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PICDEM CAN-LIN 2 Development Kit User's Guide

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PICDEM™ CAN-LIN 2 DEVELOPMENT KIT USER'S GUIDE

Table of Contents

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 about this manual and contacting customer support.

HIGHLIGHTS

Items discussed in this chapter are:

- About This Guide
- Warranty Registration
- Recommended Reading
- The Microchip Web Site
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support

ABOUT THIS GUIDE

Document Layout

This document describes how to use the PICDEM™ CAN-LIN 2 Development Board as a development system for the PIC18FXX8X family of microcontrollers. The manual layout is as follows:

- **Chapter 1. "Introduction to the PICDEM CAN-LIN 2 Board"** – What the PICDEM CAN-LIN 2 Board is, what makes it a desirable development tool and what features are available.
- **Chapter 2. "Getting Started with the PICDEM CAN-LIN 2 Board"** – Describes how to connect and begin to use the PICDEM CAN-LIN 2 board.
- **Chapter 3. "Getting Started with the CANKing Software"** – Gives a brief overview of the CANKing host software and the concept of the predefined templates.
- **Chapter 4. "Using the CANKing Templates"** – Provides a more detailed description of the individual templates and how to use them.
- **Chapter 5. "Reconfiguring the PICDEM CAN-LIN 2 Hardware"** – Describes various multi-node configurations of the board, and how to customize certain features.
- **Chapter 6. "Troubleshooting"** – Provides information on solving common problems.
- **Appendix A. "PICDEM CAN-LIN 2 Board Technical Information"** – Provides the block diagram and detailed schematics of the PICDEM CAN-LIN 2 board.
- **Appendix B. "FAQs on Configuring the PIC18FXX8X"** – Provides a list of the most commonly encountered issues when programming PIC18FXX8X microcontrollers, as well as some solutions.
- **Appendix C. "PICDEM CAN-LIN 2 Software CD"** – Provides a summary of the software on the accompanying CD-ROM.
- **Index** – Cross-reference listing of terms, features and sections of this document.
- **Worldwide Sales and Service** – gives the address, telephone and fax number for Microchip Technology Inc. sales and service locations throughout the world.

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
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) { ... }`

Documentation Updates

All documentation becomes dated, and this user's guide is no exception. Since MPLAB® IDE, MPLAB C1X and other Microchip tools are constantly evolving to meet customer needs, some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site to obtain the latest documentation available.

Documentation Numbering Conventions

Documents are numbered with a "DS" number. The 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	=	The document number.
A	=	The revision level of the document.

WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending in your Warranty Registration Card entitles you 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 CAN-LIN 2 Development Kit. The data sheets contain current information on programming the specific microcontroller devices.

MPLAB® IDE User's Guide (DS51025)

Comprehensive guide that describes installation and features of Microchip's MPLAB Integrated Development Environment (IDE), as well as the editor and simulator functions in the MPLAB IDE environment.

MPASM™ User's Guide with MPLINK™ and MPLIB™ (DS33014)

This user's guide describes how to use the Microchip PIC® MCU MPASM assembler, the MPLINK object linker and the MPLIB object librarian.

PIC® Mid-Range MCU Family Reference Manual (DS33023) and PIC® 18C MCU Family Reference Manual (DS39500)

These manuals explain the general details and operation of the mid-range and advanced MCU family architecture and peripheral modules. They are designed to complement the device data sheets.

Microsoft® Windows® Manuals

This manual assumes that users are familiar with the Microsoft Windows operating system. Many excellent references exist for this software program, and should be consulted for general operation of Windows.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, 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

DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

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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

NOTES:

Chapter 1. Introduction to the PICDEM CAN-LIN 2 Board

1.1 INTRODUCTION

The PICDEM™ CAN-LIN 2 Development Kit has been revised for the evaluation or development of CAN network nodes utilizing Microchip's PIC18FXX8X family of 28 and 40-pin microcontrollers. This tool is ideal for beginning CAN designers, as well as those new to the PIC18FXX8X family.

The Demonstration Board provides three nodes (two CAN and one LIN bus) that can be configured in numerous ways through jumpers and component selection. The CAN nodes implement basic input and output functionality, and can send and receive CAN bus messages. The host software included with the kit allows fine manipulation of the PIC18F4680 devices down to the bit level, as well as high-level control of the microcontroller. It also provides predefined templates for demonstration, evaluation and development uses.

