

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *National Instruments MC-GPIB* at our website: ***Click HERE***

Getting Started with Your MC-GPIB and the NI-488.2M™ Software for OS/2

April 1994 Edition

Part Number 370948A-01

© Copyright 1993, 1994 National Instruments Corporation.
All Rights Reserved.

National Instruments Corporate Headquarters
6504 Bridge Point Parkway
Austin, TX 78730-5039
(512) 794-0100
Technical support fax: (800) 328-2203
(512) 794-5678

Branch Offices:
Australia (03) 879 9422, Austria (0662) 435986, Belgium 02/757.00.20,
Canada (Ontario) (519) 622-9310, Canada (Québec) (514) 694-8521,
Denmark 45 76 26 00, Finland (90) 527 2321, France (1) 48 14 24 24,
Germany 089/741 31 30, Italy 02/48301892, Japan (03) 3788-1921,
Netherlands 03480-33466, Norway 32-848400, Spain (91) 640 0085,
Sweden 08-730 49 70, Switzerland 056/20 51 51, U.K. 0635 523545

Limited Warranty

The MC-GPIB is warranted against defects in materials and workmanship for a period of two years from the date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

The media on which you receive National Instruments software are warranted not to fail to execute programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace software media that do not execute programming instructions if National Instruments receives notice of such defects during the warranty period. National Instruments does not warrant that the operation of the software shall be uninterrupted or error free.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. National Instruments will pay the shipping costs of returning to the owner parts which are covered by warranty.

National Instruments believes that the information in this manual is accurate. The document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist, National Instruments reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult National Instruments if errors are suspected. In no event shall National Instruments be liable for any damages arising out of or related to this document or the information contained in it.

EXCEPT AS SPECIFIED HEREIN, NATIONAL INSTRUMENTS MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S RIGHT TO RECOVER DAMAGES CAUSED BY FAULT OR NEGLIGENCE ON THE PART OF NATIONAL INSTRUMENTS SHALL BE LIMITED TO THE AMOUNT THERETOFORE PAID BY THE CUSTOMER. NATIONAL INSTRUMENTS WILL NOT BE LIABLE FOR DAMAGES RESULTING FROM LOSS OF DATA, PROFITS, USE OF PRODUCTS, OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, EVEN IF ADVISED OF THE POSSIBILITY THEREOF. This limitation of the liability of National Instruments will apply regardless of the form of action,

whether in contract or tort, including negligence. Any action against National Instruments must be brought within one year after the cause of action accrues. National Instruments shall not be liable for any delay in performance due to causes beyond its reasonable control. The warranty provided herein does not cover damages, defects, malfunctions, or service failures caused by owner's failure to follow the National Instruments installation, operation, or maintenance instructions; owner's modification of the product; owner's abuse, misuse, or negligent acts; and power failure or surges, fire, flood, accident, actions of third parties, or other events outside reasonable control.

Copyright

Under the copyright laws, this publication may not be reproduced or transmitted in any form, electronic or mechanical, including photocopying, recording, storing in an information retrieval system, or translating, in whole or in part, without the prior written consent of National Instruments Corporation.

Trademarks

NAT4882®, NI-488®, Turbo488®, NI-488.2™, and NI-488.2M™ are trademarks of National Instruments Corporation.

Product and company names listed are trademarks or trade names of their respective companies.

Warning Regarding Medical and Clinical Use of National Instruments Products

National Instruments products are not designed with components and testing intended to ensure a level of reliability suitable for use in treatment and diagnosis of humans. Applications of National Instruments products involving medical or clinical treatment can create a potential for accidental injury caused by product failure, or by errors on the part of the user or application designer. Any use or application of National Instruments products for or involving medical or clinical treatment must be performed by properly trained and qualified medical personnel, and all traditional medical safeguards, equipment, and procedures that are appropriate in the particular situation to prevent serious injury or death should always continue to be used when National Instruments products are being used. National Instruments products are NOT intended to be a substitute for any form of established process, procedure, or equipment used to monitor or safeguard human health and safety in medical or clinical treatment.

FCC/DOC Radio Frequency Interference Compliance

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual, may cause interference to radio and television reception. This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class B digital device . A Class B device is distinguishable from a Class A device by the appearance of an FCC ID number located on the Class B device.

Canadian Department of Communications

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

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

Instructions to Users

These regulations are designed to provide reasonable protection against interference from the equipment to radio and television reception in residential areas.

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

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

- Operate the equipment and the receiver on different branches of your AC electrical system.
- Move the equipment away from the receiver with which it is interfering.
- Reorient or relocate the receiver's antenna.
- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

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

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

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß die MC-GPIB in Übereinstimmung mit den Bestimmungen der Vfg. 1046/1984 funk-entstört ist.

Der Detusche Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Bestimmungen eingeräumt.

