Getting Started with Your GPIB-ENET and the NI-488.2™ Software for Windows

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This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual, may cause interference to radio and television reception. This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class A digital device. Operation is subject to the following two conditions:

1. This device may not cause harmful interference in commercial environments.

2. This device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications

This device complies with the limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications (DOC).

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des communications du Canada.

Instructions to Users

These regulations are designed to provide reasonable protection against harmful interference from the equipment to radio reception in commercial areas. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

There is no guarantee that interference will not occur in a particular installation. However, the chances of interference are much less if the equipment is installed and used according to this instruction manual.

If the equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, one or more of the following suggestions may reduce or eliminate the problem.

• Operate the equipment and the receiver on different branches of your AC electrical system.

- Move the equipment away from the receiver with which it is interfering.

- Reorient or relocate the receiver's antenna.

- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

Notice to user: Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the equipment under the FCC Rules.

If necessary, consult National Instruments or an experienced radio/television technician for additional suggestions. The following booklet prepared by the FCC may also be helpful: *How to Identify and Resolve Radio-TV Interference Problems.* This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock Number 004-000-00345-4.

Contents

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About This Manual

This manual contains instructions for installing and configuring the National Instruments GPIB-ENET and NI-488.2 software for Windows 3.1 or higher.

This manual assumes that you are familiar with the Microsoft Windows operating environment and with TCP/IP networks and that your computer is connected to an Ethernet network. Before you can use the driver software for the GPIB-ENET, you must already have a Windows Sockets (Winsock) Interface, version 1.1 or higher, installed. You can order a Winsock Interface from Microsoft or another network vendor.

How to Use The Manual Set
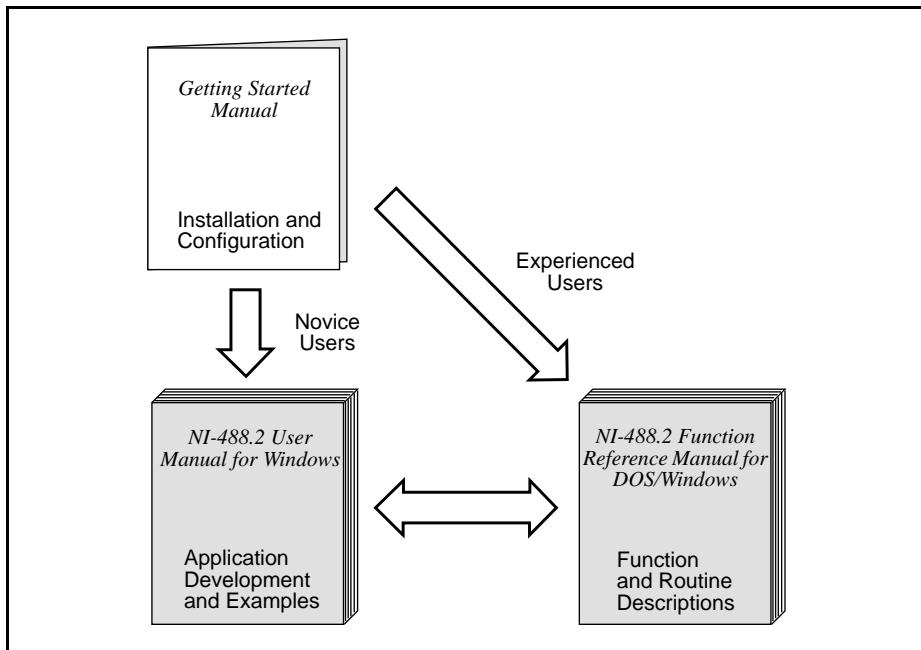
Use this getting started manual to install and configure your GPIB-ENET and the NI-488.2 software for Windows.

Use the *NI-488.2 User Manual for Windows* to learn the basics of GPIB and how to develop an application program. The user manual also contains debugging information and detailed examples.

Use the *NI-488.2 Function Reference Manual for DOS/Windows* for specific NI-488 function and NI-488.2 routine information, such as format, parameters, and possible errors.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, lists what you need to get started, describes the optional equipment you can order, and briefly describes the GPIB-ENET hardware and the NI-488.2 software.

- Chapter 2, *Installing the Software*, explains how to install your NI-488.2 software.

- Chapter 3, *Configuring the Hardware and Software*, explains how to configure your GPIB-ENET hardware and your NI-488.2 software.

- Chapter 4, *Verification and Troubleshooting*, describes how to verify the hardware and software installation and troubleshoot problems.

- Chapter 5, *Using Your NI-488.2 Software*, describes the Win16 Interactive Control utility and lists some programming considerations.

- Appendix A, *Hardware Specifications*, lists the electrical, environmental, and physical characteristics of the GPIB-ENET and the recommended operating conditions.

- Appendix B, *GPIB-ENET 8-Bit DIP Switch,* describes how the 8-bit DIP switch on the back panel can affect the operation of the GPIB-ENET.

- Appendix C, *GPIB-ENET Configuration Utilities,* contains information on the `Assign IP Address`, `Firmware Update`, and `Assign Subnet Information` utilities for the GPIB-ENET.

- Appendix D, *READY LED Signaling,* describes how to interpret the **READY** LED error codes.

- 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 description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

This manual uses the following conventions.

bold	Bold text denotes commands, menus, menu items, options, screen button names, icons, checkboxes, and LEDs.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
bold italic	Bold italic text denotes a note, caution, or warning.
`monospace`	Lowercase text in this font denotes text or characters that are to be literally input 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, utilities, device names, functions, filenames, and folder names.
`bold monospace`	Bold lowercase text in this font denotes the messages and responses that the computer automatically prints to the screen.
IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and ANSI/IEEE Standard 488.2-1987, respectively, which define the GPIB.

The *Glossary* lists abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms.

Related Documentation

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

• ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*

• ANSI/IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands*

• ANSI/IEEE Standard 802.3-1988, *Information Processing Systems, Local Area Networks, Part 3*

• *Microsoft Windows User's Guide,* Microsoft Corporation

• *Windows Sockets, An Open Interface for Network Programming under Microsoft Windows, Version 1.1*

Additionally, you might need to refer to the documentation provided by your Winsock vendor.

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.

Chapter 1
Introduction

This chapter lists what you need to get started, describes the optional equipment you can order, and briefly describes the GPIB-ENET hardware and the NI-488.2 software.

How to Use This Manual

Chapter 1	**Gather What You Need to Get Started**
Chapter 2	Install the Software
Chapter 3	Configure the Hardware → Configure the Software
Chapter 4	Verify the Installation → Passes? → No → Troubleshooting / Yes
Chapter 5	Run Win16 Interactive Control Utility → Review Programming Considerations
User Manual and Function Reference Manual	**Write Application Program**
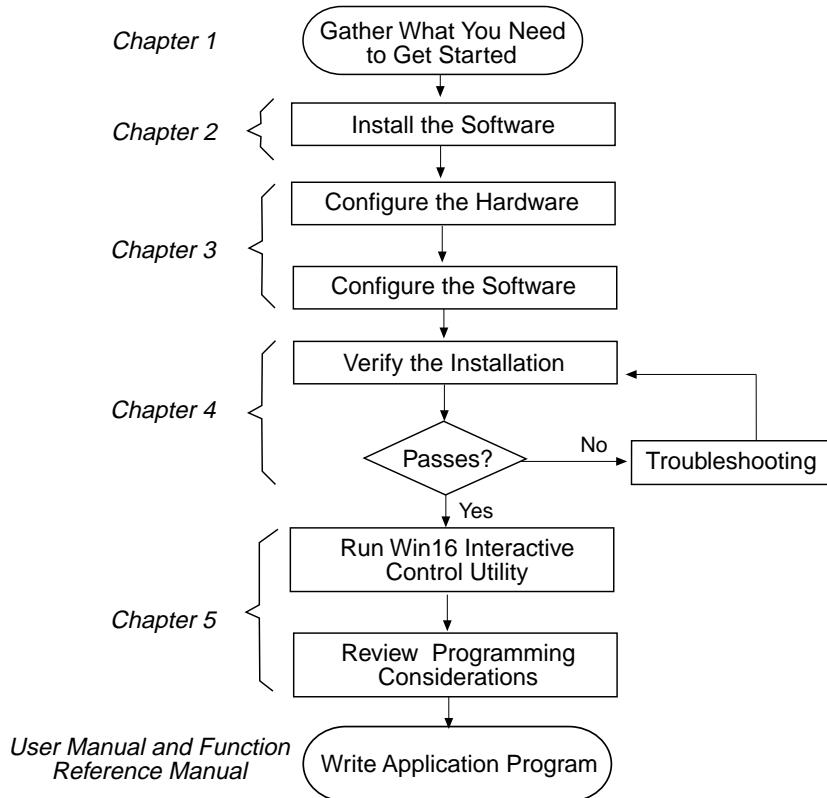
What You Need to Get Started