1.2 HIGHLIGHTS

This chapter discusses:

- PICDEM CAN-LIN 2 Development Kit Contents
- Overview of the PICDEM CAN-LIN 2 Board
- PICDEM CAN-LIN 2 Board Features
- CANKing Host Software

1.3 PICDEM CAN-LIN 2 DEVELOPMENT KIT CONTENTS

Your PICDEM CAN-LIN 2 Development kit contains the following items:

1. PICDEM CAN-LIN 2 Development Board, complete with three Microchip microcontrollers (two PIC18F4680 controllers and one PIC16C432) preprogrammed with demo firmware.
2. A universal power supply (110-230 VAC input, 12 VDC output) and power cable for the Development Board.
3. A male-to-female DB9 serial cable for use in communicating with the board.
4. The PICDEM CAN-LIN 2 CD-ROM with CANKing host software, User's Guide and other supporting documents.
5. A warranty registration card.

1.4 OVERVIEW OF THE PICDEM CAN-LIN 2 BOARD

Most demonstration or evaluation systems use a single microcontroller, and are designed to show off that controller's features. While this makes sense in most situations, it also means that users must set up several boards to evaluate even a simple network of a few nodes. The drawbacks to this arrangement should be obvious.

In contrast, PICDEM CAN-LIN 2 provides three network nodes on one circuit board. By using a common power supply, and allowing the nodes to be configured in multiple ways, the process of evaluating and developing network nodes can be significantly streamlined.

The three nodes on the PICDEM CAN-LIN 2 board are:

- Node0, a CAN node implemented with either a 28-pin PIC18F2585/2680 or 40-pin PIC18F4585/4680 microcontroller. This node interfaces to the external host computer through a standard serial (RS-232) interface, and is directly controlled by the host software. It monitors both the on-board and external CAN busses, and can be used for basic PIC18FXX8X evaluation/development.
- Node1, a CAN node also implemented with either a PIC18F2585/2680 or PIC18F4585/4680 device. This node communicates with Node0 over the on-board CAN bus. It also implements the CAN-to-LIN bus gateway to Node2 (below), and acts as the LIN bus master node. Like Node0, Node1 can also be used for basic PIC18FXX8X evaluation/development.
- Node2, a LIN bus slave node, is implemented with the 20-pin PIC16C432 microcontroller with integrated LIN bus transceiver. It communicates to Node1 via the LIN bus.

Both the CAN and LIN busses are routed off-board through a connector, which allows the board to be connected to an external bus.

1.4.1 Benefits of Using the PICDEM CAN-LIN 2 Board

Putting three nodes on one board gives the developer some definite benefits:

MULTIPLE HARDWARE CONFIGURATIONS WITH ONE BOARD: Of course, the PICDEM CAN-LIN 2 board accommodates a large selection of CAN and LIN node combinations. When all three nodes are used, sixteen different combinations of microcontrollers are possible, depending on which sockets are populated for the CAN nodes. In addition, users can implement any one of three oscillator configurations for the CAN nodes, or easily add other hardware to the board using the prototyping area and headers.

Many of these configuration changes are performed with jumpers, while others require component additions or removals. The board configurations and jumper locations are discussed in detail in **Chapter 5. "Reconfiguring the PICDEM CAN-LIN 2 Hardware"** and **Chapter 6. "Troubleshooting"**.

EASIER CAN NODE EVALUATION: The CANKing host software, included with the PICDEM CAN-LIN 2 Development Kit, allows for fast evaluation of CAN node operation, as well as the CAN protocol. Using one of the included template sets, users can evaluate everything from bit level status of registers to node operation and bus status. The host software and the templates are discussed in detail in **Chapter 3. "Getting Started with the CANKing Software"** and **Chapter 4. "Using the CANKing Templates"**.

ENHANCED CAN NODE DEVELOPMENT: Including two CAN nodes on the PICDEM CAN-LIN 2 board provides an additional tool for developing PIC18FXX8X-based CAN nodes, either by themselves or together. For example, a user might use the controller in Node1 to prototype a CAN node, while using Node0 as a simple bus monitor (using the basic template). Node0 could also be used as a tool to set or verify bit timings, masks or filters.

The possibilities are not limited to what can be developed with just the nodes on the board, either. For example, Node0 can be included as part of a more complex developmental network of many CAN nodes, and serve as the “tap point” for monitoring the entire network.

1.5 PICDEM CAN-LIN 2 BOARD FEATURES

As mentioned, the PICDEM CAN-LIN 2 board consists of two CAN nodes and one LIN node. Node0 acts as the main node. It interfaces with the host software through a serial connection (RS-232), and either executes commands from the host system or passes them to Node1. Node0 also interfaces with the on-board LCD header. If an LCD is connected, Node0 can display text messages under host software control.

Node1 also acts as a CAN node, and demonstrates a CAN-to-LIN bridge. This node is controlled via Node0, which relays commands for Node1 from the host system. Node1 receives these messages and performs the appropriate actions. This node also acts as a LIN master mode and provides CAN-to-LIN bridge functionality to Node2. As a LIN master, it receives messages from Node0 and relays them to the LIN slave node.

