

# **Getting Started with Your GPIB-ENET and the NI-488.2™ Software for Macintosh**

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

1. This device may not cause harmful interference in commercial environments.
2. This device must accept any interference received, including interference that may cause undesired operation.

## **Canadian Department of Communications**

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

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

## **Instructions to Users**

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

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

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

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

- Move the equipment away from the receiver with which it is interfering.
- Reorient or relocate the receiver's antenna.
- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

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

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

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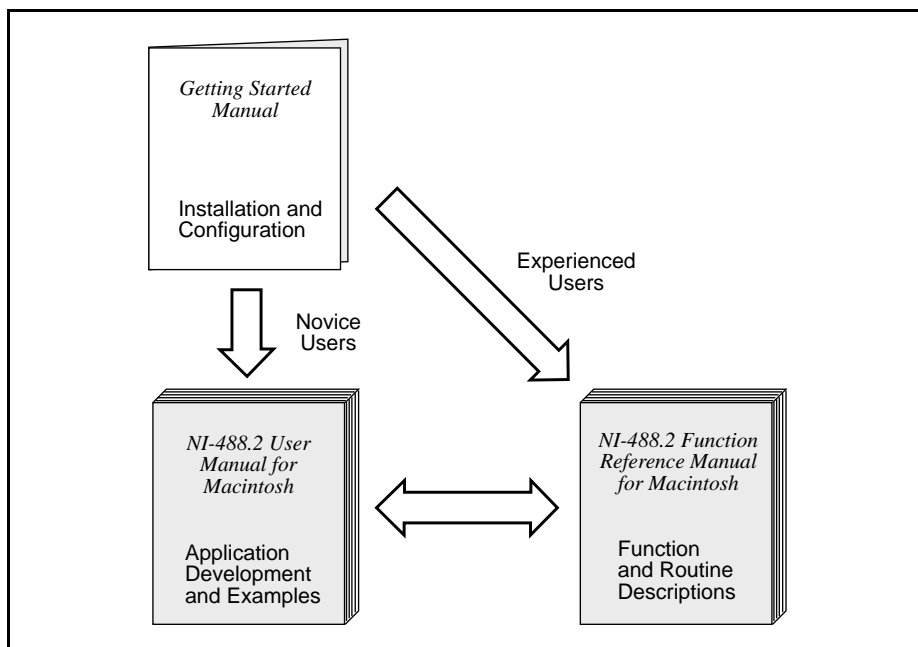
# About This Manual

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This manual contains instructions for installing and configuring the National Instruments GPIB-ENET and NI-488.2 software for Macintosh. This manual is meant to be used with the *NI-488.2 User Manual for Macintosh* and the *NI-488.2 Function Reference Manual for Macintosh*.

This manual assumes that you are familiar with the Macintosh and with Ethernet and Internet networks, and that your Macintosh is connected to an Ethernet network. This manual also assumes you have MacTCP installed on your Macintosh, which is required before you can use the driver software for the GPIB-ENET. You must order the TCP/IP Connection for Macintosh software separately from Apple Computer, Inc.

## How to Use This Manual Set



Use this getting started manual to install and configure your GPIB hardware and NI-488.2 software.

## About This Manual

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

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

## Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, lists what you need to get started and optional equipment you can order, and briefly describes the NI-488.2 software, the GPIB-ENET hardware, and its assigned Ethernet address.
- Chapter 2, *Hardware Configuration and Installation*, gives instructions for configuring the 10Base-T and coax versions of the GPIB-ENET. It also describes how to connect the GPIB-ENET to a Macintosh computer or local Ethernet network, switch on the GPIB-ENET, and power on your system.
- Chapter 3, *Software Installation and Configuration*, contains instructions for installing and configuring your NI-488.2 software.
- Chapter 4, *Installation Verification and Troubleshooting*, describes how to verify the software installation, troubleshoot hardware and software problems, and interpret the **READY** LED status messages.
- Chapter 5, *Using Your NI-488.2 Software*, describes the IBIC 488.2 utility and lists some general programming considerations.
- Appendix A, *Hardware Specifications*, lists the electrical, environmental, and physical characteristics of the GPIB-ENET and the recommended operating conditions.
- Appendix B, *Utilities*, contains information on the IPAssign and Update utilities for the GPIB-ENET.
- Appendix C, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.
- The *Index* contains an alphabetical list of key terms and topics in this manual, including the page where you can find each one.

## Conventions Used in This Manual

The following conventions are used in this manual.

<b>bold</b>	Bold text denotes commands, menus, menu items, options, screen button names, checkboxes, and LEDs.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
<b><i>bold italic</i></b>	Bold italic text denotes a note, caution, or warning.
monospace	Text in this font denotes the proper names of programs, utility names, filenames, folder names, device names, and icon names.
<i>italic monospace</i>	Italic text in this font denotes that you must supply the appropriate words or values in the place of these items.
IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and ANSI/IEEE Standard 488.2-1987, respectively, which define the GPIB.

Abbreviations, acronyms, metric prefixes, mnemonics, symbols and terms are listed in the *Glossary*.

## Related Documentation

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

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- ANSI/IEEE Standard 802.3-1988, *Information Processing Systems, Local Area Networks, Part 3*

Additionally, you might need to refer to your MacTCP or LocalTalk documentation.

## **Customer Communication**

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

# Chapter 1

## Introduction

---

This chapter lists what you need to get started and optional equipment you can order, gives instructions for inspecting your GPIB-ENET, and briefly describes the NI-488.2 software, the GPIB-ENET hardware, and its assigned Ethernet address.

### What You Need to Get Started

- One of the following boxes:
  - GPIB-ENET - 10Base-T Version (100 to 120 VAC)
  - GPIB-ENET - 10Base-T Version (220 to 240 VAC)
  - GPIB-ENET - Coax Version (100 to 120 VAC)
  - GPIB-ENET - Coax Version (220 to 240 VAC)
  
- One of the following power cords:
  - U.S.A. standard power cord
  - Switzerland power cord
  - Australian power cord
  - Universal European power cord
  - North American power cord
  - U.K. power cord
  
- 3.5 in. *NI-488.2 Software for Macintosh Distribution Disk*
  
- TCP/IP driver software installed
  - MacTCP-TCP/IP Driver Software

## Optional Equipment

You can call National Instruments to order any of the following optional equipment.

