

# **GPIB**

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## **Getting Started with Your GPIB-232/485CT-A and the NI-488.2™ Software for Windows**

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# Compliance

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## FCC/Canada Radio Frequency Interference Compliance\*

### Determining FCC Class

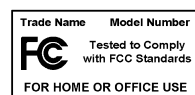
The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations).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

The curious reader can 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-232CT-A RS-232-to-GPIB controller or GPIB-485CT-A RS-485-to-GPIB controller and the NI-488.2 software for Windows. The NI-488.2 software is intended for use with Windows 3.x.

This manual assumes that you are already familiar with Windows 3.x.

## Conventions

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The following conventions appear in this manual:

»

The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.



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



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



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

**bold**

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

GPIB-232/485CT-A

*GPIB-232/485CT-A* refers to either the GPIB-232CT-A or GPIB-485CT-A box.

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 488.2-1992, respectively, which define the GPIB.

*italic*

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



<code>monospace</code>	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.
<b><code>monospace bold</code></b>	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.
<i><code>monospace italic</code></i>	Italic text in this font denotes text that is a placeholder for a word or value that you must supply.
RS-232	<i>RS-232</i> refers to the ANSI/EIA-232-C standard.
RS-485	<i>RS-485</i> refers to the EIA-485 standard.

## Related Documentation

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

- ANSI/EIA-232-D, *Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*
- EIA-485, *Standard for Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems*
- 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*

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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-232/485CT-A.

## What You Need to Get Started

---

Before you install your GPIB hardware, make sure you have all of the following items:

- ☐ Windows 3.0 or higher installed on your computer
- ☐ 3.5 in. (1.44 MB) *NI-488.2 Software for Windows and the GPIB-232/485CT-A* disk, which is included in your kit
- ☐ One of the following controllers, which is included in your kit:
  - GPIB-232CT-A, 100–120 VAC
  - GPIB-232CT-A, 220–240 VAC
  - GPIB-232CT-A, DC
  - GPIB-485CT-A, 100–120 VAC
  - GPIB-485CT-A, 220–240 VAC
  - GPIB-485CT-A, DC
- ☐ If you have an AC version, one of the following power cords, which is included in your kit:
  - U.S. standard power cord
  - Swiss power cord
  - Australian power cord
  - Universal European power cord
  - North American power cord
  - U.K. power cord

- ☐ If you have a DC version, one of the following DC power supplies, which is included in your kit:
  - Wall-mount power supply (100–120 VAC, 9 V, 1 A)
  - Desktop power supply (220–240 VAC, 9 V, 1 A)
- ☐ One of the following shielded cables, compatible with IBM PC, which you can purchase from National Instruments:
  - RS-232 DTE-to-DTE cable (1, 2, or 4 m) for the GPIB-232CT-A
  - RS-485 null-modem cable (1, 2, or 4 m) for the GPIB-485CT-A
- ☐ Type X2 double-shielded GPIB cable (1, 2, or 4 m), which you can purchase from National Instruments



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

## GPIB-232CT-A Hardware Overview

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The GPIB-232CT-A is a high-performance serial-to-GPIB interface. It enables a computer with an RS-232 serial port to be a Talker, Listener, or Controller on the GPIB. The GPIB-232CT-A is also capable of interfacing RS-232 instruments and peripherals to the GPIB.

The GPIB-232CT-A has all the software and logic required to implement the physical and electrical specifications of the IEEE 488 and RS-232 standards. It can interpret and execute high-level commands that you send to it over the serial port, and perform GPIB-to-RS-232 protocol conversion. The GPIB-232CT-A also conforms to all versions of the IEEE 488 standard, including IEEE 488.2. The NAT4882 Controller chip implements all IEEE 488 Talker/Listener/Controller functionality.