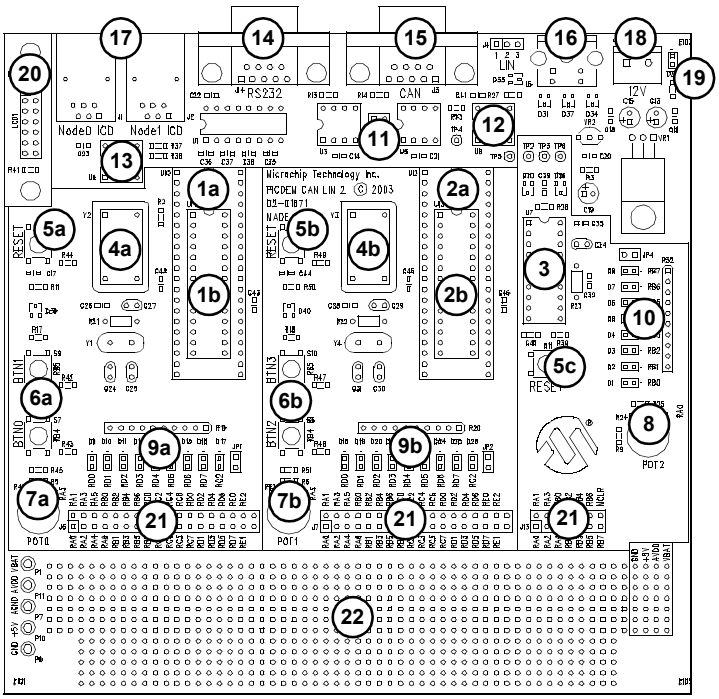
Node2 is a LIN slave node implemented by the PIC16C432. This node contains an integrated LIN bus transceiver. It waits for commands from Node1and performs the appropriate actions.

As configured from the box, the behavior of the CAN nodes is determined by its hardware configuration. While Node0 and Node1 both execute the exact same code, the function of the node is decided by its hardware configuration. When either node is reset, its firmware attempts to communicate with the external EEPROM. If the EEPROM is found, the code assumes the role of Node0 and uses the USART to communicate with the host system. If the EEPROM is not found, it assumes the role of Node1 and uses the USART for LIN bus communication. Since the EEPROM is hard-wired to the Node0 controller, this essentially ensures that this controller will always be Node0.

Node0 and Node1 are connected via the on-board CAN bus, which is also available to an external CAN bus through a D-shell connector. Node1 and Node2 are connected via the on-board LIN bus. Node1 uses a separate LIN transceiver while Node2 uses an integrated LIN transceiver. The board routes the on-board LIN bus to a 3-pin header for connection to external LIN devices.

The overall layout of the board is shown in Figure 1-1.

FIGURE 1-1: THE PICDEM™ CAN-LIN 2 BOARD (TOP ASSEMBLY VIEW)



The main features of the board include:

1. **Node0 Microcontroller:** The board is equipped with a pair of nested DIP sockets, designed to accommodate the 40-pin PIC18F4585/4680 (1a) or the 28-pin PIC18F2585/2680 (1b); each includes an integrated CAN module. The Node0 microcontroller also handles the communications to the host computer (via RS-232), as well as the external serial EEPROM and the optional LCD module.
2. **Node1 Microcontroller:** This is also a nested DIP socket pair that can accommodate either the PIC18F4585/4680 (2a) or PIC18F2585/2680 (2b). This node communicates with Node0 and any external CAN nodes over the on-board CAN bus. It also serves as the LIN master, and communicates to Node2 and other external LIN nodes over the on-board LIN bus.
3. **Node2 Microcontroller:** This is a 20-pin DIP PIC16C432 with integrated LIN bus transceiver. It acts as a LIN slave and transfers data to and from Node1.
4. **Oscillators:** Node0 and Node1 each support three different oscillator configurations (crystal, RC and canned). The board is factory equipped with 25 MHz canned oscillators for both of the CAN nodes. If a different oscillator type is required, the board hardware must be reconfigured (see **Section 5.3 "Oscillator Configurations"** for more information). Node2 uses an RC oscillator only (not shown); it cannot be reconfigured.
5. **Reset Push Buttons:** Each of the microcontrollers has its own Reset push button switch, tied to the $\overline{\text{MCLR}}$ pin. Pressing the switch causes a hard controller Reset.
6. **CAN Node User-Defined Switches:** Two push button switches are connected to each the CAN nodes to simulate digital inputs. Their status can be monitored through the host software.