❑ **One of the following boxes, which is included in your kit:**
    GPIB-ENET - 10Base-T Version (100-120 VAC)
    GPIB-ENET - 10Base-T Version (220-240 VAC)
    GPIB-ENET - Coax Version (100-120 VAC)
    GPIB-ENET - Coax Version (220-240 VAC)

❑ **One of the following power cords, which is included in your kit:**
    U.S.A. standard power cord
    Switzerland power cord
    Australian power cord
    Universal European power cord
    North American power cord
    U.K. power cord

❑ **3.5 in. high density (1.44 MB)** *NI-488.2 Software for Windows. Distribution Disk for the GPIB-ENET*, **which is included in your kit**

❑ **Microsoft Windows version 3.1 or higher installed on your computer**

❑ **Winsock Interface version 1.1 or higher installed on your computer**

❑ **Ethernet Cables, which you can purchase from National Instruments**
    Twisted Pair (10Base-T) Cables (1 m, 5 m, or 10 m)
    Coax (10Base-2) Cables (1 m, 5 m, or 10 m)
    AUI (10Base-5) Cables (1 m, 5 m, or 10 m)

❑ **Shielded GPIB Cables*, which you can purchase from National Instruments**
    Type X1 single-shielded cables (1 m, 2 m, or 4 m)
    Type X2 double-shielded cables (1 m, 2 m, or 4 m)

    * To meet FCC emission limits for this device, you must use a shielded (Type X1 or X2) GPIB cable. Operating this equipment with a non-shielded cable may cause interference to radio and television reception.

Optional Equipment

Multiple-Computer Software License

A multiple-computer software license is also available so that one or more hosts on a single physical network can access one or more GPIB-ENET boxes. Contact National Instruments for more information regarding the license.

Hardware Description

The GPIB-ENET transparently handles data transfers between an Ethernet-based TCP/IP host and the GPIB. With the GPIB-ENET, multiple hosts can share a set of GPIB instruments or a single host can control several GPIB systems.

The GPIB-ENET converts a computer equipped with an NI-488.2 driver and an Ethernet port into a GPIB Talker/Listener/Controller. It is powered by an internal 100-120 VAC or 220-240 VAC supply.

The GPIB-ENET has all the software and logic required to implement the physical and electrical characteristics of all versions of the ANSI/IEEE 488 standard, including ANSI/IEEE Standard 488.2-1987, and ANSI/IEEE Standard 802.3. The GPIB-ENET interprets and executes commands that you send to it over an Ethernet link and performs all necessary Ethernet-to-GPIB protocol conversions. For detailed hardware specifications, refer to Appendix A, *Hardware Specifications*.

Figure 1-1 shows the seven light-emitting diodes (LEDs) on the GPIB-ENET top panel. The LEDs show the current status of the GPIB-ENET. Table 1-1 describes each LED.
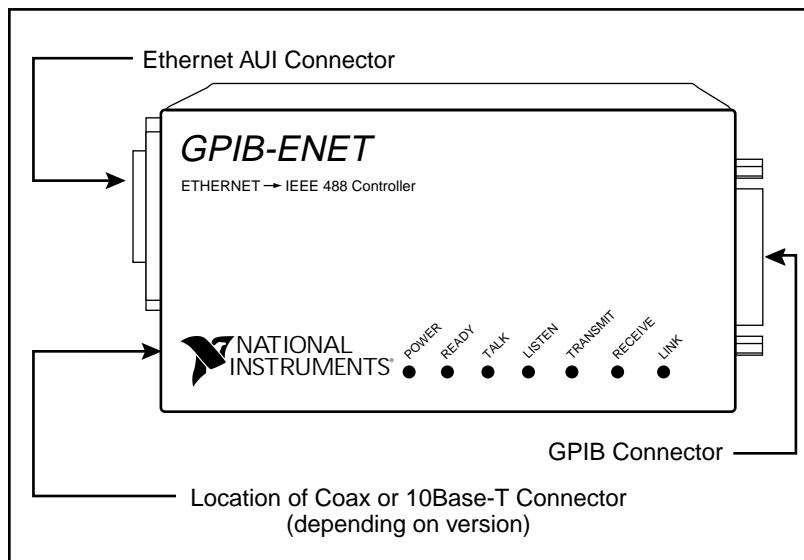
Figure 1-1. GPIB-ENET Top Panel and LEDs

Table 1-1. LED Descriptions

LED	Indication
POWER	Indicates that power has been supplied to the unit and the ON/OFF switch is in the ON position.
READY	Indicates the functional state of the GPIB-ENET. When the GPIB-ENET is powered on, this LED flashes and then becomes steady when the box is ready for operation. Continuous flashing indicates an error has occurred.
TALK	Indicates that the GPIB-ENET is configured as a GPIB Talker.
LISTEN	Indicates that the GPIB-ENET is configured as a GPIB Listener.
TRANSMIT	Indicates that the GPIB-ENET is transmitting onto the Ethernet network.
RECEIVE	Indicates that the GPIB-ENET is receiving Ethernet network traffic.
LINK	Indicates that the GPIB-ENET has detected a twisted pair (10Base-T) link. For GPIB-ENET coax and AUI options, this LED is not used and remains OFF.

Software Description

The NI-488.2 software and GPIB hardware transform a Windows PC into a GPIB Talker/Listener/Controller that has complete communications and bus management capability. The NI-488.2 software includes the following components:

•   Windows dynamic link library

•   Language interface libraries for Microsoft C and Microsoft Visual Basic for Windows

•   Software diagnostic test

•   Configuration utilities

•   Interactive control program

•   Utilities for software development

•   Example programs that use NI-488 functions and NI-488.2 routines

For a detailed list of files, refer to the *NI-488.2 User Manual for Windows*.

Optional Programming Tools

Your kit includes the NI-488.2 software for Windows. In addition, you can order the LabWindows®/CVI or LabVIEW software from National Instruments. LabWindows/CVI and LabVIEW include instrument driver libraries that make it easier to communicate with your GPIB 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 more than 300 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.

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

Chapter 2
Installing the Software

This chapter explains how to install your NI-488.2 software for the GPIB-ENET.

Complete the following steps to run the software installation program.

1. Insert the NI-488.2 software for Windows distribution disk into an unused drive.

2. Choose **Run...** from the **File** menu in the **Program Manager** window and type the following command into the dialog box:

    `x:\setup`

    where `x` is the letter of the drive containing the distribution disk (usually `a` or `b`).

    Figure 2-1 shows the software installation screen.
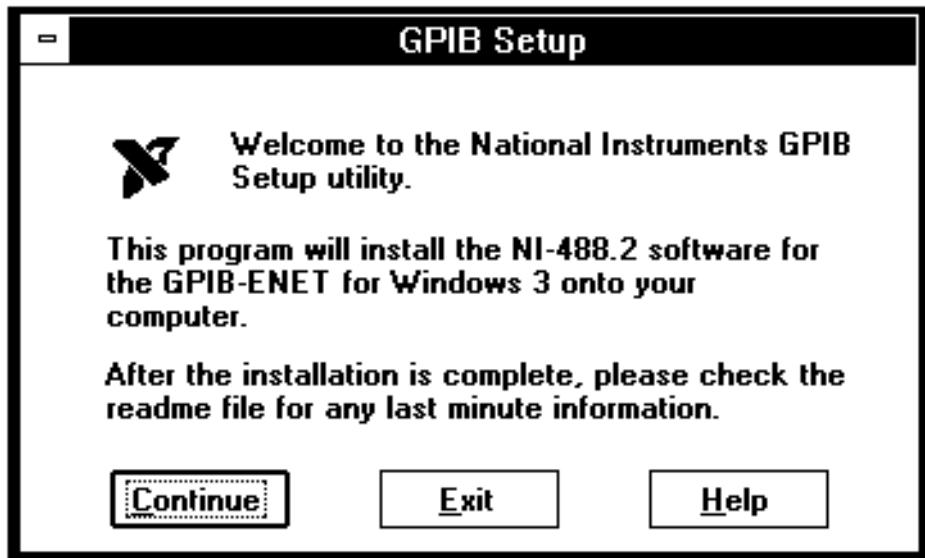
Figure 2-1. Software Installation Screen

The interactive Windows setup program takes you through the steps to install the NI-488.2 software. For help during the installation, click on the **Help** button. You can exit the setup at any time by clicking on the **Exit** button.