Contents

About This Manual xi
Organization of This Manual xi
Conventions Used in This Manual xii
How to Use This Manual Set xiv
Related Documentation xv
Customer Communication xv

Chapter 1
Introduction 1-1
How to Use This Documentation Set 1-1
What You Need to Get Started 1-2
Software Description 1-2
Hardware Description 1-3

Chapter 2
Installation and Configuration 2-1
Install the Hardware 2-1
Check the Shield Ground Configuration 2-1
Configure the Hardware 2-3
Record the Hardware Settings 2-3
Disabling DMA and Interrupts 2-4
Prepare to Install the Software 2-5
NI-488.2M Driver and Driver Utilities 2-5
Language-Related Files 2-6
Example Program Files 2-6
API-Related Files 2-7
Install the Software 2-8
Install the Software Using ddinstal 2-8
Step 1. Prepare to Install the Software 2-8
Step 2. Run ddinstal 2-8
Step 3. Edit Your System Configuration File 2-9
Step 4. Restart Your Computer 2-10
Install the Software Using install 2-10
Step 1. Prepare to Install the Software 2-10
Step 2. Run install 2-10
Accessing install 2-11
Running install 2-11

Step 3. Edit Your System Configuration File 2-11
Step 4. Restart Your Computer 2-12
Configure the Software with ibconf (Optional) 2-12

Chapter 3
Installation Verification 3-1
Run the Software Diagnostic Program 3-1
Presence Test of Driver 3-2
Presence Test of GPIB Board 3-2
Incorrect Interrupt Level 3-3
GPIB Cables Connected 3-3
Examine the GPIB Installation Information File 3-3

Chapter 4
Using Your NI-488.2M Software 4-1
Introduction to ibic 4-1
Programming Considerations 4-1
Using the 32-bit C Language Interfaces 4-2
Using the 16-bit C Language Interface 4-3

Appendix A
Specifications A-1

Appendix B
Customer Communication B-1

Glossary G-1

Figure

Figure 2-1. Ground Configuration Jumper Settings 2-1

Tables

Table A-1. Electrical Characteristics A-1
Table A-2. Physical Characteristics A-1
Table A-3. Environmental Characteristics A-2

About This Manual

This manual contains instructions for installing and configuring the National Instruments MC-GPIB board and the NI-488.2M software for OS/2. The NI-488.2M software package is meant to be used with OS/2 (IBM Operating System/2) version 2.0 or higher. This manual assumes that you are already familiar with the OS/2 system. This manual is meant to be used with the *NI-488.2M Software Reference Manual for OS/2* (Part Number 320610-01) and the *NI-488.2M Function Reference Manual for OS/2* (Part Number 320611-01).

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this documentation set, lists what you need to get started, and includes a brief description of the NI-488.2M software and the MC-GPIB board.
- Chapter 2, *Installation and Configuration*, contains instructions to install and configure the MC-GPIB board and the NI-488.2M software.
- Chapter 3, *Installation Verification*, describes the ways you can verify and test the installation of your NI-488.2M software and MC-GPIB board.
- Chapter 4, *Using Your NI-488.2M Software,* includes a brief explanation of the ibic utility and programming considerations for your NI-488.2M software.
- Appendix A, *Specifications*, lists the hardware specifications for the MC-GPIB board.
- Appendix B, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

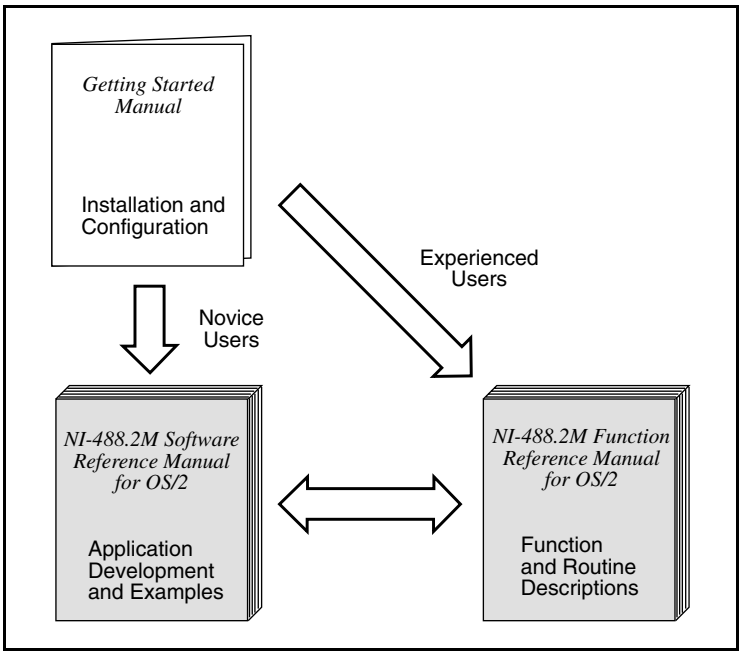
The following conventions are used in this manual:

bold	Bold text denotes menus, menu items, or options.
bold italic	Bold italic text denotes an important note.
`bold monospace`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
`italic monospace`	Italic lowercase text in this font denotes that you must supply the appropriate words or values in the place of these items.
`monospace`	Lowercase text in this font denotes text or characters that are to be literally input 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, variables, filenames, and extensions, and for statements and comments taken from program code.
<>	Angle brackets enclose the name of a key on the keyboard–for example, <PageDown>.
-	A hyphen between two or more key names enclosed in angle brackets denotes that you should simultaneously press the named keys–for example, <Ctrl-Alt-Del>.
<Enter>	Key names are capitalized.

IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 are used throughout this manual to refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1987, respectively, which define the GPIB.
NI-488.2M	NI-488.2M is used throughout this manual to refer to the NI-488.2M software for OS/2 unless otherwise noted.
NI-488 and NI-488.2	NI-488 and NI-488.2 are used in this manual to refer to the NI-488 functions and NI-488.2 routines for OS/2.
OS/2	OS/2 is used throughout this manual to refer to IBM OS/2 version 2.0 or higher unless otherwise noted.

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

How to Use This Manual Set



Use the Getting Started Manual to install and configure your GPIB hardware and NI-488.2M software for OS/2.