7. **CAN Node Potentiometers:** These analog potentiometers (7a and 7b) are connected to Node0 and Node1, respectively. These potentiometers simulate analog inputs for their controllers, and control the brightness of the PWM-controlled LED on the *other* CAN node (i.e., the Node0 potentiometer controls the brightness of Node1's LED and vice versa). Their real-time status is also displayed by the host software.
8. **Node2 Potentiometer:** This analog potentiometer is connected to Node2. When Node2 is configured for "Poll Automatically" option, the real-time status of this potentiometer is displayed by the host software.
9. **CAN Node LED Banks:** Both Node0 and Node1 are connected to their own bank of nine LEDs: one 8-bit LED port and one PWM-controlled LED. The 8-bit LED shows the (digital) status of PORTD of the controller, and can be modified under software control. The output of the PWM-controlled LED is continuously variable, and is determined by the value of the *other* CAN node's potentiometer (7a or 7b), as noted. For the LEDs to function, their associated LED enable jumper (JP1 or JP2) must be installed.
10. **Node2 LED Bank:** An 8-bit LED port is connected to PORTB of the LIN slave node and shows its (digital) status. The display can be modified under software control. The LED enable jumper, JP4, must be installed for the bank to function.
11. **CAN Transceivers:** The MCP2551 transceivers (one for each CAN node) convert the differential signal on the CAN bus to levels that are compatible with the PIC18 microcontrollers.
12. **LIN Transceiver:** The MCP201 transceiver converts the high-voltage signals from the LIN bus to levels compatible with the PIC16 microcontroller.
13. **External EEPROM**: A 24LC16 serial EEPROM is included for the use of developers in creating a full range of prototype devices. This is a 16 Kbit device which is programmable by a two-wire I^2C™ interface. The EEPROM memory is controlled by Node0. Its contents may be read or modified via the host software interface.
14. **RS-232 (DB9F) Port:** A standard D-shell connector provides a serial connection to control and monitor the Demonstration Board. Since it uses a standard 232 level shifter, this connector can also be used as a standard serial port for prototype applications.
15. **CAN Connector (DB9M):** This connector allows the on-board CAN nodes to be connected to an external CAN bus.
16. **LIN Connector (3-pin) Pad:** A space is provided to add a 3-pin connector, allowing the on-board LIN node to connect with an external LIN bus.
17. **ICD Connectors:** These two 6-wire RJ-11 connectors allow the CAN Node microcontrollers to be connected to an external programmer and programmed on the board.
18. **Power Connector:** Power (12 VDC) is supplied to the board from the power adapter through a 4-pin mini-DIN jack. Alternatively, external power can be provided through the 2-pin terminal block. On-board regulators provide separate +5 VDC sources for analog and digital circuits. Both inputs are protected from accidental polarity reversal. Direct 12 VDC is also available to appropriate circuits.
19. **Power LED (Red):** This is lit to show that power is being supplied to the Demonstration Board.
20. **LCD Connector:** This 14-pin header allows the addition of a standard LCD controller module (such as Hitachi HD4478 or equivalent) to the demonstration board.

21. **Prototype Headers:** These connector pads are provided for users to directly access the I/O port signals for all the microcontrollers. As an option, headers may be installed in these locations.
22. **MCU Prototype Area:** This grid is provided for prototyping controllers that are not supported by the existing sockets. The area is provided with connections for analog and digital power (separate +5 V_{DC} sources), V_{BAT} for LIN (up to +12 V_{DC}) and ground connections.

1.1 CANKing HOST SOFTWARE

Included with the Development Kit is the CANKing host software. Developed by Kvaser AB, the CANKing package allows users to examine and control the board's operation in detail, as well as monitor CAN node operations. Interfaces are implemented through a series of three predesigned templates, which are grouped by functionality (CAN node evaluation and control, board-level control, etc.). CAN-related templates are designed around the CAN Kingdom upper-layer protocol primitives. Previous experience with this CAN design system is helpful, but not strictly necessary.

Installation and overall operation of the host software is discussed in **Chapter 3. "Getting Started with the CANKing Software"**. The CANKing templates are detailed in **Chapter 4. "Using the CANKing Templates"**.

