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Getting Started with Your SB-GPIB/TNT and the NI-488.2M™ Software for Solaris 2

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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 A digital device. Operation is subject to the following two conditions:

1. This device may not cause harmful interference in commercial environments.

2. This device must accept any interference received, including interference that may cause undesired operation.

Canadian Department of Communications

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

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe 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 harmful interference from the equipment to radio reception in commercial areas. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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

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

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

- Move the equipment away from the receiver with which it is interfering.

- Reorient or relocate the receiver's antenna.

- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

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

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

Contents

Tables

Figure

About This Manual

This manual contains instructions for installing and configuring the National Instruments SB-GPIB/TNT or SB-GPIB interface board and NI-488.2M software. The GPIB hardware and NI-488.2M software should be used with a Sun SPARCstation workstation with SBus slots running Solaris 2.1 or higher. This manual is meant to be used with the *NI-488.2M Software Reference Manual* (Part Number 320351-01).

This manual uses the term *SB-GPIB/TNT* to refer to a National Instruments GPIB board equipped with the TNT4882C ASIC. The term *SB-GPIB* refers to a National Instruments GPIB board equipped with the NAT4882 and Turbo488 ASICs. This manual uses the term *GPIB board* in cases where the material can apply to either board.

This manual assumes that you are familiar with the Sun SPARCstation and the Solaris 2 operating system.

How to Use the Manual Set

Use this getting started manual to install and configure your GPIB board and NI-488.2M software for Solaris 2.

Use the *NI-488.2M Software Reference Manual* to learn the basics of GPIB and how to develop an application program. The software reference manual contains specific information about each NI-488 function and NI-488.2 routine such as format, parameters, and possible errors. It also contains debugging information and detailed examples.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what you need to get started, and briefly describes the GPIB board and the NI-488.2M software.

- Chapter 2, *Hardware Installation,* contains instructions to help you install your SB-GPIB/TNT or SB-GPIB board into your Sun SPARCstation.

- Chapter 3, *Software Installation and Configuration*, contains instructions to help you install and configure your NI-488.2M software.

- Chapter 4, *Installation Verification and Troubleshooting,* describes how to verify the software installation and how to troubleshoot problems.

- Chapter 5, *Using Your NI-488.2M Software,* describes the ibic utility and lists some programming considerations.

- Appendix A, *Hardware Specifications*, lists the electrical, physical, and environmental characteristics of the GPIB board and the recommended operating conditions.

- 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:

italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
bold italic	Bold italic text denotes a note or warning.
`monospace`	Lowercase text in this font denotes text or characters that are to be literally input from the keyboard, directories, programs, filenames, and statements and comments taken from program code.
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.
SB-GPIB/TNT	SB-GPIB/TNT refers to a National Instruments GPIB board equipped with the TNT4882C ASIC for Sun SPARCstation Series workstations.
SB-GPIB	SB-GPIB refers to a National Instruments GPIB board equipped with the NAT4882 and Turbo488 AISCs for Sun SPARCstation Series workstations.
GPIB board	GPIB board refers generically to either the SB-GPIB/TNT or SB-GPIB board in cases where the material can apply to either board.

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

Related Documentation

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

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*

- ANSI/IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands*

- *Solaris 2.x Answerbook* (part number 704-3138-xx), section titled *SunOS 5.0 Writing Device Drivers* (section number 800-6502-10), SunSoft, Inc., 2550 Garcia Avenue, Mountain View, California 94043

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 manual, lists what you need to get started, and briefly describes the GPIB board and the NI-488.2M software.

