GPIB

**Getting Started with Your
GPIB-ENET and NI-488.2™
for Windows Me/98/95**

Worldwide Technical Support and Product Information

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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.
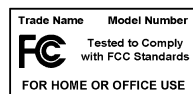
FCC/DOC Warnings

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.

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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.

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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 and NI-488.2 for Windows Me/98/95.

This manual assumes that you are already familiar with Windows Me/98/95 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 install a Windows Sockets (WinSock) interface, 1.1 or higher. Microsoft provides a WinSock interface with Windows Me/98/95. You also can use a WinSock interface purchased from another network vendor.

Conventions Used in This Manual

This manual uses the following conventions:

»   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 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.

     This icon denotes a warning, which advises you of precautions to take to avoid being electrically shocked.

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.

bold italic   Bold italic text is used in this manual to denote the default settings of the 8-bit DIP switches.

IEEE 488, IEEE 488.2, and IEEE 802.3   *IEEE 488*, *IEEE 488.2*, and *IEEE 802.3* refer to the ANSI/IEEE Standard 488.1-1987, the ANSI/IEEE Standard 488.2-1992, and the ANSI/IEEE Standard 802.3, respectively, which define the GPIB.

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.

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

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

1

Introduction

This chapter lists what you need to get started and optional equipment you can order, and briefly describes the GPIB-ENET hardware and the NI-488.2 software for Windows Me/98/95.

What You Need to Get Started

Before you install your GPIB hardware and the NI-488.2 software for Windows Me/98/95, make sure you have all of the following items:

❑   Windows Me/98/95 installed on your computer

❑   WinSock interface 1.1 or higher installed on your computer

❑   The *NI-488.2 for Windows* CD, which is included in your kit

❑   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. standard power cord
  –   Switzerland power cord
  –   Australian power cord
  –   Universal European power cord
  –   North American power cord
  –   U.K. power cord

❑ One of the following Ethernet cables, which you can purchase from National Instruments:

  – Twisted pair (10Base-T) straight-through cable (1, 5, or 10 m) for connecting the GPIB-ENET to a network hub

  – Twisted pair (10Base-T) cross-over cable (1, 5, or 10 m) for connecting the GPIB-ENET directly to a computer's network interface card (NIC)

  – Coax (10Base-2) cables (1, 5, or 10 m)

  – AUI (10Base-5) cables (1, 5, or 10 m)

❑ 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 boxes. For information about ordering a software license, contact National Instruments.

GPIB-ENET Hardware Overview

The GPIB-ENET hardware 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 uses the GPIB software to transform any computer with the GPIB driver and an Ethernet port into a fully functional GPIB Talker/Listener/Controller with complete communication and bus management capability. The GPIB-ENET is powered by an internal 100–120 VAC or 220–240 VAC supply.

The GPIB-ENET includes all the software and logic needed to implement the physical and electrical characteristics of all versions of IEEE 488, including IEEE 488.2, and IEEE 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 more information about hardware specifications, refer to Appendix D, *Specifications*.

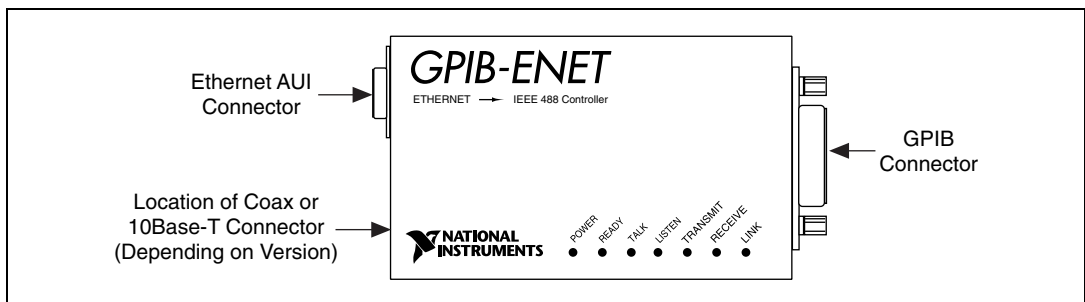Figure 1-1 shows the seven light-emitting diodes (LEDs) on the GPIB-ENET top panel.

Figure 1-1. GPIB-ENET Top Panel and LEDs

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

Table 1-1. LED Descriptions

LED	Description
POWER	Indicates that power has been supplied to the unit and the ON/OFF switch is in the ON position.
READY	Indicates that the box is ready for operation. Continuous flashing indicates an error 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 to the Ethernet network.
RECEIVE	Indicates that the GPIB-ENET is receiving Ethernet network traffic.
LINK	Indicates that the GPIB-ENET detected a twisted pair (10Base-T) link. For GPIB-ENET coax and AUI options, this LED remains OFF.

NI-488.2 Software Overview

The NI-488.2 software includes a native, 32-bit multitasking Windows Me/98/95 driver that is fully Plug and Play aware.

The NI-488.2 software supports the concurrent use of multiple types of GPIB hardware. For example, you can communicate with GPIB devices through an AT-GPIB/TNT, a PCMCIA-GPIB, and a GPIB-ENET in the same system at the same time. The NI-488.2 software is fully integrated into the operating system.

