'USB' SETTING

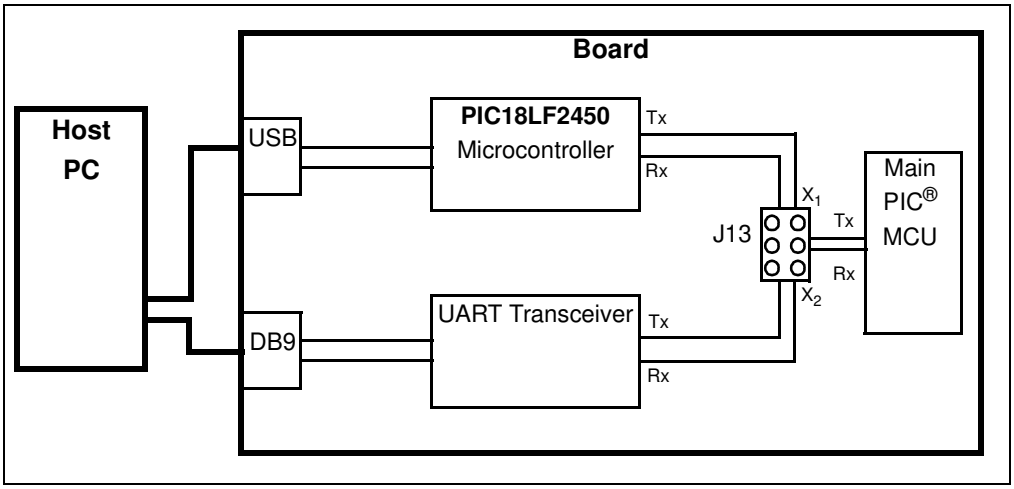


2.5 CONNECTING TO HOST PC FOR RS-232 COMMUNICATION

As shown in Figure 2-9, there are two ways to connect a PC to the PICDEM PIC18 Explorer Demonstration Board.

- Via the USB Port
- Via the DB9 Pin (RS-232 Port)

FIGURE 2-9: BOARD TO PC CONNECTION

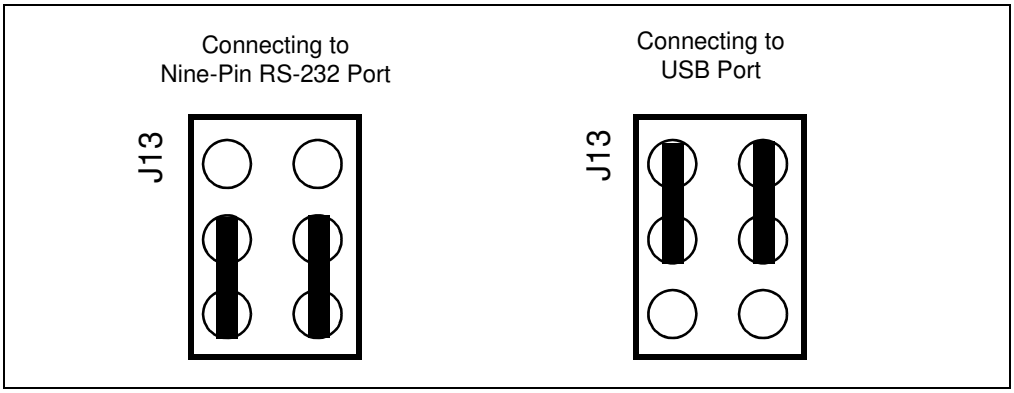


2.5.1 PC Connection Via DB9 Pin

To connect the PICDEM PIC18 Explorer Demonstration Board to a host PC via the nine-pin DB9 connector, set jumper J13, as shown in the first illustration in Figure 2-10.

This routes the main microcontroller's communications through a transceiver.

FIGURE 2-10: JUMPER J13 – SETTINGS FOR RS-232 OR USB



2.5.2 PC Connection Via USB Port

If the board PC communication is via the USB port, the data will be routed through the PIC18LF2450 mounted on the board, to convert the RS-232 communication to the USB protocol.

To connect the PICDEM PIC18 Explorer Demonstration Board to a host PC via the USB port:

1. Set jumper J13, as shown in the second illustration in Figure 2-10.
2. Install the required file on the host PC. (See the following procedure.)