Use the Software Reference Manual if you want to learn the basics of GPIB and how to develop an application program. The Software Reference Manual also contains debugging information and detailed examples.

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

Related Documentation

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

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- *The IBM Personal System/2™ Command Reference* manual
- *NI-488.2M Function Reference Manual for OS/2* (part number 320611-01)
- *NI-488.2M Software Reference Manual for OS/2* (part number 320610-01)
- *OS/2 Using the Operating System*, International Business Machines, 1992

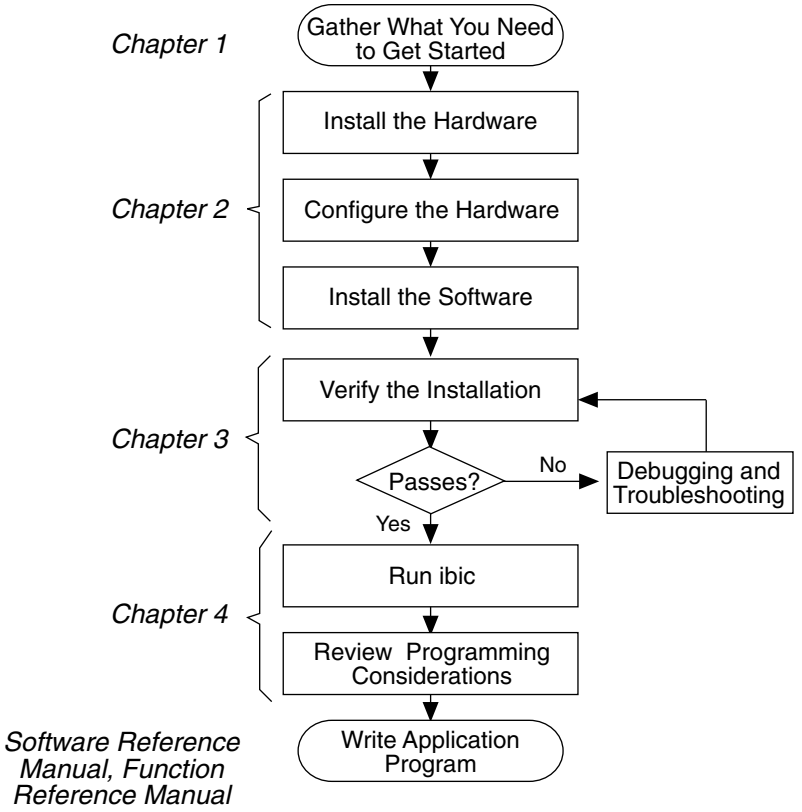
Customer Communication

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

Chapter 1
Introduction

This chapter explains how to use this documentation set, lists what you need to get started, and includes a brief description of the NI-488.2M software and the MC-GPIB board.

How to Use This Documentation Set



What You Need to Get Started

- MC-GPIB board (part number 181165-01, with keys 181165-02)
- 3.5 in. NI-488.2M Distribution Disk for MC-GPIB & OS/2 (part number 422922-64)
- *IBM Personal System/2*™ Reference Diskette
- OS/2 Version 2.0 or higher installed on your computer

Software Description

The NI-488.2M software package for OS/2 consists of a multitasking driver and utilities that transform a PS/2 computer running OS/2 into a GPIB Controller with complete communications and bus management capabilities. The NI-488.2M package includes the following components:

- NI-488.2M driver
- An installation program
- Diagnostics
- An interactive GPIB control program
- An interactive configuration utility
- Both 16-bit and 32-bit C language interfaces
- OS/2 API function interface
- Sample programs that use NI-488 functions, NI-488.2 routines, and API calls

Because the NI-488.2M driver is completely compatible with the ANSI/IEEE Standard 488.2-1987, it is compatible with both IEEE 488 and IEEE 488.2 instruments. The NI-488.2M driver runs only on National Instruments NAT4882/Turbo488-based GPIB hardware, such as the MC-GPIB.

The NI-488.2M driver, `gpib.sys`, is a memory-resident program that exists in RAM. It is loaded as a device in the OS/2 configuration file `config.sys`. The file `gpib.sys` is approximately 72 KB in size.

Hardware Description

The MC-GPIB transforms any IBM PS/2 or compatible computer equipped with 16-bit Micro Channel slots into a full-functioned Talker/Listener/Controller. The NAT4882 controller chip is fully compatible with the IEEE 488.2 standard. The Turbo488 performance-enhancing ASIC boosts GPIB read and write transfers to rates exceeding 1 Mbytes/s. You can use standard GPIB cables to connect the MC-GPIB board with up to 14 instruments, or you can install multiple MC-GPIB boards in a single system. Refer to Appendix A, *Specifications*, for more information about hardware requirements.

Chapter 2
Installation and Configuration

This chapter contains instructions to install and configure the MC-GPIB board and the NI-488.2M software.

Install the Hardware

To install and configure the MC-GPIB board, you need a backup copy of the *IBM Personal System/2* Reference Diskette. If you do not have a backup copy of the IBM reference diskette, you can make one by following the instructions in the *IBM Personal System/2™ Command Reference* manual that you received with your IBM PS/2 computer.

Check the Shield Ground Configuration

The MC-GPIB board is set at the factory with the jumper (W1) in place to connect the logic ground of the MC-GPIB to its shield ground. This configuration minimizes the EMI emitted from a PS/2 computer equipped with an MC-GPIB board. However, if your application requires that logic ground be disconnected from shield ground, remove the jumper (W1) and place it across only one of the jumper pins as shown in Figure 2-1.