- Ethernet Cables:
    - Twisted Pair (10Base-T) Cables – 1 m, 5 m, or 10 m
    - Coax (10Base-2) Cables – 1 m, 5 m, or 10 m
    - AUI (10Base-5) Cables – 1 m, 5 m, or 10 m
  - Shielded GPIB Cables\*:
    - Type X1 Single-Shielded GPIB Cables – 1 m, 2 m, or 4 m
    - Type X2 Double-Shielded GPIB Cables – 1 m, 2 m, or 4 m
- \* To meet FCC emission limits for this Class A device, you must use a shielded (Type X1 or X2) GPIB cable. Operating this equipment with a non-shielded GPIB cable may cause interference to radio and television reception in commercial areas.

## Multiple-Computer Software License

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

## Software Description

The NI-488.2 software is a comprehensive set of programs and drivers that comes with your kit. It simplifies the job of programming the GPIB-ENET to function as an IEEE 488.2 (GPIB) Controller with complete communication and bus management capabilities. The NI-488.2 software also comes with an interactive debugger and the Microsoft QuickBASIC, Macintosh Programmer's Workshop (MPW) C, THINK C, and Metrowerks CodeWarrior C language interfaces.

## Optional Programming Tools

Your kit includes the NI-488.2 software for Macintosh. In addition, you can order the LabVIEW software from National Instruments. LabVIEW includes instrument driver libraries that make it easier to communicate with your GPIB instruments.

LabVIEW is a complete programming environment that departs from the sequential nature of traditional programming languages and features a graphical programming environment. It includes all the tools needed for instrument control, data acquisition, analysis, and presentation. When you order LabVIEW, you also get more than 300 complete instrument drivers, which are modular, source-code programs that handle the communication with your instrument so that you do not have to learn the programming details.

For more information about LabVIEW, contact National Instruments.

## Hardware Description

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

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

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



## The Top Panel LEDs

Figure 1-1 shows the top panel of the GPIB-ENET. Seven status light-emitting diodes (LEDs) are mounted on the GPIB-ENET top panel. The LEDs show the current status of the GPIB-ENET at all times. Table 1-1 describes each LED.

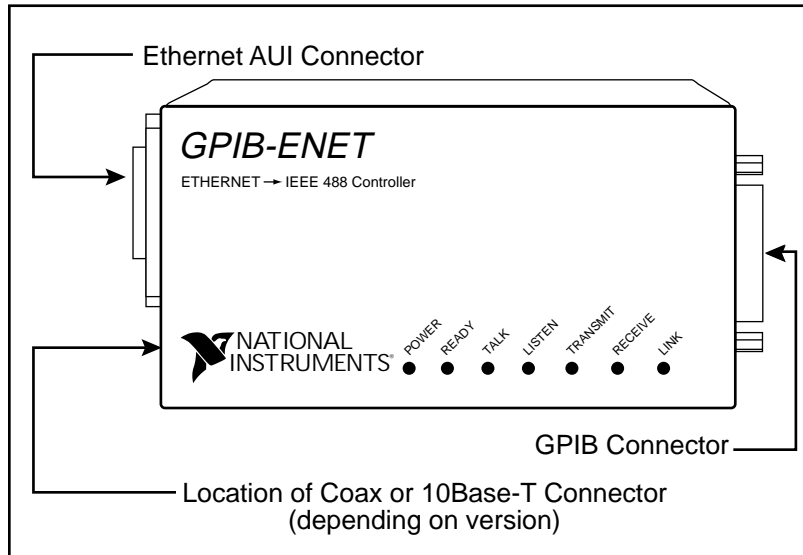


Figure 1-1. GPIB-ENET Top Panel

Table 1-1. LED Descriptions

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

## The Side Panel Connectors

Figure 1-2 shows the side panels of the 10Base-T and coax versions of the GPIB-ENET.

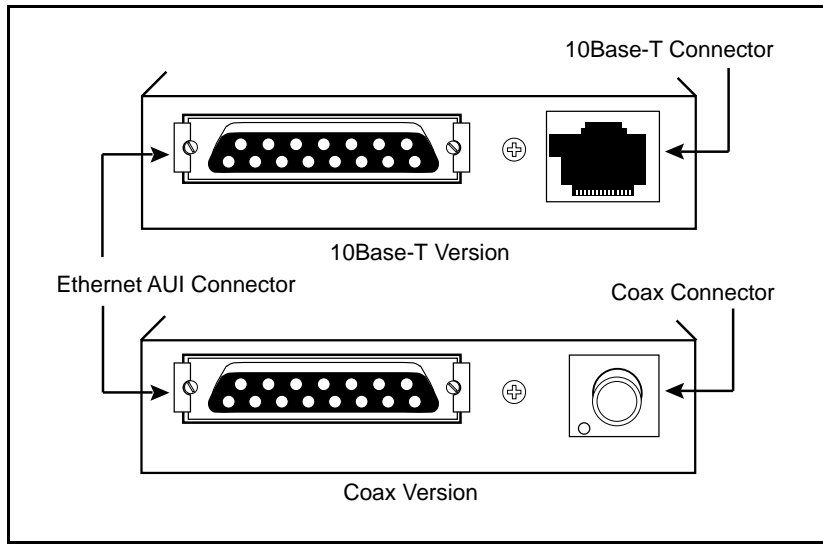


Figure 1-2. GPIB-ENET Side Panel

Both versions of the GPIB-ENET contain an Ethernet AUI connector. You can verify which type of GPIB-ENET you have by comparing the other connector to the two options shown in Figure 1-2.

### The Back Panel Switches

The GPIB-ENET has a 2-position slide switch and an 8-bit DIP switch that you use to configure the operating characteristics of the box. These switches are located on the back panel of the GPIB-ENET, as shown in Figure 1-3.