The NI-488.2 software, along with the GPIB hardware, transforms your computer into a GPIB Talker/Listener/Controller with complete communications and bus management capability.

The NI-488.2 software includes the following components:

- Device driver

- Measurement & Automation Explorer, which gives you access to the NI-488.2 development utilities, including the NI-488.2 Getting Started Wizard and the NI-488.2 Troubleshooting Wizard

- 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

- Example programs that use the NI-488.2 API

Refer to Appendix D, *Specifications*, for information about the NI-488.2 software transfer rates.

Time-Saving Development Tools

Your kit includes NI-488.2 for Windows Me/98/95. After you install your GPIB-ENET 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, 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.

The GPIB Analyzer is another 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 can easily determine the throughput and overhead of your GPIB systems. The GPIB Analyzer software for Windows Me/98/95 works with the AT-GPIB/TNT+ and PCMCIA-GPIB+ products, which provide GPIB Analyzer support along with the functionality of a high-performance GPIB Controller.

2

Installation and Configuration

This chapter describes how to install and configure your GPIB-ENET and the NI-488.2 software for Windows Me/98/95.

Install the NI-488.2 Software

Before you install the GPIB-ENET hardware, complete the following steps to install the NI-488.2 software:

1. Insert the *NI-488.2 for Windows* CD.

2. When the NI-488.2 Software for Windows screen appears, click the **Install NI-488.2 Software for Windows** item, as shown in Figure 2-1.
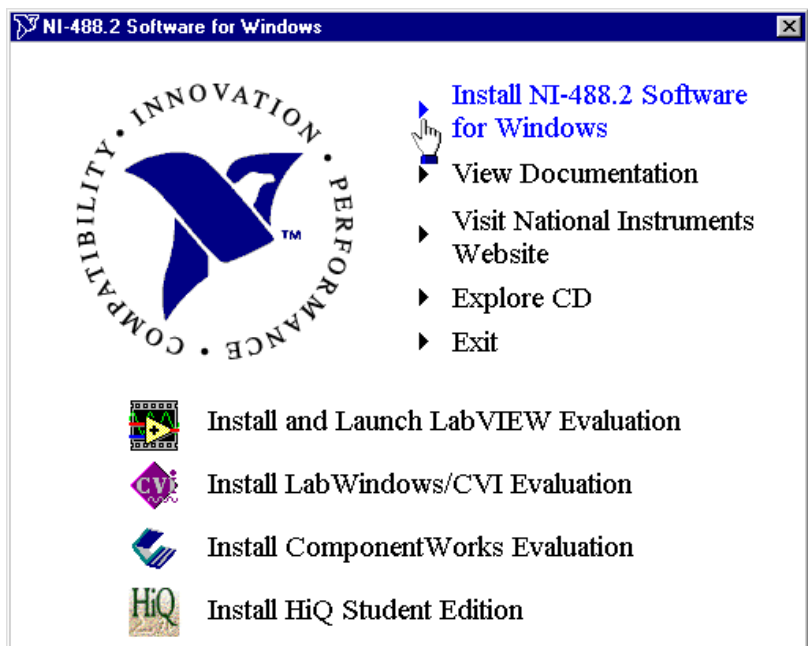

Figure 2-1. NI-488.2 Software for Windows CD Autorun Screen

The setup wizard guides you through the necessary steps to install the NI-488.2 software.

After you install NI-488.2, install the GPIB-ENET. Continue to the next section, *Add GPIB Hardware*.

Add GPIB Hardware

Use the Add GPIB Hardware Wizard to inform Windows Me/98/95 that you are adding a GPIB-ENET to your system. To do so, complete the following steps:

1. Select **Start»Programs»National Instruments»NI-488.2»Add GPIB Hardware**.

2. When the wizard prompts you for a type of hardware, select **GPIB-ENET** and click **Next** to continue.
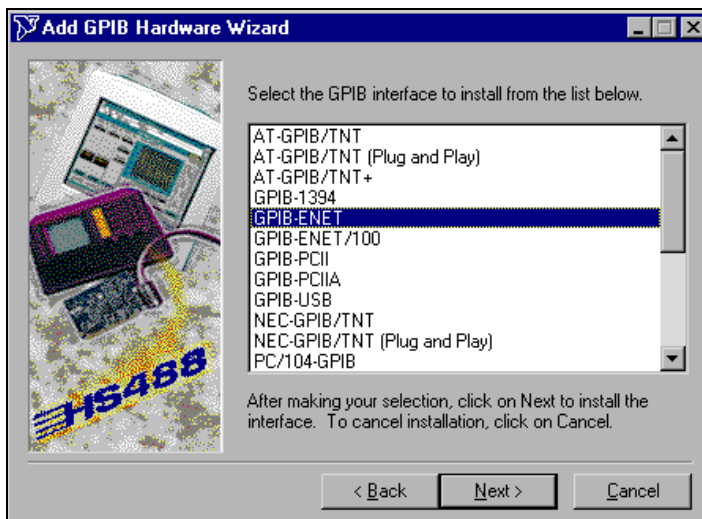

Figure 2-2. Add GPIB Hardware Wizard Dialog Box

Restart Your System

Before you use the NI-488.2 software, you must restart your system.