## GPIB-485CT-A Hardware Overview

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The GPIB-485CT-A is a high-performance serial-to-GPIB interface. It enables a computer with an RS-485 serial port to be a Talker, Listener, or Controller on the GPIB. The GPIB-485CT-A is also capable of interfacing RS-485 instruments and peripherals to the GPIB. The GPIB-485CT-A does not support any multi-drop protocols.

The GPIB-485CT-A has all the software and logic required to implement the physical and electrical specifications of the IEEE 488 and RS-485

standards. It can interpret and execute high-level commands that you send to it over the serial port, and perform GPIB-to-RS-485 protocol conversion. The GPIB-485CT-A also conforms to all versions of the IEEE 488 standard, including IEEE 488.2. The NAT4882 Controller chip implements all IEEE 488 Talker/Listener/Controller functionality.

## NI-488.2 Software Overview

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The NI-488.2 software for Windows includes a Windows dynamic link library (DLL), language interface libraries, and debugging and development utilities. The NI-488.2 software and GPIB hardware transform a general-purpose PC into a GPIB Talker/Listener/Controller that has complete communications and bus management capability.

The NI-488.2 software includes the following components:

- Device driver
- Diagnostic utilities
- Configuration utility
- Interactive control utility
- Software development utilities
- Language interface libraries for Microsoft C and Microsoft Visual Basic for Windows
- Example programs that use the NI-488.2 API

## Time-Saving Development Tools

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Your kit includes the NI-488.2 software for Windows. In addition, you can order the LabWindows/CVI or LabVIEW software from National Instruments to speed your application development time and make it easier to communicate with your instruments.

LabVIEW is an easy-to-use, 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 have acquired raw data, you can convert it into meaningful results using the powerful data analysis routines in LabVIEW. LabVIEW also comes with hundreds of instrument drivers, which dramatically reduce software development time, because you do not have to spend time programming the low-level control of each instrument.

LabWindows/CVI is similar to LabVIEW, except that it combines an interactive, easy-to-use development approach with the programming power and flexibility of compiled ANSI C code.

For ordering information, or to request free demonstration software, contact National Instruments.

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# Configure and Install Your Hardware

This chapter contains instructions for configuring your GPIB-232/485CT-A and connecting it to your computer.

## Configure the Hardware (Optional)

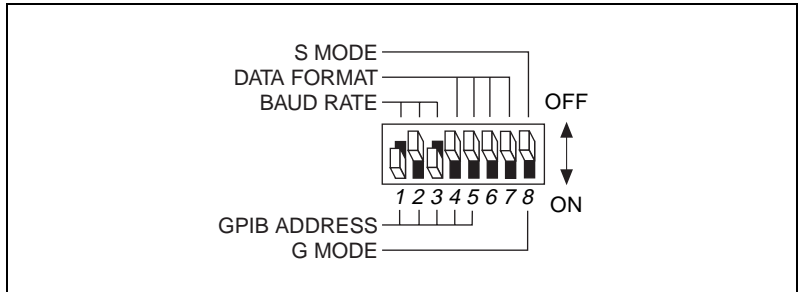
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The default hardware settings for the GPIB-232/485CT-A are compatible with the default software settings. If you change the hardware settings, make sure that you also change the software settings so that they are compatible.

The GPIB-232/485CT-A is shipped from the factory configured to operate in Serial (S) mode. In S mode, the computer attached to the serial port of the GPIB-232/485CT-A is the controlling device. The serial port is configured at 9600 baud, 1 stop bit, no parity, and 8 data bits. To change the parameters, set the configuration switches on the back panel.

The DIP switch is used to configure the serial port parameters of the GPIB-232/485CT-A while in S mode. In G mode, the GPIB-232/485CT-A is used to interface a serial device as a GPIB Talker/Listener. G mode cannot be used with the NI-488.2 software for the GPIB-232/485CT-A. Refer to the *GPIB-232/485CT-A User Manual* for information about G mode.