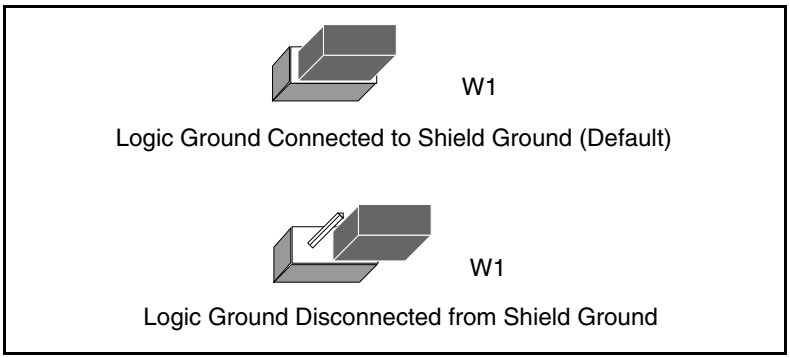


Figure 2-1. Ground Configuration Jumper Settings

Note: ***The MC-GPIB board was tested for compliance with FCC standards with the shield ground connected to logic ground. Removing the jumper may cause EMI emissions to exceed any or all of the applicable standards.***

The following steps contain general installation instructions. Refer to the manual that came with your PS/2 computer for special instructions and warnings.

1. Power-on the computer with the backup copy of the IBM reference diskette already inserted into the diskette drive.
2. From the reference program Main Menu, select **Copy an option diskette** to copy the configuration files from the NI-488.2M for OS/2 distribution diskette.
3. When the reference program requests the option diskette, insert the NI-488.2M for OS/2 distribution diskette. The computer then copies the configuration file to the IBM reference diskette.
4. Exit the reference program.
5. Turn off your computer and unplug the power cord.
6. Remove the top or side cover of the system unit.
7. Remove the expansion slot cover on the back of the system unit.
8. Insert the MC-GPIB board into an unused slot with the IEEE 488 receptacle sticking out of the opening on the back panel.
9. Screw the mounting bracket of the MC-GPIB to the back panel rail of the computer.
10. Replace the system cover.
11. Plug in the power cord.

The MC-GPIB board is now installed.

Configure the Hardware

After the MC-GPIB board is installed in your computer, restart your computer with the backup copy of the IBM reference diskette already inserted into the diskette drive. The reference program asks you if you want to automatically configure the hardware. Respond by typing `y` for yes. The reference program then automatically configures the hardware by assigning values for the base I/O address, interrupt level, and arbitration level of the MC-GPIB board.

Record the Hardware Settings

To view the settings assigned by the reference program, select **Set configuration** from the Main Menu, and then select **View configuration** from the subsequent Set Configuration Menu of the IBM reference diskette.

Record the assigned values in the space provided here so that you can refer to them as you complete the hardware and software installation.

MC-GPIB	Hardware Settings	Default Software Settings
Base I/O Address		0E00 hex
Interrupt Level		3
Arbitration Level (DMA Channel)		1
Logic Ground to Shield Ground		connected

The NI-488.2M driver software, once installed, automatically configures itself to the values selected by the reference program at startup time when the driver is loaded in memory.

Make sure that the arbitration level the reference program chooses is between 0 and 7. If the program assigns one in the range of 8 to 14, select **Change configuration** in the reference program and select an unused arbitration level between 0 and 7.

The MC-GPIB board supports fairness, so the Fairness Enable Field (FEF) defaults to `ON`. This means that the MC-GPIB board releases control of the Micro Channel bus to a requesting bus master even if it has been using the bus exclusively.

Disabling DMA and Interrupts

You can use programmed I/O GPIB transfers if you do not want to use DMA for GPIB transfers. If this is the case, you need to logically disable DMA on the MC-GPIB board. Do this by running `ibconf` and selecting `NONE` for the DMA channel. You do not need to update the configuration file on the reference diskette. However, you may want to update this file just to remind yourself that you are disabling DMA.

Similarly, if you do not want to use interrupts, you need to logically disable interrupt levels on the MC-GPIB board. Do this by running `ibconf`, selecting `NONE` for the interrupt level, and restarting the computer. You do not need to update the configuration file on the reference diskette. However, you may want to update this file just to remind yourself that you are disabling interrupts.

Prepare to Install the Software

This section summarizes the contents of the NI-488.2M distribution disk. You should review this material to gain an understanding of the files and programs that make up your software package.

NI-488.2M Driver and Driver Utilities

The NI-488.2M driver and driver utilities consist of the following files.

- `readme.doc` is a documentation file that contains important information about the NI-488.2M software not contained in the manuals.
- `gpib.sys` is the software driver file that is loaded at system startup by the OS/2 operating system.
- `install.cmd` is an OS/2 command file that performs the installation. It does not modify your `config.sys` file.
- `gpib.ddp` is a device driver profile. This file is used by the OS/2 command `ddinstal` to control the installation process.
- `@5333.adf` is the configuration file for the National Instruments MC-GPIB board that the reference program copies to your IBM reference diskette.
- `ibic.exe` is an interactive control program that you use to communicate with the GPIB devices interactively using NI-488 functions and NI-488.2 routines. It helps you learn the functions, program your instrument or other GPIB devices, and develop NI-488.2M application programs.
- `ibconf.exe` is a software configuration program that you can use to change the configuration parameters that the NI-488.2M driver uses.
- `ibtest.exe` is a software installation test program.