You must have Winsock installed on your computer before you can use the NI-488.2 software for the GPIB-ENET. After the setup program has installed the NI-488.2 software, it tries to detect a Winsock provider. If it does not detect a Winsock provider, the setup program displays a warning message. The NI-488.2 software does not work properly unless a Winsock provider is installed.

3.   Restart Windows after the installation is complete.

Figure 2-2 shows the **NI-488.2 GPIB-ENET Software** group that is created when you complete a full installation.
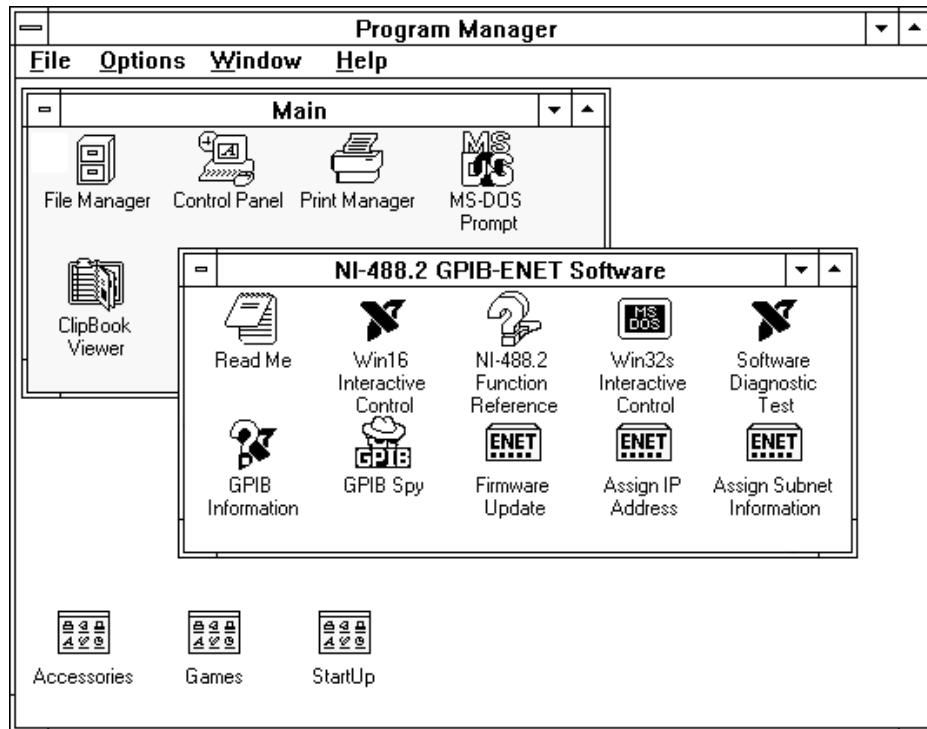
Figure 2-2. NI-488.2 GPIB-ENET Software Group After Installation

After you have installed your software, you need to configure the hardware and software. Refer to Chapter 3, *Configuring the Hardware and Software*.

Chapter 3
Configuring the Hardware and Software

This chapter explains how to configure your GPIB-ENET hardware and your NI-488.2 software.

Configure the Hardware

The following steps explain how to set up the GPIB-ENET.

Step 1. Determine IP and Ethernet Addresses

The Internet Protocol (IP) address is the address that TCP/IP-based networks use to route information to the appropriate network and host. When you first install a GPIB-ENET in a network, or if the IP address for the GPIB-ENET changes, the GPIB-ENET IP address must be configured.

1. Note the Ethernet address from the bottom panel label of the GPIB-ENET.

   The Ethernet address is not the same thing as the IP address. All devices on an Ethernet network are assigned a physical address, the Ethernet address, so that they can communicate with each other. The identification label on the bottom panel of the GPIB-ENET contains various information, including the Ethernet address. See Figure 3-1 for a picture of the GPIB-ENET identification label.
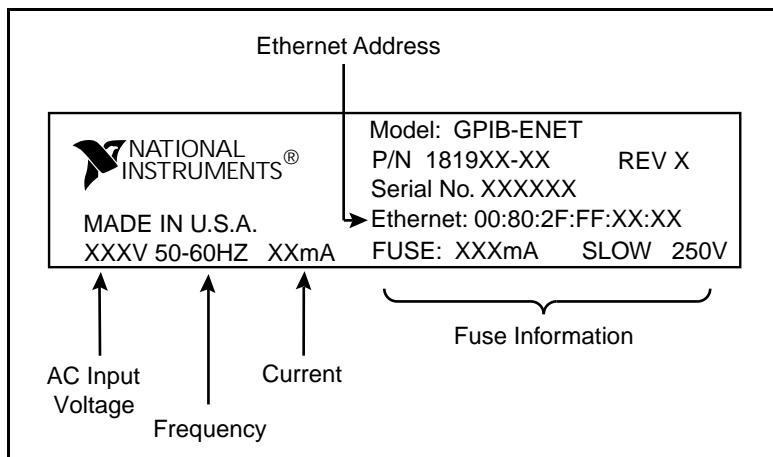
Figure 3-1. GPIB-ENET Bottom Panel Identification Label

2. Contact your network administrator to use the GPIB-ENET on your network.

    Your network administrator assigns a unique, valid IP address to your GPIB-ENET.
    Your network administrator can also tell you whether the GPIB-ENET should have
    its IP address configured automatically or manually. A Reverse Address Resolution
    Protocol (RARP) server on the network automatically configures the GPIB-ENET
    with an IP address when you power on the GPIB-ENET; once your network
    administrator has configured your network RARP server, you can use automatic
    configuration. You can configure the IP address manually using the `Assign IP`
    `Address` utility. Once you configure the IP address, it is stored in the GPIB-ENET
    so that you do not need to reassign it every time you power on the box.

3. Make a note of the IP address configured for the GPIB-ENET hardware. You must
    enter the IP address when you configure the NI-488.2 software.

Step 2. Configure the GPIB-ENET Operating Characteristics

The GPIB-ENET has a two-position slide switch that you use to configure the network
interface connector of the box. The GPIB-ENET also has an 8-bit DIP switch used to
configure the operating characteristics. The switches are located on the back panel of the
GPIB-ENET, as shown in Figure 3-2.

```
8 7 6 5 4 3 2 1   ON

                  ↓      10BASE-T  [img]  AUI
```
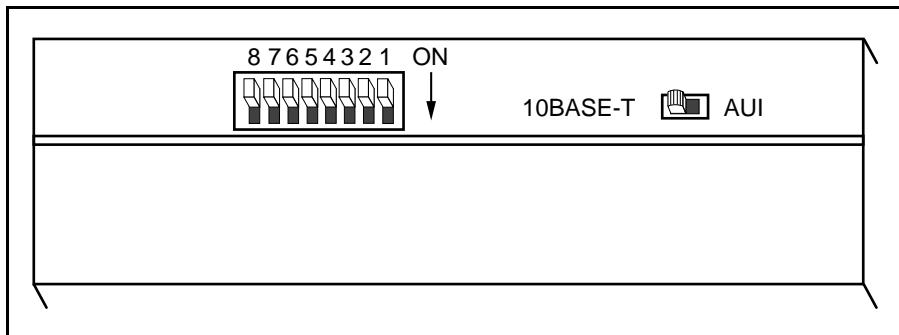
Figure 3-2. GPIB-ENET Back Panel Switches