Chapter 2. Getting Started with the PICDEM CAN-LIN 2 Board

2.1 HIGHLIGHTS

This chapter will cover the following topics:

- Host Computer Requirements
- Using the PICDEM CAN-LIN 2 Board for the First Time
- Checking the Board in Evaluation Mode

2.2 HOST COMPUTER REQUIREMENTS

To communicate with and program the PICDEM™ CAN-LIN 2 Development Board, you must have a system that meets the following hardware and software requirements:

- PC-compatible system with an Intel® 80486 class or higher processor, or equivalent
- A minimum of 16 MB RAM
- A minimum of 5 MB available hard drive space
- CD-ROM drive (for use with the accompanying CD)
- One available standard serial port, with a matching COM port available through the operating system
- Microsoft® Windows® 95, or any 32-bit version of Microsoft Windows operating system (Windows 98, Windows NT®, Windows 2000 or Windows XP)

2.3 USING THE PICDEM CAN-LIN 2 BOARD FOR THE FIRST TIME

For evaluating the PICDEM CAN-LIN 2 board, the simplest configuration uses a host computer connected directly to the board using a crossover cable. Creating this setup involves the following steps:

1. Installing the CANKing Host Software.
2. Connecting the PICDEM CAN-LIN 2 Development Board to the host system.
3. Starting the Host Software.

2.3.1 Installing the Host Software

The installation of the host software package is completely automated and does not require any user intervention or configuration once the process is started. The process is identical for all 32-bit Windows operating systems. Users with Windows NT-based desktops (NT 4.0, 2000 and XP) should not need to have administrative rights to their systems for this installation. Closing all background applications before proceeding is helpful, but not required.

> **Note:** It is possible that some organizations may implement a desktop computer policy sufficiently restrictive to prevent the user from loading any software at all. In theory, this can be done with **any** 32-bit Windows operating system on a network – including Windows 95. If this describes your situation, contact your local Information Services provider for assistance in installing this software.

To install the host software:

1. Insert the PICDEM CAN-LIN 2 Software CD into your system's CD-ROM drive.
2. Double-click on My Computer, then on the icon for the CD-ROM.
3. Double-click on the `wc32mchip_pic.exe` icon. Installation will proceed automatically and take 1-2 minutes.

Alternatively, run the installation by selecting *Run* from the Start menu. At the dialog box, enter:

```
x:\wc32mchip_pic
```

where "`x`" is the drive letter of your CD-ROM.

The installation process will install the host software package, as well as the templates and help files. By default, all files are installed by default in the directory `Program Files\Microchip` under the root level of your hard drive. A shortcut for the host software is also installed under *Programs* from the Start menu (*Programs > Microchip > CANKing*).

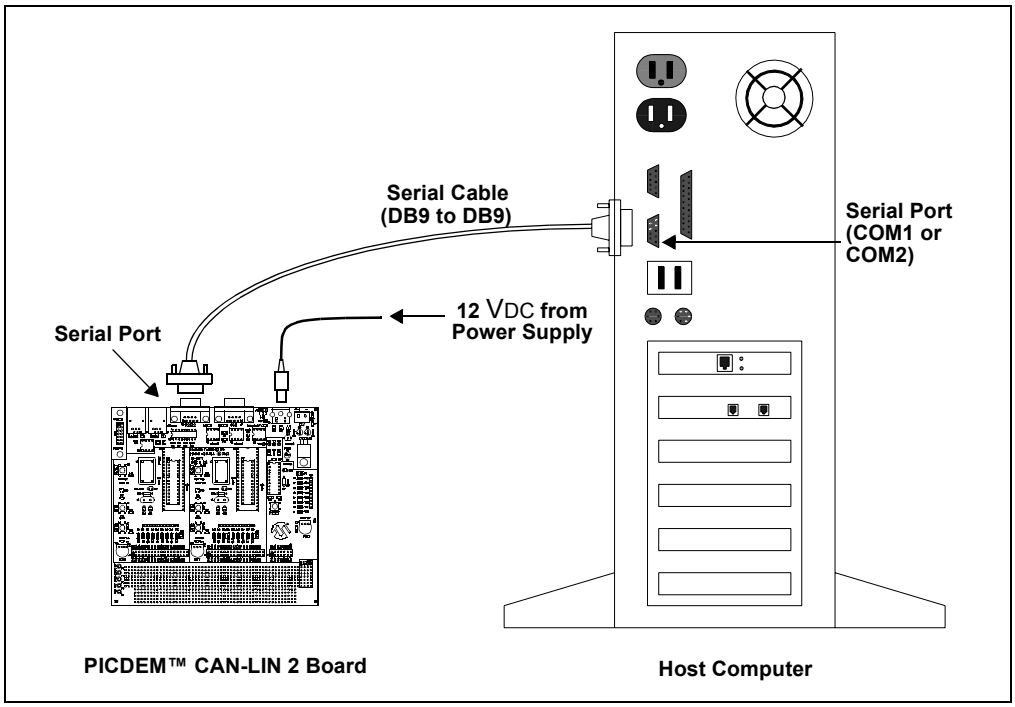
> **Note:** Always use the suggested default path for installing the host software. Because of certain software dependencies, it may not work correctly if installed elsewhere.