Language-Related Files

In addition to the NI-488.2M driver and utilities, the distribution disk also contains the following language-related files.

- `readme.doc` is a documentation file that contains information about the language interfaces.
- `ni488.dll` is a 32-bit IBM C language interface Dynamic Link Library (DLL) file.
- `nibor.dll` is a 32-bit Borland C language interface DLL file.
- `ni488_16.dll` is a 16-bit Microsoft C language interface DLL file.
- `ni488.lib` is an import library for the 32-bit IBM C language interface that you must link with your IBM C applications.
- `nibor.lib` is an import library for the 32-bit Borland C language interface that you must link with your Borland C applications.
- `ni488_16.lib` is an import library for the 16-bit Microsoft C language interface that you must link with your Microsoft C applications.
- `decl.h` is a 32-bit include file. It contains NI-488 functions and NI-488.2 routine prototypes and various pre-defined constants.
- `decl_16.h` is a 16-bit include file. It contains NI-488 functions and NI-488.2 routine prototypes and various pre-defined constants.

Example Program Files

The distribution disk contains the following example program files.

- `simple.c` is a C program that illustrates basic communication between a computer and a GPIB device.
- `clr_trg.c` is a C program that illustrates how to clear or trigger GPIB devices.

- `asynch.c` is a C program that illustrates how to perform asynchronous I/O.
- `rqs.c` is a C program that illustrates device requests using NI-488 functions.
- `easy4882.c` is a C program that illustrates basic communication with IEEE 488.2-compliant devices using NI-488.2 routines.
- `eos.c` is a C program that shows the use of the end-of-string character.
- `rqs4882.c` is a C program that illustrates serial polls using NI-488.2 routines.
- `ppoll.c` is a C program that illustrates parallel polls using NI-488.2 routines.
- `non_cic.c` is a C program that illustrates communication when the GPIB board is not the Controller.

API-Related Files

The distribution disk contains the following API-related files.

- `readme.api` is a documentation file that contains information about the OS/2 API functions.
- `nicode.h` is a C language declaration file that contains definitions of API Control function codes and other GPIB-related constant and structure definitions.
- `nictl_32.h` is a C language declaration file that contains a macro definition. You can use this definition in place of the `DosDevIOCtl` definition for applications that use 32-bit compilers.
- `nictl_16.h` is a C language declaration file that contains a macro definition. You can use this definition in place of the `DosDevIOCtl` definition for applications that use 16-bit compilers.
- `dsamp_32.c` is a 32-bit C sample program that uses API device-level functions.

- `dsamp_16.c` is a 16-bit C sample program that uses API device-level functions.
- `bsamp_32.c` is a 32-bit C sample program that uses API board-level functions.
- `bsamp_16.c` is a 16-bit C sample program that uses API board-level functions.

Install the Software

You can install the NI-488.2M software in either of the following ways.

- Using the OS/2 system installation utility `ddinstal.`
- Using the `install` command found on the NI-488.2M distribution disk.

The following sections describe the two installation methods.

Install the Software Using ddinstal

`ddinstal.exe` is an OS/2 system utility program you can use to install an external device driver. The program accesses the `gpib.ddp` device driver profile file for information about installing the NI-488.2M software.

Step 1. Prepare to Install the Software

The partition you are using for installation must have approximately 590 KB of free space to hold a copy of the software contained on the NI-488.2M distribution disk.

Step 2. Run ddinstal

Start up your computer and complete the following steps:

1. Type `ddinstal` at the OS/2 command prompt to install the software. Press the <Enter> key.

2. You are prompted to select the source directory and the destination directory. The source directory indicates the floppy drive where you inserted the NI-488.2M distribution disk. The destination directory refers to the drive where you want to install the software. If you want to change either of these directories, click on the **Change** button. Select new directories and press the **Set** button. After you select the source and destination directories, click on the **Install** button.

3. You are now prompted to select a device. Press the spacebar and then press the <Enter> key.

`ddinstal` creates a directory named `mc-gpib` on the destination drive and copies the files from the NI-488.2M distribution disk into this directory.

`ddinstal` automatically adds the following statement to the `config.sys` file:

`DEVICE=`*`y`*`:\MC-GPIB\GPIB.SYS`

where *y* is the letter of the destination drive.

When the installation is complete, click on the **Exit** button to exit `ddinstal`. You will be prompted to perform a shutdown of the system and restart the computer before the changes can take effect. Press the **OK** button, but perform Step 3 to edit your system configuration file before proceeding to Step 4 to shut down and restart the computer.

Step 3. Edit Your System Configuration File

Before you attempt to use the software you need to include the pathname of the language interface DLL file in your library path. Do this by adding the following line to the `LIBPATH` statement in your `config.sys` file:

`y``:\mc-gpib\c`

where *y* is the letter of the destination drive.

Step 4. Restart Your Computer

After `ddinstal` installs the device driver, you are prompted to restart the computer. You must perform this step to complete the installation process of the NI-488.2M driver. To restart the computer, you must perform a shutdown of the system. Refer to the *OS/2 Using the Operating System* manual for instructions on how to perform a shutdown.

If the software is installed correctly, the following information will appear, including the current version number and version date:

```
National Instruments MC-GPIB NI-488.2M Version 2.x
Driver for OS/2
Version Date : xx/xx/xx
Copyright 1993 National Instruments Corporation
```

Install the Software Using install

You can use the `install` command as an alternate method of installing the NI-488.2M software. The `install` command is located on the NI-488.2M distribution disk.

