

CAN

Getting Started with Your PXI-8461 and the NI-CAN™ Software for Windows NT

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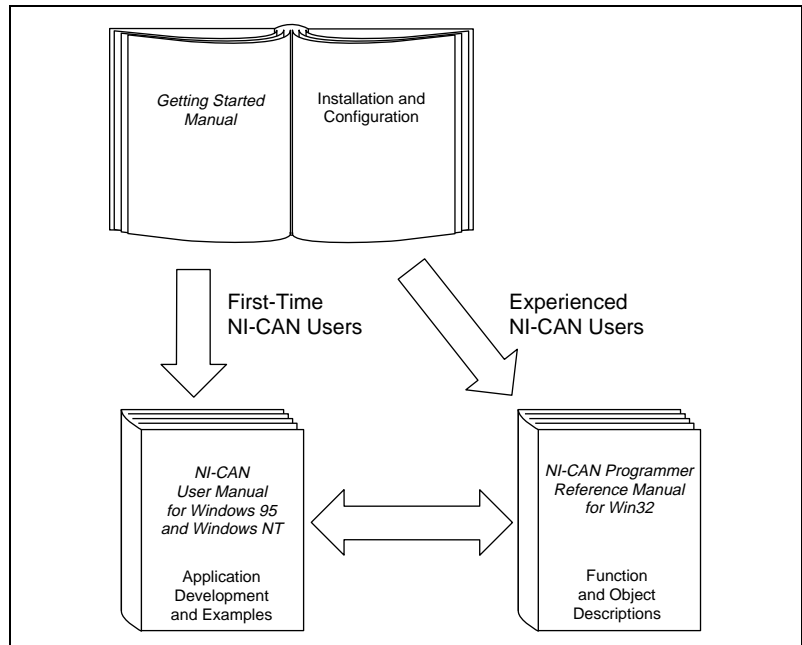
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About This Manual

This manual contains instructions to help you install and configure your PXI-8461 (one port or two port) and the NI-CAN software for Windows NT. This manual uses PXI-8461 to refer to both the one port and two port versions of the PXI-8461.

This manual assumes that you are already familiar with Windows NT.

How to Use the Manual Set



Use this getting started manual to install and configure your PXI-8461 and the NI-CAN software for Windows NT.

Use the NI-CAN User Manual to learn the basics of CAN and how to develop an application program. The user manual also contains detailed examples.

Use the NI-CAN Programmer Reference Manual for specific information about each NI-CAN function and object, including format, parameters, and possible errors.



Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what you need to get started, provides an overview of the PXI-8461 (one port or two port) and the NI-CAN software for Windows NT, and describes optional equipment you can order.
- Chapter 2, *Installation and Configuration*, describes how to install and configure the NI-CAN software for Windows NT and the PXI-8461 hardware.
- Chapter 3, *Verify the Installation*, describes how to verify the hardware and software installation.
- Chapter 4, *Begin to Use the NI-CAN Software*, helps you get started with the NI-CAN software for Windows NT.
- Appendix A, *Uninstalling the Hardware and Software*, describes how to uninstall the PXI-8461 hardware and the NI-CAN software from Windows NT.
- Appendix B, *Cabling Requirements*, describes the cabling requirements for the hardware.
- Appendix C, *Troubleshooting and Common Questions*, describes how to troubleshoot problems and answers some common questions.
- Appendix D, *Specifications*, describes the physical characteristics of the hardware and the recommended operating conditions.
- Appendix E, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and a description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

The following conventions are used in this manual:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence File»Page Setup»Options»Substitute Fonts directs you to open the File menu, select the Page Setup item, select Options , and finally select the Substitute Fonts option from the last dialog box.
	This icon to the left of bold italicized text denotes a note, which alerts you to important information.
	This icon to the left of bold italicized text denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes the names of menus, menu items, dialog boxes, dialog box buttons or options, icons, windows, Windows NT tabs, or LEDs.
<i>bold italic</i>	Bold italic text denotes a note or caution.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept. This font also denotes text for which you supply the appropriate word or value, such as in <i>Windows 3.x</i> .
monospace	Text in this font denotes text or characters that you should literally enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, parameters, operations, variables, filenames, and extensions, and for statements and comments taken from program code.
<i>monospace italic</i>	Italic text in this font denotes that you must supply the appropriate words or values in the place of these items.
paths	Paths in this manual are denoted using backslashes (\) to separate drive names, directories, folders, and files.

Related Documentation

The following documents contain information that you may find helpful as you read this manual:

- ANSI/ISO Standard 11898-1993, *Road Vehicles—Interchange of Digital Information—Controller Area Network (CAN) for High-Speed Communication*
- *CAN Specification Version 2.0*, 1991, Robert Bosch GmbH., Postfach 500, D-7000 Stuttgart 1
- CiA Draft Standard 102, Version 2.0, *CAN Physical Layer for Industrial Applications*
- *CompactPCI Specification*, Revision 2.0, PCI Industrial Computers Manufacturers Group
- *DeviceNet Specification, Version 2.0*, Open DeviceNet Vendor Association
- *PXI Specification*, Revision 1.0, National Instruments Corporation

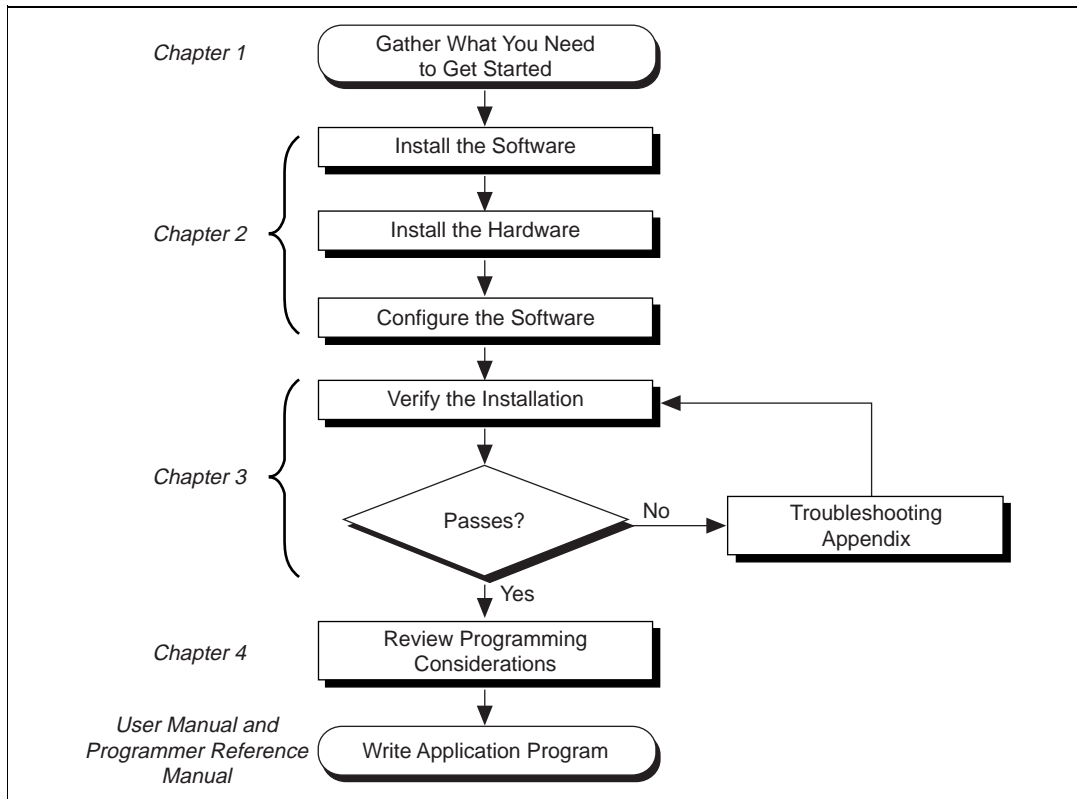
Customer Communication

National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in Appendix E, [Customer Communication](#), at the end of this manual.