Figure 2-1 shows the factory default setting of the DIP switch. Although the numbers in the figure do not appear on the GPIB-232/485CT-A itself, they appear here as a point of reference.



**Figure 2-1.** Default Setting (S Mode) for DIP Switch

In Figure 2-1, switches 1 through 3 are ON, OFF, and ON, respectively, indicating that the serial port is operating at 9600 baud. Switches 4 and 5 are both OFF, indicating that parity is disabled. Switch 6 is OFF, indicating 1 stop bit/character. Switch 7 is ON, indicating that the GPIB-232/485CT-A is using 8 bits per character for serial data transfers. Switch 8 is OFF, indicating that the GPIB-232/485CT-A is operating in S mode.

Tables 2-1 and 2-2 show the possible configurations for the baud rate and data format switches when you are using S mode and what each configuration indicates. The factory default settings are in **bold**.

**Table 2-1.** S Mode Switch Settings for Baud Rate

Switches			Indication
1	2	3	
OFF	OFF	OFF	300 baud
ON	OFF	OFF	600 baud
OFF	ON	OFF	1200 baud
ON	ON	OFF	2400 baud
OFF	OFF	ON	4800 baud
<b>ON</b>	<b>OFF</b>	<b>ON</b>	<b>9600 baud</b>
OFF	ON	ON	19200 baud
ON	ON	ON	38400 baud

**Table 2-2.** S Mode Switch Settings for Data Format

Switch	Position	Indication
4	<b>OFF</b>	<b>odd parity</b>
	ON	even parity
5	<b>OFF</b>	<b>parity generation/checking disabled</b>
	ON	parity generation/checking enabled
6	<b>OFF</b>	<b>1 stop bit/character</b>
	ON	2 stop bits/character
7	OFF	7 bits/character
	<b>ON</b>	<b>8 bits/character</b>

## Install the Hardware

Complete the following steps to install your GPIB-232/485CT-A.

### Step 1. Verify the Voltage Requirement

The AC version of the GPIB-232/485CT-A is shipped from the factory with a 100–120 V or 220–240 V internal power supply. The DC version is shipped with a 100–120 V or 220–240 V, wall-mount or desktop power supply.

Verify that the voltage marked on the GPIB-232/485CT-A or on the power supply matches the voltage that is supplied in your area.



**Caution** Do *not* operate your GPIB-232/485CT-A at any voltage other than the one marked on your GPIB-232/485CT-A. Doing so could damage the unit. Replacement fuses for the AC version must be the proper type and size. For fuse specifications, refer to Appendix A, [Troubleshooting and Common Questions](#).

### Step 2. Power Off Your System

Complete the following steps before connecting the cables:

1. Power off your system.
2. Unplug all power cords.



### Step 3. Verify That You Have the Correct Serial Cable

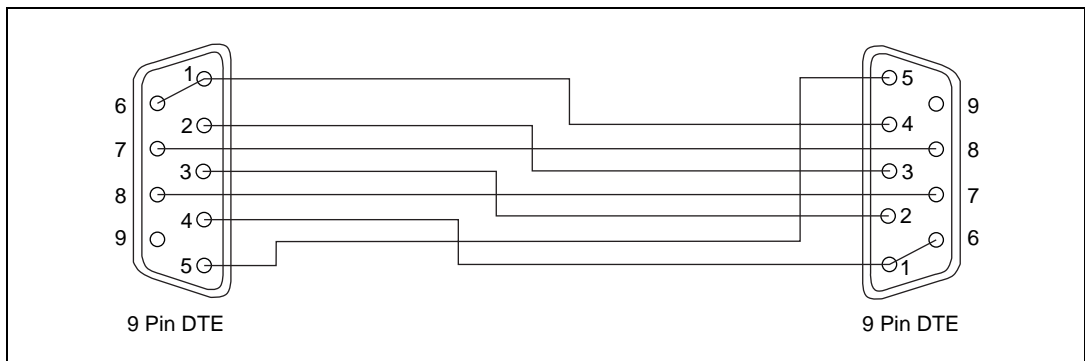
The correct serial cable you need depends upon which GPIB model you are using. If you are using the GPIB-232CT-A, you must use a null-modem serial cable (also known as an RS-232 DTE-to-DTE cable) to connect your computer to the GPIB-232CT-A. If you are using the GPIB-485CT-A, you must use a twisted pairs null-modem serial cable (also known as an RS-485 null modem cable) to connect your computer to the GPIB-485CT-A.