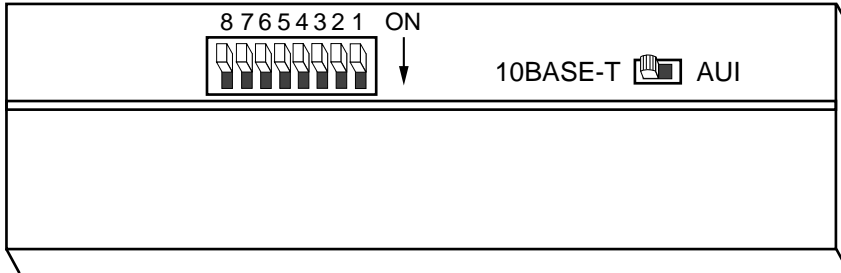


Figure 1-3. GPIB-ENET Back Panel

### The Bottom Panel Identification Label

Figure 1-4 shows the identification label on the bottom panel of the GPIB-ENET.

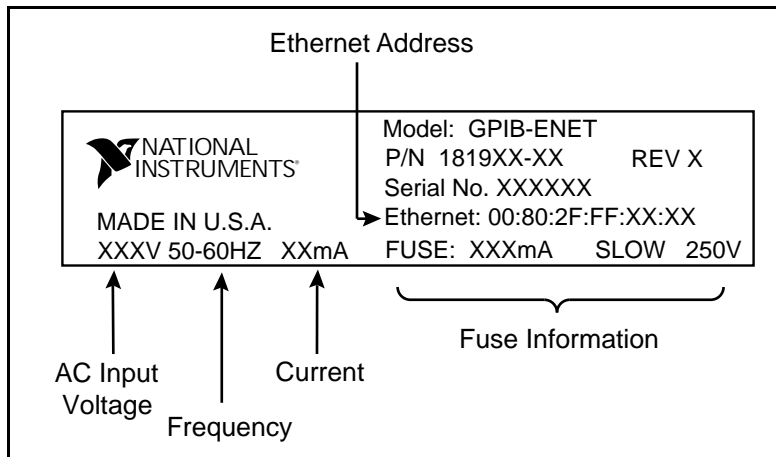


Figure 1-4. GPIB-ENET Identification Label

The identification label lists various information about the GPIB-ENET, including the part number, hardware revision number, and serial number. It also lists the unique Ethernet address that was assigned at the factory.

The last line on the identification label lists the AC input voltage (100 to 120 V or 220 to 240 V), the frequency, the current, and fuse information.

# Chapter 2

## Hardware Configuration and Installation

---

This chapter gives instructions for configuring the 10Base-T and coax versions of the GPIB-ENET. It also describes how to connect the GPIB-ENET to a Macintosh computer or local Ethernet network, switch on the GPIB-ENET, and power on your system.

### Configure the Hardware

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

**Warning:** *Operating the GPIB-ENET at any voltage other than the one specified could damage the unit. Replacement fuses must be the proper type and size. Refer to Appendix A, Hardware Specifications, for fuse specifications.*

### Determine Network Addresses

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

The IP address is *not* the same thing as the Ethernet address. All devices on an Ethernet network are assigned a physical address, which is the Ethernet address, so that they can communicate with each other. The Ethernet address of each GPIB-ENET is printed on the bottom panel identification label.

You should see your network administrator to obtain an IP address that is valid for your network. Your network administrator can also tell you whether the GPIB-ENET should have its IP address configured from the network (dynamic configuration) or with the IPAssign utility (static configuration). Dynamic configuration is provided by the Ethernet Reverse Address Resolution Protocol (RARP). This protocol allows other devices on the network to configure the GPIB-ENET with an IP address. See the section *Select the Method for Configuring the IP Address*, later in this chapter, for information on selecting the IP address configuration method.

Make a note of the IP address that you use when configuring your hardware, because you must enter the IP address when you install the NI-488.2 software.

## Configure the DIP Switch

The 8-bit DIP switch selects the operation mode of the GPIB-ENET. The GPIB-ENET is shipped from the factory with the DIP switch set for normal operating mode. Figure 2-1 shows the factory default setting of this DIP switch.

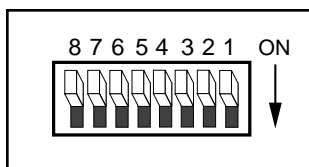


Figure 2-1. Default Mode Switch Settings (All Switches OFF)

Switches 8 and 7 are OFF, indicating normal operating mode. Switch 6 is OFF, indicating that the IP address for the GPIB-ENET needs to be configured. Switch 5 is OFF, indicating that the GPIB-ENET uses RARP to configure its IP address. Switches 4 through 1 are OFF and are reserved for future use.

Table 2-1 shows the possible configurations of GPIB-ENET DIP switches and what each configuration indicates. The entries in ***bold italic*** text represent the default settings of the switches.

Table 2-1. Configuration Parameters for the GPIB-ENET Switches

Switch	Position	Indication
8	ON	Extended Factory Test
	<b><i>OFF</i></b>	<b><i>Normal Operation</i></b>
7	ON	Update EEPROM
	<b><i>OFF</i></b>	<b><i>Normal Operation</i></b>
6	ON	Use Stored IP Address
	<b><i>OFF</i></b>	<b><i>Configure IP Address</i></b>
5*	ON	Use IPAssign Utility
	<b><i>OFF</i></b>	<b><i>Use RARP</i></b>
4-1	<b><i>OFF</i></b>	<b><i>These switches are reserved and should remain OFF.</i></b>
* Switch 5 is valid only when Switch 6 is OFF.		

### Select the Operating Mode

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

Switch 7 selects the Update EEPROM mode and should remain OFF for normal operating mode. The firmware controlling the GPIB-ENET is stored in an electrically erasable memory. When this switch is ON, you can reprogram the firmware memory from the Ethernet network using the `Update` utility. Refer to Appendix B, *Utilities*, for more information.

### Select the Method for Configuring the IP Address

Switch 6 indicates how the GPIB-ENET is configured with its IP address when it is powered on. When you first install a GPIB-ENET in a network, or if the IP address changes, this switch should be OFF, indicating that the IP address needs to be configured. When Switch 6 is OFF, the method of configuring the IP address depends on Switch 5. Once the GPIB-ENET receives its IP address, it stores the address in nonvolatile memory. After the IP address is stored, place Switch 6 ON so the GPIB-ENET refers to the stored IP address and does not wait to be configured with an IP address each time it is powered on.