2.3.2 Connecting the PICDEM CAN-LIN 2 Board

The basic connections are shown in Figure 2-1.

1. Power-down the host system. (This isn't strictly necessary, but it's always a good safety idea – particularly if you need to rearrange cables or move the system.)
2. Unbox and unwrap the board, and set it on a non-conductive surface near the host system.
3. If they aren't installed already, install the microcontrollers in their respective sockets. Check that they are completely seated and that all pins are making contact.

FIGURE 2-1: CONNECTIONS BETWEEN THE PICDEM™ CAN-LIN 2 BOARD AND THE HOST COMPUTER



4. Connect the serial cable (supplied in the kit) to the RS-232 connector on the board, then to the open serial port on your computer.

Note: If your available serial port is a DB25 male connector, you will need to use a DB25F-to-DB9M port adapter, sometimes known as an “external modem adapter”. Check with your local electronics parts store or your Information Services provider for additional information.

5. Connect the mini-DIN plug of the power supply to the power input jack on the board.
6. Plug the power adapter into your wall socket or power strip.
7. Check the board. The red power LED should light, and the Node0 port LEDs should briefly flash once. If they don’t, check all connections with the power supply and the board. For additional assistance, refer to **Chapter 6. “Troubleshooting”**.
8. Power-up the host system.

2.3.3 Starting the Host Software for the First Time

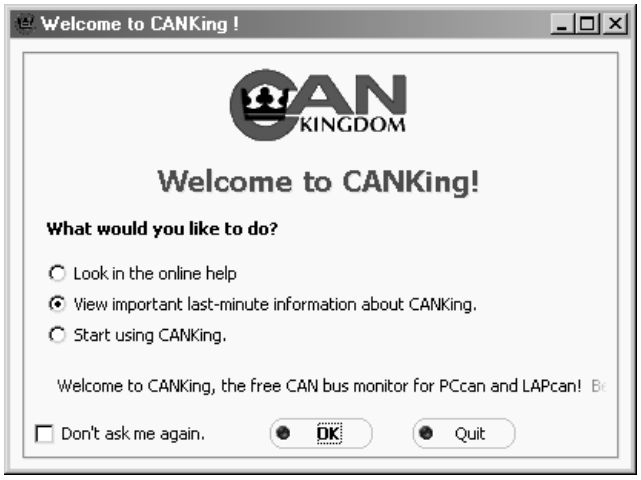
With the software installed, and the PICDEM CAN-LIN 2 board connected, all you need to do is to actually start the host software and confirm communications.

1. From the Start menu, select *Programs > Microchip > CANKing*;
   OR
   From a Command window (DOS® window on Windows 95/98), navigate to the directory `\program files\microchip`, then enter:

   ```
   wc32
   ```

   However it is started, the CANKing welcome dialog box appears (Figure 2-2).

FIGURE 2-2: THE CANKing WELCOME DIALOG

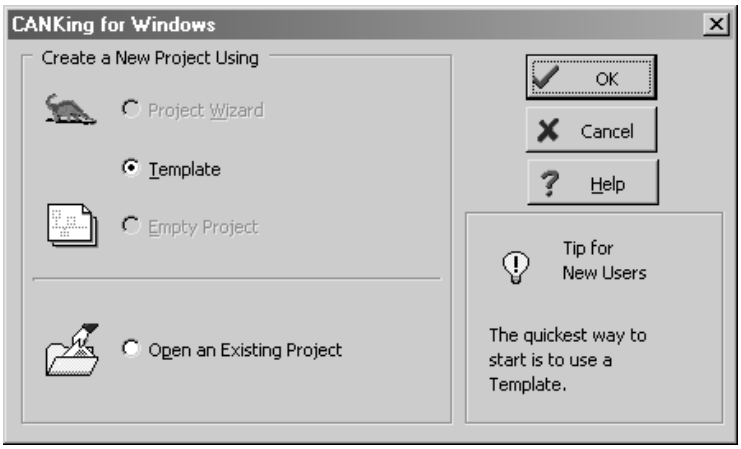


2. Select the "Start using CANKing" option. Optionally, to remove the dialog from future start-ups, check the **Don't ask me again** box. Click on **OK**.
3. At the subsequent "Warning!" dialog, click on **OK, I Know What I'm Doing** to proceed. Optionally, check **Don't show me this warning in the future** to remove this dialog from future start-ups.

> **Note:** The cautions against personal injuries in this dialog refer to those cases where the PICDEM CAN-LIN 2 board is being used in the evaluation and development of live automotive and industrial networks. Obviously, this doesn't apply to situations where the board is being used in isolation to prototype network nodes.