How to Use This Manual

Chapter 1	Gather What You Need to Get Started
Chapter 2	Install the Hardware
Chapter 3	Install the Software — Need to Change Software Settings? — Yes → Configure the Software — No
Chapter 4	Verify the Installation — Passes? — No → Troubleshooting — Yes
Chapter 5	Run ibic — Review Programming Considerations
Software Reference Manual	Write Application Program
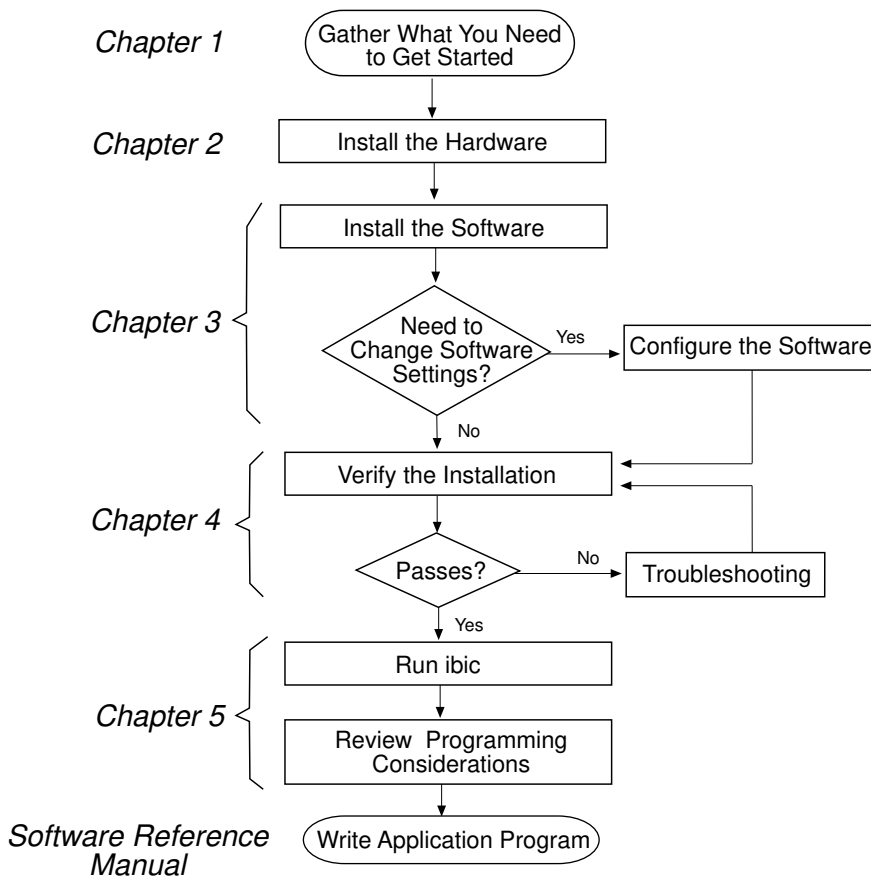
What You Need to Get Started

❑   SB-GPIB/TNT board (part number 182390-01)

or

SB-GPIB board (part number 181115-01)

❑   3.5 in. NI-488.2M Distribution Disk for SB-GPIB and Solaris 2 and C Interface
(part number 422919-62)

❑   Solaris version 2.1 or higher installed on your SPARCstation

Hardware Description

The SB-GPIB/TNT board, equipped with a TNT4882C ASIC, is compatible with all
revisions of the IEEE 488 standard, including ANSI/IEEE Standard 488.2-1987. The
TNT4882C chip combines the circuitry of the NAT4882 ASIC, the Turbo488
performance-enhancing ASIC, and GPIB transceivers to create a single-chip IEEE 488.2
Talker/Listener/Controller interface. The TNT4882C also implements the HS488
high-speed protocol, which increases the maximum data transfer rate of devices up to
3.4 Mbytes/s when using the SBus direct virtual memory access (DVMA) transfers.

The SB-GPIB board, equipped with NAT4882 and Turbo488 ASICs, is also compatible
with all revisions of the IEEE 488 standard, including the IEEE 488.2 standard. The
NAT4882 chip performs the basic IEEE 488 Talker, Listener, and Controller functions.
The Turbo488 chip enhances the performance of the SB-GPIB board. With the Turbo488
chip and the SBus DVMA transfers, data transfer rates for both read and write operations
can exceed 1 Mbytes/s.

You can install the GPIB board in any SBus master slot. Standard GPIB cables can
connect the GPIB board with up to 14 devices. If you need to connect to more than 14
devices, you can add them to your system using an IEEE 488 extender or expander, such
as the National Instruments GPIB-130, GPIB-120A, or GPIB-110. Refer to Appendix A,
Hardware Specifications, for more information about the GPIB hardware specifications
and recommended operating conditions.