Introduction

This chapter explains how to use this manual, lists what you need to get started, provides an overview of the PXI-8461 (one port or two port) and the NI-CAN software for Windows NT, and describes optional equipment you can order.

How to Use This Manual



What You Need to Get Started

Make sure you have all of the following items before you attempt to install the hardware and software:

- Windows NT 3.51 or later installed on your computer
- One of the following boards, which is included in your kit:
 - PXI-8461 one port
 - PXI-8461 two port
- The following 3.5 in., high-density (1.44 MB) disks, which are included in your kit:
 - NI-CAN Software for Windows 95/98 and Windows NT (Disk 1 of 2)*
 - NI-CAN Software for Windows 95/98 and Windows NT (Disk 2 of 2)*
- CAN interface cables that meet the requirements in Appendix B, [Cabling Requirements](#)

Hardware Overview

The PXI-8461 (one port and two port) is software configurable and compliant with the *PXI Specification* and *CompactPCI Specification*. With a PXI-8461 board, you can make your PXI or CompactPCI chassis communicate with and control CAN devices.

The PXI-8461 physical layer fully conforms to the ISO 11898 physical layer specification for CAN and is optically isolated to 500 V. CAN interfacing is accomplished using the Intel 82527 CAN controller chip. The PXI-8461 supports a wide variety of transfer rates up to 1 Mb/s. The CAN physical layer on the PXI-8461 can be powered either internally (from the board) or externally (from the bus cable power). The power source for the CAN physical layer for each port is configured with a jumper.

PXI-8461 boards are available with two physical connector types:

- DB-9 D-Sub
- Combicon-style pluggable screw terminals

The PXI-8461 uses the Intel 386EX embedded processor to implement time-critical features provided by the NI-CAN software. The PXI-8461 communicates with the NI-CAN driver through on-board shared memory and an interrupt.

NI-CAN Software Overview

The NI-CAN software includes a native, 32-bit multitasking Windows NT kernel driver. The NI-CAN software is fully integrated into the Windows NT operating system. You can configure it through the Windows NT Control Panel and uninstall it through the Add/Remove Programs applet of the Control Panel.

The NI-CAN software for Windows NT supports the concurrent use of multiple CAN boards. For example, you can use both a PXI-8461 and PCMCIA-CAN in the same system at the same time.

The NI-CAN software, along with the PXI-8461, transforms your computer into a CAN interface with complete communications and bus management capability. The NI-CAN software includes the following components:

- Firmware (runs on embedded Intel 386EX)
- Device driver
- Diagnostic test utility
- Configuration utility
- Language interface libraries for Microsoft Visual C/C++ 2.0 or later, LabWindows/CVI 4.0 or later, and LabVIEW 4.0 or later
- Example programs that use NI-CAN functions

Optional Programming Tools

Your kit includes the NI-CAN software for Windows NT. In addition, you can order the LabWindows/CVI, LabVIEW, or BridgeVIEW software from National Instruments.

LabWindows/CVI is an interactive ANSI C development environment for building test and measurement and instrument control systems. It includes interactive code-generation tools and a graphical editor for building custom user interfaces. It also includes built-in libraries for IEEE 488.2, VXI, RS-232 control, and plug-in data acquisition. When you order LabWindows/CVI, you also get hundreds of complete instrument drivers, which are modular, source-code programs that handle the communication with your instrument so that you do not have to learn the programming details.

LabVIEW is a complete programming environment that departs from the sequential nature of traditional programming languages and features a graphical programming environment. It includes all the tools needed for instrument control, data acquisition, analysis, and presentation. LabVIEW also includes an extensive instrument driver library.

BridgeVIEW is a radical departure from traditional automation software that provides a flexible program development system for a variety of DeviceNet applications including general manufacturing, test, and control. Leveraging National Instruments patented graphical programming language G (otherwise known as LabVIEW), BridgeVIEW gives you the ability to integrate functionality in a way that is not possible with traditional automation software. In addition to the programming advantages of G, BridgeVIEW also provides a number of powerful features for the development of your industrial automation application: graphical HMI (Human Machine Interface); ease of use; fill-in-the-blank configuration utilities; HMI G Wizard for simplified HMI development; historical data collection and trending; alarm and event reporting and logging; security; and connectivity to PLCs and industrial device networks like DeviceNet.

For more information about LabWindows/CVI, LabVIEW, and BridgeVIEW, contact National Instruments.

Installation and Configuration

This chapter describes how to install and configure the NI-CAN software for Windows NT and the PXI-8461 hardware.

Install the NI-CAN Software

Install the NI-CAN software for Windows NT before you install your hardware.

Installation for Windows NT 3.51

1. Log on to your Windows NT system using the Administrator account. The NI-CAN setup program must have Administrator privileges because the program modifies the configuration registry of your system.
2. Insert the *NI-CAN Software for Windows 95/98 and Windows NT (Disk 1 of 2)* into an unused drive.
3. In the **Run** dialog box, type the following:
`x:\setup`
where *x* is the letter of the drive containing the disk (usually a or b).
4. Shut down Windows NT and turn off your computer when you complete the setup.
5. Proceed to the section *Install the Hardware*.

Installing for Windows NT 4.0

1. Log on to your Windows NT system using the Administrator account. The NI-CAN setup program must have Administrator privileges because the program modifies the configuration registry of your system.
2. Select **Start»Settings»Control Panel**.

3. Double-click on the **Add/Remove Programs** icon in the Control Panel to launch the Add/Remove Programs applet. A dialog box similar to the one in Figure 2-1 appears.