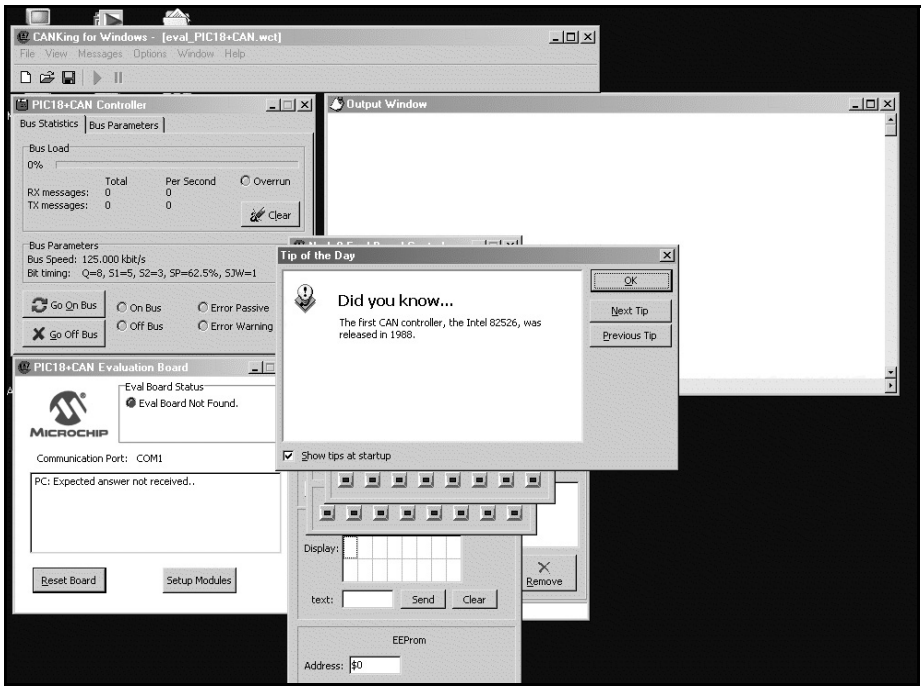
4. At the next dialog box (Figure 2-3), select the **Template** option under "Create a New Project Using". Click **OK**.

FIGURE 2-3: CREATING A NEW PROJECT



5. At the “Templates” dialog, select **PIC18+CAN Evaluation Board**. Click on **OK**.
6. A series of smaller windows and dialog boxes is launched as part of the Evaluation Board template (Figure 2-4). Go to the CANKing for Windows menu at the top of the screen and select *Options > PIC18+CAN...* (you will need to close the Tip of the Day window at center screen first).

FIGURE 2-4: THE EVALUATION BOARD TEMPLATE AT LAUNCH (CANKing MAIN MENU BAR AT TOP LEFT)



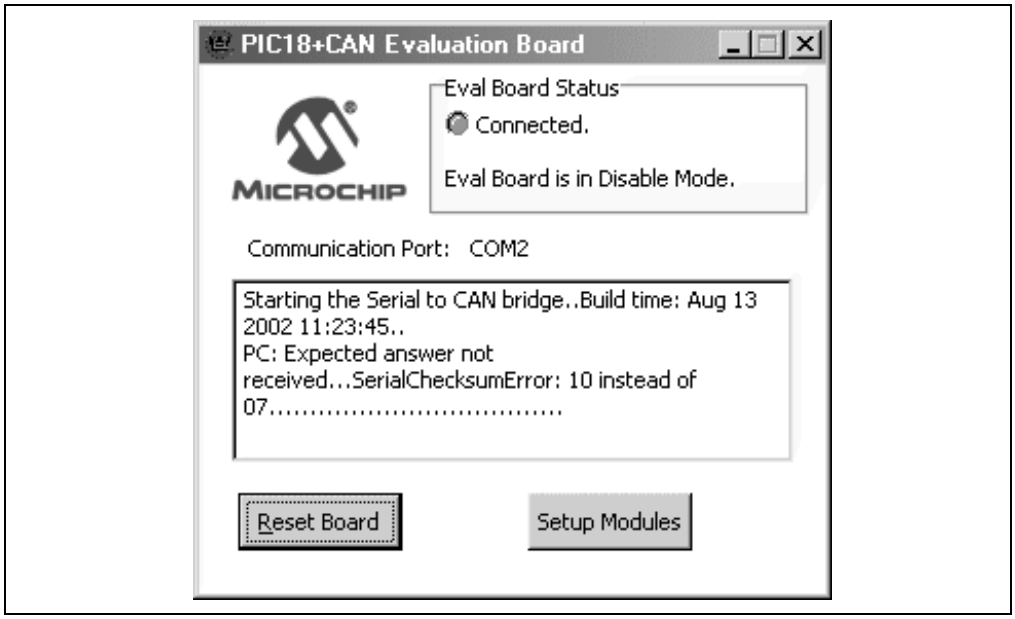
7. At the "Evaluation Board Options" dialog, select the following options from the appropriate drop-down menus:
   - Clock Frequency: 25000 kHz (25 MHz)
   - COM Baud Rate: 38400 bps
   - COM Port: (the port that the board is connected to)

   Under Options for the Current Configuration, check **Reset PIC18+CAN on Open**.