Configure the Slide Switch

Your GPIB-ENET has two network interface connectors: a 15-pin AUI connector and
either a 10Base-T Ethernet connector or a coax Ethernet connector. Use the slide switch
to select which of the two connectors the GPIB-ENET uses. The default switch setting is
either 10Base-T or coax. Figure 3-3 depicts the default setting for the different types of
GPIB-ENET boxes.
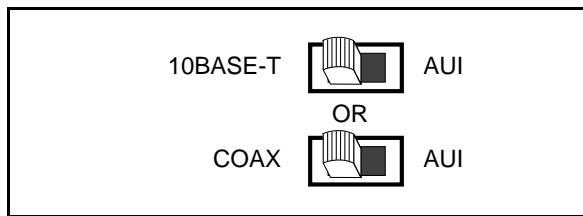
Figure 3-3. Default Switch Setting for Ethernet Port Configuration

If you want to use the AUI connector, change the switch setting to match the appropriate setting in Figure 3-4.
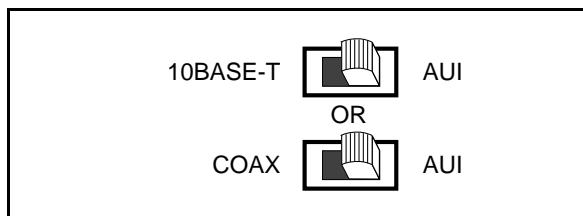
Figure 3-4. Switch Setting for AUI Ethernet Port Configuration

Configure the 8-Bit DIP Switch

The 8-bit DIP switch selects the operating mode of the GPIB-ENET. The GPIB-ENET is shipped to you with the DIP switches set for normal operation mode. In normal operation mode, all the switches are in the OFF position. Most users use the GPIB-ENET in normal operating mode. Do not change the DIP switch settings unless you run a GPIB-ENET utility that prompts you to change them. For information about the 8-bit DIP switch, refer to Appendix B, *GPIB-ENET 8-Bit DIP Switch*.

Step 3. Connect the Cables

If you do not have both a GPIB cable and Ethernet cable, refer to the *Optional Equipment* section in Chapter 1, *Introduction*, for ordering information.

1. Connect one end of the Ethernet cable to the GPIB-ENET and securely fasten it. Connect the other end of the Ethernet cable to your Ethernet network. Be sure to follow all IEEE 802.3 cabling restrictions.

2. Connect one end of the GPIB cable to the GPIB-ENET and tighten the thumb screws on the connector. Connect the other end of the GPIB cable to your GPIB system. Be sure to follow all IEEE 488.1 cabling restrictions and use only shielded GPIB cables.

3. Plug the power cord into an AC outlet of the correct voltage.

Step 4. Switch on Your GPIB-ENET

Warning: *Operating the GPIB-ENET at any voltage other than the one specified could damage the unit.*

The GPIB-ENET is shipped from the factory with either a 100-120 VAC or 220-240 VAC power supply. Before you configure your GPIB-ENET, verify that the voltage rating listed on the bottom of the box matches the voltage that is supplied in your area.

Automatic IP Address Assignment

Power on the GPIB-ENET. The **POWER** LED comes on immediately. The **READY** LED flashes while the GPIB-ENET completes its power-on self tests and the IP address is assigned. Once the **READY** LED remains steady, the unit is ready to operate and you can configure the software.

The power-on self tests take about 10 seconds to complete, then the box obtains its IP address. The time required for the IP address assignment is highly dependent on your network and the configuration of your GPIB-ENET. If the **READY** LED does not become steady after 1 minute, refer to the *Troubleshooting Hardware Problems* section in Chapter 4, *Verification and Troubleshooting*.

Manual IP Address Assignment

To assign the IP address manually, refer to Appendix C, *GPIB-ENET Configuration Utilities*, and run the `Assign IP Address` utility.

Step 5. Configure Subnet Information

Before the GPIB-ENET is fully functional, you should configure it with proper subnet information. Your GPIB-ENET may work properly even if you skip this step, but National Instruments recommends that you configure information about the subnet. This information includes the broadcast IP address and netmask to use on the subnet and up to four router IP addresses. Refer to Appendix B, *GPIB-ENET 8-Bit DIP Switch*, and run the `Assign Subnet Information` utility.

When you have completed these hardware configuration steps, you are ready to configure the software.

Configure the Software

The GPIB software configuration utility is an interactive utility that you can use to examine or modify the configuration of the driver. You *must* run the GPIB software configuration utility before you can use your GPIB-ENET. The IP address that you obtained in Step 1 of the hardware configuration section must be recorded in the `IP Address` field of the appropriate board configuration dialog box.

To run the GPIB software configuration utility, double-click on the **GPIB** icon in the **Control Panel**, which is located in the **Main** group of the **Program Manager**.

The GPIB software configuration displays a list of all the GPIB interfaces and device names. Double-click on any name to examine or edit its characteristics. You can use the online help if you have any questions. For more information about the GPIB software configuration utility, refer to the *NI-488.2 User Manual for Windows.*

After you have configured the software, you are ready to verify the installation. Refer to Chapter 4, *Verification and Troubleshooting*.

Chapter 4
Verification and Troubleshooting

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

Verify the Hardware Installation

When you power on your GPIB-ENET, the **POWER** LED comes on immediately. The **READY** LED flashes while it completes its power-on self-tests. When the tests complete successfully and the IP address is assigned, the **READY** LED remains steady, indicating that the unit is ready to operate.

The power-on self tests take about 10 seconds to complete. The time required for the IP address assignment is highly dependent on your network and the configuration of your GPIB-ENET. If the **POWER** LED does not come on immediately or the **READY** LED continues to flash for more than 1 minute, refer to the following section, *Troubleshooting Hardware Problems*. Otherwise, proceed to the *Verify the Software Installation* section, which is located later in this chapter.

Troubleshooting Hardware Problems

Warning: *The GPIB-ENET contains circuitry that operates with hazardous voltages. Do not attempt to open and service the box. Refer servicing to qualified personnel.*

- Verify that all cables are securely connected to the GPIB-ENET.

- Verify that the GPIB-ENET is powered on. If the unit is powered on and plugged into an outlet of the proper voltage, yet you see no LED activity, check the condition of the fuse.

Warning: *For continued protection against fire, replace the fuse with only the same type and rating of fuse. See Appendix A,* Hardware Specifications*, for fuse specifications.*

- Verify that the Ethernet port configuration slide switch is set to the correct Ethernet port. Refer to the *Configure the Slide Switch* section of Chapter 3, *Configuring the Hardware and Software*, for more information.

- Verify that the DIP switch settings are configured properly for your setup. Refer to the *Configure the DIP Switch* section of Chapter 3, and also to Appendix B, *GPIB-ENET 8-Bit DIP Switch*, for more information.

- Verify with the system administrator that your IP address is valid and that the network is set up to recognize the IP address properly.

- If you configured the IP address manually using the `Assign IP Address` utility, verify that you have followed the steps in Appendix C, *GPIB-ENET Configuration Utilities*, correctly.

- If the **READY** LED continues to flash for more than 1 minute, you have a problem with your setup. If the **READY** LED is flashing quickly, the GPIB-ENET is unable to obtain its IP address from the network. In this case, check with your network administrator to verify your IP address and make sure that you recorded the Ethernet address correctly. If the **READY** LED is blinking slowly, the GPIB-ENET has an internal error. In this case, refer to Appendix D, *READY LED Signaling*, to determine which error is being reported and contact National Instruments.

Verify the Software Installation

To test the software installation, and to verify that the software and hardware communicate properly, run the Software Diagnostic Test that came with your NI-488.2 software. The Software Diagnostic Test is a Windows application that requires no user interaction.

Follow these steps to run the Software Diagnostic Test:

1. Disconnect any GPIB cables.

2. Double-click on the **Software Diagnostic Test** icon in the **NI-488.2 GPIB-ENET Software** group in the **Program Manager**.

If the Software Diagnostic Test completes with no errors, you have installed the NI-488.2 software correctly. If it returns an error message, refer to the next section for troubleshooting instructions.