When your system restarts, the NI-488.2 Getting Started Wizard launches automatically. Exit the NI-488.2 Getting Started Wizard. Later, you will be prompted to start the wizard again.

Configure and Install the Hardware

To configure the NI-488.2 software and your GPIB-ENET, complete the following steps.

Step 1. Determine IP and Ethernet Addresses

TCP/IP-based networks use the Internet Protocol (IP) address to route information to the appropriate network and host. If you are installing a GPIB-ENET in a network for the first time, or if your GPIB-ENET IP address changes, you must configure the IP address. To do so, complete the following steps:

1. Locate the Ethernet address on the baseplate label of the GPIB-ENET, as shown in Figure 2-3.

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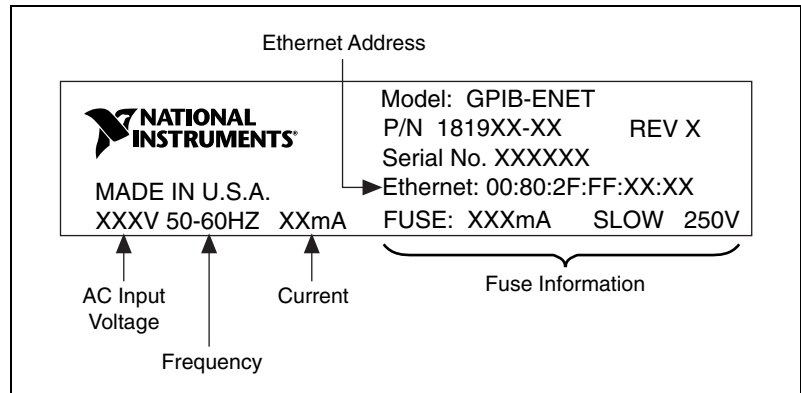

Figure 2-3. GPIB-ENET Baseplate Identification Label

2. Contact your network administrator to assign a unique, valid IP address or hostname for your GPIB-ENET. Your network administrator can determine whether the GPIB-ENET should have its IP address assigned by a RARP (Reverse Address Resolution Protocol) server, or configured manually, using the Assign IP Address utility.

3. Make a note of the IP address or hostname. You will use this information in the following steps.

Step 2. Configure the NI-488.2 Software

To configure the NI-488.2 software, complete the following steps:

1. Select **Start»Programs»National Instruments»NI-488.2»Explore GPIB** to start the Measurement & Automation Explorer.

2. Under **Measurement & Automation**, expand the **Devices and Interfaces** folder.

3. Right-click the **GPIB-ENET** item and select **Properties** from the drop-down menu that appears.

4. To configure the network addresses assigned to your GPIB-ENET, complete the following steps:

   a. Click the **Network Settings** tab.

   b. Type the IP address reserved by your network administrator in the **IP Address** field, as shown in Figure 2-4.
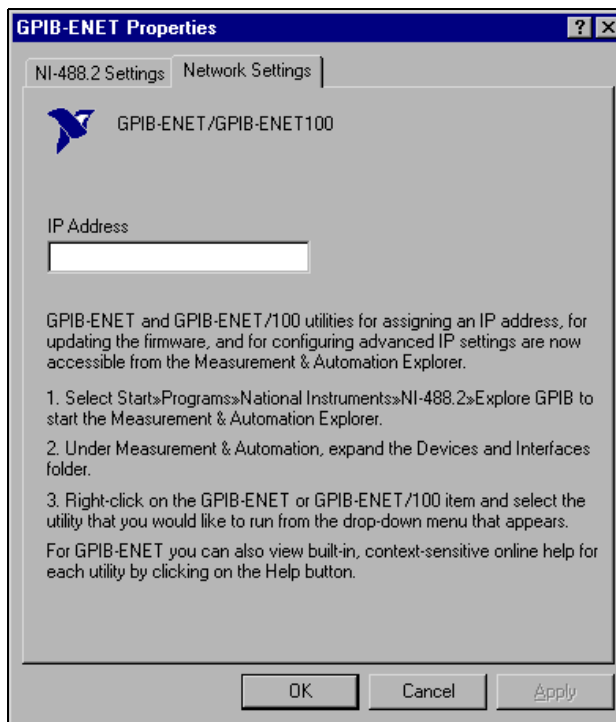

Figure 2-4. Network Settings Tab

The NI-488.2 Configuration utility context-sensitive online help contains all of the information that you need to configure the NI-488.2 software properly. To view the online help, click on the question mark (**?**) button in the toolbar and click on any item about which you want more information.

Step 3. Configure the GPIB-ENET Operating Characteristics

The GPIB-ENET has a two-position slide switch that you use to configure the network interface connector. The GPIB-ENET also has an 8-bit DIP switch that you use to configure the operating characteristics. These switches are located on the back panel of the GPIB-ENET, as shown in Figure 2-5.