Table 2-3 lists the National Instruments cables that are null-modem serial cables.

**Table 2-3.** National Instruments S and RS1 Null-Modem Serial Cables

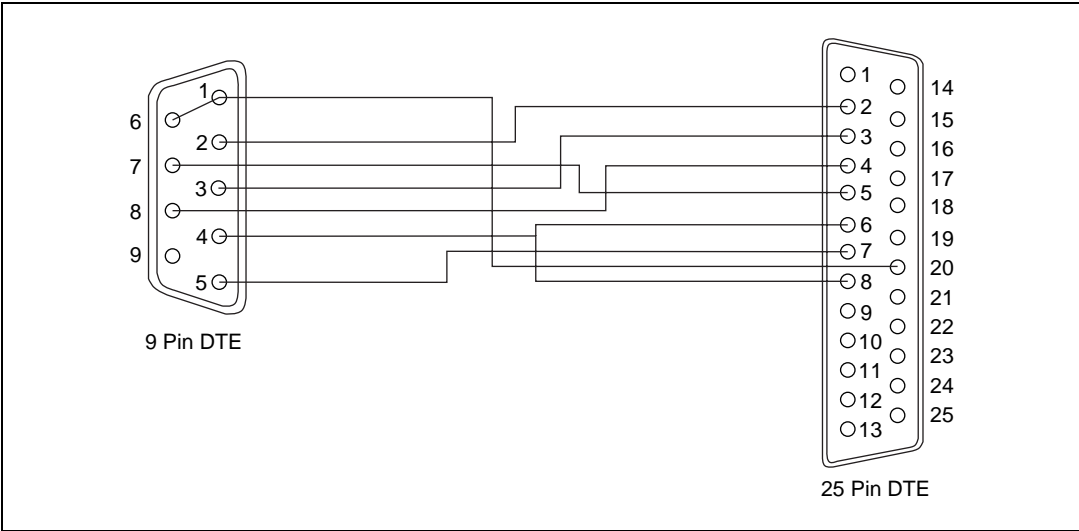
National Instruments Part Number	Cable Type
182238-01	9-pin to 9-pin, 1 m
182238-02	9-pin to 9-pin, 2 m
182238-04	9-pin to 9-pin, 4 m
181074-10	9-pin to 25-pin, 1 m

Figure 2-2 shows the pinout of the 9-pin to 9-pin National Instruments S null-modem cables.



**Figure 2-2.** 9-Pin to 9-Pin Null-Modem Cable Pinout

Figure 2-3 shows the pinout of the 9-pin to 25-pin National Instruments null-modem cables.



**Figure 2-3.** 9-Pin to 25-Pin Null-Modem Cable Pinout



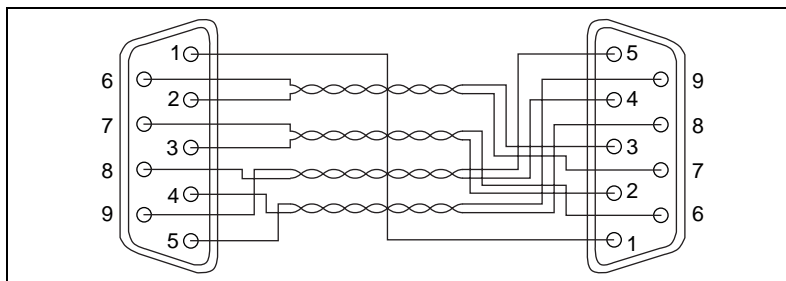
**Note** Pins 1, 6, and 9 are not connected internally on the GPIB-232CT-A.

