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# GPIB

## Getting Started with Your GPIB-ENET/100 and NI-488.2™ for Windows 2000/NT

NATIONAL INSTRUMENTS™

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# Compliance

## FCC/Canada Radio Frequency Interference Compliance*

### Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). Depending on where it is operated, this product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.)

Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products. By examining the product you purchased, you can determine the FCC Class and therefore which of the two FCC/DOC Warnings apply in the following sections. (Some products may not be labeled at all for FCC; if so, the reader should then assume these are Class A devices.)

FCC Class A products only display a simple warning statement of one paragraph in length regarding interference and undesired operation. Most of our products are FCC Class A. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

FCC Class B products display either a FCC ID code, starting with the letters **EXN**, or the FCC Class B compliance mark that appears as shown here on the right.

Consult the FCC web site `http://www.fcc.gov` for more information.

### FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE Mark Declaration of Conformity**, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

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

### Class A

#### Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. 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.

#### Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

### Class B

#### Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### Canadian Department of Communications

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## European Union - Compliance to EEC Directives

Readers in the EU/EEC/EEA must refer to the Manufacturer's Declaration of Conformity (DoC) for information** pertaining to the CE Mark compliance scheme. The Manufacturer includes a DoC for most every hardware product except for those bought for OEMs, if also available from an original manufacturer that also markets in the EU, or where compliance is not required as for electrically benign apparatus or cables.

* Certain exemptions may apply in the USA, see FCC Rules §15.103 **Exempted devices**, and §15.105(c). Also available in sections of CFR 47.

** The CE Mark Declaration of Conformity will contain important supplementary information and instructions for the user or installer.

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# About This Manual

This manual contains instructions to help you install and configure the National Instruments GPIB-ENET/100 and NI-488.2 for Windows 2000/NT. The NI-488.2 software included in this kit is intended for use with Windows 2000 and Windows NT 4.0 with Service Pack 4 or higher installed.

This manual assumes that you are already familiar with Windows 2000 or Windows NT 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/100, your host must be configured with TCP/IP protocols that conform to Windows sockets (WinSock) version 1.1 or higher.

## Conventions

The following conventions appear 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** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

This icon denotes a tip, which alerts you to advisory information.

This icon denotes a note, which alerts you to important information.

This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

**bold** Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options. Bold text also denotes parameter names and LED names.

*italic* Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

| | |
|---|---|
| `monospace` | Text in this font denotes text or characters that you should 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, operations, variables, filenames and extensions, and code excerpts. |
| **`monospace bold`** | Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. |
| *`monospace italic`* | Italic text in this font denotes text that is a placeholder for a word or value that you must supply. |

# Related Documentation

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

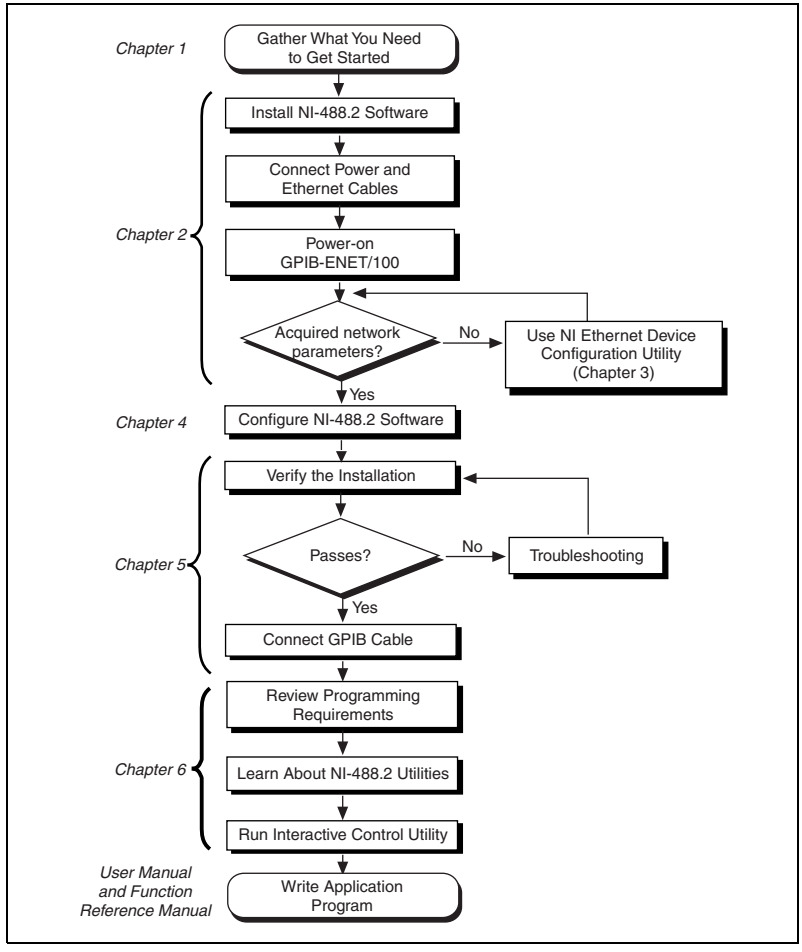
- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- ANSI/IEEE Standard 802.3-1988, *Information Processing Systems, Local Area Networks*, Part 3
- *Microsoft Win32 Software Developer Kit*, *Online Documentation for Win32 Overviews*, *Win32 Reference*, and *Microsoft Windows NT System Guide*, Microsoft Corporation

# 1

# Introduction

This chapter lists what you need to get started and optional equipment you can order, and briefly describes the GPIB-ENET/100 hardware and NI-488.2 for Windows 2000/NT.

## How to Use This Manual



# What You Need to Get Started

Before you install your GPIB-ENET/100 hardware and NI-488.2 for Windows 2000/NT, make sure you have all of the following items:

- ❑ Windows 2000 or Windows NT 4.0 with Service Pack 4, or higher, installed on your computer
- ❑ TCP/IP protocol installed on your computer
- ❑ GPIB-ENET/100, which is included in your kit
- ❑ GPIB-ENET/100 power supply, which is included in your kit
- ❑ One of the following power cords, which is included in your kit:
  - U.S. standard power cord
  - Switzerland power cord
  - Australian power cord
  - Universal European power cord
  - North American power cord
  - U.K. power cord
- ❑ The *NI-488.2 for Windows 2000/NT and GPIB-ENET/100, Version 1.2* CD, which is included in your kit
- ❑ One of the following Category 5 twisted-pair network cables, which you can purchase from National Instruments:
  - Straight-through cable for connecting the GPIB-ENET/100 to a network hub
  - Cross-over cable for connecting the GPIB-ENET/100 directly to a computer's network interface card (NIC)
- ❑ One of the following shielded GPIB cables, which you can purchase from National Instruments:
  - Type X1 single-shielded cables (1, 2, or 4 m)
  - Type X2 double-shielded cables (1, 2, or 4 m)

**Caution** To meet FCC emission limits for this device, you must use a shielded (Type X1 or X2) GPIB cable. If you operate this equipment with a non-shielded cable, it may interfere with radio and television reception.

# Optional Equipment

This section lists optional equipment that you can order from National Instruments.

## Optional Hardware

For information about ordering the following optional equipment, contact National Instruments:

- Serial or parallel bus extender and cables
- Bus expander/isolator
- GPIB mechanical switch

## Multiple-Computer Software License

A multiple-computer software license allows one or more hosts on a single physical network to access one or more GPIB-ENET/100 boxes. For information about ordering a software license, contact National Instruments.

# GPIB-ENET/100 Hardware Overview

The GPIB-ENET/100 high-speed interface controls GPIB instruments across Ethernet networks. You can use the GPIB-ENET/100 to access remote test equipment from anywhere in the world via TCP/IP protocols on 10Base-T and 100Base-TX networks. By incorporating a new architecture, 100Base-TX Ethernet, and HS488, the GPIB-ENET/100 delivers performance comparable to that of plug-in boards.

The GPIB-ENET/100 automatically detects if the available network is 10Base-T (10 Mbits/s) or 100Base-TX (100 Mbits/s) and transmits at the highest available speed.

You can use either the Dynamic Host Configuration Protocol (DHCP) or a simple Ethernet configuration utility to configure the GPIB-ENET/100 without the need for any dip switches or jumpers. Installation options include rack mounting, DIN rail mounting, wall mounting, and stackable stand-alone use. You can stack the unit with other GPIB-ENET/100 units and additional National Instruments products including the ENET-232 Series and ENET-485 Series serial controllers.

For more information about hardware specifications, refer to Appendix D, *Specifications*.

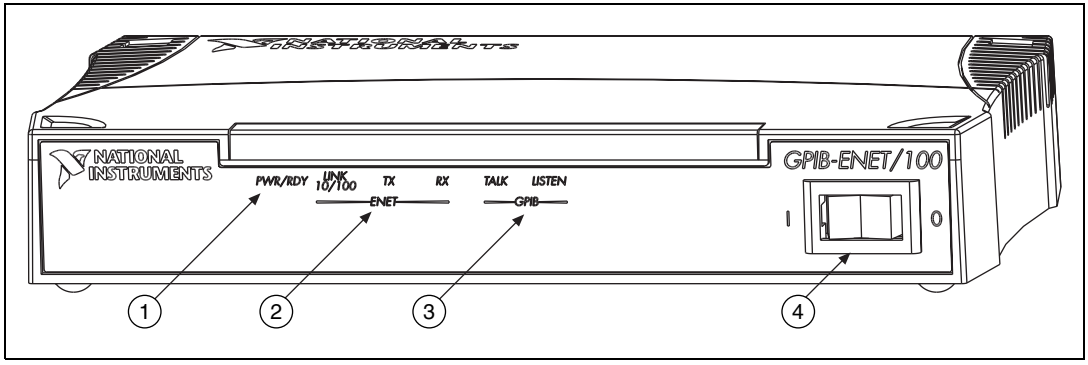
## Feature Overview

With the GPIB-ENET/100, you gain all the features inherent in a networked device: fewer cabling distance restrictions, device sharing, and communication with devices throughout the Internet.