Step 1. Prepare to Install the Software

The hard disk must have approximately 590 KB of free space to hold a copy of the software contained on the NI-488.2M distribution disk.

Step 2. Run install

Run the `install` program according to the instructions in the following paragraphs.

Accessing install

Start up the computer, switch to an OS/2 command prompt, and insert the NI-488.2M distribution disk in your disk drive. Then enter the letter of the disk drive where the NI-488.2M distribution disk is inserted, followed by a colon, and press <Enter>. To install the NI-488.2M software, enter the following command.

```
install y:
```

where *y* is the letter of the destination drive where you want to install the software.

Running install

The `install` command creates the `mc-gpib` directory, if required, and copies the files from the NI-488.2M distribution disk to the directory you selected in the previous step.

If the **`insufficient disk space`** message appears, abort the installation by pressing <Control-Break>. Increase the free space on your destination drive by moving or deleting some files and run `install` again.

Step 3. Edit Your System Configuration File

To install the MC-GPIB device driver, you must include the name of the drive in a device statement in the system configuration file, `config.sys`. Do this by entering the following line in your `config.sys` file:

```
device=y:\mc-gpib\gpib.sys
```

where *y* is the letter of the drive where the driver is installed. The file `gpib.sys` is the name of the NI-488.2M driver.

Before you attempt to use the software you need to include the pathname of the language interface DLL file in your library path. Do this by adding the following line to the `LIBPATH` statement in your `config.sys` file:

```
y:\mc-gpib\c
```

where *y* is the letter of the destination drive.

Step 4. Restart Your Computer

You must perform this step to complete the installation process of the MC-GPIB device driver. To restart the computer, you must perform a shutdown of the system. Refer to the *OS/2 Using the Operating System* manual for instructions on how to perform a shutdown.

If the software is installed correctly, the following information will appear, including the current version number and version date:

```
National Instruments MC-GPIB NI-488.2M Version 2.x
Driver for OS/2
Version Date : xx/xx/xx
Copyright 1993 National Instruments Corporation
```

This message will not appear if you did not edit your system configuration file as described in the previous step before performing a shutdown of the system.

Configure the Software with ibconf (Optional)

You can use `ibconf`, a screen-oriented, interactive utility, to view or modify the default configuration parameters of the NI-488.2M software, the GPIB interface board, and/or the devices connected to it.

You can use `ibconf` to *interactively* edit the memory-resident driver, the driver file on your disk, or your configuration data file, depending on which you select. To modify and query the board and device characteristics *dynamically*, use the `ibconfig` and `ibask` functions in your application. Refer to Chapter 1, *NI-488 Functions* of the *NI-488.2M Function Reference Manual for OS/2* for more information on the `ibconfig` and `ibask` functions.

To run `ibconf`, change to the directory where the NI-488.2M software is installed (the default is `mc-gpib`) and enter the following command:

```
ibconf
```

The `ibconf` utility scans either the file or memory-resident driver you select and displays device and board characteristics. Before you exit the program, it checks for situations that might cause problems, such as the following:

- GPIB addressing conflict between a device and its access board
- Timeouts set to `NONE` on a device or board
- GPIB board not present at the base address
- Interrupt levels set the same for two or more boards

If `ibconf` encounters any of these situations, the program alerts you and gives you the option of re-entering or exiting `ibconf`. To disable automatic checking of the above situations when starting `ibconf`, enter the following command:

```
ibconf -e
```

If you want the changes you made in `ibconf` to take effect without having to restart your computer, select `yes` in the **`Copy changes to memory-res?`** field of the output selection level of `ibconf`. However, if you change the interrupt request line, device name, or *in use* status of a board, you must save these changes to the driver file on your disk and restart your computer for those changes to take effect.

After you have made any necessary changes, exit `ibconf` by pressing the function key <F9> or the <Esc> key. The program first asks if it should **`Save configuration?`** before exiting. Typing a `y` response causes the changes to be written to the memory-resident driver, driver file, or a configuration file, depending on where you want to save the changes.

For more information about `ibconf`, refer to the *NI-488.2M Software Reference Manual for OS/2*.

Chapter 3
Installation Verification

This chapter describes the ways you can verify and test the installation of your NI-488.2M software and MC-GPIB board. Refer also to Chapter 4, *Debugging Your Application*, of the *NI-488.2M Software Reference Manual for OS/2* for more information.

Run the Software Diagnostic Program

To verify and test the hardware and software installation, run the `ibtest` software diagnostic program that came with your NI-488.2M software. The `ibtest` program is an NI-488.2M application that makes calls to the driver just as your application does.

Disconnect any GPIB cables and run `ibtest` by entering the following command:

```
ibtest
```

If `ibtest` completes with no errors, you have installed the NI-488.2M software correctly.

The remainder of this section discusses common situations or error messages generated by `ibtest`. If any of these problems or error messages appear, take the corresponding action as recommended.

Note: ***In the following paragraphs,*** `GPIBx` ***refers to board*** `GPIB0`, `GPIB1`, `GPIB2`, ***or*** `GPIB3` ***as appropriate.***

Presence Test of Driver

The following message appears in response to any of these four situations.

<<< No driver present for GPIB*x*. >>>

- The `ibtest` program always tries to test for four MC-GPIB boards. In most cases you will have fewer than four boards installed in your computer. This message appears when `ibtest` tries to test a board that does not exist. You can ignore this message when it applies to a nonexistent board.

