

# **GPIB**

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## **Getting Started with Your GPIB-ENET/100 and NI-488.2™ for Solaris**

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# Compliance

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## FCC/Canada Radio Frequency Interference Compliance\*

### Determining FCC Class

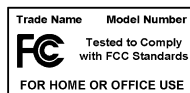
The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). 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.

### Class B

#### Federal Communications Commission

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## **Canadian Department of Communications**

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

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

## **European Union - Compliance to EEC Directives**

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

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

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

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# About This Manual

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This manual contains instructions to help you install and configure the National Instruments GPIB-ENET/100 and NI-488.2 for Solaris. The NI-488.2 software included in this kit is intended for use with Sun SPARCstations running Solaris 2.5.1 or higher.

This manual assumes that you are familiar with Solaris 2.x and with Ethernet and Internet networks, and that you have super-user privilege. This manual also assumes your computer is connected to an Ethernet network and you have TCP/IP installed on your machine, which is required before you can use the driver software for the GPIB-ENET/100.

## Conventions

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The following conventions appear in this manual:

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



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

**bold**

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

*italic*

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

`monospace`

Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.

**`monospace bold`**

Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.

*`monospace italic`*

Italic text in this font denotes text that is a placeholder for a word or value that you must supply.

**Platform**

Text in this font denotes a specific platform and indicates that the text following it applies only to that platform.

## Related Documentation

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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*

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# Introduction

This chapter lists what you need to get started and optional equipment you can order, and briefly describes the GPIB-ENET/100 hardware and NI-488.2 for Solaris 2.x.

## What You Need to Get Started

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

- Solaris 2.5.1 or higher installed on your computer
- TCP/IP protocol installed on your computer
- GPIB-ENET/100, which is included in your hardware kit
- GPIB-ENET/100 power supply, which is included in your hardware kit
- One of the following power cords, which is included in your hardware kit:
  - U.S. standard power cord
  - Switzerland power cord
  - Australian power cord
  - Universal European power cord
  - North American power cord
  - U.K. power cord
- The following software distribution media, which are included in your software kit:
  - *NI-488.2 for Solaris 2.x and GPIB-ENET/100, Version 1.4* CD
  - *NI-488.2 for Solaris 2.x and GPIB-ENET/100, Version 1.4* floppy disk

- ❑ One of the following Category 5 twisted-pair network cables, which you can purchase from National Instruments:
  - Straight-through cable for connecting the GPIB-ENET/100 to a network hub
  - Cross-over cable for connecting the GPIB-ENET/100 directly to a computer's network interface card (NIC)
- ❑ One of the following shielded GPIB cables, which you can purchase from National Instruments:
  - Type X1 single-shielded cables (1, 2, or 4 m)
  - Type X2 double-shielded cables (1, 2, or 4 m)



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

## Optional Equipment

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

### Optional Hardware

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

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

### Multiple-Computer Software License

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

# GPIB-ENET/100 Hardware Overview

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

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

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

For more information about hardware specifications, refer to Appendix C, [Specifications](#).

## Feature Overview

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

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

## LED Overview

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

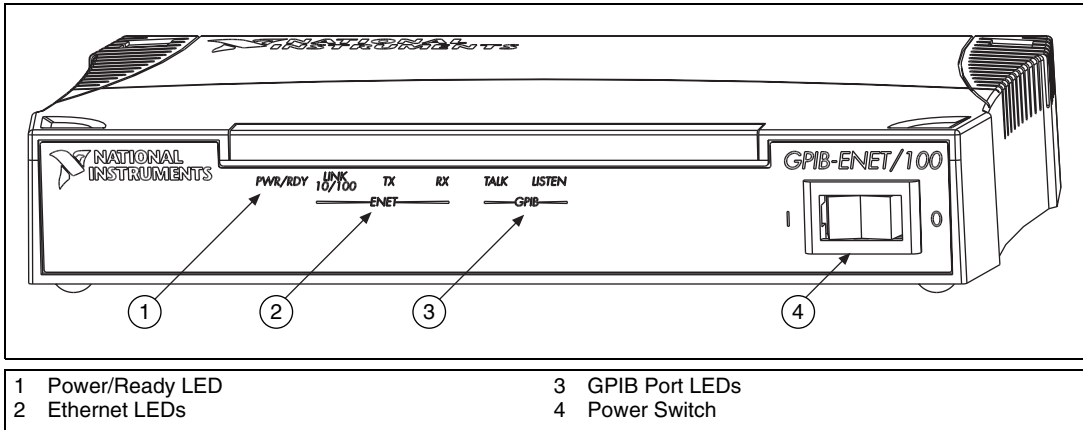


Figure 1-1. GPIB-ENET/100 Front Panel

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

Table 1-1. LED Descriptions

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

**Table 1-1.** LED Descriptions (Continued)

LED	Description
<b>TALK</b>	Indicates the GPIB-ENET/100 is configured as a GPIB Talker.
<b>LISTEN</b>	Indicates the GPIB-ENET/100 is configured as a GPIB Listener.

## NI-488.2 Overview

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The NI-488.2 software for Solaris 2.x is a comprehensive set of programs and drivers. It simplifies the job of programming the GPIB-ENET/100 to function as an IEEE 488.2 (GPIB) Controller with complete communication and bus management capabilities.

NI-488.2 includes the following components:

- NI-488.2 language interface shared library
- Software configuration utility
- Hardware configuration utility
- Installation verification utility
- Firmware update utility
- Interactive control utility

## Time-Saving Development Tools

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

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

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.



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# Installation

This chapter describes how to install NI-488.2 for Solaris and the GPIB-ENET/100. The NI-488.2 software included in this kit is intended for use with Sun SPARCstations running Solaris 2.5.1 or higher.

## Installing NI-488.2

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Complete the following steps to install NI-488.2 for Solaris 2.x.

1. Insert the NI-488.2 for Solaris installation CD-ROM or floppy disk.
2. You must have superuser privilege before you can install NI-488.2 for Solaris. To become a superuser, type `su root` and enter the root password.
3. Create a working directory (for example, `/usr/gpib`) and change to that directory.



**Note** The remainder of this manual refers to this directory as *<Install Directory>*.

4. Copy NI-488.2 to this directory. Use the steps appropriate for your installation media.

**(FLOPPY)** Enter the following command to copy NI-488.2 to your working directory:

```
tar xvf /dev/rfd0c
```

**(CD)** Follow these steps if you are installing from a CD:

- a. On Solaris 2.5.1 or later versions, the CD automatically mounts as soon as you insert the CD. If this feature is disabled on your workstation, you must mount the CD by typing the following command:

```
/usr/sbin/mount -o ro -F hfs /dev/dsk/c0t6d0s2 /cdrom/cdrom0
```

- b. Enter the following command to copy NI-488.2 to your working directory:

```
tar xvf /cdrom/cdrom0/NI4882Enet.tar
```

- To install NI-488.2 automatically, run `instgpib` in your working directory by entering the following command:

```
./instgpib
```

- Follow the instructions on your screen to complete the installation.

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

## Installing the GPIB-ENET/100 Hardware

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

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

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

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

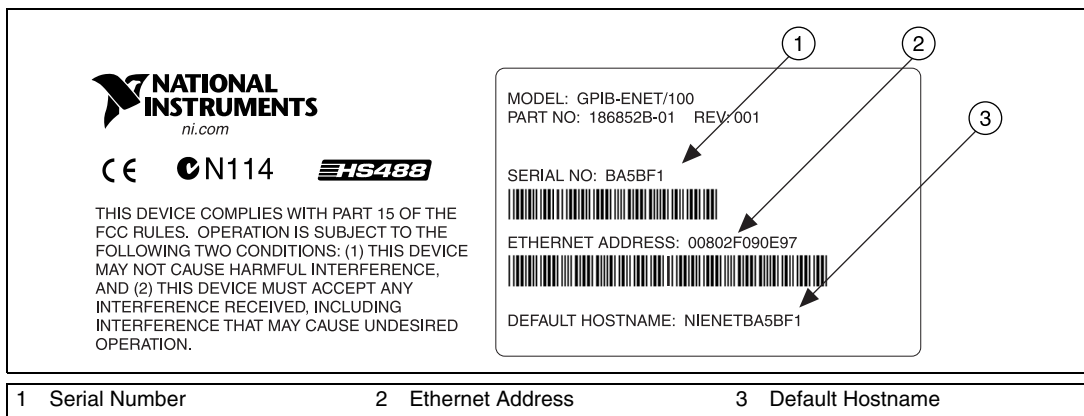


Figure 2-1. GPIB-ENET/100 Baseplate Identification Label



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

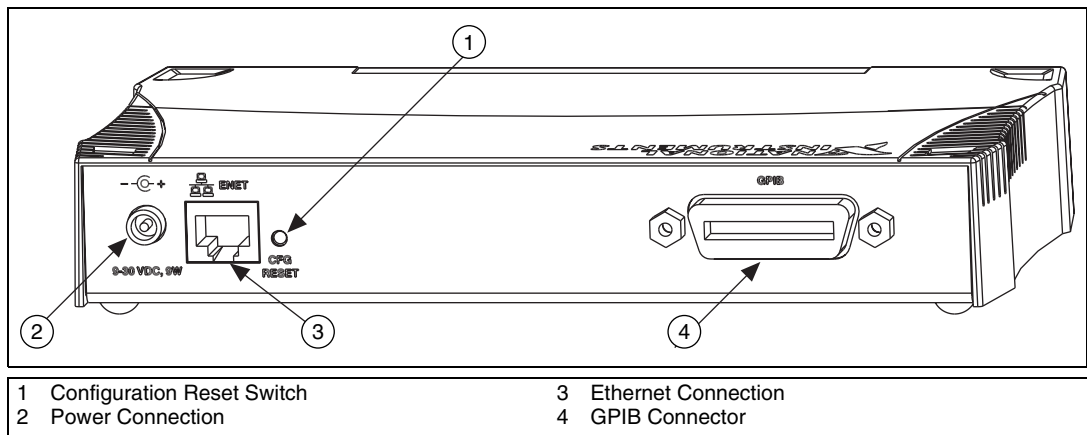
You can change the hostname after you finish the installation and configuration steps in this chapter. Refer to the [Changing the Network Settings](#) section in Chapter 3, *Ethernet Configuration*.

## Step 2. Connect the Cables



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

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

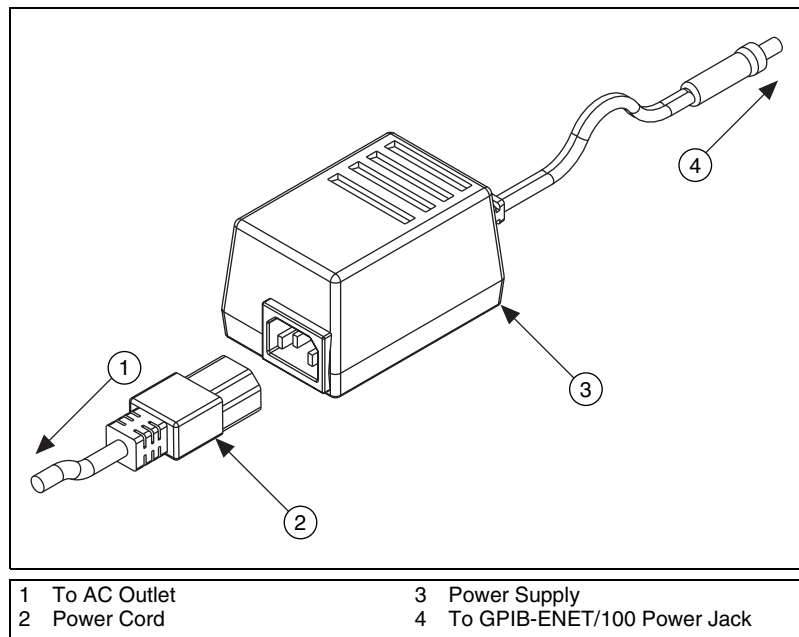


**Figure 2-2.** GPIB-ENET/100 Rear Panel

To connect your cables, complete the following steps:

1. Connect one end of your Ethernet cable to your GPIB-ENET/100. Connect the other end of the Ethernet cable to your Ethernet network. Make sure you comply with all IEEE 802.3 cabling restrictions.

2. Because AC outlets vary throughout the world, your kit includes a power cord that meets your local requirements in addition to a power supply. Figure 2-3 shows how to hook up your power cord and power supply.
  - a. Plug one end of the power cord you received in your kit into the power supply.
  - b. Screw the power connector on the other end of the power supply onto the power jack of the GPIB-ENET/100.
  - c. Plug the other end of the power cord into an AC outlet.



**Figure 2-3.** Connecting Power to the GPIB-ENET/100



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

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

Before you power-on your GPIB-ENET/100, contact your network administrator to find out if the Dynamic Host Configuration Protocol (DHCP) is available on your network to perform the configuration automatically. By default, the GPIB-ENET/100 attempts its network configuration through DHCP. If DHCP is not available, the unit enters network configuration mode so you can configure your network settings manually using the NI Ethernet Device Configuration utility. For more information about DHCP, refer to the *Using DHCP* section in Chapter 6, *Using Your GPIB-ENET/100 and NI-488.2*.

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

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

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

- If the **PWR/RDY** LED blinks a slow red/yellow pattern, the GPIB-ENET/100 did not pass its self tests. Refer to Appendix A, [PWR/RDY LED Signaling](#), to interpret the flash pattern before calling National Instruments Technical Support.
- If the **PWR/RDY** LED is steady red, the GPIB-ENET/100 has an unrecoverable error. Contact National Instruments Technical Support.

You can skip Chapter 3, [Ethernet Configuration](#), if your GPIB-ENET/100 can use DHCP, although you do need to use the NI Ethernet Device Configuration utility if you want to change the hostname from the default hostname listed on the baseplate label. You also can run this utility without entering network configuration mode if you just want to view the network settings.



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

---

# Ethernet Configuration

This chapter describes how to use the NI Ethernet Device Configuration utility to configure the network parameters of the GPIB-ENET/100.

You can use this utility for any of the following purposes:

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

Your GPIB-ENET/100 must be in network configuration mode when you make any changes to the network parameters.

---

## Entering Network Configuration Mode

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

If the GPIB-ENET/100 is configured to use DHCP and DHCP is unavailable, the unit automatically enters network configuration mode after a 60 second timeout. The GPIB-ENET/100 must be in this mode before you can make changes to the network parameters.

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

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



**Note** If you only want to view the network configuration settings without making changes, you do not need to place the unit into network configuration mode. While in normal operation, you can run the utility as described in the following section, [Using the NI Ethernet Device Configuration Utility](#), and examine the properties for any National Instruments Ethernet device on your subnet. However, any changes you attempt to make to the network parameters while in normal mode will not take effect.

## Using the NI Ethernet Device Configuration Utility

If your network administrator tells you to assign the IP address manually, run the NI Ethernet Device Configuration utility. This text-based utility can be run from any terminal, but it is designed to look best on an 80-column by 24-row display.

To run the utility, complete the following steps:

1. Enter the full path to the NI Ethernet Device Configuration utility, which is installed in the GPIB-ENET/100 utilities directory. The default path is as follows:  

```
<Install Directory>/GPIBENET100/EthernetConfig
```
2. The NI Ethernet Device Configuration utility lists National Instruments Ethernet devices found on your subnet, sorted by model. The utility can display a maximum of 10 devices per screen. If the screen indicates the utility found more than 10 devices on your subnet, choose `Display <M>ore Devices` until you find your device. Identify your device by the Ethernet address or the serial number found on the GPIB-ENET/100 baseplate label.

```

Terminal
  IP Address/      Ethernet      Serial
  Hostname        Address       Number       Model        Comment
  -----
<0> nienetBA8421   00:80:2F:09:F0 00BA8421    ENET-485/2
<1> et100          00:80:2F:0A:00:0C 00BB5FF2    GPIB-ENET/100
<2> *Unconfigured* 00:80:2F:0A:00:13 00BB5FF9    GPIB-ENET/100
<3> et200          00:80:2F:0A:00:1E 00BB6004    GPIB-ENET/100    BLD 2 UP...
<4> 130.164.54.38 00:80:2F:0A:00:26 00BB600C    GPIB-ENET/100
<5> *Busy*         00:80:2F:0A:00:28
<6> nienetBB6013  00:80:2F:0A:00:2D 00BB6013    GPIB-ENET/100
<7> nienetC38B50  00:80:2F:0A:03:58 00C38B50    GPIB-ENET/100    BLD 3 LO...
<8> !nienetC38BBB 00:80:2F:0A:03:C0 00C38BBB    GPIB-ENET/100
<9> nienetC38BC4  00:80:2F:0A:03:C8 00C38BC4    ENET-232/2

Displaying entries 1-10 of 11

Devices with (!) have configuration problems. View Properties to resolve.

You may choose to:
  View Properties of Entry <0>-<9>      <R>efresh List of Devices
  Display <M>ore Devices                 Display <H>elp for Screen
  <E>xit Program

What do you want to do? [0-9,R,M,H,E]: █

```

**Figure 3-1.** Example NI Ethernet Device Configuration Main Screen



The listed devices can be in one of four possible states, as indicated in the **IP address/hostname** column:

- A hostname indicates the device has successfully been configured by DHCP.
- A numerical IP address indicates the device has successfully been configured with a static IP address.
- **\*Unconfigured\*** indicates the device is configured to use DHCP, but DHCP failed to attain network parameters.
- **\*Busy\*** indicates the device is configured to use DHCP and currently is attempting to acquire network parameters.