In a GPIB application, you are restricted to the distance limitations of the GPIB specification. However, you can overcome these restrictions because the GPIB-ENET/100 uses Ethernet, and can add an unlimited distance to your application simply by utilizing the distances available to you by using a networked device. Because the GPIB-ENET/100 uses standard Internet protocols, you can exploit the Internet to communicate with your GPIB instruments throughout the world.

## LED Overview

Figure 1-1 shows the six light-emitting diodes (LEDs) on the GPIB-ENET/100. The LEDs are visible from the top and front of the unit.




| | |
|---|---|
| 1 Power/Ready LED | 3 GPIB Port LEDs |
| 2 Ethernet LEDs | 4 Power Switch |

**Figure 1-1.** GPIB-ENET/100 Front Panel

The LEDs show the current status of the GPIB-ENET/100. Table 1-1 describes each LED.

**Table 1-1.** LED Descriptions

| LED | Description |
|---|---|
| **PWR/RDY** | Flashes rapidly at start-up while performing self tests and when acquiring network parameters. A steady yellow state indicates the box is ready for operation. Slow flashing pattern indicates an error occurred. |
| **LINK 10/100** | Indicates the GPIB-ENET/100 detected a twisted pair (10Base-T or 100Base-TX) link. The color indicates the connection speed. If yellow, the speed is 10 Mbits/s. If green, the speed is 100 Mbits/s. |
| **TX** | Indicates the GPIB-ENET/100 is transmitting to the Ethernet network. |
| **RX** | Indicates the GPIB-ENET/100 is receiving Ethernet network traffic. |
| **TALK** | Indicates the GPIB-ENET/100 is configured as a GPIB Talker. |
| **LISTEN** | Indicates the GPIB-ENET/100 is configured as a GPIB Listener. |

# NI-488.2 Overview

NI-488.2 includes a native, 32-bit multitasking Windows 2000/NT driver and supporting utilities.

NI-488.2 for Windows 2000/NT that comes with this kit supports only the GPIB-ENET and the GPIB-ENET/100 interfaces. If you need to access other National Instruments GPIB interfaces, you must remove the software for this kit and install NI-488.2 for the other interface.

NI-488.2 includes the following components:

- Device driver
- Diagnostic utility
- Configuration utilities
- Interactive control utility

- Utilities for software development and debugging
- Language interface libraries for Microsoft Visual C/C++ 2.0 or higher, Borland C/C++ 4.0 or higher, and Microsoft Visual Basic 4.0 or higher
- Virtual device driver and special DOS and Windows 3 drivers for running existing GPIB for DOS and Windows 3 applications under Windows 2000/NT
- Example programs that use the GPIB API

# Time-Saving Development Tools

Your kit includes NI-488.2 for Windows 2000/NT. After you install your GPIB-ENET/100 and NI-488.2, you can use standard GPIB I/O functions in LabVIEW and Measurement Studio with your GPIB interface. If you already have one or more of these applications and want to use them with your GPIB-ENET/100, refer to your product documentation for information about GPIB I/O functions. For ordering information, contact National Instruments.

LabVIEW is a graphical programming environment you can use to acquire data from thousands of different instruments, including IEEE 488.2 devices, VXI devices, serial devices, PLCs, and plug-in data acquisition boards. After you acquire raw data, you can convert it into meaningful results using the data analysis routines in LabVIEW. The LabVIEW instrument drivers reduce software development time because you do not have to program the low-level control of each instrument.

Measurement Studio bundles LabWindows/CVI for C, and measurement tools for Microsoft Visual C++ and Microsoft Visual Basic. Measurement Studio is designed for building measurement and automation applications with the programming environment of your choice:

- LabWindows/CVI is an interactive ANSI C programming environment designed for building virtual instrument applications. LabWindows/CVI delivers a drag-and-drop editor for building user interfaces, a complete ANSI C environment for building your test program logic, and a collection of automated code generation tools, as well as utilities for building automated test systems, monitoring applications, or laboratory experiments.
- Measurement Studio Tools for Visual C++ takes advantage of COM and ActiveX technologies to help you build measurement and automation applications. With the Visual C++ application wizard and instrument classes, you can use the IEEE 488.2 library to send and

receive commands to and from instruments, and you can use VISA, an industry-standard I/O library, to communicate with GPIB, VXI, or serial devices using the same set of components.

- For Visual Basic programmers, Measurement Studio includes a collection of ActiveX controls designed for building virtual instrumentation systems. You can use the GPIB, serial, and VISA I/O controls and property pages to configure communication with your instruments.

GPIB Analyzer is an optional tool available from National Instruments that is useful in troubleshooting a variety of IEEE 488 hardware and software problems. With its built-in time-stamping capability, you easily can determine the throughput and overhead of your GPIB systems. The GPIB Analyzer software for Windows NT works with the AT-GPIB/TNT+ and PCI-GPIB+ products, which provide GPIB Analyzer support along with the functionality of a high-performance GPIB Controller.

# 2

# Installation

This chapter describes how to install NI-488.2 for Windows 2000/NT and the GPIB-ENET/100.

**Note** If you have a GPIB-ENET instead of a GPIB-ENET/100, refer to *Getting Started with Your GPIB-ENET and the GPIB Software for Windows NT* for installation instructions.

## Installing NI-488.2

Complete the following steps to install NI-488.2 for Windows 2000/NT:

1. Log in as `Administrator` or as a user who has `Administrator` privileges.

**Note** Power users are not administrators.

2. Insert the *NI-488.2 for Windows 2000/NT and GPIB-ENET/100* CD.
3. Select **Start»Run** and type the following in the **Run** prompt:

   *x*`:\setup`

   where *x* is the letter pertaining to the CD-ROM drive.
4. To begin your software installation, click **OK**.

   The setup wizard, shown in Figure 2-1, guides you through the necessary steps to install NI-488.2 for Windows 2000/NT. To exit the setup wizard at any time, click **Cancel**.

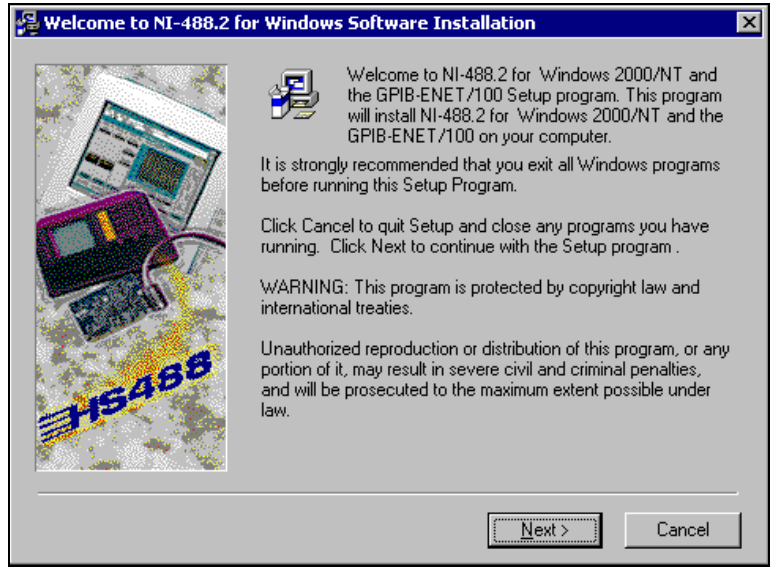



**Figure 2-1.** NI-488.2 Setup Wizard

After you install NI-488.2, you are ready to install the GPIB-ENET/100 hardware.

# Installing the GPIB-ENET/100 Hardware

Complete the following steps to install your GPIB-ENET/100.

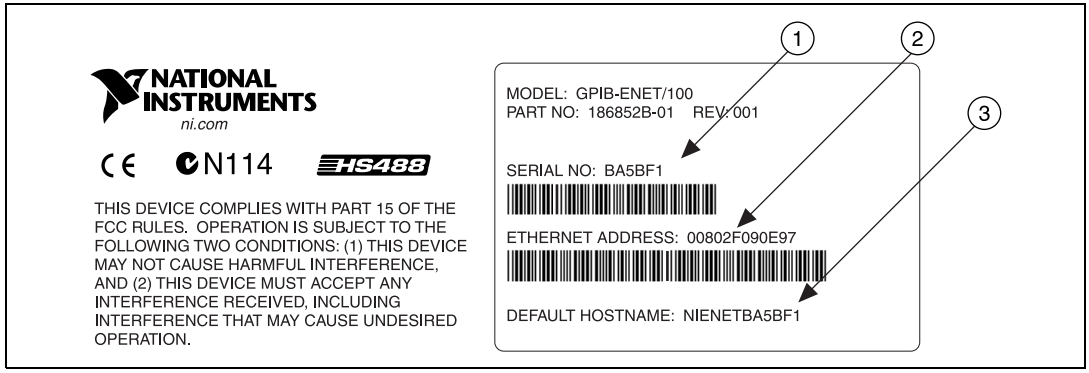
## Step 1. Record the Serial Number, Ethernet Address, and Default Hostname

When you configure the GPIB-ENET/100 for use on your network, you will need to differentiate it from other network devices. Every product has a unique serial number, Ethernet address, and default hostname.

1. Locate the serial number, Ethernet address, and default hostname on the GPIB-ENET/100 baseplate label, as shown in Figure 2-2.
2. Write down this information and keep it available for later use.

   Recording this information is not necessary for proper installation. However, you will find it convenient when you configure the GPIB-ENET/100.