Table 2-4 shows the National Instruments cables that are twisted pairs null-modem serial cables.

**Table 2-4.** National Instruments RS2 Null-Modem Serial Cables

National Instruments Part Number	Cable Type
183283-01	9-pin to 9-pin, 1 m
183283-02	9-pin to 9-pin, 2 m
183283-04	9-pin to 9-pin, 4 m

Figure 2-4 shows the pinout of the 9-pin to 9-pin twisted pairs cable.



**Figure 2-4.** 9-Pin to 9-Pin Twisted Pairs Null-Modem Cable Pinout

## Step 4. Connect the Cables

Complete the following steps to connect the cables:

1. Connect the serial cable to the serial connector on the GPIB-232/485CT-A and securely fasten the holding screws. Connect the other end of the cable to your serial computer. *Be sure* to use only shielded serial cables, and follow all appropriate serial cabling restrictions.
2. Connect the GPIB cable to the GPIB connector on the GPIB-232/485CT-A and tighten the thumb screws on the connector. Connect the other end to your GPIB device(s). *Be sure* to follow all IEEE 488 cabling restrictions, and use only shielded GPIB cables.
3. If you have an AC version, connect the power cord to the power receptacle on the front panel, then plug the supply into an AC outlet of the correct voltage.

If you have a DC version, connect the DC power plug of the DC power supply to the power jack on the serial end of the GPIB-232/485CT-A, then plug the supply into an AC outlet of the correct voltage.

## Step 5. Power On Your System and Switch On the GPIB-232/485CT-A

1. Plug the power cords for your computer system into a power outlet and power on all devices.
2. If you have an AC version, use the front panel rocker switch to power on your GPIB-232/485CT-A. If you have a DC version, use the power switch on the rear panel to power on your GPIB-232/485CT-A.

The **POWER** LED indicator should come on immediately. The **READY** LED indicator should come on after the GPIB-232/485CT-A has passed its power-on self test, indicating the unit is ready for operation. If the **READY** LED does not come on within seven seconds after the unit is powered on, recheck all connections and switch settings and retry the power-on sequence. If the **READY** LED still does not come on, refer to Chapter 4, [\*Verify Your Installation\*](#).

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# Install and Configure the Software

This chapter describes how to install and configure the NI-488.2 software.

## Install the NI-488.2 Software

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After you have install and configure your GPIB hardware, complete the following steps to install the NI-488.2 software:

1. Insert the NI-488.2 distribution disk into an unused drive.
2. In Program Manager, select **File»Run**.
3. In the **Run** dialog box, type the following:

`x:\setup`

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

After you have install the NI-488.2 software, you can view or change the NI-488.2 driver configuration. If you modified the hardware configuration or if you installed more than one GPIB-232/485CT-A, you must configure the software, as described in the following section.

Otherwise, skip to Chapter 4, [Verify Your Installation](#).

## Configure the NI-488.2 Software (Optional)

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The GPIB software configuration utility is an interactive utility you can use to view or change the configuration of the driver. If you changed any of the hardware settings or if you installed more than one GPIB-232/485CT-A, you must run the utility, as follows:

1. In the **Main** group of the Program Manager, double-click on the **Control Panel** icon.
2. Double-click on the **GPIB** icon.

The utility displays a list of all the GPIB interfaces and device names.

3. Double-click on any name to view or change it.

If you have any questions, use the online help.

After you install and configure the software, continue to Chapter 4, [\*Verify Your Installation\*](#).

---

# Verify Your Installation

To verify your hardware and software installation, complete the following steps:

1. Disconnect any GPIB cables.
2. In the **NI-488.2 GPIB Software** group of the Program Manager, double-click on the **Software Diagnostic Test** icon.