Software Description

The NI-488.2M software consists of a loadable driver and utilities that transform a Sun
SPARCstation running Solaris 2 into an IEEE 488.2 Controller with complete
communications and bus management capabilities.

The NI-488.2M driver supports up to four SB-GPIB/TNT and/or SB-GPIB boards and is
completely compatible with both IEEE 488 and IEEE 488.2 instruments.

Optional Programming Environments

Your kit includes the NI-488.2M software for Solaris. In addition, you can order the LabWindows/CVI or LabVIEW software from National Instruments. LabWindows/CVI and LabVIEW include instrument driver libraries that make it easier to communicate with your GPIB instruments.

LabWindows/CVI is an interactive ANSI C development environment for building test and measurement and instrument control systems. It includes interactive code-generation tools and a graphical editor for building custom user interfaces. It also includes built-in libraries for IEEE 488.2, VXI, RS-232 control, and plug-in data acquisition. When you order LabWindows/CVI, you also get more than 300 complete instrument drivers, which are modular, source-code programs that handle the communication with your instrument so that you do not have to learn the programming details.

LabVIEW is a complete programming environment that departs from the sequential nature of traditional programming languages and features a graphical programming environment. It includes all the tools needed for instrument control, data acquisition, analysis, and presentation. LabVIEW also includes an extensive instrument driver library.

For more information about LabWindows/CVI and LabVIEW, contact National Instruments.

Chapter 2
Hardware Installation

This chapter contains instructions to help you install your SB-GPIB/TNT or SB-GPIB board into your Sun SPARCstation.

Warning: *Several components on your GPIB board can be damaged by electrostatic discharge. To avoid such damage in handling the board, touch the antistatic plastic package to a metal part of your computer chassis before removing the board from the package.*

Perform the following steps to install the GPIB board.

1. Log on as super-user (`root`).

2. Change to the `root` directory and shut down the computer by entering the following commands on the command line:

   ```
   cd /
   sync
   shutdown
   ```

3. Wait for the `>` or `ok` prompt to appear on your screen. When you see the `>` or `ok` prompt on your screen, turn off your computer. Keep the computer plugged in so that it remains grounded while you install the GPIB board.

4. Remove the cover of the system unit.

5. Remove the GPIB connector extender (if your board came with one) by loosening the thumbscrews.

6. Insert the GPIB board into a vacant DVMA master slot with the GPIB connector sticking out of the opening on the back panel. *Do not* insert the board into a slave-only physical slot if you are using DVMA, because only programmed I/O transfers are possible in slave-only slots. Figure 2-1 shows an example SB-GPIB/TNT board installation into a Sun SPARCstation computer. Please refer to the manuals that came with your Sun SPARCstation for information about DVMA slave and DVMA master slots.
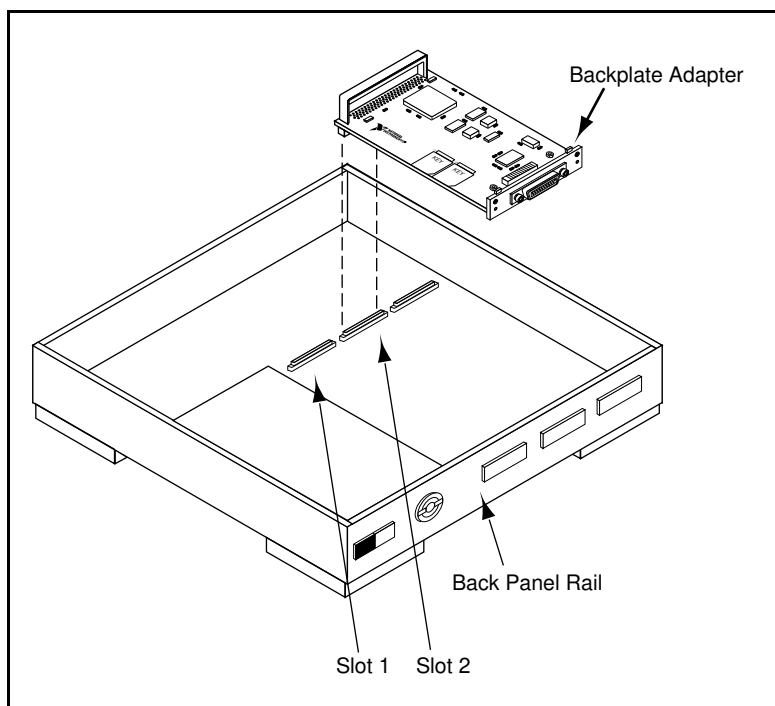
Figure 2-1. SB-GPIB/TNT Installation into a Sun SPARCstation Computer