**Note** The Ethernet address is not the IP address. All devices on an Ethernet network are assigned a unique physical address—the Ethernet address—so they can communicate with each other.




| 1 Serial Number | 2 Ethernet Address | 3 Default Hostname |
|---|---|---|

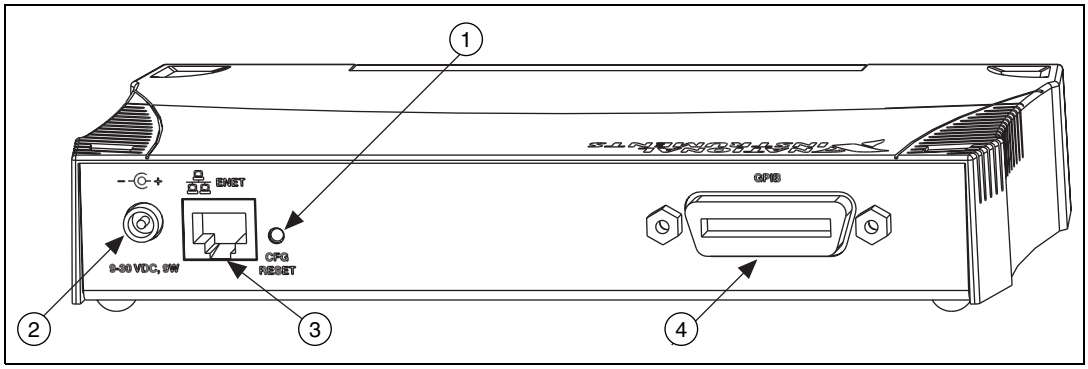
**Figure 2-2.** GPIB-ENET/100 Baseplate Identification Label

You can change the hostname after you finish the installation and configuration steps in this chapter. Refer to the *Changing the Network Settings* section in Chapter 3, *Ethernet Configuration*, for more information.

## Step 2. Connect the Cables

**Note** If you do not have an Ethernet cable, as listed in the *What You Need to Get Started* section of Chapter 1, *Introduction*, contact National Instruments for ordering information.

Figure 2-3 shows the locations of the power, Ethernet, and GPIB connections on the rear panel of the GPIB-ENET/100.

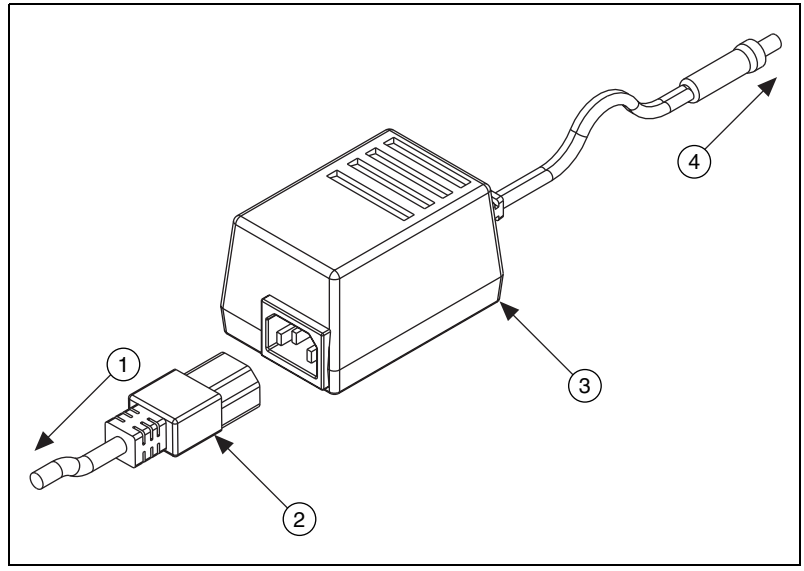



| | |
|---|---|
| 1 Configuration Reset Switch | 3 Ethernet Connection |
| 2 Power Connection | 4 GPIB Connector |

**Figure 2-3.** GPIB-ENET/100 Rear Panel

To connect your cables, complete the following steps:

1. Connect one end of your Ethernet cable to your GPIB-ENET/100. Connect the other end of the Ethernet cable to your Ethernet network. Make sure you comply with all IEEE 802.3 cabling restrictions.
2. Because AC outlets vary throughout the world, your kit includes a power cord that meets your local requirements in addition to a power supply. Figure 2-4 shows how to hook up your power cord and power supply.
   a. Plug one end of the power cord you received in your kit into the power supply.
   b. Screw the power connector on the other end of the power supply onto the power jack of the GPIB-ENET/100.
   c. Plug the other end of the power cord into an AC outlet.




| | | | |
|---|---|---|---|
| 1 | To AC Outlet | 3 | Power Supply |
| 2 | Power Cord | 4 | To GPIB-ENET/100 Power Jack |

**Figure 2-4.** Connecting Power to the GPIB-ENET/100

**Note** Do not connect GPIB devices to your GPIB port until you configure NI-488.2 as described in Chapter 4, *GPIB Configuration*, and then run the GPIB Configuration utility as described in Chapter 5, *Verify the Installation*. Running the GPIB Configuration utility requires that you leave the port unconnected.

## Step 3. Switch on Your GPIB-ENET/100

Before you power-on your GPIB-ENET/100, contact your network administrator to determine whether you need to configure your network settings manually using the NI Ethernet Device Configuration utility or use the Dynamic Host Configuration Protocol (DHCP) to perform the configuration automatically. For more information about DHCP, refer to the *Using DHCP* section in Chapter 6, *Using Your GPIB-ENET/100 and NI-488.2*.

When you turn on the front-panel power switch, the **PWR/RDY** LED alternates rapidly between red and yellow while the GPIB-ENET/100 completes its power-on self-tests and attempts to acquire its network parameters. Each Ethernet and GPIB LED lights up as its functionality is tested. By default, the GPIB-ENET/100 attempts its network configuration through DHCP.

The time required for assigning the IP address depends on your network and the configuration of your GPIB-ENET/100. Allow up to 90 seconds and observe the state of the **PWR/RDY** LED to determine the outcome of the self tests. One of the following should occur:

- A steady yellow **PWR/RDY** LED indicates the GPIB-ENET/100 passed its self tests and acquired its IP address. The unit is now ready to operate. When using DHCP, the GPIB-ENET/100 typically is ready to operate about 15 seconds after you power it on. Run the GPIB Configuration utility as described in Chapter 4, *GPIB Configuration*, to add the unit to your GPIB system.
- If the **PWR/RDY** LED continues to alternate rapidly between red and yellow, the unit was unable to use DHCP to configure its network parameters. If your network does not have DHCP, you must use the NI Ethernet Device Configuration utility, as described in Chapter 3, *Ethernet Configuration*, to give your unit its network configuration. If this utility is successful, the **PWR/RDY** LED should become steady yellow. Then you can run the GPIB Configuration utility as described in Chapter 4, *GPIB Configuration*. Refer to Appendix C, *Troubleshooting and Common Questions*, if the LED does not change to steady yellow.
- If the **PWR/RDY** LED is steady red, the GPIB-ENET/100 has an unrecoverable error. Contact National Instruments Technical Support.
- If the **PWR/RDY** LED blinks a slow red/yellow pattern, the GPIB-ENET/100 did not pass its self tests. Refer to Appendix B, *PWR/RDY LED Signaling*, to interpret the flash pattern before calling National Instruments Technical Support.

You can skip Chapter 3, *Ethernet Configuration*, if your GPIB-ENET/100 can use DHCP, although you do need to use the NI Ethernet Device Configuration utility if you want to change the hostname from the default hostname listed on the baseplate label.

**Note** If at any time you want to return the GPIB-ENET/100 to its default configuration state as given on the baseplate label, press and hold the CFG RESET switch for three seconds while you switch the power on. This switch is located on the rear panel, as shown in Figure 2-3. Refer to the *Using the CFG RESET Switch* section in Chapter 6, *Using Your GPIB-ENET/100 and NI-488.2*, for more information.

# 3

# Ethernet Configuration

This chapter describes how to use the NI Ethernet Device Configuration utility to configure the network parameters of the GPIB-ENET/100. You can use this utility for any of the following purposes:

- Manually configure the network parameters or enable DHCP
- Verify or change the hostname
- Add or change a comment to help identify the device

If DHCP is available on your network, it configures the network parameters for your GPIB-ENET/100 at startup, as described in the *Step 3. Switch on Your GPIB-ENET/100* section of Chapter 2, *Installation*. In this case, using the NI Ethernet Device Configuration utility is not required.

If DHCP is not available, the unit automatically enters network configuration mode if it is configured with the factory default settings. The GPIB-ENET/100 must be in this mode before you can make changes to the network parameters.

You also can enter this mode during normal operation by pressing and holding the CFG RESET switch for three seconds. Refer to the *Using the CFG RESET Switch* section in Chapter 6, *Using Your GPIB-ENET/100 and NI-488.2* for more information on using this switch.

While in network configuration mode, the **PWR/RDY** LED alternates rapidly between red and yellow, and normal operation is halted.

## Using the NI Ethernet Device Configuration Utility

If your network administrator says you must manually assign the IP address, complete the following steps to configure the IP address settings.

1. Select **Start»Programs»NI-488.2M for Windows NT» GPIB-ENET100 Utilities»Device Configuration**.

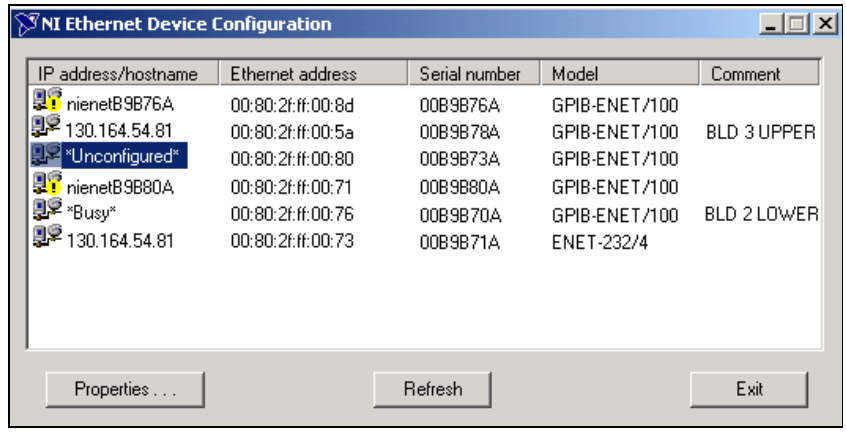



**Figure 3-1.** NI Ethernet Device Configuration Utility

2. The **NI Ethernet Device Configuration** window displays a list of National Instruments Ethernet devices sorted by model. Figure 3-1 shows an example of this display. The listed devices can be in one of four possible states, as indicated in the **IP address/hostname** column:
   - A hostname indicates the device has successfully been configured by DHCP.
   - A numerical IP address indicates the device has successfully been configured with a static IP address.
   - ***Unconfigured*** indicates the device is configured to use DHCP, but DHCP failed to attain network parameters.
   - ***Busy*** indicates the device is configured to use DHCP and currently is attempting to acquire network parameters.