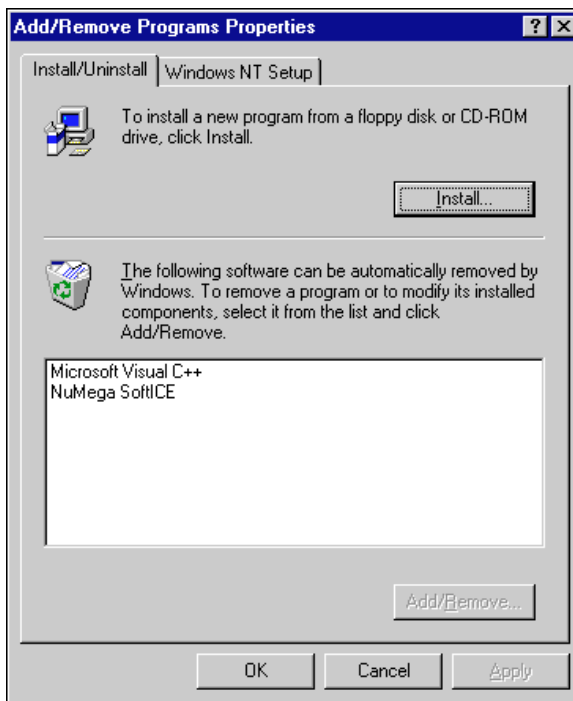


Figure 2-1. Add/Remove Programs Properties Dialog Box

4. Click on the **Install** button.
5. When prompted, insert the *NI-CAN Software for Windows 95/98 and Windows NT (Disk 1 of 2)*, and click on the **Next** button to proceed.

The software installation wizard begins with the screen shown in Figure 2-2.

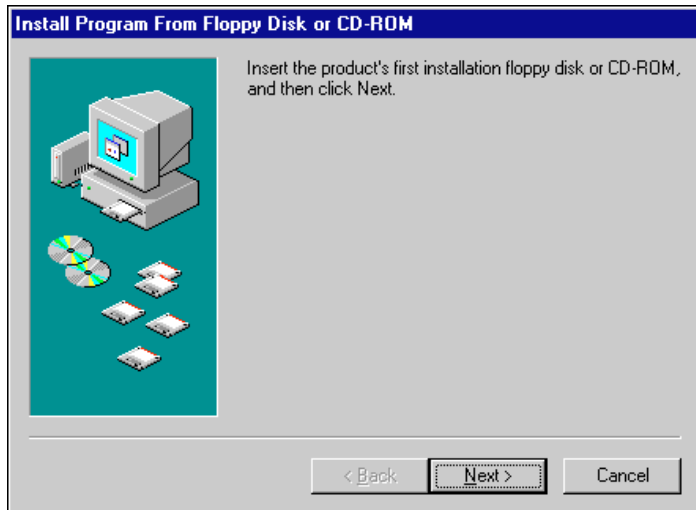


Figure 2-2. NI-CAN Software Setup Screen

The setup wizard guides you through the necessary steps to install the NI-CAN software. You may go back and change values where appropriate by clicking on the **Back** button. If at any time you want to exit the setup, click on the **Cancel** button.

6. Shut down Windows NT and turn off your computer when you complete the setup.

Install the Hardware

This section describes how to install your PXI-8461 hardware.

Install Your PXI-8461



Caution *Before you remove the board from the package, touch the antistatic package to a metal part of your system chassis to discharge electrostatic energy, which can damage several components on your board.*

1. Make sure that your PXI or CompactPCI chassis is turned off. Keep the PXI or CompactPCI chassis plugged in so that it remains grounded while you install the PXI-8461.
2. Choose an unused PXI or CompactPCI 5 V peripheral slot.

3. Remove the filler panel for the peripheral slot you have chosen.
4. Touch a metal part on your chassis to discharge any static electricity that might be on your clothes or body.
5. If you plan to use your PXI-8461 in a system where bus power is available, you may want to configure the power supply jumpers on your board. See Appendix B, *Cabling Requirements*, for more information.
6. Insert the PXI-8461 into the selected 5 V slot. Use the injector/ejector handle to fully inject the device into place. Figure 2-3 shows how to install the PXI-8461 into a PXI or CompactPCI chassis.

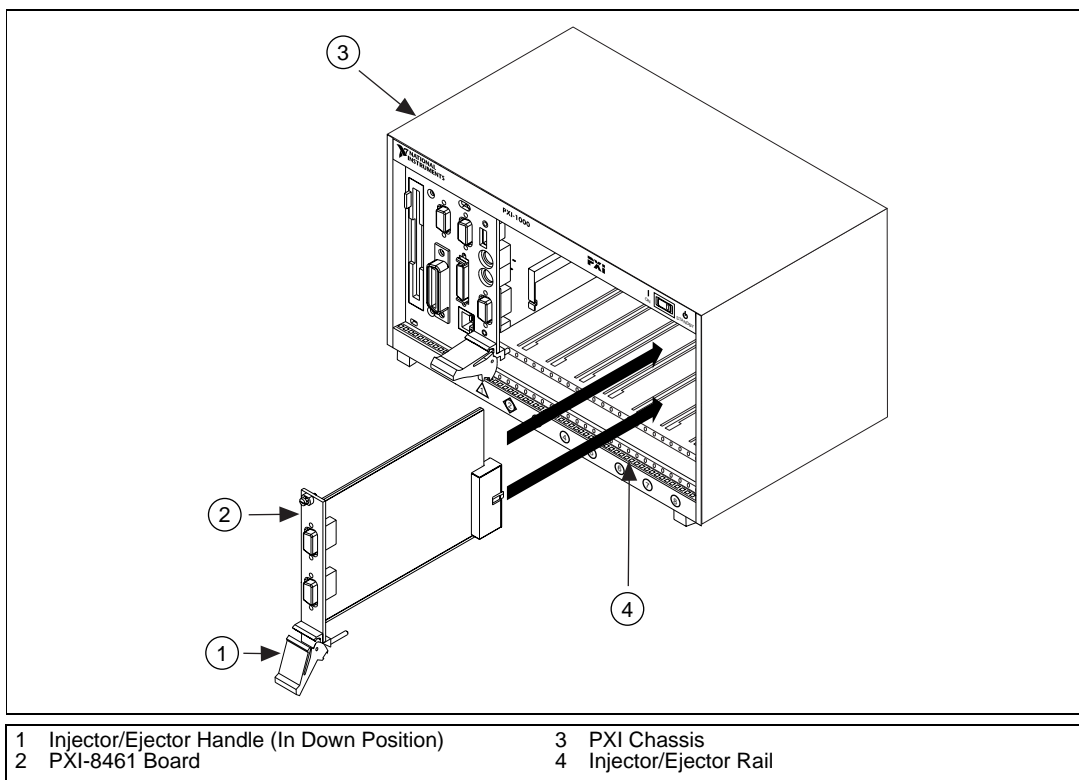


Figure 2-3. Installing the PXI-8461

7. Screw the front panel of the PXI-8461 to the front panel mounting rail of the PXI or CompactPCI chassis.
8. Turn on your PXI or CompactPCI chassis and start Windows NT.

Connect the Cables

After you have installed your board, connect the CAN cables to your PXI-8461. Because exact cabling requirements vary for each application, National Instruments does not provide cables. Refer to Appendix B, [Cabling Requirements](#), for information about the cabling requirements of the hardware.

The PXI-8461 installation is complete. Proceed to the next section, *Configure the NI-CAN Software*.

Configure the NI-CAN Software

The NI-CAN Configuration utility is located in the Windows NT Control Panel. You can use it to examine or modify the configuration of the NI-CAN software. The context-sensitive online help, available by right-clicking on any of the controls on the configuration utility buttons, includes all the information you need to configure the NI-CAN software.