Troubleshooting Software Problems

The following sections explain common error messages generated by the Software Diagnostic Test.

Note: *In the following paragraphs,* `gpibx` *refers to board* `gpib0`, `gpib1`, `gpib2`, *or* `gpib3` *as appropriate.*

Presence Test of Software Components

The Software Diagnostic Test checks for the presence of gpib.ini, gpib.dll, gpib_drv.exe, and winsock.dll. If the gpib.ini file is not found in the Windows directory, the following error message is displayed:

An unexpected ERROR occurred:
  Unable to locate C:\WINDOWS\GPIB.INI.
  Try reinstalling the NI-488.2 software.

If the gpib.dll file is not found in either the Windows or the Windows System directory, the following error message is displayed:

An unexpected ERROR occurred:
  Unable to locate GPIB.DLL in the Windows or Windows system
directory.
  Try reinstalling the NI-488.2 software.

If the gpib_drv.exe file is not found in the Windows System directory, the following error message is displayed:

An unexpected ERROR occurred:
  Unable to locate GPIB_DRV.EXE in the Windows system directory.
  Try reinstalling the NI-488.2 software.

If you get any of these three messages, you must reinstall the NI-488.2 software.

If the gpib.dll file is found in the Windows directory, the following error message is displayed:

An unexpected ERROR occurred:
  Unable to locate C:WINDOWS\SYSTEM\GPIB.DLL.
  Please move GPIB.DLL into the Windows System directory.

If you get this message, move the gpib.dll file into the Windows System directory and run the Software Diagnostic Test again.

If the winsock.dll file cannot be loaded, a warning box pops up with the following text:

File Error: Cannot find WINSOCK.DLL

Click on the **Close** button of the message box to continue. The following error message is then displayed:

An unexpected ERROR occurred:
  Unable to load the WINSOCK.DLL. You must have a winsock
provider installed to use the NI-488.2 software for the GPIB-ENET.

Make sure that `winsock.dll` is somewhere in your search path. If you do not know whether it is in your search path, place it in your Windows System directory (usually `c:\windows\system`). If you are unable to locate `winsock.dll`, you should install a Winsock provider. After installing a Winsock provider, run the Software Diagnostic Test again.

Presence Test of Driver

The Software Diagnostic Test displays the following message when it fails because of a mismatch between `gpib.ini` and `gpib.dll`:

<<< No handler present for GPIB*x*. >>>

If this message appears, you should reinstall the NI-488.2 software.

Presence Test of Interface

The following error message appears if the software is not configured properly:

<<< No interface present for GPIB*x*. >>>

If this message appears, you could have one of the following situations:

- The GPIB-ENET is not correctly configured for your network. Try to *ping* your GPIB-ENET to make sure it is recognizable on the network. `ping` is a network utility that sends a packet to a device/host on the network, then waits for it to be echoed back, which indicates an active device/host. Your winsock provider probably came with a `ping` utility. Find the directory where `ping.exe` is installed and type in the following command:

    ping *IPaddress*

    where *IPaddress* is the IP address assigned to your GPIB-ENET. If your network administrator assigned you a hostname also, you can type in `ping <hostname>`. If `ping` is unable to communicate with your GPIB-ENET and your network administrator tells you that your IP address is valid, contact National Instruments.

- The `Use this Interface` field in the GPIB software configuration utility might be unchecked for `gpibx`. If you want to use the GPIB-ENET associated with `gpibx`, you must check this field.

- The GPIB-ENET might not be properly configured. Refer to the *Configure the Hardware* section in Chapter 3, *Configuring the Hardware and Software*, for detailed instructions.

- The `IP Address` field in the GPIB software configuration utility might be incorrect for the GPIB-ENET `gpibx`. Run the GPIB software configuration utility to enter the correct IP address value.

GPIB Cables Connected

The following error message appears if a GPIB cable is connected to the GPIB-ENET when you run the Software Diagnostic Test:

```
Call(25) 'ibcmd " "' failed, ibsta (0x134) not what was expected
(0x8130)

Call(25) 'ibcmd " "' failed, expected ibsta (0x100) to have the
ERR
bit set.
```

Disconnect all GPIB cables before trying the test again.

Common Questions

My driver is not communicating with the GPIB-ENET. What should I do?

Make sure that the GPIB-ENET is configured properly. Refer to Chapter 3, *Configuring the Hardware and Software*.

My I/O worked with a board interface, but it times out when I use the GPIB-ENET interface. What should I do?

Network communication is slower than straight cable communication. You might need to raise the default **Timeout** value using the GPIB software configuration utility.

The `Firmware Update` utility returns the message "Bad checksum." What should I do?

Run the `Firmware Update` utility again. Your imagefile might be corrupted. If the same message appears when you run the utility again, try reinstalling your NI-488.2 software and then running the `Firmware Update` utility again.

I powered off my GPIB-ENET before recording the flashing READY LED pattern. What should I do?

Try to duplicate the error before calling National Instruments for assistance. Recording the **READY** LED pattern is not critical to the operation of your GPIB-ENET, but it saves you time and helps Product Support diagnose the problem quickly and accurately.

How can I determine which type of GPIB interface I have installed?

Run the GPIB Information utility. If you run the GPIB Information utility without specifying any parameters, it returns information about the GPIB-ENET boxes currently configured for use in your system. For more information about the GPIB Information utility, refer to the *NI-488.2 User Manual for Windows*.

How can I determine which version of the NI-488.2 software I have installed?

Run the GPIB Information utility. If you run the GPIB Information utility without specifying any parameters, it returns information about the version of the NI-488.2 software currently installed. For more information, refer to the *NI-488.2 User Manual for Windows*.

How many GPIB-ENET boxes can I configure for use with my NI-488.2 software?

The GPIB-ENET software for Windows can be configured to communicate with up to 24 GPIB-ENET boxes.

How many devices can I configure for use with my GPIB-ENET and NI-488.2 software?

The GPIB-ENET software for Windows provides a total of 128 logical devices for applications to use.

When should I use the Win16 Interactive Control utility?

You can use the Win16 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information, refer to Chapter 5, *Interactive Control Program*, in the *NI-488.2 User Manual for Windows*.

How do I use an NI-488.2 language interface?

For information about using NI-488.2 language interfaces, refer to Chapter 3, *Developing Your Application*, in the *NI-488.2 User Manual for Windows*.

What information should I have before I contact National Instruments?

When you contact National Instruments, you should provide the Software Diagnostic Test results and the output from the GPIB Information utility. Also, make sure you have filled out the configuration form in Appendix E, *Customer Communication*.

Chapter 5
Using Your NI-488.2 Software

This chapter describes the Win16 Interactive Control utility and lists some programming considerations.

Introduction to the Win16 Interactive Control Utility

You can use the interactive control utility to enter NI-488 functions and NI-488.2 routines interactively and display the results of the function calls automatically. Without writing an application, you can use the utility to do the following:

*   Verify GPIB communication with your device quickly and easily.

*   Learn the NI-488 functions and NI-488.2 routines before you write your application.

*   Become familiar with the commands of your device.

*   Receive data from your GPIB device.

*   Troubleshoot problems with your application.

For more information about the Win16 Interactive Control utility, refer to the *NI-488.2 User Manual for Windows.*

General Programming Considerations

As you begin developing your NI-488.2 application, remember the following points:

*   You must link the language interface library with your compiled source code.

*   You must include the header file in your source code.

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2 User Manual for Windows*. For detailed information about each NI-488 function and NI-488.2 routine, refer to the *NI-488.2 Function Reference Manual for DOS/Windows*.

Appendix A
Hardware Specifications

This appendix lists the electrical, environmental, and physical characteristics of the GPIB-ENET and the recommended operating conditions.