If you are installing the GPIB board into a Sun SPARCstation 10 or similar computer, you may have to unscrew and remove the backplate adapter on the SBus backplate of the board.

7. Replace the system unit cover.

8. Reinstall the GPIB connector extender that you removed in Step 5, if you have problems connecting the GPIB cable to the connector on the board due to space constraints.

9. Turn on your computer.

The GPIB board is now installed. Refer to Chapter 3 for instructions to install the NI-488.2M software.

Chapter 3
Software Installation and Configuration

This chapter contains instructions to help you install and configure your NI-488.2M software.

NI-488.2M Software Components

The NI-488.2M software package includes the following files:

- `ib` is the NI-488.2M driver for the GPIB board.

- `ugpib.h` is the include file for user programs.

- `libgpib.so` is the dynamic link library containing the C language interface.

- `libgpib.a` is the static linked library containing the C language interface.

- `cib.c` is the source of the C language interface library.

- `ibconf` is the software configuration utility.

- `ibic` is the interactive control utility.

- `ibtsta` tests the software installation.

Install the Software

After you install the hardware, follow these steps to install the NI-488.2M software:

1. Log on as super-user (`root`).

2. Insert the NI-488.2M distribution diskette.

3. Add the NI-488.2M software to the operating system by entering one of the following commands. (This command may take awhile to process, so be patient.)

Caution: *If you are running volume management, you must run* `volcheck` *to detect the floppy diskette.* `volcheck` *warns you that the disk is unformatted, but do NOT choose to format the disk. Instead, select cancel.*

- If you are running Solaris 2.1, or you are not running volume management for higher versions of Solaris, enter the following command:

  ```
  /usr/sbin/pkgadd -d /dev/rdiskette
  ```

- If you are running volume management and your Solaris version is 2.3 or higher, enter the following commands. Do *not* choose to format the disk.

  ```
  /usr/bin/volcheck
  /usr/sbin/pkgadd -d /vol/dev/rdiskette0/unlabeled
  ```

- If you are running volume management and your Solaris version is 2.2, enter the following commands. Do *not* choose to format the disk.

```
/usr/bin/volcheck
/usr/sbin/pkgadd -d /vol/dev/rfd0/unlabeled
```

4. Wait for the NI-488.2M software package to be successfully added, then eject the distribution diskette by entering the following command:

```
eject
```

Configure the Software with ibconf (Optional)

`ibconf` is an interactive utility you can use to examine or modify the configuration of the driver. You might want to run `ibconf` to change the settings of the software parameters. You must have super-user privilege to run `ibconf`.

`ibconf` is largely self-explanatory and contains help screens that explain all commands and options. For more information on using `ibconf`, refer to the *NI-488.2M Software Reference Manual*.

Follow these steps to change the default parameters of your NI-488.2M software. Before you configure the driver, make sure it is *not* in use.

1. Log on as super-user (`root`).

2. Run `ibconf` on the `ib` driver in the system modules directory (`/usr/kernel/drv`) by entering the following command.

```
ibconf <driver>
```

where `<driver>` refers to the directory path and name of the driver you want to modify. The default is `/usr/kernel/drv/ib`.

After you have installed and configured the software, you should verify the installation. Refer to Chapter 4, *Installation Verification and Troubleshooting*.