- The GPIB driver might not be installed. To correct this situation, ensure that the line `device=y:\mc-gpib\gpib.sys`, where `y` refers to the letter of the drive where the NI-488.2M software is installed, is in your `config.sys` file and reboot.

- The **`Use this GPIB Interface`** field in `ibconf` might be set to `no` for board `GPIB`*x*. If you want to use this board you need to set this field to `yes`.

- `GPIB`*x* might be configured to use the same interrupt level that is already used by another device in the system. This situation would cause a conflict that would prevent the driver from installing `GPIB`*x*. Try a different interrupt level and ensure that the hardware and software are configured to use the same level.

Presence Test of GPIB Board

The following error message appears if `GPIB`*x* is not installed or if it is not configured at the base I/O address that the driver expects.

<<< No board present for GPIB*x*. >>>

Check that the board is properly installed in your computer and run `ibconf` to ensure that the driver is configured to use the same base I/O address as the board.

Incorrect Interrupt Level

The `ibtest` program outputs dots and then hangs if the MC-GPIB board under test is installed but configured to use an incorrect interrupt level. Run `ibconf` to configure the driver to use the correct interrupt level.

GPIB Cables Connected

The following error message appears if a GPIB cable was connected to the board when you ran `ibtest`.

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

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

Disconnect all GPIB cables before trying the test again.

Examine the GPIB Installation Information File

The NI-488.2M software creates an information file in the root directory of the disk that contains OS/2. This file, `gpibinst.inf`, summarizes the state of the NI-488.2M driver after it has been loaded at boot-time.

The NI-488.2M driver checks for the following problems at startup and stores the results of its examination in the installation information file. If any of these messages appear, take the corresponding action as recommended.

- **`Warning: You are using a 488.1 board. Please contact National Instruments for upgrade information.`**

  The NI-488.2M software is compatible only with the National Instruments IEEE 488.2 hardware having the NAT4882/Turbo488 chip combination. Contact National Instruments for hardware upgrade information if you have an IEEE 488.1 board.

- **Warning: There is NO board at the given base address.**

  The driver alerts you with this message if no GPIB board is installed or if the GPIB board is not configured at the base I/O address that the driver expects. Install an MC-GPIB board in your computer and run `ibconf` to make sure that the driver is configured to use the same base I/O address that the board is using.

- **Interrupt conflicts. Try a different interrupt level.**

  If another device uses the same interrupt level that the NI-488.2M driver is configured to use, the NI-488.2M driver will not load. Try a different interrupt level and make sure that the hardware and software are configured to use the same interrupt level.

Chapter 4
Using Your NI-488.2M Software

This chapter includes a brief explanation of the ibic utility and programming considerations for your NI-488.2M software for OS/2.

Introduction to ibic

The ibic (Interface Bus Interactive Control) utility is included with your NI-488.2M software. You can use ibic to enter NI-488 functions and NI-488.2 routines interactively and display the results of the function call automatically. Without writing an application, you can use ibic to accomplish any of the following:

- Verify GPIB communication with your device quickly and easily.
- Learn the syntax of the NI-488 functions and NI-488.2 routines before writing your application.
- Become familiar with the commands of your device.
- Receive data from your GPIB device.
- Learn new NI-488 functions and NI-488.2 routines before integrating them into your application.

For more information about ibic, refer to the *NI-488.2M Software Reference Manual for OS/2*.

Programming Considerations

The NI-488.2M software contains 32-bit compatible C language interfaces and a 16-bit compatible C language interface. Two 32-bit C language interfaces are included with the NI-488.2M software. The 32-bit IBM C language interface consists of a dynamic link library (DLL) called ni488.dll, an import library called ni488.lib, and an include file called decl.h. The 32-bit Borland C language interface consists of a DLL called nibor.dll, an import library called nibor.lib, and an include

file called `decl.h`. The 16-bit Microsoft C language version 6.0 interface contains a DLL called `ni488_16.dll`, an import library called `ni488_16.lib`, and an include file called `decl_16.h`. The import library is used to reference the DLL for the NI-488 functions and NI-488.2 routines and needs to be linked with your compiled GPIB application.

Before you attempt to compile and link an NI-488.2M application, verify that the `LIBPATH` configuration command in the `config.sys` file includes the full pathname of the DLL you are using (`ni488.dll`, `nibor.dll`, or `ni488_16.dll`). For example, if the DLL you are using is in a directory `d:\mc-gpib\c`, the `LIBPATH` configuration command may appear as follows:

```
LIBPATH =.;D:\OS2\DLL;D:\OS2\MDOS;D:\;d:\mc-gpib\c;
```

Also verify that the `SET LIB` configuration command in the `config.sys` file includes the full pathname of the import library you are using (`ni488.lib`, `nibor.lib`, or `ni488_16.lib`). For example, if the import library is in a directory `d:\mc-gpib\c`, the `SET LIB` configuration command may appear as follows:

```
SET LIB = D:\TOOLKT20\OS2LIB;D:\CSET2\LIB;d:\mc-gpib\c;
```

Refer to the *NI-488.2M Software Reference Manual for OS/2* and the *NI-488.2M Function Reference Manual for OS/2* for a more detailed description of programming considerations, programming examples, and function syntax.

Using the 32-bit C Language Interfaces

Complete the following steps to compile and link an NI-488.2M application using IBM C (32-bit C compiler) for OS/2.