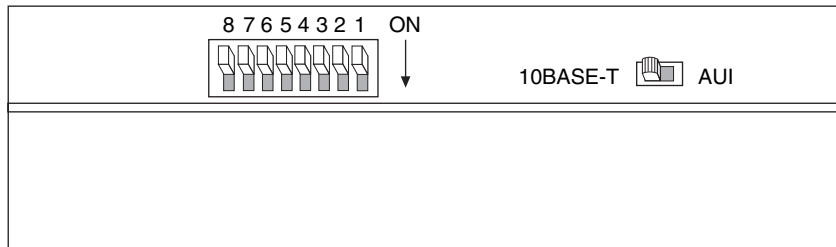To configure the GPIB-ENET operating characteristics, refer to the following sections.

Figure 2-5. GPIB-ENET Back Panel Switches

Configure the Slide Switch

The GPIB-ENET has two network interface connectors: a 15-pin AUI connector, and either a 10Base-T or coax Ethernet connector.

Use the slide switch to select the connector that the GPIB-ENET uses. The default switch setting is either **10Base-T** or **COAX**, as shown in Figure 2-6.
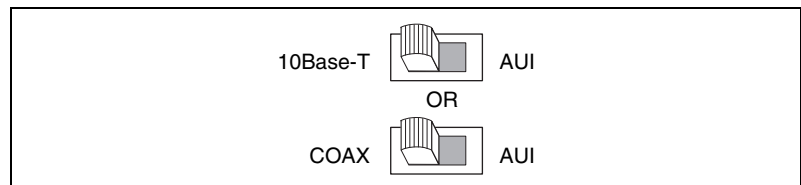

Figure 2-6. Default Switch Setting for Ethernet Port Configuration

If you want to use the AUI connector, slide the switch setting to **AUI**, as shown in Figure 2-7.
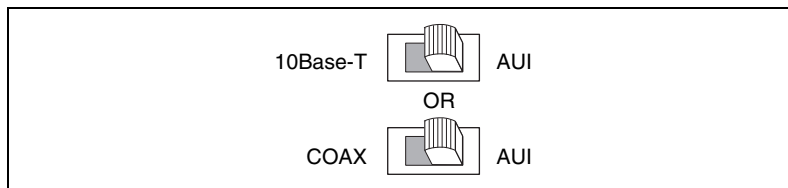
Figure 2-7. Switch Setting for AUI Ethernet Port Configuration

Verify the 8-Bit DIP Switch Setting

The 8-bit DIP switch sets the operating mode of the GPIB-ENET. The default switch setting is for normal operation mode. In normal operation mode, all the switches are in the OFF position.

Verify that all the DIP switches on your GPIB-ENET are in the OFF position. Do *not* change the DIP switch settings unless you run a utility that prompts you to do so. For more information about the 8-bit DIP switch, refer to Appendix A, *GPIB-ENET 8-Bit DIP Switch*.

Step 4. 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.

To connect your cables, complete the following steps:

1. Connect one end of your Ethernet cable to your GPIB-ENET and securely fasten it. Connect the other end of the Ethernet cable to your Ethernet network. Make sure that you comply with all IEEE 802.3 cabling restrictions.

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

Caution   Do *not* operate your GPIB-ENET at any voltage other than the one specified on your GPIB-ENET baseplate label. Doing so could damage the GPIB-ENET.

Note   Do *not* connect GPIB devices to your GPIB port until after you run the NI-488.2 Troubleshooting Wizard as described in Chapter 3, *Verify the Installation*.

Step 5. Switch on Your GPIB-ENET

The GPIB-ENET has either a 100–120 VAC or 220–240 VAC power supply. Before you use your GPIB-ENET, verify that the voltage rating listed on the baseplate label matches the voltage that is supplied in your area. To see an illustration of the baseplate label, refer to Figure 2-3.

Contact your network administrator to determine whether the IP address is assigned by a RARP server or must be assigned manually. After you contact your network administrator, refer to the following sections for instructions on how to assign the IP address.

Assign IP Address with a RARP Server

To assign the IP address with a RARP server, power on your GPIB-ENET. The **POWER** LED comes on immediately. The **READY** LED flashes while the GPIB-ENET completes its power-on self tests and assigns the IP address. When the **READY** LED remains steady, the GPIB-ENET is ready to operate.

✏️ **Note**   The power-on self tests take about 10 seconds to complete. The time required for the IP address assignment is dependent on your network and the configuration of your GPIB-ENET. If the **READY** LED continues to flash for more than one minute, refer to the *Troubleshooting Hardware Problems* section in Appendix C, *Troubleshooting and Common Questions*.

Assign IP Address with the Assign IP Address Utility

If your network administrator tells you to assign the IP address manually, run the Assign IP Address utility. To do so, complete the following steps:

1. Select **Start»Programs»National Instruments»NI-488.2»Explore GPIB** to start the Measurement & Automation Explorer.

2. Under **Measurement & Automation**, expand the **Devices and Interfaces** folder.

3. Right-click the **GPIB-ENET** item and select **Assign IP Address** from the drop-down menu that appears.

To view the built-in, context-sensitive online help for the Assign IP Address utility, click the **Help** button.