Remove the NI-488.2M Software (Optional)

If you ever decide to stop using your SB-GPIB board, you can remove the board and the NI-488.2M software. To remove the NI-488.2M software from the kernel configuration, you must have super-user privilege and the driver must *not* be in use. Enter the following command to unload the software:

```
pkgrm NICsbgpib
```

Chapter 4
Installation Verification and Troubleshooting

This chapter describes how to verify the software installation and how to troubleshoot problems.

Run the Software Diagnostic Program ibtsta

The software installation test `ibtsta` verifies that the driver is installed correctly. It checks for correct access to the device driver.

Run `ibtsta` by entering the following command.

```
ibtsta
```

If no error occurs in `ibtsta`, the NI-488.2M software is installed correctly.

If `ibtsta` fails, it displays an error message that explains why the test failed and how you can correct the problem. If you are unable to run `ibtsta` successfully after you have followed the on-screen instructions, fill out the forms in Appendix B, *Customer Communication*, and contact National Instruments.

Common Questions
How do I know that my GPIB board is installed correctly?

The `ibtsta` test verifies that both the hardware and software are installed correctly. If the test fails, and you cannot correct the problem, fill out the forms in Appendix B and contact National Instruments.

Why doesn't the GPIB board fit into my workstation?

If you received your board with a GPIB connector extender, remove it before you install the board. If you have a Sun SPARCstation 10 or similar computer, you must remove the backplate adapter on the SBus backplate of the GPIB board before you can install the board. For more information, refer to Chapter 2, *Hardware Installation*.

If you install the board and then have problems connecting the GPIB cable to the connector on the board due to space constraints, replace the connector extender.

Can I use an expansion chassis to load the GPIB board?

Yes, National Instruments has tested several expansion chassis for this purpose.

Can I use the NI-488.2M driver for Solaris 2 with a Solaris 1.x operating system?

No, the NI-488.2M software for Solaris 2 is not compatible with Solaris 1.x. If you are running Solaris 1.x (SunOS 4.x), use the NI-488.2M software for Solaris 1 and the corresponding manual. The kit that you received includes disks and manuals for both Solaris 1 and Solaris 2.

Can I use the NI-488.2M driver for Solaris 2 with the SB-GPIB (non-TNT) board?

Yes, the board and software are compatible, but you will not be able to use TNT4882C features such as HS488 (high-speed) mode.

Why can't I use DVMA with my GPIB board?

Do not insert the GPIB board into a slave-only physical slot if you want to use DVMA. Only programmed I/O transfers are possible in slave-only slots. Refer to the documentation that came with your Sun SPARCstation for information about DVMA slave and DVMA master slots.

What do I do if `ibtsta` fails with an error?

If you cannot correct the problem by following the on-screen instructions, fill out the forms in Appendix B, *Customer Communication*, and contact National Instruments.

What is wrong if `ibfind` returns a -1?

The driver may not be installed correctly, or the nodes may not have been created when the driver was loaded. Try installing the NI-488.2M software again. Refer to Chapter 3, *Software Installation and Configuration*, for more information.

Also, the file may require read/write privileges you do not have, or you may have renamed a device. Make sure that the device names in your application program match the device names in `ibconf`.

What could be causing a problem with accessing the NI-488.2M distribution diskette?

Check that the special file `/dev/rdiskette` is the correct file for the diskette driver. The codes should give you read/write access for `root`. Another possibility is that the data on the distribution diskette is corrupted.

How do I use the NI-488.2M language interface?

For information about using the NI-488.2M language interface refer to Chapter 5, *Using Your NI-488.2M Software*.

When would I use `ibic`?

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

What information should I have before I call National Instruments?

When you call National Instruments, you should have the results of the diagnostic test `ibtsta`. You should also have run `ibic` to try to find the source of your problem. Also, make sure you have filled out the configuration form in Appendix B, *Customer Communication*.

Chapter 5
Using Your NI-488.2M Software

This chapter describes the `ibic` utility and lists some programming considerations.