   Click **Properties...** for any of the following reasons:
   - You need to configure an unconfigured IP address.
   - You need to change the current network parameters.
   - You previously used DHCP, but it is no longer available.
   - You are using DHCP and need to change the hostname of the GPIB-ENET/100.
   - The **IP address/hostname** column displays an exclamation point (**!**) next to your GPIB-ENET/100, indicating a configuration problem. Refer to the *Verifying the Hostname* section for help fixing this problem.
   - You want to add or change a comment to help identify the device.

Click **Refresh** if you do not see your GPIB-ENET/100 in the list of Ethernet devices, or to discover a device that you recently added to the network.

Click **Exit** if you are using DHCP and you do not need to change the hostname of the GPIB-ENET/100, or if you are finished using the NI Ethernet Device Configuration utility.

## Changing the Network Settings

1. When you select **Properties...** from the **NI Ethernet Device Configuration** window, a **Properties** window for your GPIB-ENET/100 appears, similar to the example shown in Figure 3-2.

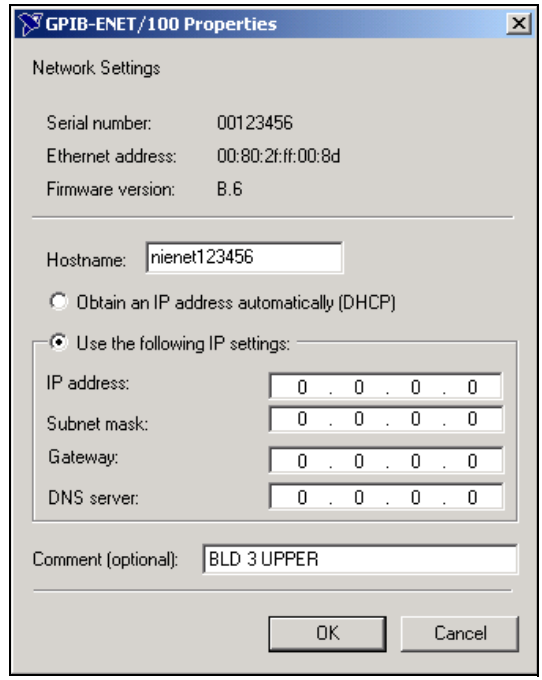



**Figure 3-2.** Properties Window for an Unconfigured GPIB-ENET/100

The current hostname is displayed. The hostname associates a name with a numerical IP address. **Hostname** is a required field.

The GPIB-ENET/100 attempts to use the hostname when registering with DHCP. Many DHCP servers have the ability to register the hostname and the assigned IP address. You then can reliably use the hostname to communicate with your GPIB-ENET/100 even if the numerical IP address changes.

However, some DHCP servers do not implement hostname registration. The GPIB-ENET/100 requires Domain Name Server (DNS) registration when using DHCP. If your DHCP server does not support DNS registration, you must use static network parameters. Consult your network administrator for more details.

2. In the **Properties** window, select either **Obtain an IP address automatically (DHCP)** or **Use the following IP settings**.
3. If you select **Obtain an IP address automatically (DHCP)**, you do not need to enter any network parameters unless you want to change the hostname of the Ethernet device. If you select **Use the following IP settings**, enter the network parameters you have chosen for the host IP address, subnet mask, gateway IP, and DNS server IP, as in the example shown in Figure 3-3. Refer to the next section, *Static IP Parameters*, for more information.

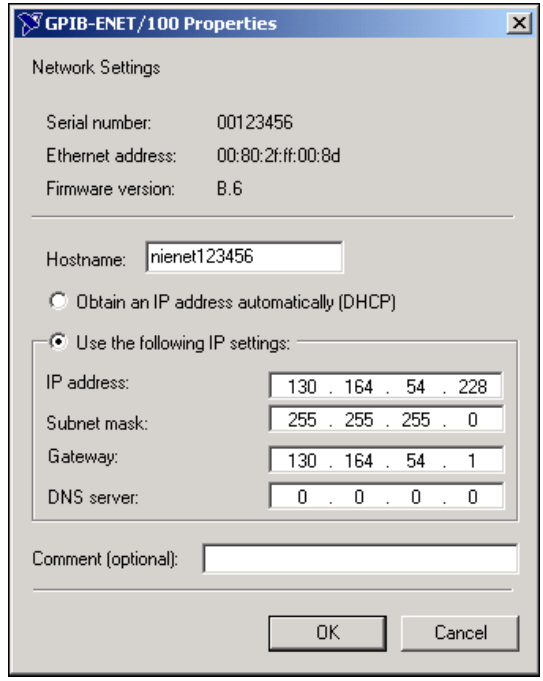



**Figure 3-3.** Specifying IP Settings

**Note** The IP settings in Figure 3-3 are shown only as an example of the format.

4. (Optional) You can enter a comment to help you identify each device.

5. Click **OK** to configure the device, or **Cancel** to exit without saving the configuration changes.
6. Click **Exit** to close the NI Ethernet Device Configuration utility.

The device automatically reboots with the new configuration in effect.

## Static IP Parameters

If DHCP is not available, you must provide the GPIB-ENET/100 with several important network parameters. These parameters are listed below.

- **IP address**—The unique, computer-readable address of a device on your network. An IP address typically is represented as four decimal numbers separated by periods (for example, `130.164.54.215`). Refer to the next section, *Choosing a Static IP Address*.
- **Subnet mask**—A code that helps the network device determine whether another device is on the same network or a different network.
- **Gateway IP**—The IP address of a device that acts as a gateway, which is a connection between two networks. If your network does not have a gateway, set this parameter to `0.0.0.0`.
- **DNS Server**—The IP address of a network device that stores hostnames and translates them into IP addresses. If your network does not have a DNS server, set this parameter to `0.0.0.0`.

## Choosing a Static IP Address

### For a Network Administered by a Network Administrator

If you are adding the GPIB-ENET/100 to an existing Ethernet network, you must choose IP addresses carefully. Contact your network administrator to obtain an appropriate static IP address for your GPIB-ENET/100. Also have the network administrator assign the proper subnet mask, gateway, and DNS server addresses.

### For a Network without a Network Administrator

If you are assembling your own small Ethernet network, you can choose your own IP addresses. The format of the IP addresses is determined by the subnet mask. You should use the same subnet mask as the computer you are using with your GPIB-ENET/100. If your subnet mask is `255.255.255.0`, the first three numbers in every IP address on the network must be the same. If your subnet mask is `255.255.0.0`, only the first two numbers in the IP addresses on the network must match.

For either subnet mask, numbers between 1 and 254 are valid choices for the last number of the IP address. Numbers between 0 and 255 are valid for the third number of the IP address, but this number must be the same as other devices on your network if your subnet mask is `255.255.255.0`.

Table 3-1 shows examples of valid and invalid IP addresses for a network using subnet mask `255.255.255.0`. All valid IP addresses contain the same first three numbers. The IP addresses in this table are for example purposes only.

**Table 3-1.** Valid and Invalid IP Addresses for Subnet Mask 255.255.255.0

| IP Address | Comment |
|---|---|
| `123.234.45.211` | Valid. |
| `123.234.45.213` | Valid. The first three numbers match the previous IP address. The fourth number must be a unique number in the range of 1 to 254. |
| `123.202.45.214` | Invalid. Second number does not match the previous IP addresses. The first three numbers must match on all IP addresses with subnet mask `255.255.255.0`. |
| `123.234.45.0` | Invalid. The first three numbers are valid but the fourth number cannot be 0. |
| `123.234.45.255` | Invalid. The first three numbers are valid but the fourth number cannot be 255. |

If you are setting up your own network, you probably do not have a gateway or DNS server, so you should set these values to `0.0.0.0`.

**Tip** To find out the network settings for your computer, run `ipconfig`.

1. Open a Windows NT Command Prompt.
2. Type `ipconfig` at the prompt.
3. Press <Enter>.

If you need more information, you can run `ipconfig` with the `/all` option by typing `ipconfig /all` at the Command Prompt. This shows you all of the settings for the Windows 2000/NT machine. Make sure you use the settings for the Ethernet adapter you are using to communicate with the GPIB-ENET/100.

## Verifying the Hostname

The NI Ethernet Device Configuration utility automatically verifies that the hostname for each DHCP-enabled device matches the DNS entry for the assigned IP address. This verification process automatically occurs when you either run the utility or click **Refresh**. The utility alerts you as shown in Figure 3-4 if it detects a problem with the network settings.

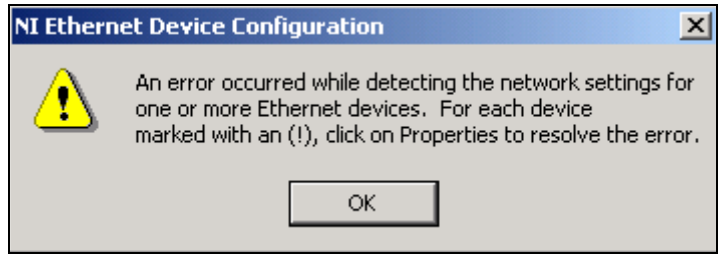



**Figure 3-4.** Hostname Verification Error Detected

To correct the problem with the hostname, complete the following steps:

1. Locate the device that has a problem. This is indicated by an (**!**) on the device icon, as shown previously in Figure 3-1.
2. Select **Properties...**. A dialog box similar to the following appears.