If the USB port is used, an `*.inf` file must be installed on the host PC. To do this:

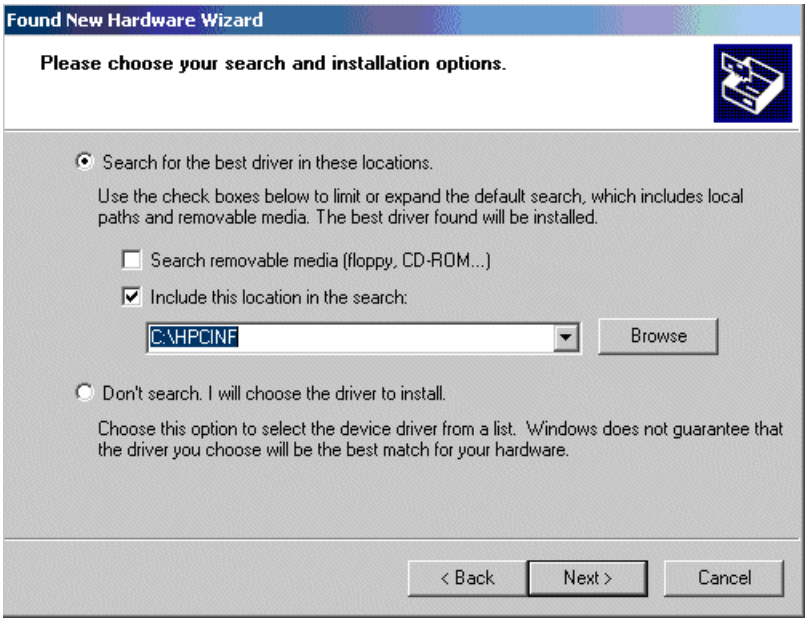
1. Create a folder named, `HPCINF`, anywhere on the host PC's hard drive.
2. Using the development kit's CD, copy the file, `mchpcdc.inf`, into that folder.
3. Connect the board to the PC and power up the board. The pop-up window, shown in Figure 2-11, appears.

Note: This procedure displays the dialog boxes that appear for the Windows® XP operating system.

FIGURE 2-11: INSTALLING USB `*.inf` FILE ON PC – SCREEN 1

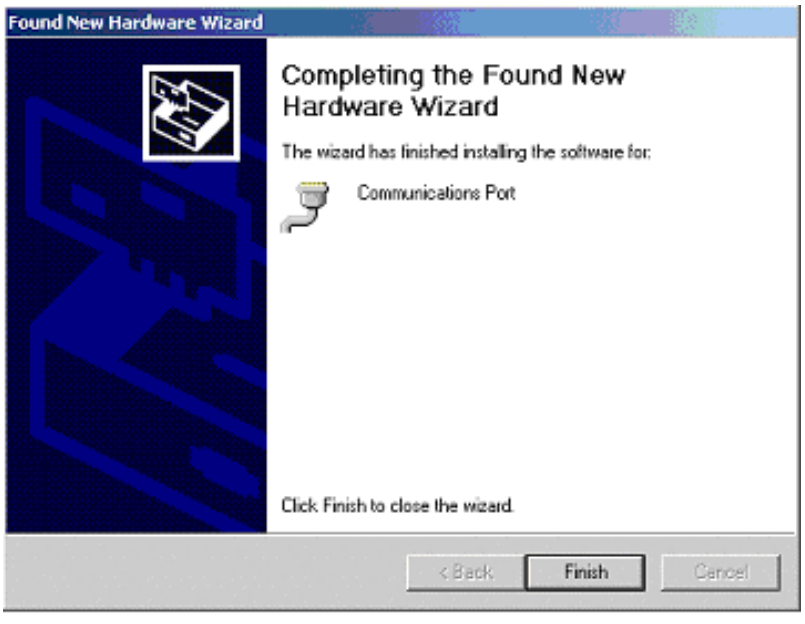
4. Select the **Install from a list or specific location** option and click **Next**. The screen shown in Figure 2-12 appears.

FIGURE 2-12: INSTALLING USB `*.inf` FILE ON PC – SCREEN 2



5. Select the check box, **Include this location in the search**, enter the name of the path (created in Step 1) in the text box below and click **Next**. The screen shown in Figure 2-13 appears.

FIGURE 2-13: INSTALLING USB `*.inf` FILE ON PC – SCREEN 4



6. Press **Finish**. The RS-232 to USB functionality is ready to be used.