If the diagnostic test completes with no errors, the NI-488.2 software is installed correctly. If it returns an error message, refer to the [Troubleshooting Diagnostic Test Error Messages](#) section in Appendix A, *Troubleshooting and Common Questions*.

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# Begin to Use the NI-488.2 Software

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

## Using the Win16 Interactive Control Utility

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

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

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

## Programming Considerations

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Before you develop your GPIB application, consider the following requirements:

- You must link the language interface library with your compiled source code.
- You must include the header file in your source code.

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



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# Troubleshooting and Common Questions

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

## Troubleshooting Diagnostic Test Error Messages

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The following sections describe common error messages generated by the diagnostic test.

### No Handler Present

If the following message appears, reinstall the NI-488.2 software.

```
<<< No handler present for GPIBx. >>>
```

### No Interface Present

The following error message appears if `gpibx` is not installed or if the software is not configured properly:

```
<<< No interface present for GPIBx. >>>
```

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

- The interface might not be properly configured. Run the GPIB software configuration utility to verify the hardware settings. Refer to the [Configure the Hardware \(Optional\)](#) section of Chapter 2, [Configure and Install Your Hardware](#), for information about configuring the GPIB-232/485CT-A, and to the *NI-488.2 User Manual for Windows* for information about the GPIB software configuration utility.
- The interface might not be properly installed. Refer to the [Install the Hardware](#) section of Chapter 2, [Configure and Install Your Hardware](#), for information about installing the GPIB-232/485CT-A.

## GPIB Cables Connected

The following error message appears if a GPIB cable is connected to the GPIB-232/485CT-A when you run the Software Diagnostic Test:

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

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

To solve the problem, disconnect all GPIB cables before trying the test again.

## Troubleshooting Hardware Problems

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**Warning** The AC version of the GPIB-232/485CT-A contains circuitry that operates with hazardous voltages. Do *not* open the unit unless so instructed by National Instruments. Be sure to remove the power cord before opening the unit.

- Verify that all cables are securely connected to the GPIB-232/485CT-A.
- Verify that you are using a null-modem serial cable.
- Check the DIP switch settings. In S mode, the DIP switch selects the serial port configuration. Most applications can use the default setting, which is shown in Figure 2-1, *Default Setting (S Mode) for DIP Switch*. Refer to the *Configure the Hardware (Optional)* section of Chapter 2, *Configure and Install Your Hardware*, for information on setting the configuration using this switch.
- Verify that the GPIB-232/485CT-A is powered on.
- Verify that the power cable is securely plugged into the outlet.
- If you have an AC version, check the fuse.



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

## Troubleshooting Software Problems

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If all of the following conditions apply, your GPIB-232/485CT-A and the NI-488.2 software are unable to communicate properly:

- GPIB calls return with the ERR bit set in `ibsta`.
- The value of `iberr` is EDVR.
- The value of `ibcntl` is 122541, 188077, or 253613 (1DEAD, 2DEAD, or 3DEAD in hexadecimal notation).

The solution to this problem depends on the value of `ibcntl`. Refer to the following troubleshooting tips for each of the `ibcntl` values:

- If `ibcntl` is 1DEAD, the software is unable to open and initialize the serial communications port. You should reconfigure your GPIB-232/485CT-A and software to verify that the settings match.
- If `ibcntl` is 2DEAD, the software is encountering serial overrun errors when it attempts to access the GPIB-232/485CT-A. Serial overrun errors occur when the software is not able to service incoming serial data rapidly enough. One way to eliminate this problem is to slow down the baud rate that the GPIB-232/485CT-A and NI-488.2 software are using. Another way to eliminate this problem is to unload any device drivers or applications that you are using that might disallow interrupts over an extended period of time.
- If `ibcntl` is 3DEAD, there is total miscommunication between the NI-488.2 software and the GPIB-232/485CT-A. The only solution is to power off the box and restart the computer. If the problem persists, try using a different serial cable.