Switch 5 selects the method by which IP addresses are configured in the GPIB-ENET. When Switch 5 is OFF, the GPIB-ENET issues RARP requests each time it is powered on. The GPIB-ENET continues to issue RARP requests until a valid RARP reply is received. If Switch 5 is ON, the GPIB-ENET does not issue RARP requests. Instead, you must use the `IPAssign` utility to configure the IP address in the GPIB-ENET. In most networks, the GPIB-ENET can use RARP to have its address dynamically configured; however, there are some networks which, for security or other reasons, do not use RARP. In this case, you must use `IPAssign`. Refer to Appendix B, *Utilities*, for more information on `IPAssign`. If Switch 6 is ON, the setting of Switch 5 is irrelevant.

### Set the Ethernet Port Configuration

In addition to a 15-pin AUI connector, your GPIB-ENET has either a 10Base-T Ethernet connector or a coax Ethernet connector. Use the slide switch to select the Ethernet port the GPIB-ENET uses. Depending on which version you have, National Instruments configures the GPIB-ENET to use either the 10Base-T port or the coax port for data transmissions, as shown in Figure 2-2.

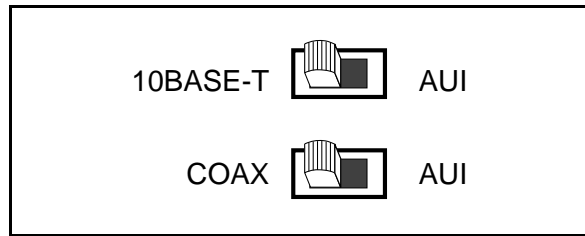


Figure 2-2. Default Ethernet Port Configuration Switch Setting for Either Type of GPIB-ENET

If you want to connect an Ethernet conversion box to the AUI port, change the setting of the switch to match that shown in Figure 2-3.

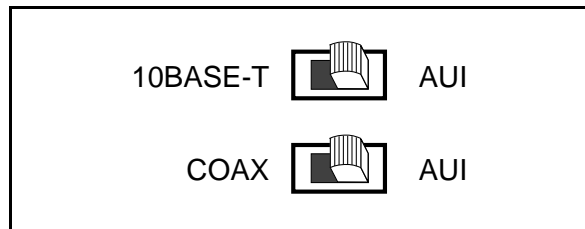


Figure 2-3. AUI Ethernet Port Configuration Switch Setting for Either Type of GPIB-ENET

## Connect the Hardware

After configuring the switch settings on your GPIB-ENET, complete the following steps to connect the GPIB-ENET to an Ethernet network.

### Step 1. Connect the Cables

1. Connect the Ethernet cable to the GPIB-ENET and securely fasten it. Connect the other end to your Ethernet network. Be sure to follow all IEEE 802.3 cabling restrictions.
2. Connect the GPIB cable to the GPIB-ENET and tighten the thumb screws on the connector. Connect the other end to your GPIB system. Be sure to follow all IEEE 488.1 cabling restrictions, and use only shielded GPIB cables.
3. Plug the power cord into an AC outlet of the correct voltage.

## Step 2. Switch on Your GPIB-ENET

Power on your GPIB-ENET. The **POWER** LED should come on immediately. The **READY** LED should flash while it completes its power-on self tests. When all the tests complete successfully and the IP address is assigned, from either nonvolatile memory or the network, the **READY** LED remains steady, indicating that the unit is ready to operate.

If the **POWER** LED does not come on immediately or the **READY** LED continues to flash after the IP address should have been assigned, recheck all connections and switch settings, and retry the power-on sequence. If the **READY** LED still does not become steady after the IP address should have been assigned, refer to Appendix C, *Customer Communication*, fill out the technical support and configuration forms, and contact National Instruments for technical support.

When the **READY** LED remains steady, continue with Chapter 3, *Software Installation and Configuration*.



# Chapter 3

## Software Installation and Configuration

---

This chapter contains instructions for installing and configuring your NI-488.2 software.

You must have MacTCP installed on your Macintosh before you can use the driver software for the GPIB-ENET. MacTCP contains the necessary drivers to support the TCP/IP protocols and AppleTalk-to-TCP/IP protocol conversions for Macintosh. To acquire MacTCP for Macintosh, you must purchase the *TCP/IP Connection for Macintosh* software separately from Apple Computer, Inc.

You can use the NI-488.2 package to connect to your GPIB-ENET through LocalTalk after you make the necessary configurations to MacTCP. In addition, your LocalTalk network must have an Ethernet gateway. You can also connect directly to Ethernet if your Macintosh system has an Ethernet connector or board, and the proper network configurations are made to the MacTCP software. Refer to your MacTCP and LocalTalk documentation for information on setting up your Macintosh for Ethernet or LocalTalk network services.

### NI-488.2 Software Components

The NI-488.2 software includes the following components:

- `NI-488.2 Installer` is the software installation program.
- `NI-488 INIT` is an INIT that loads the device drivers for installed National Instruments GPIB interfaces when you power on or restart your Macintosh.
- `NI-488 Config` is a control panel configuration utility that you can use to examine or change the software settings.
- `NB-Boards` is a control panel utility that displays information about the boards currently installed in your computer if it contains plug-in slots.
- `NI-DMA/DSP` is a system extension that provides DMA functionality through an RTSI connection to an NB-DMA2800 or NB-DMA-8.
- The `C LI` and `BASIC LI` folders contain language interfaces for Macintosh Programmer's Workshop (MPW) C, THINK C, Metrowerks CodeWarrior C, and Microsoft QuickBASIC.
- `Device Manager Calls` contains sample programs that make high-level and low-level Device Manager calls.
- `IBIC 488.2` is an interactive GPIB control utility.
- `NI-488.2 Test` is a software diagnostic utility.

- The `Update` utility updates the GPIB-ENET firmware. This utility is contained in the `Ethernet` folder.
- The `IPAssign` utility assigns an IP address to the GPIB-ENET. This utility is contained in the `Ethernet` folder.
- `GPIBENET_EPROMxx` is the GPIB-ENET firmware image, where `xx` stands for the firmware revision number. This file is contained in the `Ethernet` folder.
- The `Read Me` file contains the latest updates and corrections to the manual when appropriate.