Introduction to ibic

You can use `ibic`, the Interface Bus 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 `ibic` 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

- Learn new NI-488.2 routines before integrating them into your application

- Troubleshoot problems with your application

For more information about `ibic`, refer to the *NI-488.2M Software Reference Manual.*

Programming Considerations

As you begin developing your GPIB application, remember the following points:

- The application program must include the `ugpib.h` header file as follows:

    ```
    # include <sys/ugpib.h>
    ```

- When you compile your application, you must link it to the GPIB C language interface library using one of the following commands, where *example.c* is your application name:

    ```
    cc example.c –lgpib
    ```
    or
    ```
    cc example.c –dy –lgpib
    ```
    or
    ```
    cc example.c –dn –lgpib
    ```

      `-dy` specifies dynamic linking, which is the default method. It links the application to `libgpib.so`. `-dn` specifies static linking in the link editor. It links the application to `libgpib.a`. For more information about compiling and linking, see the `man` pages for `cc` and `ld`.

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2M Software Reference Manual*. The reference manual also contains detailed information about each NI-488 function and NI-488.2 routine.

Appendix A
Hardware Specifications

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

Table A-1. Electrical Characteristics for the SB-GPIB/TNT

Characteristic	Specification

Transfer Rates:
 	
3-wire
    GPIB Reads
    GPIB Writes
High Speed
    GPIB Reads
    GPIB Writes
	
	1.6 Mbytes/s*
	1.4 Mbytes/s*
	
	3.2 Mbytes/s*
	3.2 Mbytes/s*

Power Requirement (from SBus)	+5 VDC 300 mA Typical 350 mA Maximum
* Actual rates may vary considerably from speed shown because of system and instrumentation capabilities.	

Table A-2. Electrical Characteristics for the SB-GPIB

Characteristic	Specification

Transfer Rates:
 	
3-wire
    GPIB Reads
    GPIB Writes
	
	970 kbytes/s*
	1 Mbytes/s*

Power Requirement (from SBus)	+5 VDC 500 mA Typical 780 mA Maximum
* Actual rates may vary considerably from speed shown because of system and instrumentation capabilities.	

Table A-3. Physical Characteristics

Characteristic	Specification
Dimensions	3.3 in. by 5.78 in. (83.8 mm by 146.7 mm)
I/O Connector	IEEE 488 Standard 24-pin

Table A-4. Environmental Characteristics

Characteristic	Specification
Operating Environment Component Temperature Relative Humidity	 0° to 40° C 5% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	 -20° to 70° C 5% to 90%, noncondensing
EMI	FCC Class A Verified

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.

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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	056/27 00 25
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. Include additional pages if necessary.

Name   _____

Company   _____

Address   _____

                    _____

Fax   (____)_____   Phone   (____)_____

Computer brand   _____

    Model _____   Processor   _____

    Operating system _____

    Speed _____MHz   RAM _____MB

    Display adapter _____

    Mouse _____yes   _____no

    Other adapters installed _____

    Hard disk capacity _____MB   Brand _____

    Instruments used   _____

National Instruments hardware product model _____

    Revision _____

    Configuration _____

National Instruments software product _____

   Version _____

   Configuration _____

The problem is _____

_____

_____

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_____

List any error messages _____

_____

_____

_____

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_____

_____

_____

The following steps will reproduce the problem _____

_____

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_____

GPIB Board 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

- GPIB Board and Revision Number

    – SB-GPIB/TNT Board (part number 182390-01) Revision _____

    or

    – SB-GPIB Board (part number 181115-01) Revision _____

- NI-488.2M Software Revision Number on Distribution Medium_____

Other Products

- Programming Language and Version_____

- Solaris Version   _____

- Computer Make and Model   _____

- Other Devices in System   _____

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 SB-GPIB/TNT and the NI-488.2M**[TM] **Software for Solaris 2**

Edition Date: **June 1994**

Part Number: **320529-01**

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

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(continues)

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

_____

_____

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Thank you for your help.

Name   _____

Title   _____

Company   _____

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Glossary

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

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
C	Celsius
DVMA	direct virtual memory access
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
m	meters
MB	megabytes of memory
s	seconds
VDC	volts direct current