When you find your device, select it by entering the number to the left of the **IP Address/Hostname** column to view the properties of the device. You should view the device properties for any of the following reasons:

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

Choose `<R>efresh List of Devices` if you do not see your GPIB-ENET/100 in the list of Ethernet devices, or to discover a device that you recently added to the subnet.

Choose `<E>xit Program` if you are using DHCP and you do not need to change the hostname of the GPIB-ENET/100, or if you are finished using the NI Ethernet Device Configuration utility.

## Changing the Network Settings

Your GPIB-ENET/100 must be in network configuration mode if you want to change its network settings. Any changes you make will not take effect while in normal operating mode.

1. When you choose to view the device properties, the NI Ethernet Device Configuration utility displays a Properties screen for your GPIB-ENET/100, similar to Figure 3-2.

```

Terminal
-----
GPIB-ENET/100 Properties
-----
Serial Number:      00BB5FF2
Ethernet Address:   00:80:2F:0A:00:0C
Firmware Version:   B.7

Hostname:           nienetBB5FF2

(*)Obtain an IP address automatically (DHCP)
( )Use the following IP settings:
  IP address:       130.164.54.67
  Subnet mask:      255.255.255.0
  Gateway:          130.164.54.2
  DNS server:       0.0.0.0

Comment (optional):

You may choose to:
Change Host<N>ame           Use <S>tatic IP settings
Enter <C>omment             Display <H>elp for Screen
<E>xit Screen

What do you want to do? [N,S,C,H,E]:

```

**Figure 3-2.** Example Properties Screen

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

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

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

2. The Properties screen shows whether your GPIB-ENET/100 is currently configured to **Obtain an IP address automatically (DHCP)** or **Use the following IP settings**. If your device is configured to use DHCP, and you do not want to change this option, you do not need to enter any network parameters unless you want to change the hostname of the Ethernet device. Choose `Change Host<N>ame` if this is the case.
3. If you want to **Use the following IP settings**, choose `Use <S>tatic IP settings` and enter the network parameters you have chosen for the host IP address, subnet mask, gateway IP, and DNS server IP. Refer to the next section, *Static IP Parameters*, for more information about these network parameters. If you decide not to use static IP settings, and DHCP is available, choose `Use <D>HCP`.
4. (Optional) You can choose `Enter <C>omment` to add information to help identify the device, such as its location or user's name.
5. Choose `<E>xit Screen` when you are finished. If you have made any changes, you will be prompted to commit your changes to the device.
6. Choose `<E>xit Program` to close the NI Ethernet Device Configuration utility.

The device automatically reboots with the new configuration in effect.

## Static IP Parameters

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

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

## Choosing a Static IP Address

### **For a Network Administered by a Network Administrator**

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

### **For a Network without a Network Administrator**

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

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

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

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

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

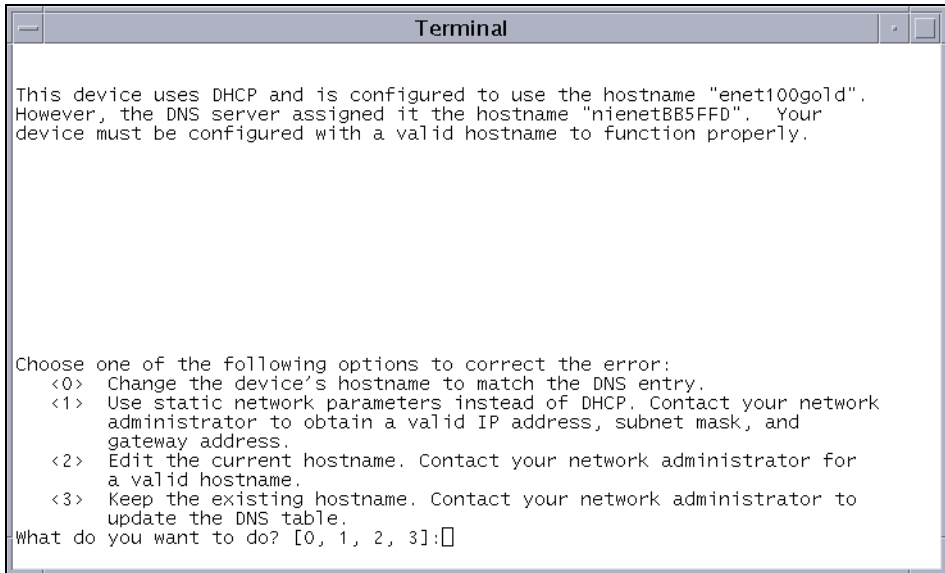
If you are setting up your own network, you probably do not have a gateway or DNS server, so you should set these values to 0.0.0.0.

## Verifying the Hostname

The NI Ethernet Device Configuration utility automatically verifies that the hostname for each DHCP-enabled device matches the DNS entry for the assigned IP address. This verification process occurs when you either run the utility or choose `<R>efresh List of Devices` from the main menu.

If any errors were detected during this process, an exclamation point (!) appears to the left of the device that has a problem. To correct the problem with the hostname, complete the following steps:

1. Review the list of devices to determine which one displays an (!) next to its IP address/hostname.
2. Select the number that corresponds to the device to view its properties.



```

Terminal

This device uses DHCP and is configured to use the hostname "enet100gold".
However, the DNS server assigned it the hostname "nienetBB5FFD". Your
device must be configured with a valid hostname to function properly.

Choose one of the following options to correct the error:
  <0> Change the device's hostname to match the DNS entry.
  <1> Use static network parameters instead of DHCP. Contact your network
      administrator to obtain a valid IP address, subnet mask, and
      gateway address.
  <2> Edit the current hostname. Contact your network administrator for
      a valid hostname.
  <3> Keep the existing hostname. Contact your network administrator to
      update the DNS table.
What do you want to do? [0, 1, 2, 3]:

```

**Figure 3-3.** Verification Error Message

3. The utility gives you four options for resolving the verification error. Select the number corresponding to the option that best fits your situation.

**<0> Change the device's hostname to match the DNS entry.** Use this option if you want to accept the hostname assigned by the DHCP server, or if you cannot contact the network administrator to change the DNS entry.

**<1> Use static network parameters instead of DHCP.** Use this option if you cannot use the hostname assigned by the DHCP server. Contact your network administrator to obtain a valid IP address, subnet, and gateway. This option disables DHCP on the device.

**<2> Edit the current hostname.** Use this option to change the hostname to a name other than either the configured hostname or the name assigned by the DHCP server. Contact your network administrator to obtain a valid name.

**<3> Keep the existing hostname.** Use this option if you wish to keep the previously assigned hostname. If you select this option, contact your network administrator to change the DNS entry.

4. Review the network parameter settings in the Properties display.
5. Confirm that the device is in network configuration mode and choose `<E>xit` Screen. You will be prompted to commit the changes to the device. If you choose `<Y>es`, the device reboots with the new settings in effect.
6. After the device reboots, choose `<R>efresh List of Devices` to verify that the hostname is now valid.
7. If you are finished using the NI Ethernet Device Configuration utility, choose `<E>xit Program`.

---

# GPIB Configuration

This chapter describes how to configure your Sun SPARCstation to use the GPIB-ENET/100.

## Configuring the NI-488.2 Software Characteristics

---

The default settings for NI-488.2 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 is installed, you might want to associate a device with a particular interface.

### Configuring the Software

The GPIB software configuration utility, `ibconf`, is an interactive utility that you can use to examine or modify the driver configuration.

To run `ibconf`, enter the full path to the GPIB software configuration utility, which is installed in the GPIB directory. The default path is as follows:

```
<Install Directory>/ibconf
```

`ibconf` displays a list of all the GPIB interfaces and device names, as shown in Figure 4-1. Context-sensitive online help is available to describe each configuration option.



```

-----
National Instruments | Device map for board gpib0 | SPARCstation
-----
      | gpib0 |
      | [gpib0] |
      |-----|
      |---0 dev1 | |---0 dev12 | 1 dev23 | 2 dev34
      |---0 dev2 | |---0 dev13 | 1 dev24 | 2 dev35
      |---0 dev3 | |---0 dev14 | 1 dev25 | 2 dev36
      |---0 dev4 | 1 dev15 | 1 dev26 | 2 dev37
      |---0 dev5 | 1 dev16 | 1 dev27 | 2 dev38
      |---0 dev6 | 1 dev17 | 1 dev28 | 2 dev39
      |---0 dev7 | 1 dev18 | 2 dev29 | 2 dev40
      |---0 dev8 | 1 dev19 | 2 dev30 | 2 dev41
      |---0 dev9 | 1 dev20 | 2 dev31 | 2 dev42
      |---0 dev10 | 1 dev21 | 2 dev32 | 3 dev43
      |---0 dev11 | 1 dev22 | 2 dev33 | 3 dev44
-----
                                     |
-----
^Q: help      ^R: rename      ^T: (dis)connect  ^I: edit      ^O: exit

```

**Figure 4-1.** Example ibconf Screen

ibconf can use a numerical IP address, a hostname, or a hostname alias to identify your GPIB-ENET/100. Contact your network administrator to determine which of these is appropriate and whether you need to modify your `/etc/hosts` system file. If you do need to modify this file, refer to the [Modifying the /etc/hosts System File](#) section later in this chapter.

To identify your GPIB-ENET/100 in ibconf, perform the following steps:

1. Press <Ctrl-R> to select the rename option.
2. Type the IP address, hostname, or hostname alias assigned to your GPIB-ENET/100 and press <Enter>.
3. Press <Ctrl-O> to exit, and choose <Y> to save your changes.

## Increasing the Allowed Number of Boxes or Devices (Optional)

NI-488.2 for Solaris supports eight GPIB-ENET/100 boxes and 44 devices by default. If you want to use more GPIB-ENET/100 boxes or devices, you can use `ibconf` to create a new `/etc/gpibrc` configuration file that will allow NI-488.2 to access up to 128 boards and 128 devices. Perform the following steps to create a new `/etc/gpibrc` file:



**Note** You must have superuser privileges to perform this procedure.

1. Make a backup copy of the current `/etc/gpibrc` in a separate directory and delete the current `/etc/gpibrc` file.

2. Execute `ibconf` with the following options:

```
ibconf -b Nboards -d Ndevices
```

where *Nboards* is the number of boards you want the GPIB-ENET/100 to support (default is 8, minimum is 1, and maximum is 128); and *Ndevices* is the number of devices you want the GPIB-ENET/100 to support (default is 44, minimum is 44, maximum is 128).

3. Choose `<Y>` when `ibconf` prompts you to create the new file.
4. Edit the `ibconf` file to suit your application.



**Note** `ibconf` will configure the first 44 devices. You can configure other devices (during run time only) using `ibfind()`, `ibconfig()`, or `ibdev()`.

For more information about `ibconf`, refer to the *NI-488.2M Software Reference Manual*. After you have configured the software, you are ready to verify the installation.

## Modifying the `/etc/hosts` System File

You do *not* have to modify the `/etc/hosts` file if either of the following circumstances is true:

- You want to use the numerical IP address to refer to your GPIB-ENET/100.
- Your network uses DNS or other hostname-to-IP address resolution.

However, if you want to use the hostname alias or your network does not use any form of hostname-to-IP address resolution, you must edit the `/etc/hosts` file and add an entry for the GPIB-ENET/100. Create the entry in the following format:

*Internet-address official-host-name aliases*

- *Internet-address* is the IP address assigned to the GPIB-ENET/100. If DHCP did not configure the network parameters, enter the static IP address you configured for your GPIB-ENET/100 using the NI Ethernet Device Configuration utility.
- *official-host-name* is the default hostname listed on the baseplate label unless you changed the hostname using the NI Ethernet Device Configuration utility. The name must be a fully qualified hostname, which includes your domain-name extension.
- *aliases* is any other name(s) you want to associate with the box. You should add at least one alias to the entry because the software configuration utility, `ibconf`, uses this alias to locate the GPIB-ENET/100. The default configuration expects the alias `gpib0` for the first GPIB-ENET/100 or GPIB-ENET, `gpib1` for the second, `gpib2` for the third, and so on.

The following is an example `/etc/hosts` entry:

```
130.164.1.212 gpib0.natinst.com gpib0
```

where `gpib0.natinst.com` is the *official-host-name* and `gpib0` is the default alias that `ibconf` uses. If you use an alias other than the default, you must change the alias in `ibconf` to match the alias you are using.

For more information about `/etc/hosts`, refer to the man pages for `hosts` (5) or contact your network administrator.

---

# Verify the Installation

This chapter describes how to verify the software installation. If you encounter hardware problems, please refer to the [Troubleshooting Hardware Problems](#) section in Appendix B, [Troubleshooting and Common Questions](#).

The software diagnostic test, `ibtsta`, verifies that the NI-488.2 driver is installed and functioning with the GPIB-ENET/100. If `ibtsta` fails, the driver is either installed or configured incorrectly. Refer to Chapter 3, [Ethernet Configuration](#), or Chapter 4, [GPIB Configuration](#) to verify your configuration settings.

Follow these steps to run the software verification test.

1. Ensure all GPIB cables are disconnected from the GPIB-ENET/100.
2. Enter the full path to the GPIB software verification utility, which is installed in the GPIB directory. The default path is as follows:

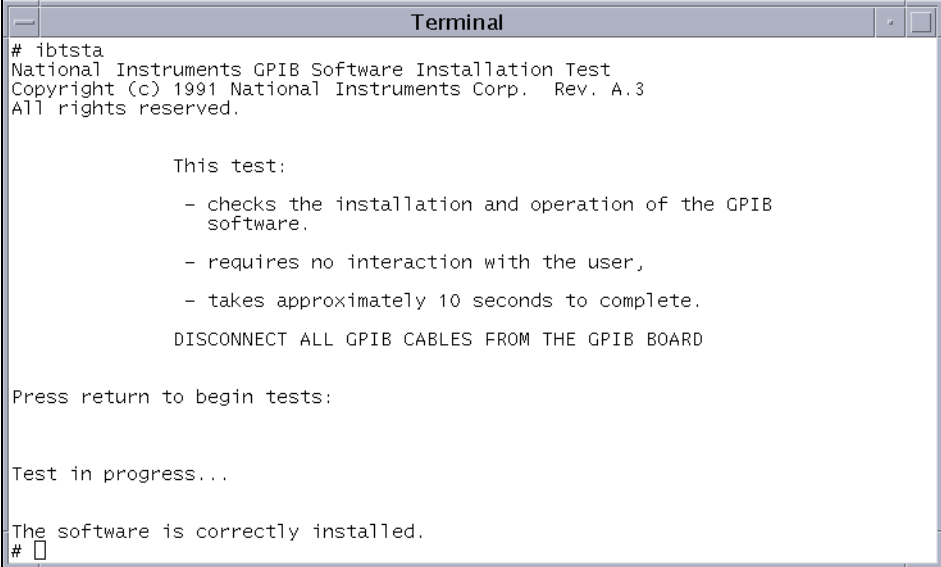
```
<Install Directory>/ibtsta
```

If `ibtsta` completes without errors, the installation is complete and you are ready to write your own application program.

3. If `ibtsta` reports an error, restart your machine and run the test again.

If the test fails again, refer to the [Troubleshooting Software Problems](#) section in Appendix B, [Troubleshooting and Common Questions](#), for help resolving your problem.

Figure 5-1 shows a successfully completed run of `ibtsta`.



```

Terminal
# ibtsta
National Instruments GPIB Software Installation Test
Copyright (c) 1991 National Instruments Corp. Rev. A.3
All rights reserved.

      This test:
      - checks the installation and operation of the GPIB
        software.
      - requires no interaction with the user,
      - takes approximately 10 seconds to complete.
      DISCONNECT ALL GPIB CABLES FROM THE GPIB BOARD

Press return to begin tests:

Test in progress...

The software is correctly installed.
#

```

**Figure 5-1.** Example of `ibtsta` Verification

## Connecting the GPIB Cable

When you finish verifying the installation, you can connect the GPIB cable to your GPIB-ENET/100.



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

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

---

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

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

- Dynamic Host Configuration Protocol (DHCP)
- Configuration Reset (CFG RESET) switch
- Firmware update utility
- Interactive Control utility

## Using DHCP

---

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

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

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

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

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

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

## Using the CFG RESET Switch

---

The Configuration Reset (CFG RESET) switch is a recessed switch located beside the ENET connector on the rear panel. Refer to Figure 2-2, [GPIB-ENET/100 Rear Panel](#), for an illustration of its location.

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

### Using the CFG RESET Switch during Operation

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

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



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

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

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

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

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



## Using the CFG RESET Switch at Power-On

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

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

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

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

## Updating the Firmware

---

NI-488.2 for Solaris and the GPIB-ENET/100 contains a firmware update utility you can use to access new features that may be added to the GPIB-ENET/100 in the future. It may be necessary to update the firmware to take advantage of these new features.

You need to know either the IP address or hostname of your GPIB-ENET/100 before you run the NI Ethernet Device Firmware Update utility. If you do not remember this information, first run the NI Ethernet Device Configuration utility as described in Chapter 3, *Ethernet Configuration*.



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



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

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

1. Enter the full path to the NI Ethernet Device Firmware Update utility, which is installed in the GPIB-ENET/100 utilities directory. The default path is as follows:

```
<Install Directory>/GPIBENET100/FirmwareUpdate
```

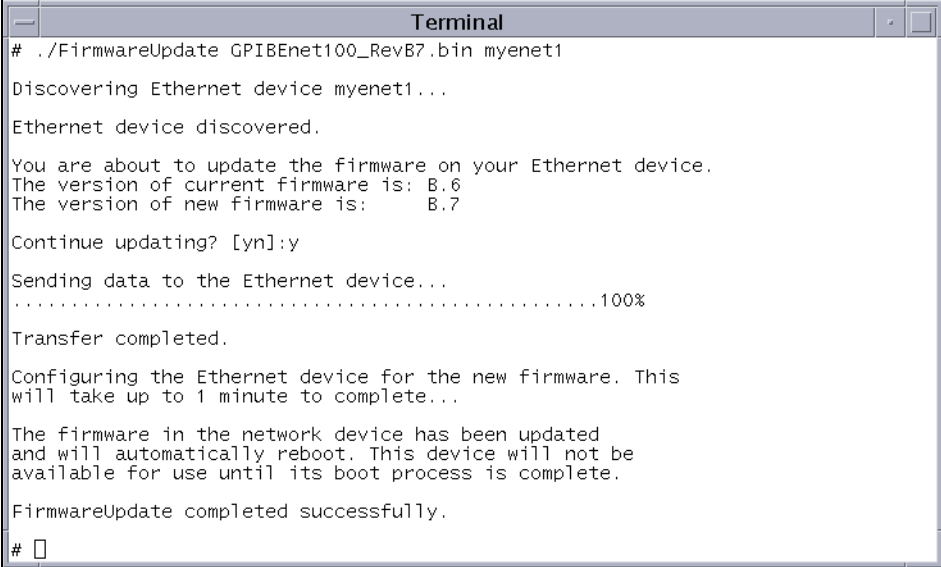
2. The utility requires two parameters: an image filename and either the numerical IP address or the hostname of your GPIB-ENET/100. An example of an IP address is 137.65.220.40. An example of a hostname is myenet1. For example, the following command copies the imagefile GPIBENET100\_RevXY.bin into the EEPROM of myenet1:

```
FirmwareUpdate GPIBENET100_RevXY.bin myenet1
```

where XY refers to the new firmware version number.

3. The NI Ethernet Device Firmware Update utility communicates with the specified GPIB-ENET/100 to verify the device has no open network connections and to determine the current version of the firmware in the unit.
4. The utility prompts you to confirm the change you are about to perform. Choose <y> to continue or <n> to abort. As the firmware image is transferred to the device, the utility reports each step in the process and indicates whether the firmware update completed successfully or failed.
5. The GPIB-ENET/100 automatically reboots with the new firmware in effect.

Figure 6-1 shows a successful execution of FirmwareUpdate.



```

Terminal
# ./FirmwareUpdate GPIBEnet100_RevB7.bin myenet1
Discovering Ethernet device myenet1...
Ethernet device discovered.

You are about to update the firmware on your Ethernet device.
The version of current firmware is: B.6
The version of new firmware is:    B.7

Continue updating? [yn]:y
Sending data to the Ethernet device...
.....100%
Transfer completed.

Configuring the Ethernet device for the new firmware. This
will take up to 1 minute to complete...

The firmware in the network device has been updated
and will automatically reboot. This device will not be
available for use until its boot process is complete.

FirmwareUpdate completed successfully.

# █

```

Figure 6-1. Successful Execution of FirmwareUpdate

## Using ibic

The NI-488.2 software includes the Interface Bus Interactive Control utility, `ibic`. You can use `ibic` to enter NI-488 functions and IEEE 488.2-style functions (also known as *NI-488.2 routines*) interactively and display the results of the function calls automatically. Without writing an application, you can use `ibic` 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

`ibic` is installed in the GPIB directory. The default path is `<Install Directory>/ibic`. For more information about `ibic`, refer to Chapter 6, *ibic*, in the *NI-488.2M Software Reference Manual*.

# 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 example, you must include the header file `sys/ugpib.h` in your source code if you are using C/C++.

You must link the language interface library with your compiled source code. Link the dynamically linked GPIB library `libgpib` as shown by the following example:

```
cc test.c -lgpib
```

If you are using LabVIEW or LabWindows/CVI for your application, you do not need to add any files to implement GPIB. Everything is included.

For information about each NI-488 function and IEEE 488.2-style function, choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2M Software Reference Manual*.

The IEEE 488.2-style functions are compatible with any other NI-488.2 functions used with other National Instruments products, except for the following functions:

- `ibdma`
- `IBGET`, `IBSET`, `IBDINFO`

---

# PWR/RDY LED Signaling

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

## PWR/RDY LED Overview

---

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

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



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

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



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

## Step 1. Count the Long Flashes

---

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

## Step 2. Count the Short Flashes

---

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

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

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

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

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

## Step 3. Record Your Status Code Number

---

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

## Troubleshooting and Common Questions

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

### Troubleshooting Hardware Problems

---

Try the following solutions if you encounter hardware problems:

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

### Troubleshooting Software Problems

---

Try the following solutions if you encounter software problems:

- If the software verification test `ibtsta` fails, make sure that no GPIB cables are connected to the GPIB-ENET/100. If necessary, remove and reinstall NI-488.2 from the CD or floppy disk.
- Refer to Appendix B, *Common Errors and Their Solutions*, in the *NI-488.2M Software Reference Manual*.

- Use the `ping` command to verify that the GPIB-ENET/100 is communicating on the Ethernet. Refer to *My driver is not communicating with the GPIB-ENET/100. What should I do?* in the next section for information on using the `ping` command.
- Check for the correct hostname or hostname alias in the file `/etc/hosts`. Refer to Chapter 5, *Verify the Installation*, for more information.
- Verify that the `gpibrc` file was copied to the `/etc` directory.

## Common Questions

---

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

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

### How many GPIB interfaces and devices can I configure for use with NI-488.2 for Solaris?

NI-488.2 for Solaris supports up to eight GPIB-ENET/100 boxes and up to 44 logical devices by default. You can use `ibconf` to modify the software to support up to 128 boxes and 128 logical devices. Refer to the *Increasing the Allowed Number of Boxes or Devices (Optional)* section in Chapter 4, *GPIB Configuration*.

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

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

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

This version of NI-488.2 includes options for configuring both the GPIB-ENET and the GPIB-ENET/100. Use the utilities in the `<Install Directory>/GPIBENET/` directory with the GPIB-ENET, and the utilities in the `<Install Directory>/GPIBENET100/` directory with the GPIB-ENET/100. For information on configuring the GPIB-ENET hardware, refer to *Getting Started with Your GPIB-ENET and the NI-488.2M Software for Solaris 2*.



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

Yes. You do not need to rewrite your application code to replace a GPIB-ENET with a GPIB-ENET/100. However, you do need to configure the GPIB-ENET/100 to have the same network identity as the GPIB-ENET you are replacing. First, acquire network parameters for the GPIB-ENET/100 using DHCP or the NI Ethernet Device Configuration utility. Then use `ibconf` to remove the GPIB-ENET information and reassociate the same entry with the numerical IP address, hostname, or hostname alias for the GPIB-ENET/100. For example, if your application code refers to the GPIB-ENET as `gpib1`, reconfigure `gpib1` to refer to the GPIB-ENET/100.

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

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

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

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

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

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

**I have GPIB-ENET interfaces as well as GPIB-ENET/100 interfaces. Why doesn't the NI Ethernet Device Configuration utility recognize my GPIB-ENET interfaces?**

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

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

Refer to the *Troubleshooting Software Problems* section of this appendix for information about what might cause this test to fail. If you already have completed the troubleshooting steps, contact National Instruments.

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

Make sure that the GPIB-ENET/100 is configured properly. To isolate the problem, try to *ping* your GPIB-ENET/100 to make sure it is recognizable on the network. *ping* is a network utility that sends a packet to a device/host on the network, then waits for it to be echoed back, which indicates an active device/host. The **TX** (transmit) LED should blink in response to a successful ping.

Use one of the following commands:

```
/usr/etc/ping    IPaddress  
/usr/etc/ping    hostname
```

where *IPaddress* is the IP address assigned to your GPIB-ENET/100, and *hostname* is the hostname or the name assigned to your GPIB-ENET/100 in the */etc/hosts* file. If *ping* fails, the GPIB-ENET/100 might not be properly configured or installed, or perhaps you did not ping the correct unit. Refer to Chapter 2, *Installation*, and Chapter 4, *GPIB Configuration*. Then run *ibtsta* again.

**When should I use `ibic`?**

You can use `ibic` to practice communication with your instrument, troubleshoot problems, and develop your application program. For more information about `ibic`, refer to Chapter 6, *ibic*, in the *NI-488.2M Software Reference Manual*.

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

For information about using NI-488.2 language interfaces, refer to the *NI-488.2M Software Reference Manual*.

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

Network communication is slower than straight cable communication. You might need to raise the timeout value using `ibconf`. Refer to Chapter 4, *GPIB Configuration*, for more information.

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

Refer to the documentation that came from the instrument manufacturer. The command sequences you use are totally dependent on the specific instrument. The documentation for each instrument should include the GPIB commands you need to communicate with it. In most cases, NI-488 device-level calls are sufficient for communicating with instruments. Refer to Chapter 5, *NI-488M Software Characteristics and Functions*, in the *NI-488.2M Software Reference Manual*, for more information.

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

Examine the value of `ibsta` after each NI-488 or NI-488.2 call. If a call fails, the ERR bit of `ibsta` is set and an error code is stored in `iberr`. For more information about global status variables, refer to the *General Programming Information* section in Chapter 3, *Understanding the NI-488.2 Software*, and Appendix B, *Common Errors and Their Solutions*, in the *NI-488.2M Software Reference Manual*.



---

# Specifications

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

## Electrical Characteristics

Input power requirements .....	9–30 VDC
Current requirements	
9–30 VDC .....	425 mA maximum
@ 15 VDC .....	250 mA typical

## Environmental Characteristics

Operating temperature.....	0 to 60 °C
Relative humidity, operating.....	10% to 90% noncondensing conditions
Storage temperature .....	–40 to 100 °C
Relative humidity, storage .....	5% to 90% noncondensing conditions
EMI .....	FCC Class A Verified

## Physical Characteristics

Overall case size (dimensions).....	21.0 by 12.4 by 3.7 cm (8.25 by 4.89 by 1.44 in.)
Case material.....	Hard plastic with metal baseplate
Weight.....	0.41 kg (0.9 lb)

## Software Characteristics

Maximum software transfer rate<sup>1</sup> .....800 kbytes/s

## Electrostatic Discharge Protection

Non-isolated devices.....1.5 kV

## Connectors

Ethernet connector .....RJ-45

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

## Network Specifications

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

Duplex mode.....Half duplex

---

<sup>1</sup> Actual speed may vary considerably from speed shown due to system, network, and instrumentation capabilities.

---

# 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](http://ni.com)

## NI Developer Zone

---

The NI Developer Zone at [ni.com/zone](http://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

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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](http://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](http://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](http://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

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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
ANSI	American National Standards Institute
API	Application Programming Interface
b	bits
B	bytes
C	Celsius
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Server
EMI	electromagnetic interference
EEPROM	Electrically Erasable Programmable Read Only Memory
FCC	Federal Communications Commission
g	grams
GPIB	General Purpose Interface Bus
Hz	hertz
I/O	input/output
IEEE	Institute of Electrical and Electronic Engineers
in.	inches



*Glossary*

IP	Internet Protocol
lb.	pounds
LED	light-emitting diode
m	meters
MB	megabytes of memory
NIC	network interface card
s	seconds
TCP	Transmission Control Protocol
V	volts
VAC	volts alternating current

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