To use the NI-CAN Configuration utility, you must first log in as Administrator or as a user with Administrator privileges. To configure the NI-CAN software, double-click on the **NI-CAN Configuration** icon in the **Control Panel**:

- Windows NT 3.51: Open the **Control Panel** in the **Main** group of the **Program Manager**.
- Windows NT 4.0 or later: Select **Start»Settings»Control Panel**.

Figure 2-4 shows a CAN interface that is working properly. If no interfaces are listed under **NI-CAN Configuration**, refer to the [Missing Board in the NI-CAN Configuration Utility](#) section in Appendix C, [Troubleshooting and Common Questions](#), to resolve the problem.

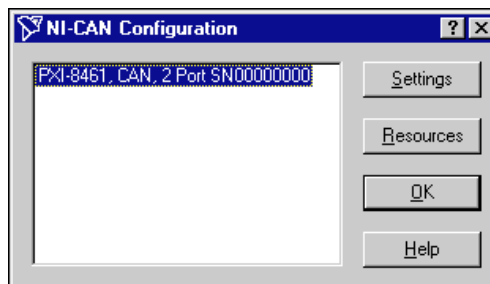


Figure 2-4. PXI-8461 That Is Working Properly

To select a particular interface, click on that interface in the list.

When you install a PXI-8461, your computer automatically assigns valid resources to it. Because this resource assignment is automatic, you do not need to use the **Resources** dialog box for the PXI-8461, and you do not need to restart Windows NT.

To view information about the NI-CAN software configuration for the PXI-8461, click on the **Settings** button. Figure 2-5 shows the **Settings** dialog box.

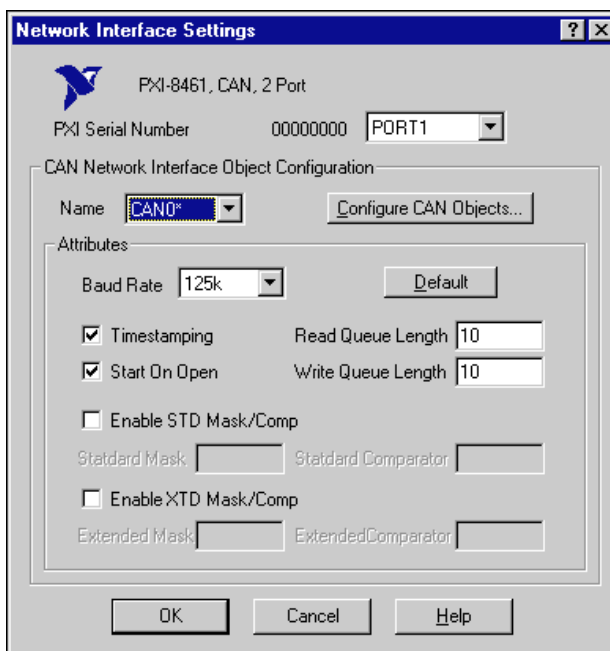


Figure 2-5. NI-CAN Settings for the PXI-8461

Each port of the PXI-8461 is configured from this tab. Use the drop-down box nearest the top of the tab to select the physical port number to configure. For each port, use the **Name** drop-down box to select the name for the CAN Network Interface Object (CAN0, CAN1, and so on). You use this name to refer to the physical port from within your NI-CAN application.

To access online help for the NI-CAN Configuration utility, click on the **Help** button. You can also right-click on a specific control and select

What's This? from the pop-up menu to see context-sensitive help for the item you have clicked on.

When you have finished configuring the NI-CAN software, proceed to Chapter 3, [Verify the Installation](#).

Verify the Installation

This chapter describes how to verify the hardware and software installation.

You can use the NI-CAN Diagnostic utility, installed with your NI-CAN software, to test the hardware and software installation. The utility verifies that your hardware and software are functioning properly and that the configuration of your hardware does not conflict with anything else in your system.

To run the utility, select the **NI-CAN Diagnostic** item:

- Windows NT 3.51: Double-click on the **NI-CAN Diagnostic** icon in the **NI-CAN Software** group of the **Program Manager**.
- Windows NT 4.0 or later: Select **Start»Programs»NI-CAN Software»NI-CAN Diagnostic**.

When you have started the NI-CAN Diagnostic utility, test your CAN interfaces by clicking on the **Test All** button. You can also test one CAN interface by highlighting it and clicking on the **Test One** button. If the NI-CAN Diagnostic is successful, it puts a checkmark next to the interface and changes its status from **Untested** to **Passed**. If the NI-CAN Diagnostic fails, it puts an X next to the interface, and changes its status from **Untested** to **Failed**. Figure 3-1 shows the NI-CAN Diagnostic utility after it has tested some CAN interfaces.

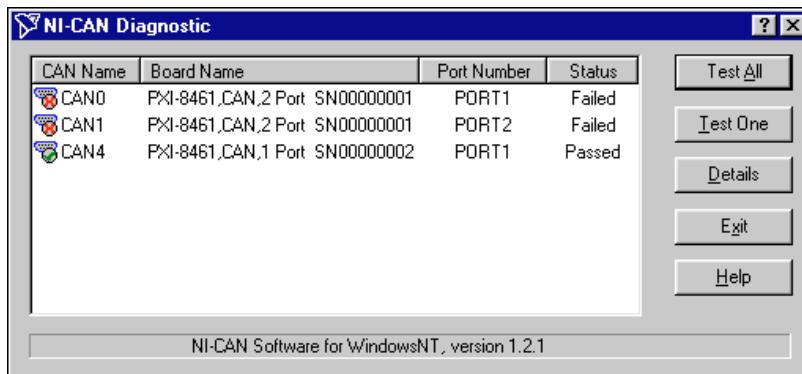


Figure 3-1. NI-CAN Diagnostic Utility after Testing

You can get details about any tested CAN interface by selecting the interface and clicking on the **Details** button. For each failed CAN interface, select it and click on the **Details** button to get a description of the failure. Use that information and the information in Appendix C, *Troubleshooting and Common Questions*, to troubleshoot the problem. Troubleshooting information is also available in the online help for the NI-CAN Diagnostic utility, which you can access by clicking on the **Help** button.

Begin to Use the NI-CAN Software

This chapter helps you get started with the NI-CAN software for Windows NT.

Using the NI-CAN Software

The functions provided by the NI-CAN software are similar to those provided by many other device drivers. For example, NI-CAN has open, close, read, and write functions. NI-CAN provides two different levels of access to a CAN network: the CAN Network Interface Object and CAN Objects. Both forms of access support timestamping of incoming data and various forms of queuing.

The CAN Network Interface Object provides low-level access to a CAN network. Each CAN Network Interface Object maps to a specific CAN port, with no limitation on the maximum number of ports or boards you can use (for example, two PXI-8461 two-port interfaces would provide CAN0 through CAN3). You can use this object to transmit and receive entire CAN frames. For example, to transmit a CAN frame, you would specify the outgoing arbitration ID, frame type (data or remote), data length, and data.