   Click **OK**.
8. In the Evaluation Board window (which launched along with the other windows of the Evaluation Board template), the "Connected" status indicator turns green, and a message indicating a successful serial connection appears.

   Click on **Reset Board**. The green light stays on, and the message below it changes to "Eval Board is in Disable Mode" (Figure 2-5).

FIGURE 2-5: THE EVALUATION BOARD WINDOW, SHOWING A SUCCESSFUL CONNECTION



9. In the CAN Controller window, click on **Go on Bus**. The On Bus light turns green. At the same time, the message in the Evaluation Board window changes to "Eval Board is in Normal Mode".
10. In the Evaluation Board window, click on **Setup Modules**. Output information from the board appears in the Output window.

The PICDEM CAN-LIN 2 board is now ready to respond to control inputs from the host software.

2.4 CHECKING THE BOARD IN EVALUATION MODE

While the board is connected to the host system and the host software is using the Evaluation template, it may be useful to verify its operation. This is also a good way to show off the board's capabilities.

After following the instructions in **Section 2.3 "Using the PICDEM CAN-LIN 2 Board for the First Time"**, do the following:

1. Slowly turn the Node0 potentiometer clockwise and counterclockwise. The right most LED of Node1's LED bank should brighten and dim. At the same time, the **Pot Value** displayed in the Node0 Eval Board window should increase and decrease, while the **PWM Intensity** indicator in the Node1 Eval Board window should increase and decrease by the same amount.
2. Slowly turn the Node1 potentiometer clockwise and counterclockwise. The right most LED of Node0's LED bank should brighten and dim. At the same time, the **Pot Value** displayed in the Node1 Eval Board window should increase and decrease, while the **PWM Intensity** indicator in the Node0 Eval Board window should increase and decrease by the same amount.

> **Note:** While this may seem anti-intuitive, using one node's potentiometer to affect the other's LED does prove a point. For this demonstration, we are showing that an analog input from one microcontroller can be communicated across the CAN bus to control the PWM output of the other microcontroller.

3. Click on any of the LED buttons in either of the CAN node's windows. The corresponding LED on the board should toggle on or off.
4. In the Node2 Eval Board window, select the **Count LEDs** check box. Both the LED buttons in the window, as well as the Node2 LEDs on the board, should start counting up in binary and in sync with each other.

If all of these tests worked, you are now ready to start working with the board.

NOTES:

Chapter 3. Getting Started with the CANKing Software

3.1 HIGHLIGHTS

The items discussed in this chapter are:

- Software Overview
- Starting the Program
- Introduction to the Templates
- The Main Menu
- The Output Window
- Customizing Projects

3.2 SOFTWARE OVERVIEW

The CANKing host software provides a comprehensive interface to control the board's operation. To make things easier, the program uses three distinct, predefined templates that perform specific functions.

Note: Using the CANKing host software requires that the PICDEM™ CAN-LIN 2 board's microcontrollers be programmed with the demo firmware. Since the CAN firmware is designed to run on PIC18F4680 microcontrollers only, using any configuration in Node0 and Node1 other than two PIC18F4680 microcontrollers precludes the use of CANKing host software. The board can still be used in other configurations for prototype development.

3.3 STARTING THE PROGRAM

To run CANKing, select *Programs > Microchip > CANKing*. from the Start menu. Alternatively, double-click on the CANKing icon or shortcut.

If you have not disabled them on the first use of the software, you will see the initial CANKing Dialog and Warning window (see **Section 2.3.3 "Starting the Host Software for the First Time"** for details). If they appear, click **OK** at these dialogs to continue.

At the Open a Project or Template dialog (simply titled "CANKing for Windows"), select the **Template** option for creating a new project. (The other options listed are not available in this version of CANKing and should be dimmed.) Click **OK**.

At the "Templates" dialog, select the appropriate template and click **OK** to launch it. You can also directly launch the template by double-clicking on its icon.

If you have an alternate template or project you wish to use, select the **Open an Existing Project** option at the "Open a Project" dialog. A standard Windows dialog allows you to browse for the desired folder. Custom projects and templates are covered in more detail in **Section 3.7 "Customizing Projects"**.