Table A-1. Electrical Characteristics

Characteristic	Specification
Power Supply Unit	100-120 VAC ± 10%, 50-60 Hz or 220-240 VAC ± 10%, 50-60 Hz
Maximum Current Requirement	100-120 VAC 110 mA or 220-240 VAC 55 mA
Fuse Rating and Type	100-120 VAC 300 mA, UL/CSA approved or 220-240 VAC 500 mA, IEC approved

Table A-2. Environmental Characteristics

Characteristic	Specification
Operating Temperature	0° to 40° C
Storage Temperature	-20° to 70° C
Relative Humidity	10% to 90% noncondensing conditions
EMI	FCC Class A Verified

Table A-3. Physical Characteristics

Characteristic	Specification
Overall Case Size (Dimensions)	8.89 cm by 14.35 cm by 4.11 cm (3.5 in by 5.65 in. by 1.62 in.)
Case Material	All metal enclosure
Weight	0.41 kg (0.9 lb)

Appendix B
GPIB-ENET 8-Bit DIP Switch

This appendix describes how the 8-bit DIP switch on the back panel can affect the operation of the GPIB-ENET.

The 8-bit DIP switch is located on the back panel of the GPIB-ENET, as shown in Figure B-1. The DIP switches are used to set the operation mode of the GPIB-ENET. The GPIB-ENET is shipped to you with the DIP switches set for normal operation mode; all the switches are in the OFF position.
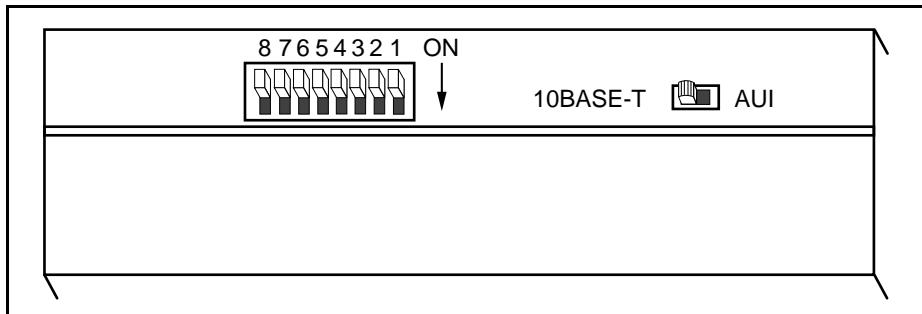

Figure B-1. GPIB-ENET Back Panel Switches

8-Bit DIP Switch Descriptions

Table B-1 shows the possible configurations of the GPIB-ENET DIP switches and what each configuration indicates. The entries in *bold italic* text represent the default settings.

Table B-1. DIP Switch Settings for Modes of Operation

Switch	Position	Indication
8	ON	Extended Factory Test
	OFF	*Normal Operation*
7	ON	Modify Mode
	OFF	*Normal Operation*
6	ON	Use Stored IP Address
	OFF	*Obtain IP Address*
5	ON	Manual IP Assignment
	OFF	*Automatic IP Assignment*
1-4	*OFF*	*These switches are reserved and should remain OFF.*

Switch 8 selects the Extended Factory Test mode and should remain OFF for normal operating mode. When this switch is ON, the GPIB-ENET performs extended tests which require special connections to the GPIB and Ethernet ports. Without these connections, the GPIB-ENET cannot pass the extended factory tests.

Switch 7 selects the Modify Mode and should remain OFF for normal operating mode. The firmware controlling the GPIB-ENET is stored in an electrically erasable memory. When this switch is ON, you can reprogram the firmware memory from the Ethernet network using the `Firmware Update` utility, or you can modify the subnet information using the `Assign Subnet Information` utility. Refer to Appendix C, *GPIB-ENET Configuration Utilities*, for more information.

Switch 6 indicates how the GPIB-ENET IP address is determined when it is powered on. If switch 6 is OFF, the GPIB-ENET expects to receive its IP address from the network, and then the GPIB-ENET stores the address in nonvolatile memory. If switch 6 is ON, the GPIB-ENET retrieves the IP address that is stored in nonvolatile memory.

Switch 5 selects the method by which IP addresses are configured in the GPIB-ENET. When switch 5 is OFF, the GPIB-ENET issues Reverse Address Resolution Protocol (RARP) requests each time it is powered on. The GPIB-ENET continues to issue RARP requests until a valid RARP reply is received. If switch 5 is ON, the GPIB-ENET does not issue RARP requests. In most networks, the GPIB-ENET can use RARP to have its address automatically configured; however, there are some networks which, for security or other reasons, do not use RARP. In this case, you must configure the IP address of the GPIB-ENET using `Assign IP Address`. Refer to Appendix C, *GPIB-ENET Configuration Utilities*, for more information on `Assign IP Address`. Note that if switch 6 is ON, the setting of Switch 5 is ignored.

Switches 1-4 are reserved for future expansion and should remain OFF.

Appendix C
GPIB-ENET Configuration Utilities

This appendix contains information on the `Assign IP Address`, `Firmware Update`, and `Assign Subnet Information` utilities for the GPIB-ENET.

Assign IP Address Utility

Use the `Assign IP Address` utility to manually configure the IP address of your GPIB-ENET. Once you configure the IP address, it is stored in nonvolatile memory in the GPIB-ENET. You only need to run the `Assign IP Address` utility when the box is new or when you decide to reconfigure your network in a way that changes the IP address of the GPIB-ENET.

The `Assign IP Address` utility must be run on a machine that is connected to the same subnet as the GPIB-ENET you are configuring. You must also run the utility from Windows for Workgroups, version 3.11 or higher. It does not work with Windows 3.1. If you must run the `Assign IP Address` utility and you do not have Windows for Workgroups version 3.11 or higher, contact National Instruments for assistance.

Figure C-1 shows the `Assign IP Address` utility screen.
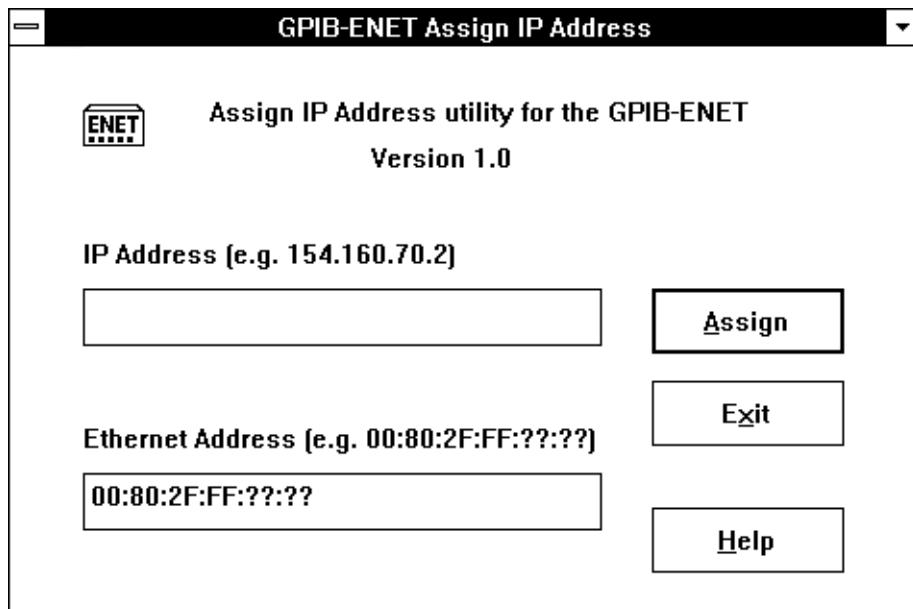

Figure C-1. Assign IP Address Utility

To run `Assign IP Address`, follow these steps after you have connected the GPIB-ENET to the network and installed the NI-488.2 software.

1. Make sure you know the Ethernet address of the GPIB-ENET (listed on the bottom panel of the box) and the IP address of your GPIB-ENET (assigned by your network administrator). If you do not know the IP address, repeat Step 1 in Chapter 3, *Configuring the Hardware and Software*.

2. Power off the GPIB-ENET. Make sure that all of the DIP switches are OFF except for switch 5, which should be ON. This indicates that you want to use `Assign IP Address` to configure the IP address.

3. Power on the GPIB-ENET and wait 10 seconds for the power-on self tests to complete.

4. Double-click on the `Assign IP Address` icon in the **NI-488.2 GPIB-ENET Software** group in the **Program Manager**.

5. Enter the IP address that has been selected for the box. Either enter the IP address in standard decimal dotted notation, which is four decimal numbers separated with periods, or enter the hostname if your network administrator created a mapping between the IP address and a hostname.