The CAN Objects provide higher level access to a CAN network. Each CAN Object maps to a specific data item (arbitration ID), and you can use multiple CAN Objects for a given port. When configuring a CAN Object for use, you specify the arbitration ID, direction of data transfer, data length, and how you want the data to be accessed (such as periodically). For example, you could configure a CAN Object to transmit an outgoing data frame for a specific arbitration ID every 100 ms. After opening this CAN Object, you use the write function to provide data to transmit, and the NI-CAN embedded firmware handles all periodic timing.

For detailed information about the NI-CAN software and functions, refer to the NI-CAN User Manual and the NI-CAN Programmer Reference Manual.

General Programming Considerations

As you begin developing your Win32 NI-CAN application, remember the following points:

- For your LabVIEW or BridgeVIEW application, you must use the NI-CAN LabVIEW functions in `nican.llb`.
- For your C/C++ application, you must include the NI-CAN header file, `nican.h`, in your source code.
- The NI-CAN software is accessed through the 32-bit DLL, `nican.dll`, either by linking with one of the language interfaces provided with the NI-CAN software, or by using direct DLL entry from other programming environments.
- Several sample CAN applications are included with the NI-CAN software. Use these as a guide for your own application development.

For information about developing your application, refer to the NI-CAN User Manual. For detailed information about NI-CAN functions and objects, refer to the NI-CAN Programmer Reference Manual.

Uninstalling the Hardware and Software

This appendix describes how to uninstall the PXI-8461 hardware and the NI-CAN software from Windows NT.

Uninstalling the Hardware from Windows NT

Because Windows NT 3.51 and 4.0 do not maintain hardware information for the board, you just need to physically remove your PXI-8461 from your computer. To do so, shut down Windows NT, power off your PXI or CompactPCI chassis, remove any cables attached to your board, and physically remove the board from your computer.

Uninstalling the NI-CAN Software from Windows NT

**Note**

The following instructions apply to Windows NT 4.0 only. If you are using Windows NT 3.51, refer to the `readme.txt` file in your NI-CAN directory for information on how to uninstall the NI-CAN software.

Before uninstalling the NI-CAN software, you should remove the PXI-8461 boards from your computer, as explained in the previous section.

Complete the following steps to remove the NI-CAN software from Windows NT 4.0:

1. Select the **Add/Remove Programs** icon under **Start»Settings»Control Panel**. A dialog box similar to the one in Figure A-1 appears. This dialog box lists the software available for removal.



Figure A-1. Add/Remove Programs Properties Dialog Box

2. Select the NI-CAN software you want to remove and click on the **Add/Remove** button. The uninstall program runs and removes all folders, utilities, device drivers, DLLs, and registry entries associated with the NI-CAN software. Figure A-2 shows the results of a successful uninstallation.

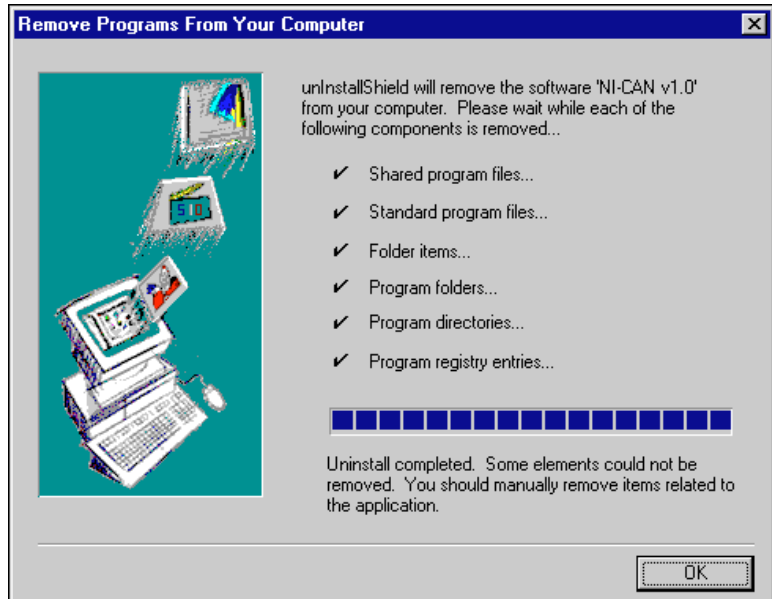


Figure A-2. NI-CAN Uninstallation Results

The uninstall program removes only items that the installation program installed. If you add anything to a directory that was created by the installation program, the uninstall program does not delete that directory because the directory is not empty after the uninstallation. You need to remove any remaining components yourself.

If you want to reinstall the hardware and software, refer to Chapter 2, *Installation and Configuration*.

Cabling Requirements

This appendix describes the cabling requirements for the hardware.

Cables should be constructed to meet these requirements and the requirements of the other CAN or DeviceNet devices in the network.

Connector Pinouts

Depending on the type of PXI-8461 you are installing, it either has DB-9 D-Sub connectors(s) or Combicon-style pluggable screw terminal connector(s).

The 9-pin D-Sub follows the pinout recommended by CiA Draft Standard 102. Figure B-1 shows the pinout for this connector.

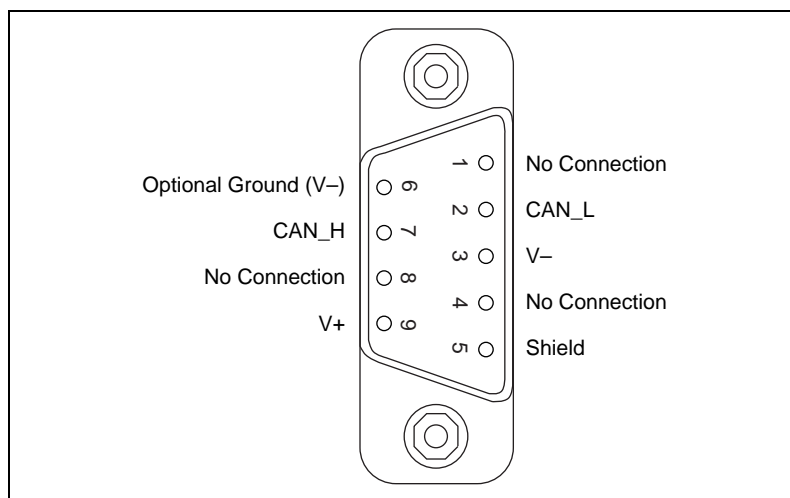


Figure B-1. Pinout for 9-Pin D-Sub Connector

The 5-pin Combicon-style pluggable screw terminal follows the pinout required by the *DeviceNet Specification*. Figure B-2 shows the pinout for this connector.

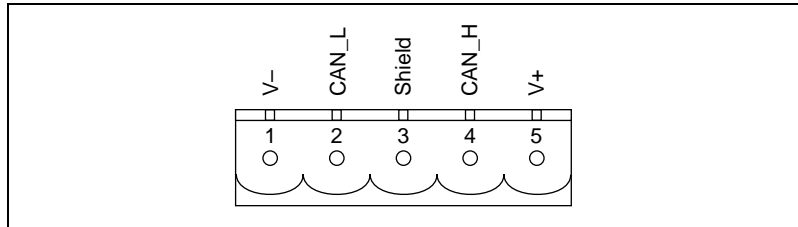


Figure B-2. Pinout for 5-Pin Combicon-Style Pluggable Screw Terminal

CAN_H and CAN_L are signal lines that carry the data on the CAN network. These signals should be connected using twisted-pair cable.