Step 6. Configure Advanced IP Settings

Before you use your GPIB-ENET for your application, you can use the Advanced IP Settings utility to configure the proper subnet information. Your GPIB-ENET may work properly if you skip this step, but National Instruments recommends that you configure the proper subnet information, including the broadcast IP address and netmask, and up to four router IP addresses. Contact your network administrator for this information.

To configure the proper subnet information with the Advanced IP Settings utility, complete the following steps:

1. Select **Start»Programs»National Instruments»NI-488.2»Explore GPIB** to start the Measurement & Automation Explorer.

2. Under **Measurement & Automation**, expand the **Devices and Interfaces** folder.

3. Right-click the **GPIB-ENET** item and select **Advanced IP Settings** from the drop-down menu that appears.

To view the built-in, context-sensitive online help for the Advanced IP Settings utility, click the **Help** button.

After you configure the software and hardware, continue to Chapter 3, *Verify the Installation*.

3

Verify the Installation

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

Power-On Self Tests

When you power on your GPIB-ENET, the **POWER** LED comes on immediately. The **READY** LED flashes while the GPIB-ENET completes its power-on self tests and assigns an IP address.

The power-on self tests take about 10 seconds to complete. The time required for the IP address assignment is dependent on your network and the configuration of your GPIB-ENET. When the tests are successful and the IP address is assigned, the **READY** LED remains steady, indicating that the GPIB-ENET is ready to operate.

If the **READY** LED continues to flash for more than one minute, refer to the *Troubleshooting Hardware Problems* section in Appendix C, *Troubleshooting and Common Questions*.

Run the NI-488.2 Getting Started Wizard

To test the hardware and software installation, run the NI-488.2 Getting Started Wizard. Select **Start»Programs»National Instruments» NI-488.2**»**Getting Started** and follow the instructions on the screen.

The NI-488.2 Getting Started Wizard, shown in Figure 3-1, verifies the hardware and software installation and helps you begin to communicate with your GPIB instruments.

Figure 3-1. NI-488.2 Getting Started Wizard Dialog Box

When you click **Verify your hardware and software installation**, the NI-488.2 Troubleshooting Wizard tests your GPIB interface and displays the results, as shown in as shown in Figure 3-2.

✏️ **Note** The GPIB cable must be disconnected from your GPIB interface before you run the NI-488.2 Troubleshooting Wizard.
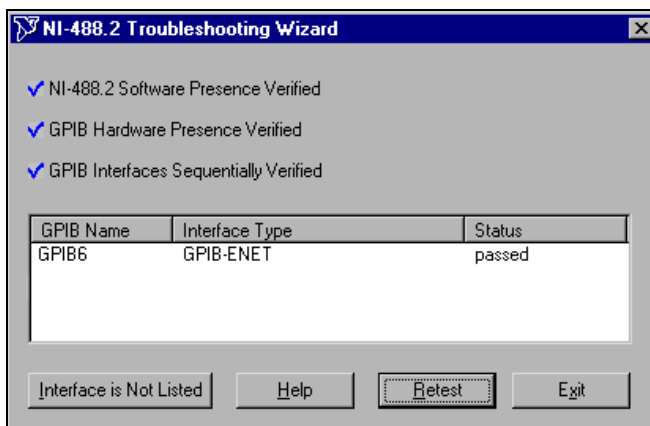

Figure 3-2. NI-488.2 Troubleshooting Wizard

To view online help for the Troubleshooting Wizard, click the **Help** button. Also refer to Appendix C, *Troubleshooting and Common Questions*.

Connecting the GPIB Cable

When you finish verifying the installation, you can connect the GPIB cable to your GPIB-ENET.

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 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.

4

Begin to Use the NI-488.2 Software

This chapter helps you get started with the NI-488.2 software.

Getting Started

The NI-488.2 Getting Started Wizard helps you get started with GPIB instrument communication using the Measurement & Automation Explorer. To run the NI-488.2 Getting Started Wizard, select **Start»Programs»National Instruments»NI-488.2**»**Getting Started**.

After the NI-488.2 Getting Started Wizard runs the NI-488.2 Troubleshooting Wizard to verify the installation, click **Communicate with your instrument**. The Getting Started Wizard then steps you through communicating with your GPIB instruments via the Measurement & Automation Explorer.
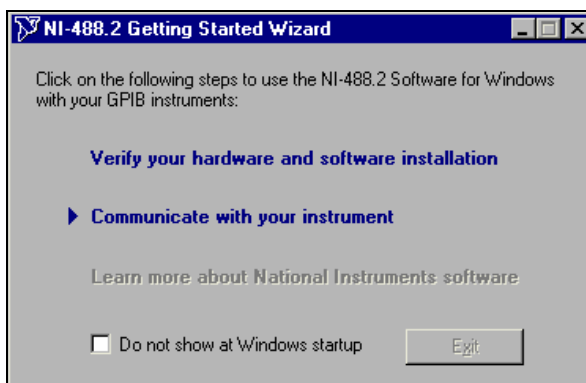

Figure 4-1. Communicating with Your Instrument

A

GPIB-ENET 8-Bit DIP Switch

This appendix describes how the 8-bit DIP switch on the back panel affects 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 A-1. The DIP switches are used to set the operation mode of the GPIB-ENET. The default switch setting is for normal operation mode; all the switches are in the OFF position.
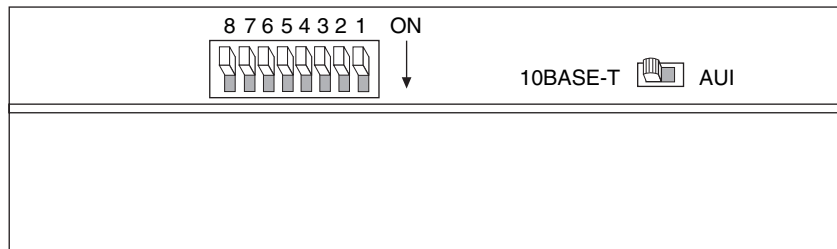

Figure A-1. GPIB-ENET Back Panel Switches

8-Bit DIP Switch Descriptions

Table A-1 shows the possible settings of the GPIB-ENET DIP switches and what each setting indicates. Default settings are in ***bold italics***.

Table A-1. DIP Switch Settings

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***

Table A-1. DIP Switch Settings (Continued)

Switch	Position	Indication
5	ON	Manual IP Assignment
	OFF	*Automatic IP Assignment*
1–4	*OFF*	*These switches are reserved and should remain OFF.*
* When switch 6 is in the ON position, switch 5 is ignored.		

Switch 8

This switch puts your GPIB-ENET in Extended Factory Test mode. In normal operating mode, switch 8 should be in the OFF position.

When this switch is in the ON position, the GPIB-ENET performs extended tests that require special connections to the GPIB and Ethernet ports. Without these connections, the GPIB-ENET cannot pass the extended factory tests.

Switch 7

This switch puts your GPIB-ENET in Modify Mode. In normal operating mode, switch 7 should be in the OFF position.

The firmware controlling your GPIB-ENET is stored in EEPROM. When switch 7 is in the ON position, you can reprogram the firmware memory from the Ethernet network using the Update Firmware utility.

✎ **Note** Before you update the firmware, your GPIB-ENET must already be configured for your subnet with a valid IP address, as described in *Step 2. Configure the NI-488.2 Software*, in Chapter 2, *Installation and Configuration*.

The GPIB-ENET always ships with the most recent firmware. You do not need to run the firmware update utility on a new product. You can obtain the latest upgrade at the following path:

```
ftp://ftp.ni.com/support/gpib/firmware/GPIBENET/
```

With switch 7 in the ON position, complete the following steps to start the Update Firmware utility:

1. Select **Start»Programs»National Instruments»NI-488.2»Explore GPIB** to start the Measurement & Automation Explorer.

2. Under **Measurement & Automation**, expand the **Devices and Interfaces** folder.

3. Right-click the **GPIB-ENET** item and select **Update Firmware** from the drop-down menu that appears.

⚠ **Caution**   Do *not* power-off the GPIB-ENET or disconnect the power supply while running the Update Firmware utility. Doing so will damage the unit.

When the GPIB-ENET finishes updating the firmware, the **READY** LED flashes a slow pattern.

To view the built-in, context-sensitive online help for the utility, click the **Help** button.

Switch 6

This switch sets how the IP address is determined when you power on the GPIB-ENET. When switch 6 is in the OFF position, the GPIB-ENET receives the IP address from the network. Each time the GPIB-ENET receives the IP address from the network, the GPIB-ENET stores it in nonvolatile memory. When switch 6 is in the ON position, the GPIB-ENET retrieves the IP address that is stored in nonvolatile memory.

When switch 6 is in the ON position, the setting of switch 5 is ignored.

Switch 5

This switch sets how the GPIB-ENET configures IP addresses. When switch 5 is in the OFF position, the GPIB-ENET issues Reverse Address Resolution Protocol (RARP) requests each time you power it on. The GPIB-ENET continues to issue RARP requests until it receives a valid RARP reply. If switch 5 is in the ON position, the GPIB-ENET does not issue RARP requests.

In most networks, the GPIB-ENET can use RARP to configure its IP address automatically; however, some networks, for security or other reasons, do not use RARP. If your network does not use RARP, you must manually configure the IP address. To do so, run the Assign IP Address utility, as described in the *Assign IP Address with the Assign IP Address Utility* section in Chapter 2, *Installation and Configuration*.

When switch 6 is in the ON position, the setting of switch 5 is ignored.

Switches 1–4

These switches are reserved for future expansion. They should remain in the OFF position.

B

READY LED Signaling

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

Overview

The **READY** LED has several purposes on the GPIB-ENET. When you power on the GPIB-ENET, the **READY** LED flashes while the GPIB-ENET completes its power-on self tests. When the tests successfully complete and the IP address is assigned, the **READY** LED remains steady, indicating that the GPIB-ENET is ready to operate.

Note The power-on self tests take about 10 seconds to complete. The time required for the IP address assignment is dependent on your network and the configuration of your GPIB-ENET. If the **READY** LED continues to flash for more than one minute, refer to the *Troubleshooting Hardware Problems* section in Appendix C, *Troubleshooting and Common Questions*.

Troubleshooting a Slowly Blinking READY LED

During operation, the **READY** LED might blink slowly. This occurs after you run the Update Firmware utility, while the GPIB-ENET reports status on the operation. At other times, the **READY** LED blinks slowly in a recognizable pattern to alert you of GPIB-ENET internal errors.

Recording the READY LED Pattern

READY LED signaling can report up to 100 different errors. The errors are reported through sequences of **READY** LED flashes. A three-second interval, during which the **READY** LED is OFF, separates each repetition of the sequence. Interpret and record the signal pattern as described in this section.

Note By recording the **READY** 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 before recording the flashing **READY** LED pattern.

To record the pattern, complete the following steps:

1. Do *not* switch off power to your GPIB-ENET.

2. Count the number of long one-second flashes—that is, one second ON, one second OFF. The long flashes appear in sets of one to ten.

3. Count the number of short flashes after the long flashes; each short flash lasts about one-fifth of a second. Flashes occur in sets of one to ten.

4. Make a note of the **READY** LED pattern.

5. Refer to Appendix E, *Technical Support Resources*, and contact National Instruments.

You can try to resolve the problem by completing the following steps:

1. Verify that all of your Ethernet cables are attached securely.

2. Turn your GPIB-ENET off and wait five seconds.

3. Turn your GPIB-ENET on and wait to see if the **READY** LED is still blinking slowly.

C

Troubleshooting and Common Questions

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

Troubleshooting Hardware Problems

⚠ **Warning** Do *not* try to open and service the box unless you are qualified personnel and equipped to do so. The GPIB-ENET contains circuitry that operates under hazardous voltages.

To troubleshoot problems with your GPIB-ENET, complete the following steps:

1. Make sure that all cables are securely connected to the GPIB-ENET.

2. Make sure that the GPIB-ENET is powered on. If the unit is powered on and plugged into an outlet of the proper voltage, but you see no LED activity, check the condition of the fuse. For fuse specifications, refer to Appendix D, *Specifications*.

⚠ **Warning** To prevent fire, replace the fuse with only the same type and rating of fuse. For fuse specifications, refer to Appendix D, *Specifications*.

3. Make sure that the Ethernet port configuration slide switch is set to the correct Ethernet port. For more information, refer to the *Configure the Slide Switch* section in Chapter 2, *Installation and Configuration*.

4. Make sure that the DIP switch settings are configured properly for your system. For more information, refer to Appendix A, *GPIB-ENET 8-Bit DIP Switch*.

5. Verify your IP address, as follows:

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

    b. If you configured the IP address manually using the Assign IP Address utility, make sure that you followed the instructions in the online help.

READY LED Problems

If the **READY** LED continues to flash for more than one minute, you have a problem with your setup. If the **READY** LED flashes quickly, the GPIB-ENET cannot 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, refer to Appendix B, *READY LED Signaling*, for instructions on how to record the **READY** LED pattern.

Troubleshooting Problems

To troubleshoot problems with the NI-488.2 software, start the Measurement & Automation Explorer by selecting **Start» Programs»National Instruments»NI-488.2**»**Explore GPIB**. Within the Measurement & Automation Explorer, select **Help»Troubleshooting» NI-488.2 Troubleshooting Wizard** to start the NI-488.2 Troubleshooting Wizard.

✎ **Note** The GPIB cable must be disconnected from your GPIB interface before you run the NI-488.2 Troubleshooting Wizard.

Troubleshooting EDVR Error Conditions

In some cases, calls to the NI-488.2 API may return with the ERR bit set in `ibsta` and the value EDVR in `iberr`. You can use the value stored in `ibcntl` to troubleshoot the error condition. If you receive an EDVR error condition, refer to the following sections to troubleshoot 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 allowed range (typically 0 to 3), but the board has not been assigned to a GPIB interface, an EDVR error condition occurs with ibcntl set to 0xE028002C. To assign the board number to a GPIB interface, configure the NI-488.2 software and select an interface name. For instructions on how to do so, refer to the *Configure and Install the Hardware* section in Chapter 2, *Installation and Configuration*.

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

If a call is made with a board number that is not within the allowed range (typically 0 to 3), an EDVR error condition occurs with ibcntl set to 0xE0140025. To solve this problem, change the board number to one within the allowed range. For instructions on how to do so, refer to the *Configure and Install the Hardware* section in Chapter 2, *Installation and Configuration*.

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 NI-488.2 Configuration utility, an EDVR error condition occurs with ibcntl set to 0xE0140035. To solve this problem, rename the device template, as follows:

1. Select **Start»Settings»Control Panel**.
2. Double-click on the **System** icon.
3. Select the **Device Manager** tab and click on the **View devices by type** button.
4. Click on the **National Instruments GPIB Interfaces** icon.
5. Click on the **Properties** button.
6. Select the **Device Templates** tab and rename the device template as described in your application documentation.
7. Click on the **OK** button twice to save your changes and exit.

EDVR Error Conditions with ibcntl in the Range of 0xE1002710 (-520083696) to 0xE1002EE0 (-520081696)

The WinSock interface returns errors in the range of 0xE1002710 to 0xE1002EE0. The lower 16 bits of ibcntl specify the actual WinSock interface error. For more information about the specific error, refer to your WinSock interface documentation.