6. Enter the physical Ethernet address for the GPIB-ENET. This is the address shown on the identification label on the bottom panel of the GPIB-ENET. Enter the Ethernet address in standard notation, which is six hexadecimal numbers separated with colons.

7. Click on the **Assign** button. The utility constructs 10 packets and sends them across the local Ethernet. When the GPIB-ENET successfully receives its IP address, the **READY** LED remains steady. As long as the **READY** LED is not steady, the address has not been configured.

    Because the packets do not form a guaranteed delivery protocol, it is possible (though extremely unlikely) for all 10 packets to get lost in the network and for the GPIB-ENET not to receive any of them. In this case, repeat Steps 5 through 7 several times until the GPIB-ENET successfully receives its new IP address, indicated by a steady **READY** LED. If after several attempts, the **READY** LED does not become steady, contact National Instruments for further assistance.

8. When the **READY** LED remains steady, exit the `Assign IP Address` utility.

9. Power off the GPIB-ENET. Set DIP switch 5 to the OFF position and switch 6 to the ON position. With the switches in this position, the GPIB-ENET powers on with the IP address stored in nonvolatile memory. For more information on the DIP switch settings, refer to Appendix B, *GPIB-ENET 8-Bit DIP Switch*.

10. Power on the GPIB-ENET and wait for the **READY** LED to come on and remain steady. If the **READY** LED does not become steady, the slow blinking indicates an internal GPIB-ENET error. Refer to Appendix D, *READY LED Signaling*, to determine which error is being reported.

Firmware Update Utility

If you have received your NI-488.2 software as an update to your current GPIB-ENET, you need to update the firmware in the GPIB-ENET. Electrically Erasable Programmable Read Only Memory (EEPROM) stores the firmware that controls the GPIB-ENET. You can use the `Firmware Update` utility to upgrade the firmware in the EEPROM. The latest firmware file is called `enet_xx.bin`, where *xx* stands for the latest firmware revision number.

Figure C-2 shows the Firmware Update utility screen.
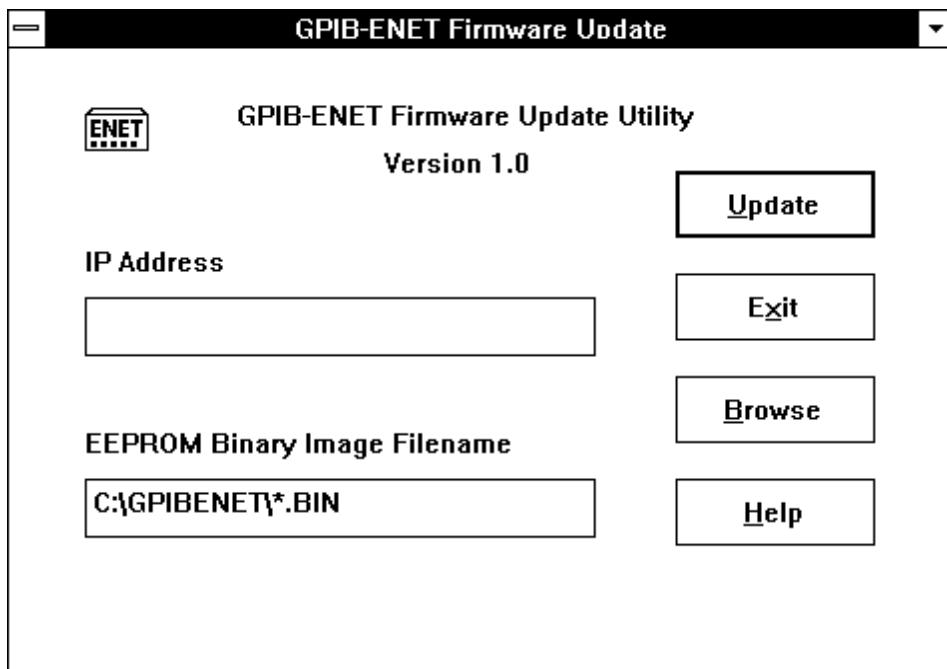
Figure C-2. Firmware Update Utility

Caution: *Because of the potential loss of EEPROM functionality, it is extremely important to follow the instructions in this section. Please read this entire section before attempting to update your firmware.*

If you are directly linked to the Internet, and not just to an isolated network using IP protocols, you can contact the National Instruments GPIB Product Support Department to update your firmware. If you are not on the actual Internet or you want to update the firmware yourself, you can execute `Firmware Update` locally. In either case, pay close attention to the GPIB-ENET **READY** LED, which reports important status codes.

Although you should update your firmware as needed, the number of times you can do so is limited. Therefore, update the firmware only when necessary. Also, notice that there is a time period of about two seconds when the GPIB-ENET runs exclusively in volatile RAM memory with the EEPROMs erased. If the box loses power during this time, it is no longer usable and must be returned to National Instruments for repair. If you are not comfortable with this procedure, call National Instruments for assistance.

Caution: *Because of the potential loss of EEPROM information, do not attempt to update the firmware when your electrical power is in danger; that is, during a weather storm or similar situation. Once you have started the update process, do not switch off power to your GPIB-ENET until you see and record the flashing* **READY** *LED pattern.*

The following steps describe how to update the firmware.

1. Power off the GPIB-ENET and set DIP switch 7 to the ON position.

2. Power on the GPIB-ENET and wait for the **READY** LED light to remain steady.

3. Double-click on the `Firmware Update` icon in the **NI-488.2 GPIB-ENET Software** group in the **Program Manager**.

4. Enter the IP address of the GPIB-ENET and the EEPROM binary image filename.

5. Click on the **Update** button when you are ready to begin the update process. Follow the instructions provided by the `Firmware Update` program.

6. Make sure you wait for the **READY** LED to begin flashing, which signals that the update is complete. Do *not* power off your GPIB-ENET before you see and record the flashing **READY** LED pattern.

   If the programming is successful, the **READY** LED signals a status code of 00, signified by one long flash and one short flash. Other patterns are used to indicate that the EEPROMs did not program properly. If a pattern other than 00 is indicated, refer to Appendix D, *READY LED Signaling*, for more information on recording the flashing pattern.

7. Power off the GPIB-ENET and return DIP switch 7 to the OFF position.

8. Power on the GPIB-ENET and wait for the **READY** LED to remain steady.

Assign Subnet Information Utility

Use the `Assign Subnet Information` utility to configure the IP characteristics of the specified GPIB-ENET. The IP characteristics include the following:

- Broadcast IP address—used by an IP device when a packet must go to all devices on the local subnet.

- Netmask of the local subnet—used by an IP device to determine if the destination of an out-going packet is local (that is, on the same subnet). If the destination is local, no routing is required. If the destination is not local, routing is required.

- List of router IP addresses—used when an IP device determines that the destination of a packet is not on the local subnet. If routing is required, the best route is chosen dynamically. Up to four default routers can be specified.

Note: *You should not run this utility without assistance from your network administrator.*

Figure C-3 shows the `Assign Subnet Information` utility screen.
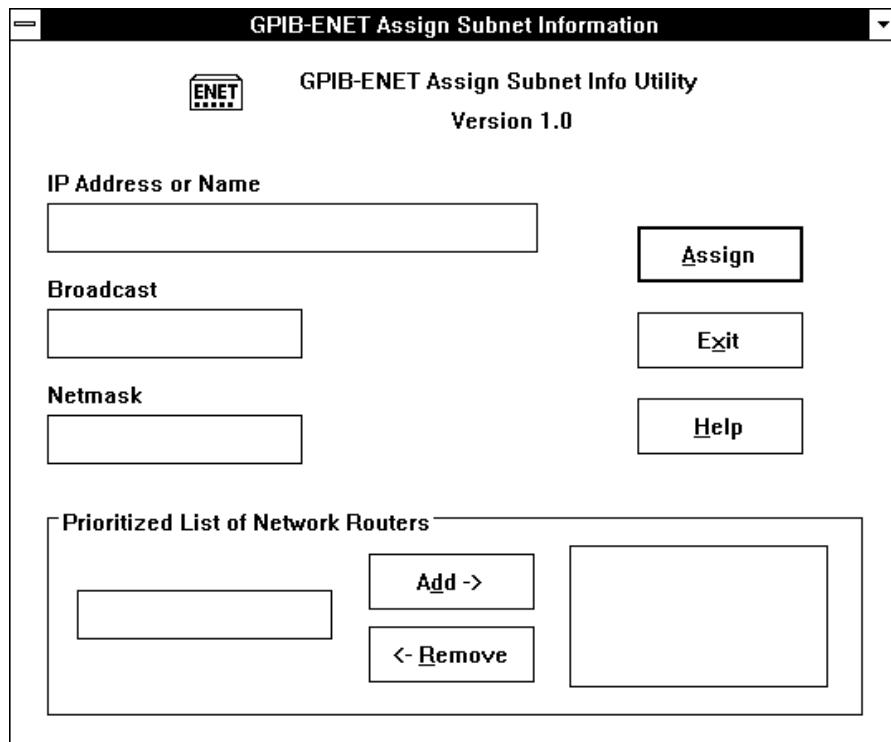
Figure C-3. Assign Subnet Information Utility