The V+ and V- pins are used to supply bus power to the CAN physical layer if external power is required for the CAN physical layer. If internal power for the CAN physical layer is used, the V- pin serves as the reference ground for CAN_H and CAN_L. See the next section, *Power Supply Information for the CAN Ports*, for more information.

Power Supply Information for the CAN Ports

For the PXI-8461, a jumper controls the source of power for the CAN physical layer. For the PXI-8461 one-port and port one of the PXI-8461 two-port, power is configured with jumper J5. For port two of the PXI-8461 two-port, power is configured with jumper J6. The location of these jumpers is shown in Figure B-3.

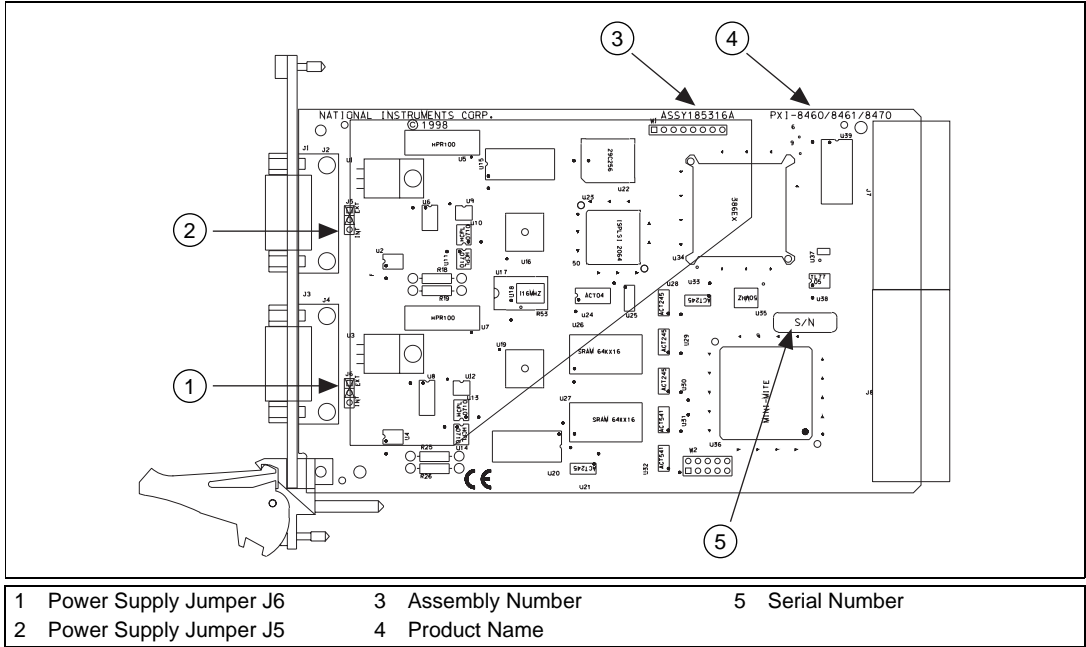


Figure B-3. PXI-8461 Power Source Jumpers

Connecting pins 1 and 2 of a jumper configures the CAN physical layer to be powered externally (from the bus cable power). In this configuration, the power must be supplied on the V+ and V- pins on the port connector.

Connecting pins 2 and 3 of a jumper configures the CAN physical layer to be powered internally (from the board). In this configuration, the V- signal serves as the reference ground for the isolated signals.

Figure B-4 shows how to configure your jumpers for internal or external power supplies.

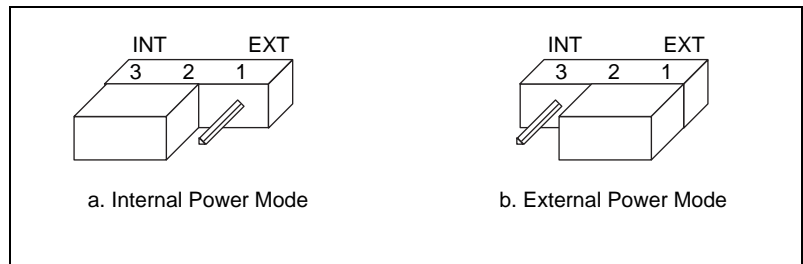


Figure B-4. Power Source Jumpers

The CAN physical layer is still isolated regardless of the power source chosen.

Bus Power Supply Requirements

If the CAN physical layer is powered from a bus power supply, the power supply should be a DC power supply with an output of 10 V to 30 V. The power requirements for the CAN ports for bus-powered configurations are shown in Table B-1. You should take these requirements into account when determining requirements of the bus power supply for the system.

Table B-1. Power Requirements for the CAN Physical Layer for Bus-Powered Versions

Characteristic	Specification
Voltage Requirement	V+ 10 to 30 VDC
Current Requirement	40 mA typical 100 mA maximum

Cable Specifications

Cables should meet the physical medium requirements specified in ISO 11898, shown in Table B-2.

Belden cable (3084A) meets all of those requirements and should be suitable for most applications.

Table B-2. ISO 11898 Specifications for Characteristics of a CAN_H and CAN_L Pair of Wires

Characteristic	Value
Impedance	108 Ω minimum, 120 Ω nominal, 132 Ω maximum
Length-related resistance	70 m Ω /m nominal
Specific line delay	5 ns/m nominal

Cable Lengths

The allowable cable length is affected by the characteristics of the cabling and the desired bit transmission rates. Detailed cable length requirements can be found in ISO 11898, CiA Draft Standard 102, and the *DeviceNet Specification*.

ISO 11898 specifies 40 m total cable length with a maximum stub length of 0.3 m for a bit rate of 1 Mb/s. The ISO 11898 specification says that significantly longer cable lengths may be allowed at lower bit rates, but each node should be analyzed for signal integrity problems.

Table B-3 lists the DeviceNet cable length specifications.

Table B-3. DeviceNet Cable Length Specifications

Baud Rate	Trunk Length	Drop Length Maximum	Drop Length Cumulative
500 kb/s	100 m (328 ft)	6 m (20 ft)	39 m (128 ft)
250 kb/s	250 m (820 ft)	6 m (20 ft)	78 m (256 ft)
125 kb/s	500 m (1640 ft)	6 m (20 ft)	156 m (512 ft)

Maximum Number of Devices

The maximum number of devices that you can connect to a CAN port depends on the electrical characteristics of the devices on the network. If all of the devices meet the requirements of ISO 11898, at least 30 devices may be connected to the bus. Higher numbers of devices may be connected if the electrical characteristics of the devices do not degrade signal quality below ISO 11898 signal level specifications. If all of the devices on the network meet the DeviceNet specifications, 64 devices may be connected to the network.

Cable Termination

The pair of signal wires (CAN_H and CAN_L) constitutes a transmission line. If the transmission line is not terminated, each signal change on the line causes reflections that may cause communication failures.