## Install the Software

The NI-488.2 software for Macintosh is distributed in compressed form on one disk. Installing all of the software requires about 1 MB of space on your hard disk and takes about five minutes.

If an `NI-488 INIT` file is already installed in your system, the `NI-488.2 Installer` program removes it and replaces it with the current `NI-488 INIT`. If the `NI-488 Config` or `NI-DMA/DSP` files are already installed in your system, they are also replaced.

Install the NI-488.2 software by completing the following steps.

### Step 1. Install the NI-488.2 Files and Folders

**Caution:** *Virus detection software might prevent the installer from copying important files to the System Folder. You must disable or bypass any virus prevention software before attempting the installation procedure.*

1. Insert the NI-488.2 software distribution disk and double-click on the `NI-488.2 Installer` icon.
2. If you have a National Instruments software driver already installed, the dialog box shown in Figure 3-1 appears. If the dialog box does not appear, skip to Step 3.

If you want to copy the bus and device settings from your original driver to the new `NI-488 INIT`, click on the **Retain** button. Otherwise, reset all settings to the defaults by clicking on the **Clear** button. To exit from the installation procedure, click on the **Cancel** button.

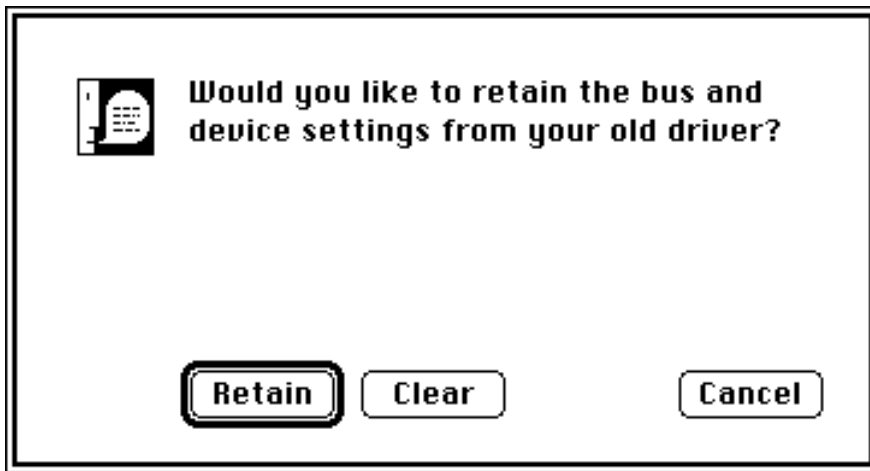


Figure 3-1. Settings Dialog Box

3. The installer creates a folder named NI-488.2 to contain NI-488.2 files and folders. If you want to rename the folder, click on the **Change Folder** button in the installation dialog box, shown in Figure 3-2, and enter a new folder name.

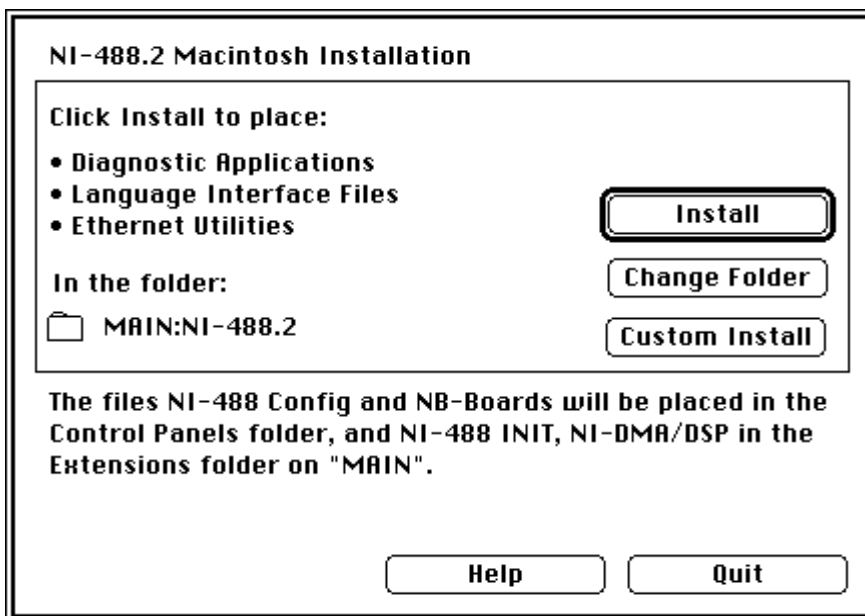


Figure 3-2. Installation Dialog Box

- Click on the **Install** button to install all of the NI-488.2 software. If you want to install only some of the files, click on the **Custom Install** button and select the items to install.

After installation of all of the software, the NI-488.2 folder should contain the items shown in Figure 3-3. If you are running System 7.0 or later, the NI-488 Config file is placed in the Control Panels folder, and the NI-488 INIT and NI-DMA/DSP files are placed in the Extensions folder. If you are running System 6 or earlier, the NI-488 Config, NI-488 INIT, and NI-DMA/DSP files are installed in the System Folder. NB-Boards, a control panel utility, appears with the files.

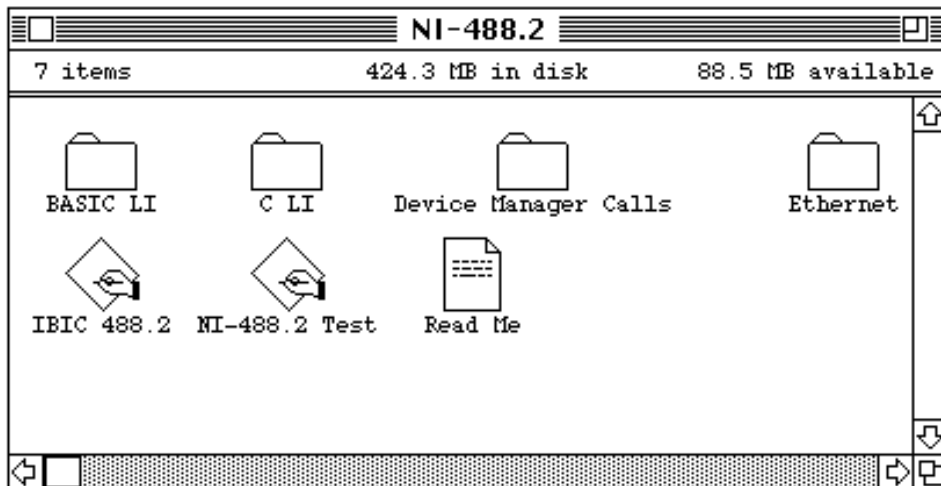


Figure 3-3. File and Folder Organization after Installation

## Step 2. Run the NI-488 Config Control Panel

The NI-488 Config control panel is a configuration utility that you can use to examine and change the software settings for your GPIB-ENET.

- To activate the configuration utility, select **Control Panels** from the **Apple** menu and double-click on the NI-488 Config icon.
- Click on the **Interface Type** menu and select **Ethernet box products** as shown in Figure 3-4.
- To choose a GPIB bus to use with your GPIB-ENET, check one of the bus selection boxes as shown in Figure 3-4. The configuration in Figure 3-4 shows `gpiib4`, with primary GPIB address 0 and secondary GPIB address disabled, as the connection to the GPIB-ENET at IP address 130.164.1.1.

4. To enter the IP address of your GPIB-ENET, choose the GPIB bus associated with your box by selecting the bus using the **Bus/Device** menu. An **IP Address** edit box appears below the **Bus Timing** menu. If you do not know the IP address, see your network administrator. The IP address you used to configure your GPIB-ENET hardware is the same IP address you should enter here.
5. Enter your GPIB-ENET box IP address in the edit box. The address should be a 32-bit IP address in IP dot notation (a.b.c.d), or valid domain name syntax. The IP address can also be an alias as defined in the `Hosts` file in your `System Folder`. Refer to your `MacTCP` documentation for details on how to properly assign IP address aliases.

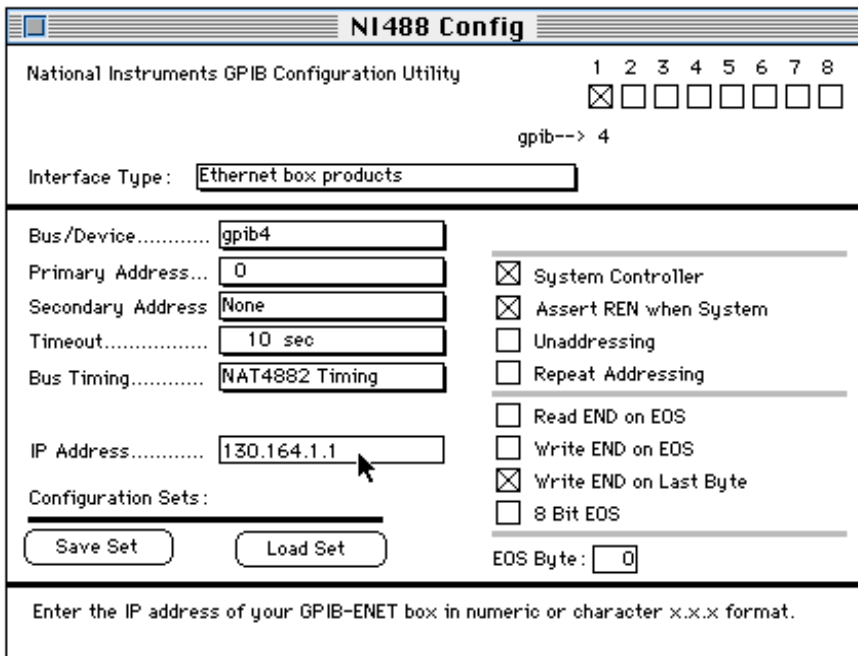


Figure 3-2. NI-488 Config Control Panel

### Step 3. Restart Your Macintosh

The NI-488.2 software is installed every time you start or restart your Macintosh. The NI-488.2 software displays the National Instruments icon momentarily in the lower left corner of the screen to indicate that the software is being installed. If the National Instruments icon does not appear on your screen, repeat the installation procedure before continuing to the next chapter to verify the installation and troubleshoot any problems that may occur.

## **Configure the Software (Optional)**

The default settings for the NI-488.2 software work for most applications and devices. However, you might want to change a device name or primary address. Also, if more than one GPIB interface or external box is installed, you might want to associate a device with a particular interface.

You can examine and adjust the configuration of the software using the NI-488 Config control panel utility. For information on running the configuration utility and for information about the configurable software parameters, refer to Chapter 6, *GPIB Configuration Utility*, in the *NI-488.2 User Manual for Macintosh*.

# Chapter 4

## Installation Verification and Troubleshooting

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This chapter describes how to verify the software installation, troubleshoot hardware and software problems, and interpret the **READY** LED status messages.

If you still have problems after completing the steps in this chapter, complete the forms in Appendix C, *Customer Communication*, and call National Instruments for technical support. It is essential to have these forms filled out before calling so that National Instruments can answer your questions more quickly and accurately.

### Troubleshooting Hardware Problems

**Warning:** *The GPIB-ENET contains circuitry that operates with hazardous voltages. Refer servicing to qualified personnel.*

- Verify that all cables are securely connected to the GPIB-ENET.
- Verify that the Ethernet port configuration slide switch is set to the correct Ethernet port. Refer to the *Set the Ethernet Port Configuration* section of Chapter 2, *Hardware Configuration and Installation*, for more information.
- Verify that the DIP switch settings are configured properly for your setup. Refer to the *Configure the DIP Switch* section of Chapter 2, *Hardware Configuration and Installation*, for more information.
- Verify that the GPIB-ENET is powered on.
- Check the condition of the fuse.

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

### Verify the Software Installation

This step verifies that the NI-488.2 driver is installed and functioning with the GPIB-ENET. If any one of the software installation steps fails, you might have to change a hardware or software setting. If this is the case, refer to Chapter 2, *Hardware Configuration and Installation* or Chapter 3, *Software Installation and Configuration*.

Follow these steps to run the software verification test.

1. Disconnect all GPIB cables from the GPIB-ENET.
2. Double-click on the NI-488.2 Test icon in the NI-488.2 folder.

If no error messages are displayed, the installation is complete and you are ready to write your own application program. Refer to the *NI-488.2 Function Reference Manual for Macintosh* for sample programs.

3. If error messages are displayed, restart your Macintosh and double-click on the NI-488.2 Test icon.

If the test fails again, reinstall the NI-488.2 software from the distribution disk, restart your Macintosh, and double-click on the NI-488.2 Test icon.

If the verification still fails, carefully note all error information on the *GPIB-ENET Hardware and Software Configuration Form* in Appendix C, *Customer Communication*, and contact National Instruments.

## Troubleshooting Software Problems

- The NI-488 Config control panel (GPIB configuration utility) should show the following software configuration:
  - The **Interface Type** box should be set to **Ethernet box products**.
  - An **X** should appear in one of the bus selection boxes to the right of the system interface menu.
  - The IP address of the GPIB-ENET should be visible in the **IP Address** edit box. Verify that this address is correct.

You can use the NI-488 Config control panel utility to examine and adjust the configuration of the software. Refer to Chapter 6, *GPIB Configuration Utility*, in the *NI-488.2 User Manual for Macintosh* for more information on running the utility and for information about the configurable software parameters.

- If the software verification test fails, make sure that no GPIB cables are connected to the GPIB-ENET.



## READY LED Signaling

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

During operation, there are times when the **READY** LED might flash again. The first time occurs after upgrading the EEPROMs, when the GPIB-ENET reports status on the operation. Refer to Appendix B, *Utilities*, for more information. At other times, the GPIB-ENET alerts you of internal errors. For assistance in correcting this problem, please record the pattern that the **READY** LED flashes, and contact National Instruments.

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

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

### Step 1. Count the Long Flashes

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

### Step 2. Count the Short Flashes

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

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

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

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

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

### Step 3. Record Your Status Code Number

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

Table 4-1 lists some examples of the long and short flashes and the status codes they report.

Table 4-1. Sample **READY** LED Signals and the Corresponding Status Code Numbers

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

## Common Questions

### When should I use IBIC 488.2?

You can use IBIC 488.2 to practice communication with your instrument, troubleshoot problems, and develop your application program. For more information about IBIC 488.2, refer to Chapter 4, *Interface Bus Interactive Control Utility*, in the *NI-488.2 User Manual for Macintosh*.

### How do I use an NI-488.2 language interface?

For information about using NI-488.2 language interfaces, refer to the *NI-488.2 User Manual for Macintosh*.

### What do I do if the software verification test fails with an error?

Refer to the *Troubleshooting Software Problems* section of this chapter for information about what might cause this test to fail.

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

Make sure that DIP Switch 7 is set to OFF. If Switch 7 is OFF and the driver still cannot communicate with the GPIB-ENET, make sure that the Ethernet Port Configuration slide switch is in the correct position for your network connections.

**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 **Timeout** value on your NI-488 `Config` configuration screen.

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

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

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

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

**What do I do if I have installed the NI-488.2 software and now my Macintosh crashes upon startup?**

Try changing the name of the `NI-488 INIT` to `ZNI-488 INIT`. Because INITs load in alphabetical order, the `ZNI-488 INIT` will load last, preventing possible corruption from INITs that load after it. If changing the name of the `NI-488 INIT` does not solve the problem, another INIT file might have a conflict with the `NI-488 INIT`. Try removing some of your other INIT files. You can store them in a temporary folder, in case you need to reload them later. If you are using System 7.5 or later, you can use the `Extensions Manager` control panel to disable certain extensions and control panels.

**My system has been crashing since I switched to a Quadra computer. What should I do?**

This problem was associated with some versions of the `NB Handler INIT`. Upgrade to the `NI-488 INIT` to resolve this situation.

**What information should I have before I call National Instruments?**

When you call National Instruments, you should have the results of the software verification test. In addition, make sure you have filled out the configuration form in Appendix C, *Customer Communication*.

# Chapter 5

## Using Your NI-488.2 Software

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This chapter describes the IBIC 488.2 utility and lists some general programming considerations.

### Introduction to IBIC 488.2

The NI-488.2 software includes the Interface Bus Interactive Control utility, IBIC 488.2. You can use IBIC 488.2 to enter NI-488 functions and NI-488.2 routines interactively and display the results of the function calls automatically. Without writing an application, you can use IBIC 488.2 to do the following:

- Verify GPIB communication with your device quickly and easily.
- Become familiar with the commands of your device.
- Receive data from your GPIB device.
- Learn new functions and routines before integrating them into your application.
- Troubleshoot problems with your application.

For more information about IBIC 488.2, refer to the *NI-488.2 User Manual for Macintosh*.

### General Programming Considerations

Depending on the programming language you use to develop your application, you must include certain files, statements, or global variables at the beginning of your application. For specific instructions, refer to Chapter 2, *Developing Your Application*, in the *NI-488.2 User Manual for Macintosh*.

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

# Appendix A

## Hardware Specifications

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

Table A-1. Electrical Characteristics

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

Table A-2. Environmental Characteristics

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

Table A-3. Physical Characteristics

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

# Appendix B

## Utilities

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This appendix contains information on the `IPAssign` and `Update` utilities for the GPIB-ENET.

### IPAssign Utility

If your network does not have RARP capabilities, you can use the `IPAssign` utility to configure the IP address for the GPIB-ENET. Before using this application, make sure that you know the Ethernet address of the GPIB-ENET, which is listed on the bottom panel of the box, and the IP address that has been selected for the box. The IP address should be a unique IP address not yet used within your network or domain. If you do not know the IP address, see your network administrator. Once you configure the IP address, it is stored in nonvolatile memory in the GPIB-ENET.

You should run the `IPAssign` utility *only* when the box is new or when you decide to reconfigure your network in a way that changes the IP address of the GPIB-ENET. Because of protocol limitations, this utility must be run from a Macintosh with an Ethernet port. This utility does not work from LocalTalk.