The following steps describe how to configure the IP characteristics:

1. Power off the GPIB-ENET, and set DIP switch 7 to the ON position.

2. Power on the GPIB-ENET and wait for the **READY** LED to remain steady.

3. Double-click on the **Assign Subnet Information** icon in the **NI-488.2 GPIB-ENET Software** group in the **Program Manager**.

4. Enter the appropriate information into each of the fields in the dialog box and click the **Assign** button to perform the configuration process.

    To remove the current list of routers for the GPIB-ENET, run the `Assign Subnet Information` utility without any routers specified. A message box appears when the configuration is complete.

5. Power off the GPIB-ENET, and return DIP switch 7 to the OFF position.

6. Power on the GPIB-ENET and wait for the **READY** LED to remain steady.

Appendix D
READY LED Signaling

This appendix describes how to interpret the **READY** LED error codes.

READY LED Overview

The **READY** LED has several purposes on the GPIB-ENET. When you first power on the GPIB-ENET, the **READY** LED flashes quickly while it completes its power-on self-tests. When the tests complete successfully and the IP address is assigned from either nonvolatile memory or the network, the **READY** LED remains steady, indicating that the unit is ready to operate.

During operation, the **READY** LED might begin to blink slowly. This occurs after running the `Firmware Update` utility, when the GPIB-ENET reports status on the operation. Refer to Appendix C, *GPIB-ENET Configuration Utilities*, for more information. At other times, the **READY** LED blinks slowly to alert you of internal GPIB-ENET errors. For assistance in correcting this problem, use this appendix to interpret and record the pattern that the **READY** LED flashes, and then contact National Instruments.

Note: *By recording the* READY *LED status messages before calling National Instruments, you can save yourself time, and the GPIB Product Support Department can answer your questions more accurately and efficiently. Do not switch off power to your GPIB-ENET before recording the flashing* READY *LED pattern.*

READY LED signaling can report up to 100 different errors. The errors are numbered from 0 to 99 and are reported through sequences of **READY** LED flashes.

Step 1. Count the Long Flashes

A 3-second interval, during which the **READY** LED is OFF, separates each repetition of the sequence. The sequence begins with a series of long 1-second flashes—that is, one second ON, one second OFF. These long flashes represent the digit in the tens column. There can be 1 to 10 long flashes, which represent digits 0 through 9. For example, one long flash represents the digit 0 in the tens column, two long flashes represent the digit 1 in the tens column, and 10 long flashes represent the digit 9 in the tens column.

Step 2. Count the Short Flashes

The long flashes are followed by shorter flashes; each short flash lasts about one-fifth of a second. These short flashes represent the digit in the ones column. Again, there can be 1 to 10 flashes, which represent the digits 0 through 9. For example, one short flash represents the digit 0 in the ones column, two short flashes represent the digit 1 in the ones column, and 10 short flashes represent a 9 in the ones column.

Using this method, the **READY** LED flashes the following sequence to represent status message 11.

<three seconds OFF> <two long flashes> <two short flashes> <three seconds OFF>. . .

The **READY** LED flashes the following sequence to represent status message 30.

<three seconds OFF> <four long flashes> <one short flash> <three seconds OFF>. . .

Step 3. Record Your Status Code Number

When you have computed your status code number, record it on the *GPIB-ENET Hardware and Software Configuration Form* in Appendix E, *Customer Communication*, before calling National Instruments.

Table D-1 lists some examples of the long and short flashes and the status codes they report.

Table D-1. Sample **READY** LED Signals and the Corresponding Status Code Numbers

Number of Long Flashes	Number of Short Flashes	Corresponding Status Code Number
1	1	00
2	1	10
5	3	42
1	8	07
3	4	23
10	10	99

Appendix E
Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems you might have as well as a form you can use to comment on the product documentation. Filling out a copy of the *Technical Support Form* before contacting National Instruments helps us help you better and faster.

National Instruments provides comprehensive technical assistance around the world. In the U.S. and Canada, applications engineers are available Monday through Friday from 8:00 a.m. to 6:00 p.m. (central time). In other countries, contact the nearest branch office. You may fax questions to us at any time.

Corporate Headquarters
(512) 795-8248
Technical support fax: (800) 328-2203
                            (512) 794-5678

Branch Offices	Phone Number	Fax Number
Australia	(03) 879 9422	(03) 879 9179
Austria	(0662) 435986	(0662) 437010-19
Belgium	02/757.00.20	02/757.03.11
Denmark	45 76 26 00	45 76 71 11
Finland	(90) 527 2321	(90) 502 2930
France	(1) 48 14 24 00	(1) 48 14 24 14
Germany	089/741 31 30	089/714 60 35
Italy	02/48301892	02/48301915
Japan	(03) 3788-1921	(03) 3788-1923
Mexico	95 800 010 0793	95 800 010 0793
Netherlands	03480-33466	03480-30673
Norway	32-848400	32-848600
Singapore	2265886 2265887	
Spain	(91) 640 0085	(91) 640 0533
Sweden	08-730 49 70	08-730 43 70
Switzerland	056/20 51 51	056/20 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	0635 523545	0635 523154

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. Use additional pages if necessary.

Name _____

Company _____

Address _____

_____

Fax (___)_____   Phone (___)_____

Computer brand _____

    Model _____   RAM _____MB

    Processor _____   Speed _____MHz

    Operating system _____

    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 will reproduce the problem _____

_____

_____

_____

_____

_____

_____

GPIB-ENET Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Update this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration.

National Instruments Products

- GPIB-ENET Hardware Revision _____

- 10Base-T or Coax Version _____

- AC Input Voltage (100-120 V or 220-240 V) _____

- NI-488.2 Software Version Number on Disk _____

- DIP Switch Settings _____

- Ethernet Port Configuration Slide Switch Setting _____

- IP Address _____

- **READY** LED Signaling Status Code _____

Other Products

- Computer Model _____

- Memory Capacity on Computer _____

- Operating System Version _____

- Application Programming Language _____

- Other Ethernet Devices in System _____

- Other GPIB Devices in System _____

- Type of Monitor _____

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 GPIB-ENET and the NI-488.2** ™ **Software for Windows**

Edition Date: **January 1995**

Part Number: **320894A-01**

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

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(continues)

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

_____

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Glossary

Prefix	Meaning	Value
m-	milli-	10^{-3}
c-	centi-	10^{-2}
k-	kilo-	10^{3}
M-	mega-	10^{6}

o	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
AUI	attachment unit interface
C	Celsius
CSA	Canadian Standards Association
DIP	dual inline package
EEPROM	Electrically Erasable Programmable Read Only Memory
EMI	electromagnetic interference
FCC	Federal Communications Commission
g	grams
GPIB	General Purpose Interface Bus
Hz	hertz
IBIC	Interactive Bus Interactive Control
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
IP	Internet Protocol
lb	pounds
LED	light-emitting diode
m	meters
MB	megabytes of memory
RAM	random-access memory
RARP	Reverse Address Resolution Protocol
s	seconds
TCP	Transmission Control Protocol
UL	Underwriters Laboratories
V	volts
VAC	volts alternating current