For more information about error codes, refer to the *NI-488.2 User Manual for DOS*.

## Common Questions

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### Which NI-488.2 software (DOS or Windows) should I install?

If you want to run a GPIB application under DOS, install the NI-488.2 software for DOS. If you want to run a GPIB application in Windows, install the NI-488.2 software for Windows.

### Can I have the DOS and Windows drivers for NI-488.2 installed at the same time?

Yes, but you should not access both drivers at the same time.

### **How can I determine which type of GPIB controller I have?**

Run the `GPIBInfo` utility without specifying any parameters. It displays information about the GPIB controllers configured for use in your system. For more information about `GPIBInfo`, refer to the *NI-488.2 User Manual for Windows*.

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

Run the `GPIBInfo` utility without specifying any parameters. It displays information about the version of the NI-488.2 software installed. For more information about `GPIBInfo`, refer to the *NI-488.2 User Manual for Windows*.

### **What should I do if the diagnostic test fails with an error?**

Refer to the [Troubleshooting Diagnostic Test Error Messages](#) section of this appendix.

### **When should I use the Win16 Interactive Control utility?**

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

### **How do I use a GPIB language interface?**

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

### **Why is there an unmarked DIP switch on my GPIB-232/485CT-A?**

The second DIP switch is reserved for future expansion and all switches should remain OFF.

### **I currently have a driver for another National Instruments GPIB interface. Can I use the GPIB-232/485CT-A with that driver?**

No. The drivers are not interchangeable and cannot be loaded at the same time.

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

Before you call National Instruments, make a note of the results of the `ibdiag` and `wibtest` tests and the output from `GPIBInfo`.

# Specifications

This appendix lists the electrical, environmental, and physical characteristics of the GPIB-232/485CT-A, along with recommended operating conditions.

## Electrical Characteristics

### AC Version

Power supply unit (50–60 Hz) ..... 100–120 VAC  $\pm$  10% or  
 220–240 VAC  $\pm$  10%

#### Current

100–120 VAC ..... 55 mA  
 220–240 VAC ..... 45 mA

#### Fuse rating and type

100–120 VAC ..... 300 mA, UL/CSA approved  
 220–240 VAC ..... 500 mA, IEC approved

### DC Version

Power supply unit (50–60 Hz input, 9 VDC at 1 A output)  
 Wall-mount type ..... 100–120 VAC  $\pm$  10%  
 Desktop type ..... 220–240 VAC  $\pm$  10%

DC input ..... +5 to +13, regulated

Current ..... 700 mA minimum

# Environmental Characteristics

## AC Version

Operating temperature .....	10 to 40 °C
Storage temperature .....	0 to 70 °C
Relative humidity .....	10% to 95%, noncondensing
EMI .....	FCC Class A Verified

## DC Version

Operating temperature .....	10 to 40 °C
Storage temperature .....	0 to 70 °C
Relative humidity .....	10% to 95%, noncondensing
EMI .....	FCC Class B Certified

# Physical Characteristics

## AC Version

Overall case size (dimensions) .....	118.1 by 76.2 by 44.2 mm (4.65 by 3.0 by 1.74 in.)
Case material .....	All metal enclosure
Weight .....	340 g (12 oz)

## DC Version

Overall case size (dimensions) .....	118.1 by 76.2 by 28.2 mm (4.65 by 3.0 by 1.11 in.)
Case material .....	All metal enclosure
Weight .....	198 g (7 oz)



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# Technical Support Resources

This appendix describes the comprehensive resources available to you in the Technical Support section of the National Instruments Web site and provides technical support telephone numbers for you to use if you have trouble connecting to our Web site or if you do not have internet access.

## NI Web Support

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To provide you with immediate answers and solutions 24 hours a day, 365 days a year, National Instruments maintains extensive online technical support resources. They are available to you at no cost, are updated daily, and can be found in the Technical Support section of our Web site at [www.ni.com/support](http://www.ni.com/support)

## Online Problem-Solving and Diagnostic Resources

- **KnowledgeBase**—A searchable database containing thousands of frequently asked questions (FAQs) and their corresponding answers or solutions, including special sections devoted to our newest products. The database is updated daily in response to new customer experiences and feedback.
- **Troubleshooting Wizards**—Step-by-step guides lead you through common problems and answer questions about our entire product line. Wizards include screen shots that illustrate the steps being described and provide detailed information ranging from simple getting started instructions to advanced topics.
- **Product Manuals**—A comprehensive, searchable library of the latest editions of National Instruments hardware and software product manuals.
- **Hardware Reference Database**—A searchable database containing brief hardware descriptions, mechanical drawings, and helpful images of jumper settings and connector pinouts.
- **Application Notes**—A library with more than 100 short papers addressing specific topics such as creating and calling DLLs, developing your own instrument driver software, and porting applications between platforms and operating systems.

## Software-Related Resources

- **Instrument Driver Network**—A library with hundreds of instrument drivers for control of standalone instruments via GPIB, VXI, or serial interfaces. You also can submit a request for a particular instrument driver if it does not already appear in the library.
- **Example Programs Database**—A database with numerous, non-shipping example programs for National Instruments programming environments. You can use them to complement the example programs that are already included with National Instruments products.
- **Software Library**—A library with updates and patches to application software, links to the latest versions of driver software for National Instruments hardware products, and utility routines.

## Worldwide Support

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National Instruments has offices located around the globe. Many branch offices maintain a Web site to provide information on local services. You can access these Web sites from [www.ni.com/worldwide](http://www.ni.com/worldwide)

If you have trouble connecting to our Web site, please contact your local National Instruments office or the source from which you purchased your National Instruments product(s) to obtain support.

For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 03 9879 5166, Austria 0662 45 79 90 0, Belgium 02 757 00 20, Brazil 011 284 5011, Canada (Calgary) 403 274 9391, Canada (Ontario) 905 785 0085, Canada (Québec) 514 694 8521, China 0755 3904939, Denmark 45 76 26 00, Finland 09 725 725 11, France 01 48 14 24 24, Germany 089 741 31 30, Greece 30 1 42 96 427, Hong Kong 2645 3186, India 91805275406, Israel 03 6120092, Italy 02 413091, Japan 03 5472 2970, Korea 02 596 7456, Mexico (D.F.) 5 280 7625, Mexico (Monterrey) 8 357 7695, Netherlands 0348 433466, Norway 32 27 73 00, Poland 48 22 528 94 06, Portugal 351 1 726 9011, Singapore 2265886, Spain 91 640 0085, Sweden 08 587 895 00, Switzerland 056 200 51 51, Taiwan 02 2377 1200, United Kingdom 01635 523545



# Glossary

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Prefix	Meaning	Value
n-	nano-	$10^{-9}$
m-	milli-	$10^{-3}$
k-	kilo-	$10^3$
M-	mega-	$10^6$

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
C	Celsius
CSA	Canadian Standards Association
DIP	dual inline package
DLL	dynamic link library
EDVR	DOS error
EIA	Electronic Industries Association
EMI	electromagnetic interference
ERR	GPIB error
FCC	Federal Communications Commission
g	grams
GND	ground
GPIB	General Purpose Interface Bus
hex	hexadecimal

Hz	hertz
IEC	International Electrotechnical Commission
IEEE	Institute for Electrical and Electronic Engineers
in.	inches
I/O	Input/Output
IRQ	Interrupt Request
ISO	International Standards Organization
LED	light-emitting diode
m	meters
MB	megabytes of memory
oz	ounces
PC	personal computer
RAM	random-access memory
s	seconds
UL	Underwriters Laboratories
V	volts
VAC	volts alternating current
VDC	volts direct current