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

1. Make sure that you configure the DIP switches properly. Switch 6 should be OFF, indicating that you are going to configure a protocol address from the network. Switch 5 should be ON, indicating that you are using `IPAssign` to configure the IP address. Switches 8, 7, and 4 through 1 should all be OFF.
2. Power on the GPIB-ENET.
3. Change to the folder that contains the NI-488.2 distribution files.
4. Execute the `IPAssign` utility, which is located in the `Ethernet` folder.
  - a. Select an Ethernet interface to use by clicking on the appropriate dialog button.
  - b. Enter the IP address that has been selected for the box. Enter the IP address in standard notation, which is four decimal numbers separated with periods.
  - c. Enter the physical Ethernet address for the GPIB-ENET. This is the address shown on the identification label on the bottom panel of the GPIB-ENET. Enter the Ethernet address in standard notation, which is six hexadecimal numbers separated with colons.

- d. IPassign constructs 10 reply packets and sends them across the local Ethernet. When the GPIB-ENET successfully receives its IP address, the **READY** LED remains steady. As long as the **READY** LED is flickering, the address has not been configured.

Because the reply packets do not form a guaranteed delivery protocol, it is possible (though extremely unlikely) for all 10 packets to get lost in the network and for the GPIB-ENET not to receive any of them. In this case, rerun the utility until the GPIB-ENET successfully receives its new IP address.

5. When the **READY** LED remains steady, power off the GPIB-ENET and set DIP Switch 6 to the ON position. With the switch in this position, the GPIB-ENET powers on at the IP address configured in Step 4, which is stored in nonvolatile memory. If Switch 6 is ON, the position of Switch 5 does not matter.
6. Power on the GPIB-ENET and wait for the **READY** LED to come on and remain steady.

## Update Utility

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

**Caution:** *Please read this entire section before attempting to update your firmware.*

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

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

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



The following procedures describe how to update the firmware.

1. Power off the GPIB-ENET and set DIP switch 7 to the ON position.
2. Power on the GPIB-ENET and wait for the **READY** LED light to remain steady without flashing.
3. Execute the `Update` application, which is located in the `Ethernet` folder.
  - a. Enter the IP address of the GPIB-ENET in the space provided, and click on the **Done** button to continue.
  - b. Select a GPIB-ENET EEPROM file to use as the firmware image.

After the GPIB-ENET receives the firmware image, the `Update` utility reports the status of the download. At that point, the network connection is closed. Therefore, the utility does not report the success or failure of the actual EEPROM programming, but only of the transfer of the firmware image.

- c. After the connection terminates, the GPIB-ENET attempts to program its EEPROMs. Wait for the **READY** LED to begin flashing, which signals that the procedure is complete. Do *not* power off your GPIB-ENET before you see and record the flashing **READY** LED pattern.

If the programming is successful, the **READY** LED signals a status code of 00, signified by one long flash and one short flash. Other patterns are used to indicate that the EEPROMs did not program properly. If a pattern other than 00 is indicated, make note of the flashing pattern before switching off the GPIB-ENET, and contact National Instruments for further assistance. Refer to the section *READY LED Signaling* in Chapter 4, *Installation Verification and Troubleshooting*, for more information on recording the flashing pattern.

4. Power off the GPIB-ENET and return DIP switch 7 to the OFF position.
5. Power on the GPIB-ENET and wait for the **READY** LED to remain steady without flashing.

# Appendix C

## Customer Communication

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

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

### Corporate Headquarters

(512) 795-8248

Technical support fax: (800) 328-2203  
(512) 794-5678

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

# Technical Support Form

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

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

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Fax (\_\_\_\_) \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Computer brand \_\_\_\_\_

Model \_\_\_\_\_ RAM \_\_\_\_\_ MB

Processor \_\_\_\_\_ Speed \_\_\_\_\_ MHz

Operating system \_\_\_\_\_

Display adapter \_\_\_\_\_

Mouse \_\_\_\_\_yes \_\_\_\_\_no

Other adapters installed \_\_\_\_\_

Hard disk capacity \_\_\_\_\_ MB Brand \_\_\_\_\_

Instruments used \_\_\_\_\_

National Instruments hardware product model \_\_\_\_\_

Revision \_\_\_\_\_

Configuration \_\_\_\_\_

(continues)

National Instruments software product \_\_\_\_\_

Version \_\_\_\_\_

Configuration \_\_\_\_\_

The problem is \_\_\_\_\_

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List any error messages \_\_\_\_\_

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The following steps will reproduce the problem \_\_\_\_\_

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# GPIB-ENET Hardware and Software Configuration Form

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

## National Instruments Products

- GPIB-ENET Model and Hardware Revision \_\_\_\_\_
- 10Base-T or Coax Version \_\_\_\_\_
- AC Input Voltage (100 to 120 V or 220 to 240 V) \_\_\_\_\_
- NI-488.2 Software Version Number on Disk \_\_\_\_\_
- Application Programming Language \_\_\_\_\_
- DIP Switch Settings \_\_\_\_\_
- Ethernet Port Configuration Slide Switch Setting \_\_\_\_\_
- IP Address \_\_\_\_\_
- **READY** LED Signaling Status Code \_\_\_\_\_

## Other Products

- Computer Model \_\_\_\_\_
- Memory Capacity on Computer \_\_\_\_\_
- Operating System Version \_\_\_\_\_
- Other Ethernet Devices in System \_\_\_\_\_
- Other GPIB Devices in System \_\_\_\_\_
- Type of Monitor \_\_\_\_\_





# Glossary

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Prefix	Meaning	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
EEPROM	Electrically Erasable Programmable Read Only Memory
EMI	electromagnetic interference
FCC	Federal Communications Commission
g	grams
GPIB	General Purpose Interface Bus
Hz	hertz
IBIC	Interactive Bus Interactive Control
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
IP	Internet Protocol
lb	pounds
LED	light-emitting diode
m	meters
MB	megabytes of memory
RAM	random-access memory
RARP	Reverse Address Resolution Protocol
s	seconds
TCP	Transmission Control Protocol
UL	Underwriters Laboratories
V	volts
VAC	volts alternating current



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