EDVR Error Condition with ibcntl set to 0xE1030043 (-519897021)

If you enabled DOS NI-488.2 support and tried to run an existing DOS NI-488.2 application that was compiled with an older, unsupported DOS language interface, an EDVR error condition occurs with `ibcntl` set to 0xE1030043.

Missing WinSock Support

If you have not enabled and configured WinSock support, complete the following steps:

1. Select **Start»Settings»Control Panel**.

2. Double-click the **Network** icon.

   For Windows Me, if you do not see the **Network** icon, select **view all Control Panel options** on the left side of the window.

3. In the **Network** dialog box, click the **Configuration** tab and click **Add**.

4. In the **Select Network Component Type** dialog box, select **Protocol** from the list box and click **Add**.

5. In the **Select Network Protocol** dialog box, select the appropriate **Manufacturers** and **Network Protocols** from the list boxes.

   Because many different network providers and protocols are available in this dialog box, consult your network provider documentation to determine which protocol provides WinSock support from that vendor. For example, to enable Microsoft WinSock support, select **Microsoft** in the **Manufacturers** list box and **TCP/IP** in the **Network Protocols** list box. For instructions on how to configure the selected protocol, consult your network provider documentation.

6. Click **OK**.

7. After you enable and configure WinSock support, run the NI-488.2 Troubleshooting Wizard. To do so, start the Measurement & Automation Explorer by selecting **Start»Programs»National Instruments»NI-488.2»Explore GPIB**. Within the Measurement & Automation Explorer, select **Help»Troubleshooting»NI-488.2 Troubleshooting Wizard**.

Common Questions

I do not have a WinSock interface installed. How do I install a WinSock interface?

Before you use the driver software for the GPIB-ENET, you must install a WinSock interface, 1.1 or higher. You can install a WinSock interface from Microsoft or another network vendor. For instructions on how to install and configure WinSock support, refer to the *Missing WinSock Support* section earlier in this appendix.

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

Make sure that your GPIB-ENET is configured properly. For instructions on how to configure your GPIB-ENET, refer to the *Configure and Install the Hardware* section in Chapter 2, *Installation and Configuration*.

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.

1. Select **Start»Programs»National Instruments»NI-488.2»Explore GPIB** to start the Measurement & Automation Explorer.

2. Under **Measurement & Automation**, expand the **Devices and Interfaces** folder.

3. Right-click on the **GPIB-ENET/100** item and select **Properties** from the drop-down menu that appears.

4. Click on the **NI-488.2 Settings** tab and change the **I/O Timeout** setting.

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

Before you contact National Instruments, try to duplicate the error. Recording the **READY** LED pattern is not critical to the operation of your GPIB-ENET, but it saves you time and helps National Instruments diagnose the problem quickly and accurately.

How many GPIB interfaces can I configure for use with the NI-488.2 software?

You can configure the NI-488.2 software to communicate with up to 100 GPIB interfaces.

How many devices can I configure for use with the NI-488.2 software?

You can configure the NI-488.2 software to use up to 1,024 logical devices. The default number of devices is 32. The maximum number of physical devices you should connect to a single GPIB interface is 14, or fewer, depending on your system configuration.

How can I determine if my GPIB hardware and the NI-488.2 software are installed properly?

Run the NI-488.2 Getting Started Wizard by selecting **Start»Programs» National Instruments»NI-488.2**»**Getting Started**.

D

Specifications

This appendix lists the electrical, physical, and environmental characteristics of the GPIB-ENET hardware and the transfer rates of the GPIB software, along with the recommended operating conditions.

Electrical Characteristics

Power supply unit

    100–120 VAC .... ±10%, 50–60 Hz

    220–240 VAC .... ±10%, 50–60 Hz

Maximum current requirement

    100–120 VAC .... 110 mA

    220–240 VAC .... 55 mA

Fuse rating and type

    100–120 VAC .... 300 mA, UL/CSA approved

    220–240 VAC .... 500 mA, IEC approved

Environmental Characteristics

Operating temperature .... 0° to 40° C

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

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

EMI .... FCC Class A Verified

Physical Characteristics

Overall case size (dimensions) ....8.89 by 14.35 by 4.11 cm
(3.5 by 5.65 by 1.62 in.)

Case material ....All metal enclosure

Weight ....0.41 kg (0.9 lb)

GPIB Software Transfer Rate for the GPIB-ENET

3-wire (IEEE 488) ....Over 70 kbytes/s[1]

---

[1] Actual speed may vary considerably from speed shown because of system 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	Meanings	Value
m-	milli-	10^{-3}
c-	centi-	10^{-2}
k-	kilo-	10^{3}
M-	mega-	10^{6}

°	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
DLL	dynamic link library
EEPROM	electrically erasable programmable read-only memory
EMI	electromagnetic interference
FCC	Federal Communications Commission
g	grams
GPIB	General Purpose Interface Bus
Hz	hertz
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
PC	personal computer
RAM	random-access memory
RARP	Reverse Address Resolution Protocol
s	seconds
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
UL	Underwriters Laboratories
V	volts
VAC	volts alternating current

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