Because communication flows both ways on the CAN bus, CAN requires that both ends of the cable be terminated. However, this requirement does not mean that every device should have a termination resistor. If multiple devices are placed along the cable, only the devices on the ends of the cable should have termination resistors. See Figure B-5 for an example of where termination resistors should be placed in a system with more than two devices.

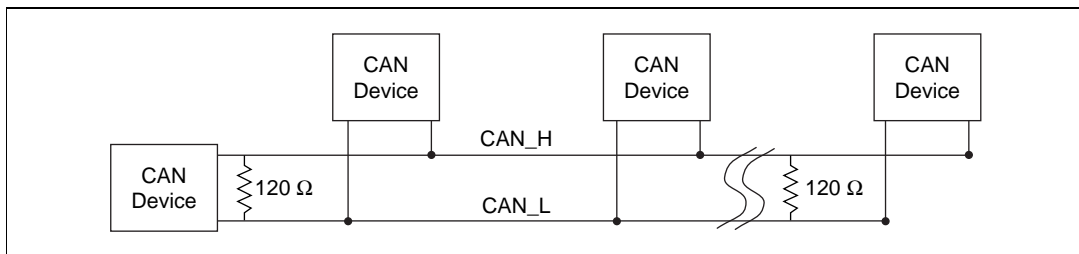


Figure B-5. Termination Resistor Placement

The termination resistors on a cable should match the nominal impedance of the cable. ISO 11898 requires a cable with a nominal impedance of 120 Ω; therefore, a 120 Ω resistor should be used at each end of the cable. Each termination resistor should each be capable of dissipating at least 0.25 W of power.

Cabling Example

Figure B-6 shows an example of a cable to connect two CAN devices. For the internal power configuration, no V+ connection is required.

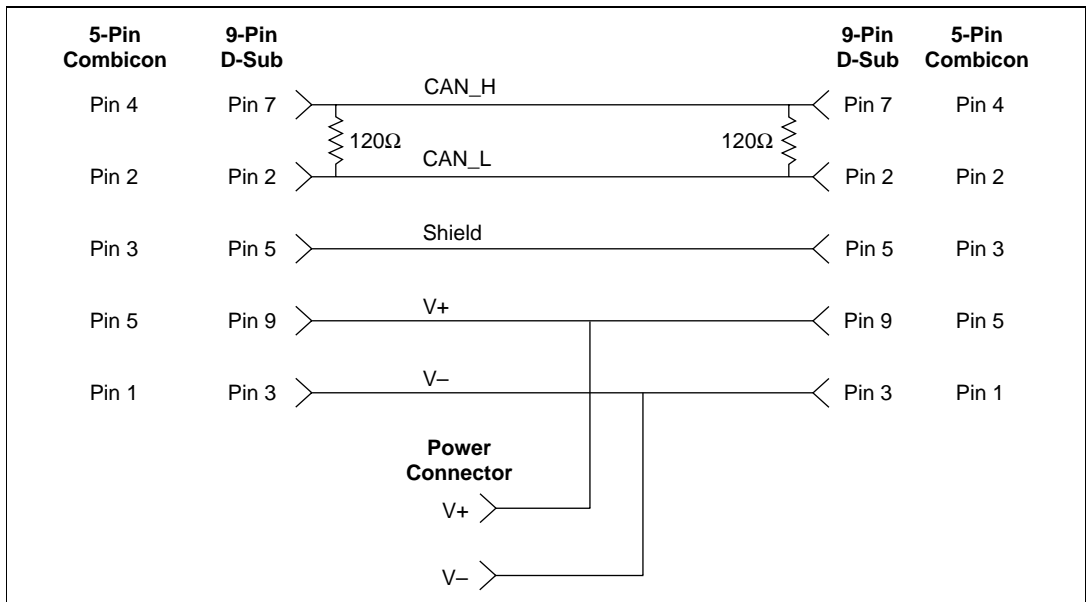


Figure B-6. Cabling Example



Troubleshooting and Common Questions

This appendix describes how to troubleshoot problems and answers some common questions.

Missing Board in the NI-CAN Configuration Utility

If your board is not listed under **NI-CAN Configuration** in the NI-CAN Configuration utility, the board is not properly installed. For the PXI-8461, this means that the board is not physically present in the system. If your board is firmly plugged into its slot and the problem persists, contact National Instruments.

Diagnostic Utility Failures

The following sections explain common error messages generated by the NI-CAN Diagnostic utility.

Resource Errors

This error occurs if the memory resource or interrupt resource assigned to a board conflicts with the resources being used by other hardware in the system. If a resource error occurs, click on the **Resources** button in the NI-CAN Configuration utility to view the board resources. For the PXI-8461, if legacy hardware in your system is using the resources, change the resource configuration of the legacy hardware. If you need help, refer to the documentation that came with your hardware. If the problem persists, contact National Instruments.

NI-CAN Software Problem Encountered

This error occurs if the NI-CAN Diagnostic utility detects that it is unable to communicate correctly with the hardware using the installed NI-CAN software. If you get this error, shut down your computer, restart it, and run the NI-CAN Diagnostic utility again. If the problem persists, try reinstalling the NI-CAN software for Windows NT.

Missing Board in Diagnostic Utility

If your board is physically installed in your system, but is not listed in the NI-CAN Diagnostic utility, check to see if the NI-CAN Configuration utility has detected the board. For more information, refer to the [Missing Board in the NI-CAN Configuration Utility](#) section earlier in this appendix.

Hardware Problem Encountered

This error occurs if the NI-CAN Diagnostic utility detects a defect in the hardware. If you get this error, write down the numeric code shown with the error and contact National Instruments. Depending on the cause of the hardware failure, you may need to repair or replace your board.

Common Questions

How can I determine which type of CAN hardware I have installed?

Run the NI-CAN Configuration utility. To run the utility, select **Start»Settings»Control Panel»NI-CAN Configuration**. If any hardware is correctly installed, it is listed under **National Instruments CAN Interfaces**.

How can I determine which version of the NI-CAN software I have installed?

Run the NI-CAN Diagnostic utility. To run the utility, select the **NI-CAN Diagnostic** item under **Start»Programs»NI-CAN Software**. The NI-CAN Diagnostic utility displays information about the version of the NI-CAN software currently installed.

Which CAN interfaces does the NI-CAN software for Windows NT support?

The NI-CAN software for Windows NT supports the PCI-CAN, PCI-CAN/2, PCMCIA-CAN, PCMCIA-CAN/2, and PXI-8461 (one port and two port).

How many PXI-8461 boards can I configure for use with my NI-CAN software?

The NI-CAN software for Windows NT can be configured to communicate with up to 10 boards.

How do I connect a CAN cable to my CAN port?

You will need to use an appropriate cable. For information about cabling requirements for National Instruments CAN hardware, refer to Appendix B, *Cabling Requirements*.

Are interrupts required for the PXI-8461?

Yes, one interrupt per board is required.

What do I do if the NI-CAN Diagnostic utility fails with an error?

Refer to the *Diagnostic Utility Failures* section in this appendix for specific information about what might cause the NI-CAN Diagnostic utility to fail. If you have already completed the troubleshooting steps, fill out the forms in Appendix E, *Customer Communication*, and contact National Instruments.

How do I use an NI-CAN language interface?

For information about using NI-CAN language interfaces, refer to Chapter 3, *Developing Your Application*, in the NI-CAN User Manual.

How do I use NI-CAN from within LabVIEW or BridgeVIEW?

For information about using NI-CAN from within LabVIEW, refer to Chapter 3, *Developing Your Application*, in the NI-CAN User Manual.

Why does the uninstall program leave some components installed?

The uninstall program removes only items that the installation program installed. If you add anything to a directory that was created by the installation program, the uninstall program does not delete that directory because the directory is not empty after the uninstallation. You must remove any remaining components yourself.

What information should I have before I call National Instruments?

When you call National Instruments, you should have all of the information filled out on the *Hardware and Software Configuration Form* in Appendix E, *Customer Communication*.

Specifications

This appendix describes the physical characteristics of the hardware and the recommended operating conditions.

Table D-1. PXI-8461 One Port and Two Port Hardware Characteristics

Characteristic	Specification
Dimensions	PXI 3U Module 100 by 160 mm (3.94 by 6.30 in.)
Power Requirement	+5 VDC 775 mA typical
I/O Connector	9-pin D-Sub for each port (standard) or 5-pin Combicon-style pluggable DeviceNet screw terminal
Operating Environment Ambient Temperature Relative Humidity	0° to 55° C 10% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	-20° to 70° C 10% to 90%, noncondensing

Table D-2. CAN Port Characteristics for Bus-Powered Ports

Characteristic	Specification
Power Requirement	10 to 30 V 40 mA typical 100 mA maximum
Isolation	500 VDC optical

Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve your technical problems and a form you can use to comment on the product documentation. When you contact us, we need the information on the Technical Support Form and the configuration form, if your manual contains one, about your system configuration to answer your questions as quickly as possible.

National Instruments has technical assistance through electronic, fax, and telephone systems to quickly provide the information you need. Our electronic services include a bulletin board service, an FTP site, a fax-on-demand system, and e-mail support. If you have a hardware or software problem, first try the electronic support systems. If the information available on these systems does not answer your questions, we offer fax and telephone support through our technical support centers, which are staffed by applications engineers.

Electronic Services

Bulletin Board Support

National Instruments has BBS and FTP sites dedicated for 24-hour support with a collection of files and documents to answer most common customer questions. From these sites, you can also download the latest instrument drivers, updates, and example programs. For recorded instructions on how to use the bulletin board and FTP services and for BBS automated information, call 512 795 6990. You can access these services at:

United States: 512 794 5422

Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

United Kingdom: 01635 551422

Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

France: 01 48 65 15 59

Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

FTP Support

To access our FTP site, log on to our Internet host, `ftp.natinst.com`, as anonymous and use your Internet address, such as `joesmith@anywhere.com`, as your password. The support files and documents are located in the `/support` directories.

Fax-on-Demand Support

Fax-on-Demand is a 24-hour information retrieval system containing a library of documents on a wide range of technical information. You can access Fax-on-Demand from a touch-tone telephone at 512 418 1111.

E-Mail Support (Currently USA Only)

You can submit technical support questions to the applications engineering team through e-mail at the Internet address listed below. Remember to include your name, address, and phone number so we can contact you with solutions and suggestions.

support@natinst.com

Telephone and Fax Support

National Instruments has branch offices all over the world. Use the list below to find the technical support number for your country. If there is no National Instruments office in your country, contact the source from which you purchased your software to obtain support.

Country	Telephone	Fax
Australia	03 9879 5166	03 9879 6277
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Brazil	011 288 3336	011 288 8528
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 725 725 11	09 725 725 55
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 6120092	03 6120095
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
United Kingdom	01635 523545	01635 523154
United States	512 795 8248	512 794 5678

Technical Support Form

Photocopy this form and update it each time you make changes to your software or hardware, and use the completed copy of this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

If you are using any National Instruments hardware or software products related to this problem, include the configuration forms from their user manuals. Include additional pages if necessary.

Name _____

Company _____

Address _____

Fax (____) _____ Phone (____) _____

Computer brand _____ Model _____ Processor _____

Operating system (include version number) _____

Clock speed _____ MHz RAM _____ MB Display adapter _____

Mouse ___ yes ___ no Other adapters installed _____

Hard disk capacity _____ MB Brand _____

Instruments used _____

National Instruments hardware product model _____ Revision _____

Configuration _____

National Instruments software product _____ Version _____

Configuration _____

The problem is: _____

List any error messages: _____

The following steps reproduce the problem: _____

Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Complete a new copy of this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

National Instruments Products

General Information

CAN Interface Type (such as PXI-8461) _____

NI-CAN Diagnostic Utility Results _____

Version Information

To access complete version information, including the hardware version and the NI-CAN driver version, open the **MS-DOS Prompt** and change to the NI-CAN installation directory (usually `c:\nican`). At the prompt, enter the following command:

```
canddiag -v
```

Version Information from the NI-CAN Diagnostic _____

Other Products

Programming Environment Information

Programming Language _____

Compiler Vendor _____

Compiler Version _____

Application Information

LabVIEW Application _____

Win32 Application _____

If Win 32, method of accessing DLL (link with language interface or direct entry?) _____

Documentation Comment Form

National Instruments encourages you to comment on the documentation supplied with our products. This information helps us provide quality products to meet your needs.

Title: *Getting Started with Your PXI-8461 and the NI-CAN™ Software for Windows NT*

Edition Date: May 1998

Part Number: 322006A-01

Please comment on the completeness, clarity, and organization of the manual.

If you find errors in the manual, please record the page numbers and describe the errors.

Thank you for your help.

Name _____

Title _____

Company _____

Address _____

E-Mail Address _____

Phone (____) _____ Fax (____) _____

Mail to: Technical Publications
National Instruments Corporation
6504 Bridge Point Parkway
Austin, Texas 78730-5039

Fax to: Technical Publications
National Instruments Corporation
512 794 5678

Glossary

Prefix	Meanings	Value
n-	nano-	10^{-9}
m-	milli-	10^{-3}
k-	kilo-	10^3
M-	mega-	10^6

°	degrees
Ω	ohms
%	percent
A	amperes
ANSI	American National Standards Institute
b	bits
B	bytes
C	Celsius
CAN	Controller Area Network
CiA	CAN in Automation
DC	direct current
DLL	dynamic link library
FCC	Federal Communications Commission
ft	feet
HMI	Human Machine Interface
Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
IRQ	interrupt request

Glossary

ISO	International Standards Organization
LED	light-emitting diode
m	meters
PC	personal computer
PCI	peripheral component interconnect
PCMCIA	Personal Computer Memory Card International Association
PLC	Programmable Logic Controller
RAM	random-access memory
resource	hardware settings used by National Instruments CAN hardware, including an interrupt request level (IRQ) and an 8 KB physical memory range (such as D0000 to D1FFF hex)
s	seconds
V	volts
VDC	volts direct current
VXI	VME eXtensions for Instrumentation
W	watts