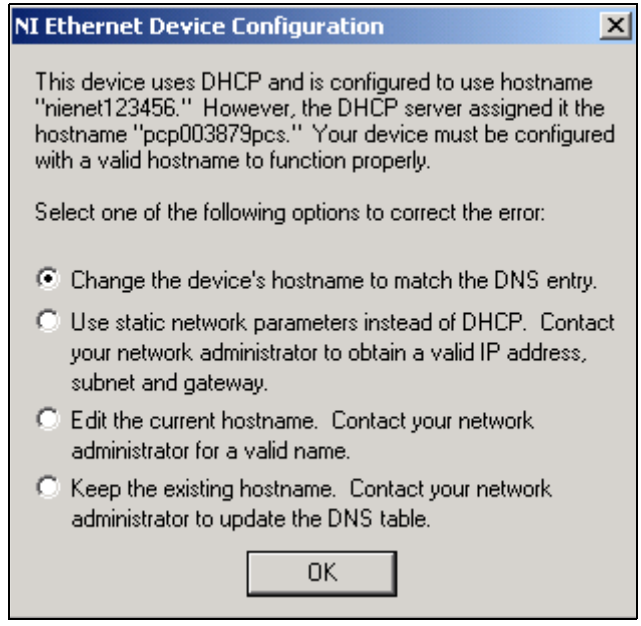



**Figure 3-5.** Fixing a Hostname Verification Error

3. The utility gives you four options for fixing the hostname. Select the one that best fits your situation and click **OK**.
   - **Change the device's hostname to match the DNS entry.** Use this option if you want to accept the hostname assigned by the DHCP server, or if you cannot contact the network administrator to change the DNS entry.
   - **Use static network parameters instead of DHCP.** Use this option if you cannot use the hostname assigned by the DHCP server. Contact your network administrator to obtain a valid IP address, subnet, and gateway. This option disables DHCP on the device.

- **Edit the current hostname.** Use this option to change the hostname to a name other than either the configured hostname or the name assigned by the DHCP server. Contact your network administrator to obtain a valid name.
- **Keep the existing hostname**. Use this option if you wish to keep the previously assigned hostname. If you select this option, contact your network administrator to change the DNS entry.

4. Review the network parameter settings in the **Properties** window.
5. Confirm that the device is in network configuration mode and click **OK**. The device reboots with the new settings in effect.
6. After the device reboots, click **Refresh** to verify that the hostname is now valid.

# 4

# GPIB Configuration

This chapter describes how to configure your Windows 2000/NT machine to use the GPIB-ENET/100.

## Configuring the NI-488.2 Software Characteristics

The GPIB Configuration utility is an interactive utility you can use to view or change the configuration of the NI-488.2 driver. You must run this utility before you use NI-488.2 with your GPIB-ENET/100.

1. Select **Start»Settings»Control Panel** and double-click the **GPIB** icon. The **GPIB Configuration** dialog box displays a list of all the GPIB interfaces and device names.

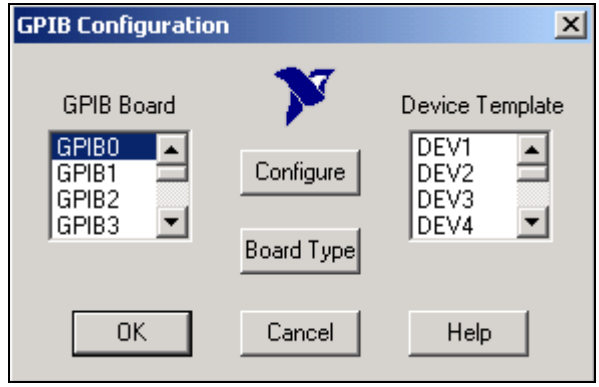



**Figure 4-1.** GPIB Configuration Dialog Box

2. Select the GPIB interface name for your GPIB-ENET/100 from the **GPIB Board** list, such as `GPIB0`.
3. Click **Board Type**.
4. Select **GPIB-ENET/100** and click **OK**.
5. Click **Configure**.

6. Type a **Host Name** or IP address for your GPIB-ENET/100.
7. (Optional) Configure any other software characteristics in this dialog box. For more information, refer to the online help.

**Note** In the online help, all references to the GPIB-ENET apply also to the GPIB-ENET/100.

8. To save your changes and exit the utility, click **OK** twice.

# 5

# Verify the Installation

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

## Running the Diagnostic Utility

The Diagnostic utility installed with NI-488.2 verifies that your hardware and software are functioning properly. Make sure the GPIB cable is not attached to your GPIB interface. Select the **Diagnostic** item under **Start»Programs»NI-488.2M for Windows NT**.

If the device you configured using the GPIB Configuration utility does not appear in the Diagnostic utility display, verify you entered a valid hostname or IP address in the GPIB Configuration utility. The Diagnostic utility will not recognize your device unless the hostname or IP address is valid.

Test your GPIB interfaces by clicking the **Test All** button. If the Diagnostic is successful, it puts a checkmark next to the interface and changes its status from **untested** to **passed**. If the Diagnostic fails, it puts an **X** next to the failing interface, and changes its status from **untested** to **failed**. Figure 5-1 shows the Diagnostic utility after it has tested some GPIB interfaces.

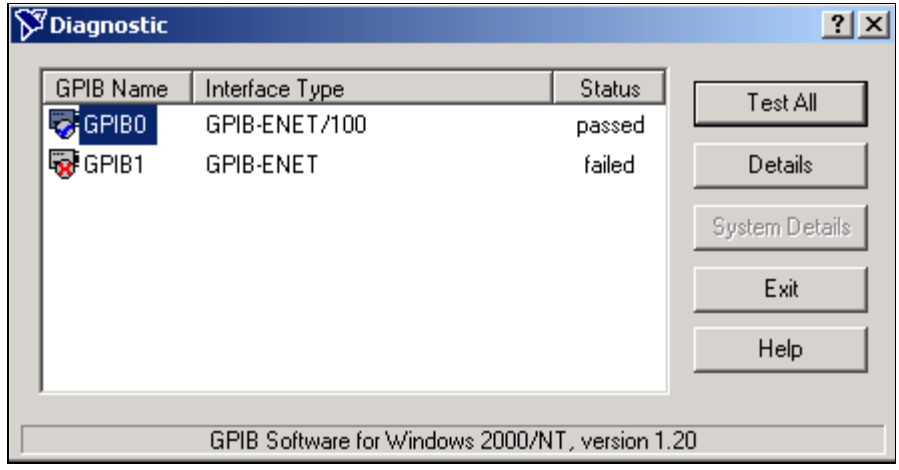



**Figure 5-1.** Diagnostic Utility after Testing

For more information about the test results for any tested GPIB interface, select the interface and click **Details**. For each failed GPIB interface, click **Details** 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 Diagnostic utility, which you access by clicking **Help**.

# Connecting the GPIB Cable

When you finish using the Diagnostic utility, you can connect the GPIB cable to your GPIB-ENET/100.

**Note** If you do not have a GPIB cable, as listed in the *What You Need to Get Started* section of Chapter 1, *Introduction*, contact National Instruments for ordering information.

Connect one end of your GPIB cable to your GPIB-ENET/100 and tighten the thumb screws on the connector. Connect the other end of your GPIB cable to your GPIB system. Make sure you comply with all IEEE 488.1 cabling restrictions and use only shielded GPIB cables.

# 6

# Using Your GPIB-ENET/100 and NI-488.2

This chapter lists some general programming requirements and describes how to use the following options available with the GPIB-ENET/100 and NI-488.2 for Windows 2000/NT:

- Dynamic Host Configuration Protocol (DHCP)
- Configuration Reset (CFG RESET) switch
- Firmware update utility
- Win32 Interactive Control utility
- GPIB Spy utility
- GPIB Virtual Device Driver

## Using DHCP

The Dynamic Host Configuration Protocol (DHCP) is designed for large networks in which networking devices are transient and network parameters cannot be statically assigned and thus tied to specific devices. DHCP eases the addition of networking devices onto a network by having a server assign necessary network parameters, including the IP address, the netmask, and router information, to a newly attached network device. Optionally, if the device provides a hostname with the configuration request, DHCP may attempt to configure your network to recognize the device with the requested hostname.

DHCP requires a Domain Name Server (DNS) to associate the numerical IP address assigned with the requested hostname. Within the past few years, an Internet community standard has emerged to provide a standardized way for these services to provide dynamic domain name services. Using this standard, after DHCP assigns the numerical IP address, it can communicate with DNS to register the newly assigned IP address with the requested hostname. However, the complexity of DHCP and dynamic name registration typically requires active management by a corporate MIS department, or equivalent, because of several risks for failure.

One possible failure can occur if the pool of available addresses contains no more unassigned IP addresses. This problem is evident if DHCP fails to work and the **PWR/RDY** LED continues to flicker for longer than 90 seconds at power on. In this situation, you will need to obtain a static IP address from your network administrator and configure the device yourself using the NI Ethernet Device Configuration utility. Refer to the *Choosing a Static IP Address* section in Chapter 3, *Ethernet Configuration*, for more information. Notice that if DHCP fails to assign you an address, the current subnet might not have an address available for you to use. In this case, you may have to move your product to another subnet where there is an available IP address.

Failure also happens if communication between DHCP and DNS does not occur. In this situation, DHCP assigns an address to the device, but you cannot communicate to it using the hostname you assigned. Your network administrator may have to manually insert the hostname into the DNS table. Alternatively, you can use the NI Ethernet Device Configuration utility to determine the hostname associated with your assigned IP address, and change the hostname to match the DNS entry. Refer to the *Verifying the Hostname* section in Chapter 3, *Ethernet Configuration*, for more information.

Because there are many other possible reasons for failure, contact your network administrator if you are having problems getting DHCP to work. When you can use DHCP and DNS successfully, you can use the hostname form of the IP address to communicate with your product—even if the numerical IP address changes with successive reboots.

If you are setting up a small network for your instrumentation system, it is recommended to use static IP addresses, because they are easier to implement and maintain. In this system, you can safely use the numerical form of the IP address to communicate with your product because the address is unlikely to change. Small networks are less likely to have domain name services available that would resolve the hostname into a numerical IP address.

# Using the CFG RESET Switch

The Configuration Reset (CFG RESET) switch is a recessed switch located beside the ENET connector on the rear panel. Refer to Figure 2-3 for an illustration of its location.

This switch performs two functions, depending on whether you press it while switching the power on or during operation.

## Using the CFG RESET Switch during Operation

While the GPIB-ENET/100 is operational, as indicated by a steady yellow **PWR/RDY** LED, you can use the CFG RESET switch to place the box into network configuration mode. You then can use the NI Ethernet Device Configuration utility as described in Chapter 3, *Ethernet Configuration*.

This special mode ensures that network parameters are not changed while in use. Because you cannot change the network parameters unless you deliberately place the GPIB-ENET/100 into network configuration mode, the parameters are protected while in normal operation. Hosts cannot connect to the GPIB-ENET/100 while it is in network configuration mode.

**Note** Pressing the CFG RESET switch has no effect if hosts are currently connected.

Close all connections, then press and hold the CFG RESET switch for three seconds. If you release the switch prior to three seconds, the GPIB-ENET/100 continues to operate normally.

The **PWR/RDY** LED goes through the following changes during these three seconds:

1. The LED begins slowly alternating between red and yellow.
2. The alternating pattern increases in tempo.
3. At three seconds, the **PWR/RDY** LED becomes steady red. This indicates the GPIB-ENET/100 is ready to enter network configuration mode.
4. Now release the CFG RESET switch. The **PWR/RDY** LED alternates rapidly between red and yellow to indicate the GPIB-ENET/100 is now in network configuration mode.

This mode remains in effect until you switch off the GPIB-ENET/100 or you use the NI Ethernet Device Configuration utility to change its network characteristics. The GPIB-ENET/100 automatically reboots when you exit the utility.

## Using the CFG RESET Switch at Power-On

If you want to reset the unit to its default network characteristics, you can use the CFG RESET switch at power-on. By pressing and holding the CFG RESET switch while you power on the GPIB-ENET/100, the network parameters revert to the default settings as defined on the baseplate label.

You must press and hold the switch for three seconds. If you release the switch prior to three seconds, no change occurs to the network configuration, and the GPIB-ENET/100 continues to boot normally.

The **PWR/RDY** LED goes through the following changes during these three seconds:

1. The LED begins slowly alternating between red and yellow.
2. The alternating pattern increases in tempo.
3. At three seconds, the **PWR/RDY** LED becomes steady red. This indicates the network configuration will be set to the factory default settings.
4. When you release the CFG RESET switch, the box continues to boot as normal, and the **PWR/RDY** LED indicates the boot process as described in Table 1-1, *LED Descriptions*.

# Updating the Firmware

NI-488.2 for the GPIB-ENET/100 and Windows 2000/NT contains a firmware update utility you can use to access new features that may be added to the GPIB-ENET/100 in the future. You must update the firmware to take advantage of any new features.

You need to know either the IP address or hostname of your GPIB-ENET/100 before you run the NI Ethernet Device Firmware Update utility. If you do not remember this information, first run the NI Ethernet Device Configuration utility by selecting **Start»Programs»NI-488.2M for Windows NT»GPIB-ENET100 Utilities»Device Configuration**. Refer to Chapter 3, *Ethernet Configuration*, for more information.

**Caution** Do *not* power-off the GPIB-ENET/100 or disconnect the power supply while running the NI Ethernet Device Firmware Update utility. Doing so will damage the unit. The GPIB-ENET/100 reboots automatically when the update completes.

**Note** The NI Ethernet Device Firmware Update utility cannot update the firmware while any network connections are active. Close any open connections before you attempt a firmware update. Hosts cannot connect to the GPIB-ENET/100 while it is updating the firmware.

Complete the following steps to run the NI Ethernet Device Firmware Update utility.

1. Select **Start»Programs»NI-488.2M for Windows NT» GPIB-ENET100 Utilities»Firmware Update**.

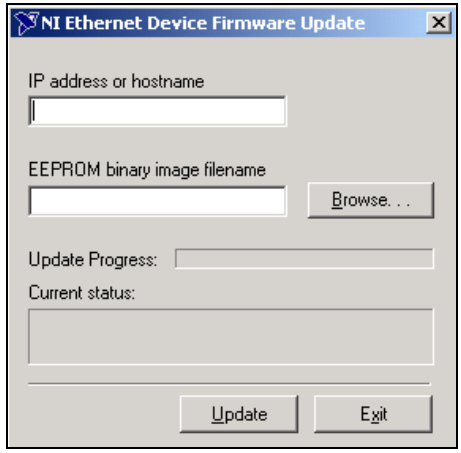



**Figure 6-1.** NI Ethernet Device Firmware Update Utility

2. Enter the IP address or the hostname of the GPIB-ENET/100 in the **IP address or hostname** edit box. An example of an IP address is `137.65.220.40`. An example of a hostname is `myenet1`.
3. Enter the full path of the binary file where the firmware is located in the **EEPROM binary image filename** edit box. You also can click **Browse...** to locate the file.
4. Click **Update** to update the firmware. The NI Ethernet Device Firmware Update utility communicates with the specified GPIB-ENET/100 to verify the box has no open network connections and determine the current version of the firmware in the unit. A dialog box reports that the update utility is searching for the Ethernet device.
5. The utility prompts you to confirm the change you are about to perform. Click **OK** to continue. As the update utility transfers the firmware image to your machine, the **Update Progress** status bar fills, and the **Current status** box describes each step in the process. The **Current status** box reports whether the firmware update completed successfully or failed. The GPIB-ENET/100 automatically reboots with the new firmware in effect.
6. Click **Exit** to close the NI Ethernet Device Firmware Update utility.

# Using the Win32 Interactive Control Utility

You can use the interactive control utility to enter NI-488 functions and IEEE 488.2-style functions interactively and see the values returned by the function calls. You can use the utility to do the following:

- Verify GPIB communication with your device quickly and easily.
- Learn the NI-488 functions and IEEE 488.2-style functions before you write your application.
- Become familiar with the commands of your device.
- Receive data from your GPIB device.
- Troubleshoot problems with your application.

To run the Win32 Interactive Control utility, select the **Win32 Interactive Control** item under **Start»Programs»NI-488.2M for Windows NT**.

This utility includes extensive online help. For more information, refer to Chapter 6, *Win32 Interactive Control Utility*, in the *NI-488.2M User Manual for Windows 95 and Windows NT.*

# Using the GPIB Spy Utility

NI-488.2 includes a Win32 utility that can monitor NI-488.2 calls made by your applications. You can use GPIB Spy to do the following:

- Capture information about NI-488 functions and IEEE 488.2-style functions as they are invoked by your GPIB applications.
- Display captured information, including, but not limited to, input and output parameter values, I/O buffer contents, and return values.
- Save, restore, and print captured information.

To run GPIB Spy, select the **GPIB Spy** item under **Start»Programs» NI-488.2M for Windows NT**.

For more information about GPIB Spy, refer to Chapter 5, *GPIB Spy Utility*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*, or use the GPIB Spy context-sensitive online help.

# Programming Considerations

As you begin developing your Win32 NI-488.2 application, remember the following points:

- If you are using LabVIEW or Measurement Studio for your application, you do not need to add any files to implement GPIB. Everything is included.
- For your C/C++ application, you must include the NI-488.2 header file in your source code.
- NI-488.2 is accessed through the 32-bit DLL, `gpib-32.dll`, either by linking with one of the language interfaces provided with NI-488.2, or by using direct DLL entry from other programming environments.
- Several sample GPIB applications are included with NI-488.2. Use these as a guide for your own application development.

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2M User Manual for Windows 95 and Windows NT*. For detailed information about each NI-488 function and IEEE 488.2-style function, refer to the *NI-488.2 Function Reference Manual for Windows*.

# Running Existing DOS and Windows GPIB Applications

You can run existing DOS and Windows GPIB applications under Windows 2000/NT by using the GPIB Virtual Device Driver, `gpib-vdd.dll`, which is included with NI-488.2.

To run DOS GPIB applications, open a Windows NT Command Prompt, and load the special GPIB device driver `gpib-nt.com` instead of `gpib.com`, which you normally use with DOS. When you install NI-488.2, the installation program copies `gpib-nt.com` into a subdirectory of the GPIB installation directory called `doswin16`.

To use `gpib-nt.com`, modify your `config.nt` file to load `gpib-nt.com` whenever a DOS application runs. The `config.nt` file is located in your *`winnt`*`\system32` directory, where *`winnt`* is your Windows NT directory, for example, `c:\windows`.

To load gpib-nt.com, add the following line to your config.nt file:

```
device=path\doswin16\gpib-nt.com
```

where *path* is the directory where you installed NI-488.2. The default installation directory is c:\gpib-nt.

To run 16-bit Windows GPIB applications, the system uses the special GPIB dynamic link library, gpib.dll. When you install NI-488.2, the installation program copies gpib.dll into the *winnt*\system32 directory, where *winnt* is your Windows NT directory, for example c:\windows. As long as gpib.dll is in your Windows NT directory, your system automatically accesses gpib.dll whenever you launch a 16-bit Windows GPIB application.

# A

# Uninstalling the Software

This appendix describes how to uninstall NI-488.2 for Windows 2000/NT.

This version of NI-488.2 supports only the GPIB-ENET/100 and GPIB-ENET. If you need to access other National Instruments GPIB interfaces, you must remove this version and install NI-488.2 for the other interfaces.

Complete the following steps to remove NI-488.2:

1. Close all NI-488.2 applications.
2. Select **Start»Settings»Control Panel**.
3. Double-click the **Add/Remove Programs** icon. A dialog box appears, listing the software you can uninstall.
4. Select the NI-488.2 software you want to remove, and click **Add/Remove**. An uninstall program runs and removes all folders, programs, and DLLs associated with NI-488.2.
5. Reboot your system.

**Note** You must reboot your system to complete the uninstallation. The uninstall program cannot remove some of the components associated with NI-488.2 until you restart the computer.

To reinstall the hardware and software, refer to Chapter 2, *Installation*.

# B

# PWR/RDY LED Signaling

This appendix describes how to interpret the **PWR/RDY** LED error codes.

## PWR/RDY LED Overview

The **PWR/RDY** LED has several purposes on the GPIB-ENET/100. When you first power on the unit, the **PWR/RDY** LED alternates rapidly between red and yellow while it completes its power-on self-tests and acquires network parameters. When the tests complete successfully and the IP address is assigned from either nonvolatile memory or the network, the **PWR/RDY** LED remains steady yellow, indicating that the unit is ready to operate.

The **PWR/RDY** LED also alternates rapidly between red and yellow while the device is in network configuration mode. At other times, the **PWR/RDY** LED blinks slowly in a recognizable pattern to alert you of internal errors. Use this appendix to interpret and record the pattern that the **PWR/RDY** LED flashes, and then contact National Instruments.

**Note** By recording the **PWR/RDY** LED status messages before calling National Instruments, you can save yourself time, and the Product Support Department can answer your questions more accurately and efficiently. Do not switch off power to your GPIB-ENET/100 before recording the flashing **PWR/RDY** LED pattern.

**PWR/RDY** LED signaling can report up to 81 different errors. The errors are numbered from 11 to 99 and are reported through sequences of **PWR/RDY** LED flashes.

**Note** There is no zero in any error message. This means that error message numbers 0–10, 20, 30, 40, 50, 60, 70, 80, and 90 are not possible.

# Step 1. Count the Long Flashes

A three-second interval, during which the **PWR/RDY** LED is yellow, separates each repetition of the sequence. The sequence begins with a series of long one-second flashes—that is, one second red, one second yellow. These long flashes represent the digit in the tens column. There can be one to nine long flashes, which represent digits 1 through 9. For example, one long flash represents the digit 1 in the tens column, and nine 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—that is, one-fifth of a second red, one-fifth of a second yellow. These short flashes represent the digit in the ones column. Again, there can be one to nine flashes, which represent the digits 1 through 9. For example, one short flash represents the digit 1 in the ones column, and nine short flashes represent the digit 9 in the ones column.

Using this method, the **PWR/RDY** LED flashes the following sequence to represent status message 11:

<three seconds yellow> <one long red flash> <one short red flash> <three seconds yellow>…

The **PWR/RDY** LED flashes the following sequence to represent status message 31:

<three seconds yellow> <three long red flashes> <one short red flash> <three seconds yellow>…

# Step 3. Record Your Status Code Number

When you have computed your error message number, write it down and also note the ON/OFF state of the **LINK**, **TX**, and **RX** LEDs. Have this information available when calling National Instruments.

C

# Troubleshooting and Common Questions

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

## Troubleshooting Hardware Problems

- Verify that all cables are securely connected to the GPIB-ENET/100.
- Verify that the unit is plugged in and powered on.
- Verify with the network 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 NI Ethernet Device Configuration utility, verify that you have correctly followed the steps in Chapter 3, *Ethernet Configuration*.
- If the **PWR/RDY** LED continues to flash rapidly after 90 seconds, the GPIB-ENET/100 is unable to obtain its IP address from the network. Check with your network administrator to verify your IP address and make sure that you recorded the Ethernet address correctly.
- If the **PWR/RDY** LED is blinking in a slower red/yellow pattern, the GPIB-ENET/100 is reporting an internal error. Refer to Appendix B, *PWR/RDY LED Signaling*, to interpret the error code and contact National Instruments.

# Troubleshooting EDVR Error Conditions

In some cases, calls to NI-488 functions or IEEE 488.2-style functions may return with the ERR bit set in `ibsta` and the value EDVR in `iberr`. The value stored in `ibcntl` is useful in troubleshooting the error condition.

## EDVR Error Condition with ibcntl Set to 0xE028002C (–534249428)

If a call is made with a board number that is within the range of allowed board numbers (typically 0 to 31), but which has not been assigned to a GPIB interface, an EDVR error condition occurs with `ibcntl` set to 0xE028002C. You can assign a board number to a GPIB interface by running the GPIB Configuration utility and selecting an interface name. Refer to *Configuring the NI-488.2 Software Characteristics*, in Chapter 4, *GPIB Configuration*, for information about how to configure NI-488.2.

## EDVR Error Condition with ibcntl Set to 0xE0140025 (–535560155)

If a call is made with a board number outside the range of allowed board numbers (typically 0 to 31), an EDVR error condition occurs with `ibcntl` set to 0xE0140025.

## EDVR Error Condition with ibcntl Set to 0xE0140035 (–535560139)

If a call is made with a device name that is not listed in the logical device templates that are part of the GPIB Configuration utility, an EDVR error condition occurs with `ibcntl` set to 0xE0140035.

## EDVR Error Conditions with ibcntl in the Range from 0xE1002710 (–520083696) to 0xE1002EE0 (–520081696)

These errors are returned from the WinSock Interface. The lower 16 bits of `ibcntl` specify the actual WinSock Interface error. Refer to your WinSock Interface documentation for more information about the specific error.

## EDVR Error Condition with ibcntl Set to 0xE1000054 (–520093612)

You are attempting to communicate with a GPIB-ENET/100 that does not have a hostname (IP address) specified in the GPIB Configuration utility. Refer to *Configuring the NI-488.2 Software Characteristics*, in Chapter 4, *GPIB Configuration*, for information about how to configure NI-488.2.

### EDVR Error Condition with ibcntl Set to 0xE100004E (–520093618)

You are attempting to communicate with a GPIB-ENET/100 that has a firmware revision that is incompatible with the current driver. Use the NI Ethernet Device Firmware Update utility to upgrade the firmware to a compatible version.

To run the utility, select the **Firmware Update** item under **Start»Programs»NI-488.2M for Windows NT»GPIB-ENET100 Utilities**.

## Troubleshooting Diagnostic Utility Failures

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

### Missing Software Components

This error occurs if the software components that are necessary for NI-488.2 for Windows 2000/NT to function correctly are not present in the system. If you encounter this problem, uninstall NI-488.2 for Windows 2000/NT, reinstall the software, and run the Diagnostic utility again.

### No GPIB Interfaces Present

This error occurs if there are no GPIB interfaces physically present in the system or there is a resource conflict with the interfaces that are installed. If you encounter this problem, use the GPIB Configuration utility to examine the installed GPIB interfaces and the resources assigned to each. Then run the Diagnostic utility again.

To access this information in the GPIB Configuration utility, complete the following steps:

1. Select **Start»Settings»Control Panel** and double-click the **GPIB** icon.
2. Click the **Board Type** button and verify that the type of GPIB interface listed for each logical board name is correct. Click the **OK** button to return to the main dialog box.
3. Double-click each board name and verify that the hardware settings displayed in the dialog box match your actual hardware settings.

## GPIB-ENET/100 Problem Encountered

This error occurs if an unknown problem is encountered while attempting to access the GPIB-ENET/100. There are several possible reasons that you might encounter this problem:

- The GPIB-ENET/100 might not be properly configured. Refer to the *Installing the GPIB-ENET/100 Hardware* section in Chapter 2, *Installation*, for detailed instructions.
- The **Host Name** field in the GPIB Configuration utility might be incorrect for the GPIB-ENET/100. Run the GPIB Configuration utility, as described under *Configuring the NI-488.2 Software Characteristics*, in Chapter 4, *GPIB Configuration*, to verify that the IP address value has been correctly specified.
- The GPIB-ENET/100 might not be correctly configured for your network. Try to ping your GPIB-ENET/100 to verify 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. Find the directory where `ping.exe` is installed, run it, and type in the following command:

  `ping IPaddress`

  where `IPaddress` is the IP address assigned to your GPIB-ENET/100. If your network administrator also assigned you a hostname, you can type in `ping hostname` instead. If ping is unable to communicate with your GPIB-ENET/100 and your network administrator tells you that your IP address is valid, contact National Instruments.

## Missing WinSock Support

WinSock support is enabled and configured in the Network Control Panel applet. To configure WinSock support, perform the following steps.

♦ **Windows NT**

1. Double-click the **Network** icon under **Start»Settings»Control Panel**.
2. In the **Network** dialog box that appears, select the **Protocols** tab.
3. On the **Protocols** tab, click **Add**.
4. In the **Select Network Protocol** dialog box that appears, select **TCP/IP Protocol**.

- **Windows 2000**

  1. Double-click the **Network and Dial-up Connections** icon under **Start»Settings»Control Panel**.
  2. Double-click the **Local Area Connection** icon.
  3. In the **Local Area Connection Status** dialog, select **Properties**.
  4. In the **Local Area Connection Properties** dialog, click **Install**.
  5. In the **Select Network Component Type** dialog, select **Protocol** and click **Add**.
  6. In the **Select Network Protocol** dialog, select **TCP/IP Protocol**.
  7. Click **OK**.

  After you have properly installed and configured WinSock support, run the Diagnostic utility again.

## GPIB Cables Need To Be Disconnected

This error occurs if you have any GPIB cables connected to the GPIB interface. Disconnect all GPIB cables and run the Diagnostic utility again.

## NI-488.2 Software Problem Encountered

This error occurs if the Diagnostic utility detects that it is unable to communicate correctly with the GPIB hardware using the installed NI-488.2 software. If you get this error, shut down your computer, restart it, and run the Diagnostic utility again. If the problem persists, try uninstalling and reinstalling NI-488.2 for Windows 2000/NT and the GPIB-ENET/100.

## Unknown Problem Encountered

This error occurs if an unknown problem is encountered while trying to execute the Diagnostic utility. If you encounter this problem, shut down your computer, restart it, and run the Diagnostic utility again. If the problem persists, try uninstalling and reinstalling NI-488.2 for Windows 2000/NT and the GPIB-ENET/100.

# Common Questions

**I currently do not have a WinSock provider installed. What do I need to do to install a WinSock provider?**

Before you can use the driver software for the GPIB-ENET/100, you must have a WinSock interface, version 1.1 or higher, installed. You can install a WinSock interface from Microsoft or another network vendor. Refer to the *Missing WinSock Support* section of this appendix for information about how to install and configure WinSock support.

**My driver is not communicating with the GPIB-ENET/100. What should I do?**

Make sure that the GPIB-ENET/100 is configured properly. Refer to Chapter 2, *Installation*, and Chapter 4, *GPIB Configuration*. Then run the Diagnostic utility again.

**My I/O worked with a board interface, but it times out when I use the GPIB-ENET/100. What should I do?**

Network communication is slower than straight cable communication. You might need to raise the default **Timeout** value using the GPIB Configuration utility. Refer to *Configuring the NI-488.2 Software Characteristics*, in Chapter 4, *GPIB Configuration*, for information about the GPIB Configuration utility.

**I powered off my GPIB-ENET/100 before recording the flashing PWR/RDY LED pattern. What should I do?**

Try to duplicate the error before calling National Instruments for assistance. Recording the **PWR/RDY** LED pattern is not critical to the operation of your GPIB-ENET/100, but it saves you time and helps National Instruments diagnose the problem quickly and accurately.

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

Run the Diagnostic utility. Select the **Diagnostic** item under **Start»Programs»NI-488.2M for Windows NT**.

A banner at the bottom of the Diagnostic utility window displays the version of NI-488.2 that is installed.

**Can I control the GPIB-ENET/100 and other GPIB interfaces from the same computer?**

This version of NI-488.2 supports only the GPIB-ENET/100 and GPIB-ENET. If you need to access other National Instruments GPIB interfaces, you must remove this version and install NI-488.2 for the other interfaces.

**I have a GPIB-ENET. Can I use the GPIB-ENET and GPIB-ENET/100 in the same system?**

Yes, this version of NI-488.2 supports systems containing both products as well as systems containing only one of the two products. The configuration utility includes options for configuring both products.

**How do I configure my existing GPIB-ENET with this software?**

This version of NI-488.2 includes a link to utilities specific to the GPIB-ENET at **Start»Programs»NI-488.2M for Windows NT» GPIB-ENET Utilities**. For information on using these utilities, refer to *Getting Started with Your GPIB-ENET and the GPIB Software for Windows NT.*

**I have an application using the GPIB-ENET. Can I replace the GPIB-ENET with a GPIB-ENET/100?**

Yes. You do not need to rewrite your application code to replace a GPIB-ENET with a GPIB-ENET/100. However, you do need to configure the GPIB-ENET/100 to have the same network identity as the GPIB-ENET you are replacing. First, acquire network parameters for the GPIB-ENET/100 using DHCP or the NI Ethernet Device Configuration utility. Then use the GPIB Configuration utility to remove the GPIB-ENET information from the **GPIB Board** list and reassociate the same entry with the IP address for the GPIB-ENET/100. For example, if your application code refers to the GPIB-ENET as `GPIB0`, reconfigure `GPIB0` to refer to the GPIB-ENET/100.

**What should I do if the Diagnostic utility fails with an error?**

Refer to the troubleshooting sections of this appendix for specific information about what might cause the Diagnostic utility to fail. If you already have completed the troubleshooting steps, contact National Instruments.

**How many GPIB interfaces can I configure for use with NI-488.2 for Windows 2000/NT?**

You can configure NI-488.2 for Windows 2000/NT to communicate with up to 32 GPIB interfaces.

**How many devices can I configure for use with NI-488.2 for Windows 2000/NT?**

NI-488.2 for Windows 2000/NT provides a total of 1,024 logical devices for applications to use. The maximum number of physical devices you should connect to a single GPIB interface is 14, or fewer, depending on your system configuration.

**When should I use the Win32 Interactive Control utility?**

You can use the Win32 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information, refer to Chapter 6, *Using Your GPIB-ENET/100 and NI-488.2*.

**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-488.2M User Manual for Windows 95 and Windows NT.*

**How do I communicate with my instrument over the GPIB?**

Refer to the documentation that came from the instrument manufacturer. The command sequences you use are totally dependent on the specific instrument. The documentation for each instrument should include the GPIB commands you need to communicate with it. In most cases, NI-488 device-level calls are sufficient for communicating with instruments. Refer to Chapter 3, *Developing Your Application*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*, for more information.

**Can I use the NI-488 and NI-488.2 calls together in the same application?**

Yes, you can mix NI-488 functions and IEEE 488.2-style-functions.

**How should I check for errors in my GPIB application?**

Examine the value of `ibsta` after each NI-488 or NI-488.2 call. If a call fails, the ERR bit of `ibsta` is set and an error code is stored in `iberr`. For more information about global status variables, refer to Chapter 3, *Developing Your Application*, in the *NI-488.2M User Manual for Windows 95 and Windows NT.*

**Why does the NI Ethernet Device Configuration utility list my box as `*BUSY*` when I know my network uses DHCP?**

For up to one minute, the GPIB-ENET/100 attempts to retrieve network parameters from a DHCP server. During this time, **`*BUSY*`** appears in the utility display. If this status does not change, there are several reasons why DHCP may fail to respond. One of the most likely reasons is that your subnet has no more available addresses to assign using DHCP. Please consult your network administrator to determine the specific reason for the problem.

**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 the installation program created, the uninstall program does not delete that directory, because the directory is not empty after the uninstallation. You will need to remove any remaining components yourself. Also remember to restart your computer after using the uninstall program. The program cannot remove certain components associated with NI-488.2 until the computer is restarted.

**I just added a GPIB-ENET/100 to the network, but it does not show up in the NI Ethernet Device Configuration utility. What is the problem?**

Allow at least 15 seconds for the GPIB-ENET/100 to complete its power-on self tests before launching the utility or clicking **Refresh**.

Communication between the NI Ethernet Device Configuration utility and the GPIB-ENET/100 is not guaranteed. Though unlikely, it is possible that the communication gets lost in the network. Click **Refresh** more than once before concluding the device is not discovered.

Verify that the GPIB-ENET/100 shares the same subnet as the computer running the NI Ethernet Device Configuration utility. The utility cannot communicate with devices through gateways on the network and will not discover devices on another subnet.

**I have GPIB-ENET interfaces as well as GPIB-ENET/100 interfaces. Why can't I see the GPIB-ENET interfaces in the NI Ethernet Device Configuration utility?**

The GPIB-ENET/100 uses a configuration protocol that can communicate with the NI Ethernet Device Configuration utility. Because GPIB-ENET interfaces are not compatible with this configuration protocol, the utility does not recognize them on the network.

# D

# Specifications

This appendix describes the characteristics of the GPIB-ENET/100 and the transfer rates of the NI-488.2 software, along with the recommended operating conditions.

## Electrical Characteristics

Input power requirements ..... 9–30 VDC

Current requirements

9–30 VDC ..... 425 mA maximum

@ 15 VDC ..... 250 mA typical

## Environmental Characteristics

Operating temperature..... 0 to 40 °C

Relative humidity, operating..... 10% to 90% noncondensing conditions

Storage temperature ..... –20 to 70 °C

Relative humidity, storage ..... 5 to 90% noncondensing conditions

EMI ..... FCC Class A Verified

## Physical Characteristics

Overall case size (dimensions)..... 21.0 by 12.4 by 3.7 cm (8.25 by 4.89 by 1.44 in.)

Case material..... Hard plastic with metal baseplate

Weight..... 0.41 kg (0.9 lb)

## Software Characteristics

Maximum software transfer rate[1] .....Over 800 kbytes/s

## Electrostatic Discharge Protection

Non-isolated devices.....1.5 kV

## Connectors

Ethernet connector.....RJ-45

GPIB connector .....IEEE 488 standard 24 pin

## Network Specifications

Connection type.....IEEE 802.3 compliant
100BaseTX (100 Mbits/s)
10BaseT (10 Mbits/s)

Duplex mode.....Half duplex

[1] Actual speed may vary considerably from speed shown due to system, network, and instrumentation capabilities.

# E

# Technical Support Resources

## Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of `ni.com`. You also can contact our application engineers by visiting `ni.com/ask` and filling out an e-mail request form.

## NI Developer Zone

The NI Developer Zone at `ni.com/zone` is the essential resource for building measurement and automation systems. At the NI Developer Zone, you can easily access the latest example programs, system configurators, tutorials, technical news, as well as a community of developers ready to share their own techniques.

## Customer Education

National Instruments provides a number of alternatives to satisfy your training needs, from self-paced tutorials, videos, and interactive CDs to instructor-led hands-on courses at locations around the world. Visit the Customer Education section of `ni.com` for online course schedules, syllabi, training centers, and class registration.

## System Integration

If you have time constraints, limited in-house technical resources, or other dilemmas, you may prefer to employ consulting or system integration services. You can rely on the expertise available through our worldwide network of Alliance Program members. To find out more about our Alliance system integration solutions, visit the System Integration section of `ni.com`.

# Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of `ni.com`. Branch office web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. Phone numbers for our worldwide offices are listed at the front of this manual.

# Glossary

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

## Symbols

| | |
|---|---|
| ° | degrees |
| % | percent |

## A

| | |
|---|---|
| A | amperes |
| ANSI | American National Standards Institute |
| API | Application Programming Interface |

## B

| | |
|---|---|
| b | bits |
| B | bytes |
| bps | bits per second |

## C

| | |
|---|---|
| C | Celsius |

## D

| | |
|---|---|
| DHCP | Dynamic Host Configuration Protocol |
| DLL | dynamic link library |
| DNS | Domain Name Server |

## E

| | |
|---|---|
| EMI | electromagnetic interference |

## F

| | |
|---|---|
| FCC | Federal Communications Commission |

## G

| | |
|---|---|
| g | grams |
| GPIB | General Purpose Interface Bus |

## H

| | |
|---|---|
| Hz | hertz |

## I

| | |
|---|---|
| I/O | input/output |
| IEEE | Institute of Electrical and Electronic Engineers |
| in. | inches |
| IP | Internet Protocol |

## L

| | |
|---|---|
| lb. | pounds |
| LED | light-emitting diode |

## M

| | |
|---|---|
| m | meters |
| MB | megabytes of memory |

## N

| | |
|---|---|
| NIC | network interface card |

## S

| | |
|---|---|
| s | seconds |

## V

| | |
|---|---|
| V | volts |
| VAC | volts alternating current |

## W

| | |
|---|---|
| Win16 | describes a 16-bit Windows application |
| Win32 | describes a 32-bit Windows application |

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