1. Include the following C statement at the beginning of your application program:

   ```
   #include "decl.h"
   ```

2. Compile your application program using the following command:

   ```
   icc /c cprog.c
   ```

3. Use the following command to link your compiled application program with the NI-488.2M 32-bit IBM C language interface:

```
link386 /NOI cprog.obj,,,ni488.lib;
```

Complete the following steps to compile and link an NI-488.2M application using Borland C (32-bit C compiler) for OS/2.

1. Include the following C statement at the beginning of your application program:

```
#include "decl.h"
```

2. Compile your application program using the following command:

```
bcc /c cprog.c
```

3. Use the following command to link your compiled application program with the NI-488.2M 32-bit Borland C language interface:

```
tlink /c /Toe c02.obj cprog.obj,,,os2.lib
  c2mti.lib nibor.lib;
```

Using the 16-bit C Language Interface

Complete the following steps to compile and link an NI-488.2M application using Microsoft C language version 6.0 interface (16-bit C complier) for OS/2.

1. Include the following C statement at the beginning of your application program:

```
#include "decl_16.h"
```

2. Compile your application program using the following C command:

```
cl /c cprog.c
```

3. Use the following command to link your compiled program with the NI-488.2M 16-bit Microsoft C version 6.0 C language interface:

```
link /NOI cprog.obj,,,ni488_16.lib;
```

Appendix A
Specifications

This appendix lists the hardware specifications for the MC-GPIB board.

Table A-1. Electrical Characteristics

Characteristic	Specification
Turbo488 Clock	20 MHz
GPIB Interface Controller Clock	20 MHz
Transfer Rates GPIB Reads GPIB Writes	 400 kbytes/s 400 kbytes/s
Power Requirement	+5 VDC 1.0 A Typical 1.6 A Maximum
* Actual speed may vary considerably from those shown due to instrumentation capabilities.	

Table A-2. Physical Characteristics

Characteristic	Specification
Dimensions	3.5 in. by 11.5 in. (8.82 mm by 29.21 mm)
I/O Connector	IEEE 488 Standard 24-pin

Table A-3. Environmental Characteristics

Characteristic	Specification
Operating Environment	
Component Temperature	0° to 70° C
Relative Humidity	5% to 90%, noncondensing
Storage Enviroment	
Temperature	-55° to +150° C
Relative Humidity	5% to 90%, noncondensing
EMI	FCC Class B Certified

Appendix B
Customer Communication

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

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

Corporate Headquarters
(512) 795-8248
Technical support fax: (800) 328-2203
(512) 794-5678

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

Technical Support Form

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

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

Name _____

Company _____

Address _____

_____

Fax (____) _____ Phone (___) _____

Computer brand _____

Model _____ RAM _____MB

Processor _____ Speed _____MHz

Operating system _____

Display adapter _____

Mouse _____yes _____no

Other adapters installed _

Hard disk capacity _____MB Brand _____

Instruments used _____

National Instruments hardware product model _____

Revision _____

Configuration _____

(continues)

National Instruments software product _____

Version _____

Configuration _____

The problem is _____

_____

_____

_____

_____

_____

_____

_____

List any error messages _____

_____

_____

_____

_____

_____

_____

_____

The following steps will reproduce the problem _____

_____

_____

_____

_____

_____

_____

MC-GPIB Hardware and Software Configuration Form

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

National Instruments Products

- NI-488.2M Software Revision Number on Disk _____
  (Disk Label: *NI-488.2M Distribution Disk for MC-GPIB & OS/2*)
- Programming Language Interface Revision _____
- MC-GPIB Revision _____
- Base I/O Address Level of MC-GPIB _____
- Interrupt Level of MC-GPIB _____
- Arbitration Level of MC-GPIB _____
- Shield Ground Connected to Logic Ground (yes or no) _____

Other Products

- Computer Make and Model _____
- Type of Monitor Card Installed _____
- OS/2 Version _____
- Programming Language and Version _____
- Other Boards in System _____
- Base I/O Address Level of Other Boards _____
- Interrupt Level of Other Boards _____
- Arbitration Level of Other Boards _____
- Base I/O Address of Other Boards _____
- DMA Channels of Other Boards _____
- Interrupt Level of Other Boards _____

Documentation Comment Form

National Instruments encourages you to comment on the documentation supplied with our products. This information helps us provide quality products to meet your needs.

Title: **Getting Started with Your MC-GPIB and the NI-488.2M™ Software for OS/2**

Edition Date: **April 1994**

Part Number: **370948A-01**

Please comment on the completeness, clarity, and organization of the manual.

(continues)

If you find errors in the manual, please record the page numbers and describe the errors.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for your help.

Name _____

Title _____

Company _____

Address _____

_____

Phone (_____) _____

Mail to: Technical Publications
National Instruments Corporation
6504 Bridge Point Parkway, MS 53-02
Austin, TX 78730-5039

Fax to: Technical Publications
National Instruments Corporation
MS 53-02
(512) 794-5678

Glossary

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

°	degrees
%	percent
A	amperes
ANSI	American National Standards Institute
API	application program interface
ASIC	Application Specific Integrated Circuit
C	Celsius
DLL	dynamic link library
DMA	direct memory access
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface (IEEE 488) Bus
hex	hexadecimal
Hz	hertz
ibic	Interface Bus Interactive Control
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
KB	kilobytes of memory
MB	megabytes of memory
m	meters
OS/2	IBM Operating System/2
PS/2	IBM Personal System/2
RAM	random access memory
s	seconds
VDC	volts direct current

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP