GPIB-PRL
User Manual

MicroGPIB®
IEEE 488 to Parallel Interface

November 1993 Edition

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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'émiet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le réglement sur le brouillage radioélectrique édicté par le ministére des communications du Canada.

Instructions to Users

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

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

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

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

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

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

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About This Manual

Introduction to the GPIB-PRL

The GPIB-PRL is one of National Instruments family of MicroGPIB products. These products are high performance, low cost IEEE 488 support items, packaged in small all-metal cases, capable of being rack mounted.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Description of the GPIB-PRL*, contains general information about the National Instruments GPIB-PRL and lists components and accessories. Environmental, electrical, and physical specifications are also provided.
- Chapter 2, *Installation and Operation*, describes the procedures for configuring and operating the GPIB-PRL.
- Chapter 3, *Technical Information*, contains a more detailed description of the operation of the GPIB-PRL. The timing characteristics of the parallel port are provided in this section.
- The appendix, *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 a 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, caution, or warning.

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

Related Documentation

The following document contains information that you may find helpful as you read this manual.

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

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 the appendix, *Customer Communication*, at the end of this manual.

Chapter 1
Description of the GPIB-PRL

This chapter contains general information about the National Instruments GPIB-PRL and lists components and accessories. Environmental, electrical, and physical specifications are also provided.

Introduction

The GPIB-PRL, shown in Figure 1-1, provides a method of connecting a device with a Centronics-type interface port to the IEEE 488 (GPIB) bus. The GPIB-PRL allows transparent conversion of data between the two ports so that control codes or special commands are not required. The GPIB-PRL also increases the efficiency of the interface system by isolating the slower device from the faster port with a 256 KB character buffer. This buffer is used to offload the host computer during printer and plotter applications.

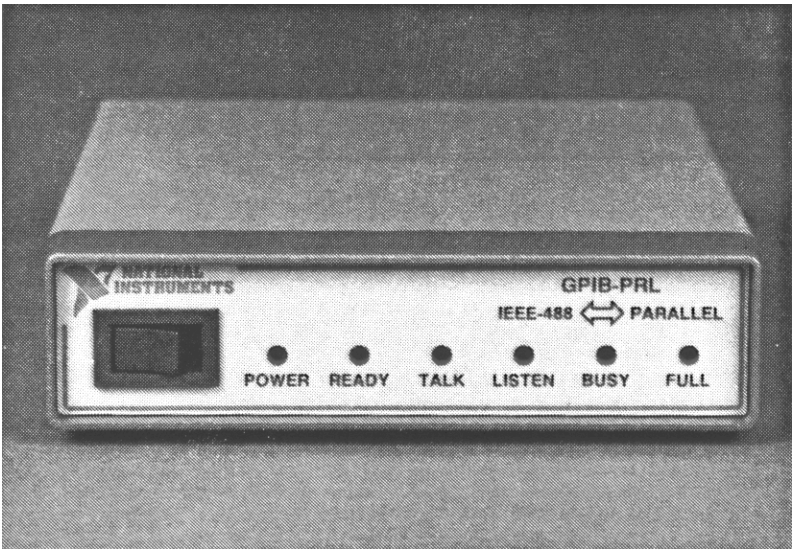

Figure 1-1. The GPIB-PRL

The GPIB-PRL is capable of providing data conversion in either direction; that is, it can be used to interface GPIB plotters and printers to a computer with a Centronics-type output port or to add a standard Centronics-type printer to a GPIB network.

Although the GPIB-PRL is designed to be used with a device which adheres to the Centronics interface standard, it can also be used with other devices which use a unidirectional parallel 8-bit bus similar in nature to the Centronics specification. Since the GPIB is also a parallel bus, to avoid confusion the Centronics-type interface port is referred to as the *parallel port* and the GPIB port is referred to as the *GPIB* or *IEEE 488* throughout the manual.

What Your Kit Contains

Your kit should contain the following components:

Component	Part Number
One of the following boxes: • GPIB-PRL (256K RAM - 115 VAC) • GPIB-PRL (256K RAM - 230 VAC)	 776177-02 776177-32
GPIB-PRL User Manual	320090-01

Optional Equipment

Component	Part Number
Rack Mount Kit:	
Single (1 unit)	180480-01
Dual (2 units)	180480-02
Parallel (Centronics) Shielded Cables (2 meters):	
Standard (36-pin male champ to 36-pin male champ)	180323-10
For IBM PC (25-pin D-sub to 36-pin male champ)	181073-20
Double Shielded GPIB Cables:	
GPIB Type X2 Cable – 1 m	763061-01
GPIB Type X2 Cable – 2 m	763061-02
GPIB Type X2 Cable – 4 m	763061-03

GPIB-PRL Specifications

The following tables specify the electrical, environmental, and physical characteristics of the GPIB-PRL.

Table 1-1. Electrical Characteristics

Characteristic	Specification
Power Supply Unit	Wall mount type, 115 VAC or 230 VAC, 50/60 Hz input, 9 VDC @ 1A max output
Voltage	9 VDC regulated
Current	640 mA typical; 1,500 mA max

Table 1-2. Environmental Characteristics

Characteristic	Specification
Operating Temperature	10° to 40° C
Storage Temperature	0° to 70° C
Relative Humidity	10% to 95% noncondensing conditions
Noise Emissions	FCC Class A Verified

Table 1-3. Physical Characteristics

Characteristic	Specification
Case Size	1.6 in. by 5.7 in. by 8.4 in.(40.6 mm by 144.8 mm by 213.4 mm)
Case Material	All metal enclosure
Rack Mounting	Single or dual kits available
Weight	28 oz. (without power supply unit)

The GPIB-PRL Front Panel

The front panel of the GPIB-PRL is shown in the following figure. The power switch and six light-emitting diodes (LEDs) are mounted on the GPIB-PRL front panel.

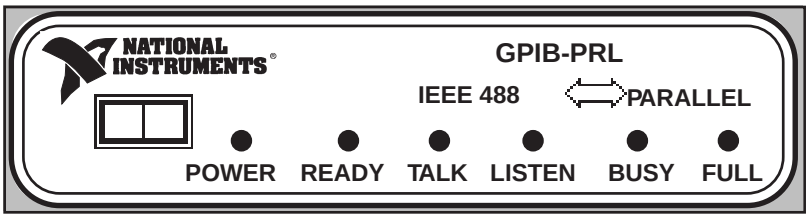

Figure 1-2. The GPIB-PRL Front Panel

The LEDs show the current status of the GPIB-PRL at all times. Table 1-4 describes each LED.

Table 1-4. LED Descriptions

LED	**Indication**
POWER	Indicates that power to the unit has been applied and the ON/OFF switch is in the ON position.
READY	Indicates that the power-on self-test has passed successfully and the unit is ready to operate.
TALK	Indicates that the GPIB-PRL is configured as a GPIB Talker.
LISTEN	Indicates that the GPIB-PRL is configured as a GPIB Listener.
BUSY	Indicates the current status of the parallel bus signal BUSY.
FULL	Indicates that the internal data buffer of the GPIB-PRL has become full. This is not an error condition, but is merely a signal that bus performance may be reduced to the speed of the slower interface.

The GPIB-PRL Rear Panel

The rear panel of the GPIB-PRL is shown in the following figure. The power cable, parallel cable, and GPIB cable are shown connected to the rear panel of the GPIB-PRL.

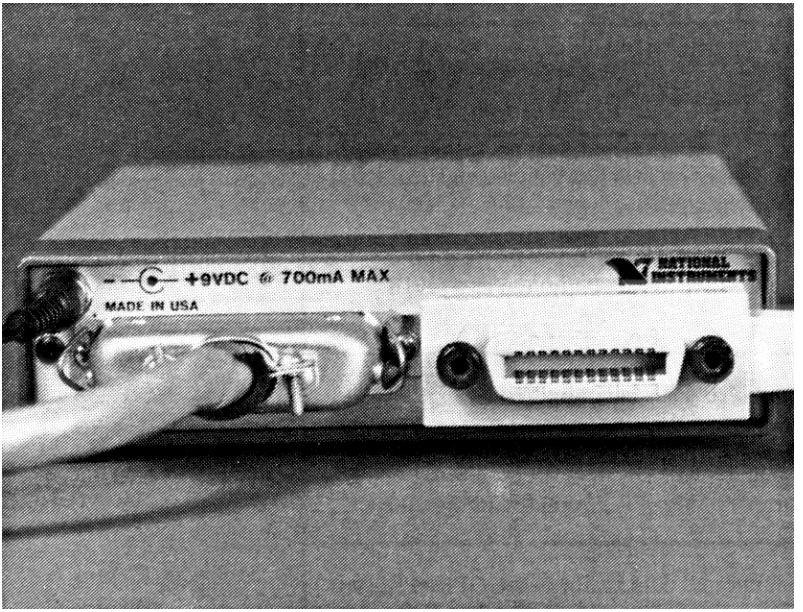

Figure 1-3. The GPIB-PRL Rear Panel

The Parallel Connector

The parallel connector is a standard 36-pin shielded AMP Champ female connector with bail-lock clips. The parallel connector will accept standard 36-pin Centronics-style male connectors. A diagram of the parallel connector and the signals supported is shown below (a * suffix indicates that the signal is active low).

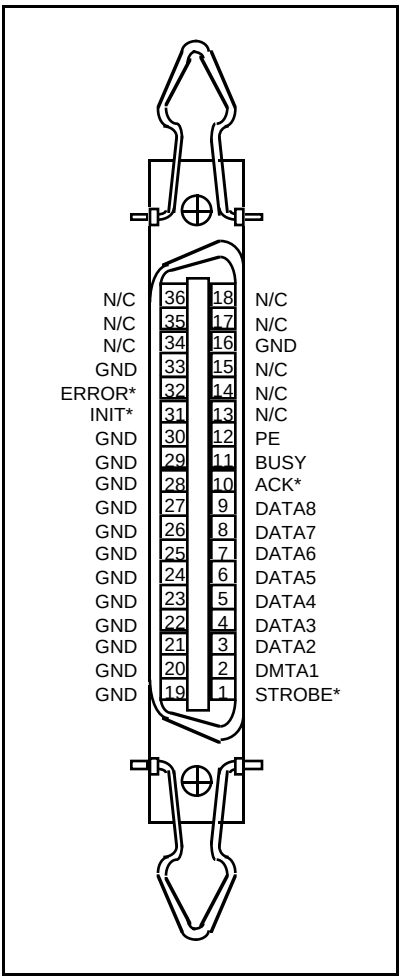

Figure 1-4. The Parallel Connector and Signal Designations

The GPIB Connector

The GPIB connector is a standard 24-pin shielded AMP Champ female connector with metric screwlock hardware. A diagram of the GPIB connector and the signals supported is shown below (a * suffix indicates that the signal is active low).

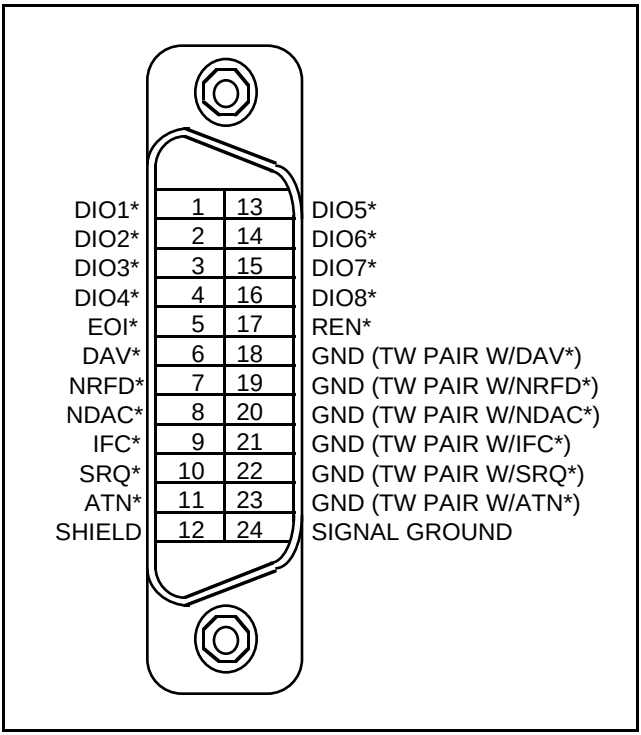

Figure 1-5. The GPIB Connector and Signal Designations

Chapter 2
Installation and Operation

As mentioned in Chapter 1 the GPIB-PRL can transfer data either from the GPIB port to the parallel port or from the parallel port to the GPIB port. The parallel interface supports only unidirectional data transfers so the GPIB-PRL must be configured to source data onto the parallel port or to receive data from the parallel port.

If the parallel port is going to be the source of the data and a GPIB device will be the end recipient of the data (as with a GPIB plotter connected via a GPIB-PRL to the Centronics port on an IBM PC), you will be operating in P (Parallel) mode.

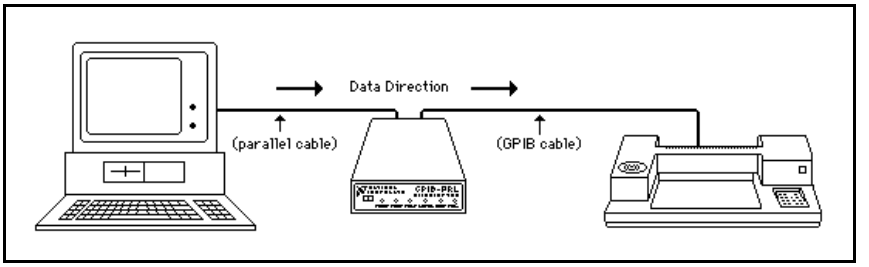

Figure 2-1. Example of P Mode System Setup

If the GPIB port will be the source of the data and a parallel device will be receiving the data (as with a Centronics printer interfaced to the IEEE 488 via a GPIB-PRL), you will be operating in G (GPIB) mode.

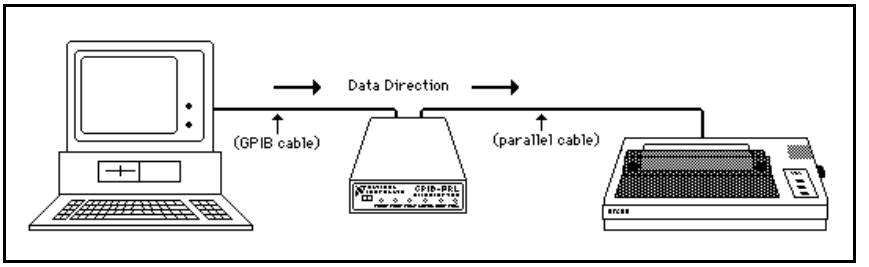

Figure 2-2. Example of G Mode System Setup

Installation

There are five basic steps to installing the GPIB-PRL.

1. Inspect the GPIB-PRL for damage that may have been caused in shipment.
2. Verify the voltage requirement.
3. Configure the operating parameters.
4. Connect the cables.
5. Power on the unit.

These steps are described in more detail in the following sections.

Step 1. Inspection

Before you install the GPIB-PRL, inspect the shipping container and its contents for damage. If damage appears to have been caused in shipment, file a claim with the carrier. Retain the packing material for possible inspection and/or for reshipment.

If the equipment appears to be damaged, do not attempt to operate it. Contact National Instruments for instructions.

Step 2. Verify the Voltage Requirement

The GPIB-PRL is shipped from the factory with either a 115 V or 230 V wall-mount supply. Verify that the voltage on the supply matches the voltage that is supplied in your area.

Caution: ***Operating the unit at any voltage other than the one specified could damage the unit***.

Step 3. Configure the Operating Parameters

The GPIB-PRL is shipped from the factory configured to operate in G mode and set to the GPIB primary address of 5. If you wish to use the GPIB-PRL in P mode or wish to change the GPIB primary address, it is necessary to open the unit and set the configuration switches. To change the configuration switches follow these steps:

1. Disconnect power to the unit and disconnect any cables that may be connected to the unit.

2. Unscrew the two screws on the opposite sides of the rear panel.

3. Grab the rear panel bezel and pull it straight away from the rest of the unit. The card should slide out the back of the enclosure.

4. Locate the configuration DIP switch (U22) on the printed wire board.

5. Set the switches for the desired mode of operation. Refer to *Set Configuration Switches* later in this manual.

   Caution: ***Most of the circuitry in the GPIB-PRL uses advanced CMOS technology and can be damaged by static electricity. Avoid touching any of the components and take any necessary CMOS handling precautions***.

6. Close the unit and reinsert the screws removed in Step 2.

Set Configuration Switches

The DIP switch at location U22 on the printed wire board is used to configure the GPIB-PRL. Figure 2-3 shows the factory default settings.

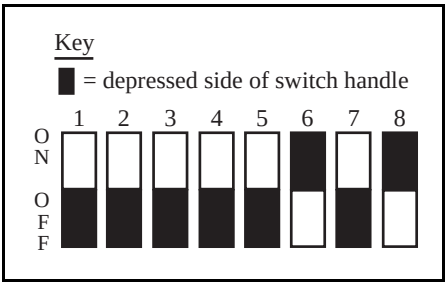

Figure 2-3. Factory Default Settings for Dip Switch U22

Default Settings

In Figure 2-3, switch 1 is in the OFF position; this indicates that the unit is configured to operate in G Mode. Switches 2 and 3 are in the OFF position; this indicates no service request will be generated when the buffer becomes empty. Switches 4 through 8 are in the OFF OFF ON OFF ON positions, respectively; this indicates a GPIB primary address of 5.

Tables 2-1, 2-2, and 2-3 show the possible configurations of the eight switches and what the configurations indicate. Default settings are in shaded rows.

Table 2-1. Configuration Switch Settings for Switch 1

Switch	Position	Indication
1	OFF	Configures the GPIB-PRL to operate in G mode.
	ON	Configures the GPIB-PRL to operate in P mode.

Table 2-2. Configuration Switch Settings for Switches 2 and 3

Switches		Indication	
2	**3**	**G Mode**	**P Mode**
OFF	OFF	No SRQ on empty.	The GPIB-PRL sends out listener address on switches 4 through 8. If switches 4 - 8 are all ON, all possible listener addresses will be sent.
OFF	ON	SRQ on empty.	GPIB-PRL considers switches 4 through 8 to be its talk address.
ON	OFF	Not Used.	No addressing is performed.
ON	ON	Not Used.	Factory use only.

Table 2-3. Configuration Switch Settings for Switches 4 through 8

Switches					Indication
4	**5**	**6**	**7**	**8**	
OFF	OFF	OFF	OFF	OFF	GPIB Primary address 0
OFF	OFF	OFF	OFF	ON	GPIB Primary address 1
OFF	OFF	OFF	ON	OFF	GPIB Primary address 2
OFF	OFF	OFF	ON	ON	GPIB Primary address 3
OFF	OFF	ON	OFF	OFF	GPIB Primary address 4
OFF	OFF	ON	OFF	ON	GPIB Primary address 5
OFF	OFF	ON	ON	OFF	GPIB Primary address 6
OFF	OFF	ON	ON	ON	GPIB Primary address 7
OFF	ON	OFF	OFF	OFF	GPIB Primary address 8
OFF	ON	OFF	OFF	ON	GPIB Primary address 9
OFF	ON	OFF	ON	OFF	GPIB Primary address 10

(continues)

Table 2-3. Configuration Switch Settings for Switches 4 through 8 (continued)

Switches 4	5	6	7	8	Indication
OFF	ON	OFF	ON	ON	GPIB Primary address 11
OFF	ON	ON	OFF	OFF	GPIB Primary address 12
OFF	ON	ON	OFF	ON	GPIB Primary address 13
OFF	ON	ON	ON	OFF	GPIB Primary address 14
OFF	ON	ON	ON	ON	GPIB Primary address 15
ON	OFF	OFF	OFF	OFF	GPIB Primary address 16
ON	OFF	OFF	OFF	ON	GPIB Primary address 17
ON	OFF	OFF	ON	OFF	GPIB Primary address 18
ON	OFF	OFF	ON	ON	GPIB Primary address 19
ON	OFF	ON	OFF	OFF	GPIB Primary address 20
ON	OFF	ON	OFF	ON	GPIB Primary address 21
ON	OFF	ON	ON	OFF	GPIB Primary address 22
ON	OFF	ON	ON	ON	GPIB Primary address 23
ON	ON	OFF	OFF	OFF	GPIB Primary address 24
ON	ON	OFF	OFF	ON	GPIB Primary address 25
ON	ON	OFF	ON	OFF	GPIB Primary address 26
ON	ON	OFF	ON	ON	GPIB Primary address 27
ON	ON	ON	OFF	OFF	GPIB Primary address 28
ON	ON	ON	OFF	ON	GPIB Primary address 29
ON	ON	ON	ON	OFF	GPIB Primary address 30
ON	ON	ON	ON	ON	Sets listen-only mode (G mode) or sends out possible Listener addresses (P mode)

Step 4. Connect the Cables

The cables should be connected in the following order to ensure proper connection:

1. Connect the parallel cable to the GPIB-PRL and close the bail-lock clips. Connect the other end of the cable to your parallel device. Be sure to use only shielded parallel cable.

2. Connect the GPIB cable to the GPIB-PRL and tighten the thumb screws on the connector. Connect the other end to your GPIB system. Be sure to obey all IEEE 488 cabling restrictions, and use shielded GPIB cable.

3. Connect the power jack of the wall-mount power supply to the power receptacle on the back panel of the GPIB-PRL, then plug the supply into an AC outlet of the correct voltage.

Note: ***To disconnect the cables, remove the GPIB cable before removing the parallel cable so that the bail-lock clips can be unlocked***.

Step 5. Power on the Unit

Power on your GPIB-PRL by using the front panel rocker switch. The POWER LED should come on immediately and the READY indicator should come on after the GPIB-PRL has passed its power-on self-test indicating the unit is ready for operation.

If the READY indicator 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 light still fails to come on, contact National Instruments.

Operation

The GPIB-PRL is now ready to operate. All characters sent to the unit will be received at full speed and stored in the internal data buffer. The characters will be sent to the receiving device at the rate of the receiving device.

If using the GPIB-PRL in P mode, turn on the GPIB instrument before turning on the GPIB-PRL and be sure the configuration switches are set correctly. Simply send data to your parallel port as you would if you had a parallel device connected to it and the data will be converted and sent to the GPIB instrument. If you are using a standard software package, such as a word

processor with printing capabilities, the program will typically send the data automatically to the parallel port when printing is selected.

If using the GPIB-PRL in G mode, simply address the GPIB-PRL to listen (if not in listen-only mode) and send the desired data to the interface. The data will be received and passed along automatically to the device connected to the parallel port.

Chapter 3
Technical Information

The GPIB-PRL is actually a powerful 8-bit microcomputer tailored for use as an IEEE-488-to-parallel protocol converter. The unit's operating system is contained in Read Only Memory (ROM) and can address up to 256 KB of dynamic RAM. The GPIB-PRL microprocessor contains an integrated Direct Memory Access (DMA) controller for high-speed data transfers from the GPIB circuitry. The processor also contains an integrated memory management unit, a dynamic RAM controller, a clock generator, a programmable timer unit, and an interrupt controller.

The parallel port on the GPIB-PRL has been designed to source data onto the parallel bus or to receive data from the parallel port (switch selectable). All GPIB functionality is provided by an LSI GPIB controller chip which is programmed and maintained by the operating system. Both the parallel port and GPIB port are interrupt driven and feature extremely fast response times to external data transfers. For more information on how the individual modes of operation work, refer to the following sections.

G Mode Operation

When operating in G mode, the GPIB-PRL accepts data from the GPIB port using the onboard DMA controller. The DMA controller transfers the data directly to the memory buffer without processor intervention. This allows for very high-speed GPIB transfer rates – as high as 900 kbytes/s. This means that the GPIB system performance will not be degraded by interfacing a "slow" printer or plotter to the interface.

The buffered data is then dumped to the device on the parallel interface at its own rate. These two asynchronous events take place concurrently and without user interaction. All operations are completely transparent to the user.

If very large amounts of data are sent to the GPIB-PRL (greater than the amount of RAM in the system) and the parallel device is a very slow data acceptor, the GPIB-PRL internal data buffer might become full. In the unlikely event that this does occur, the FULL indicator on the front panel will illuminate and the GPIB transfer rate will slow to approximately the same rate as the parallel device accepting the data. Since the maximum data transfer rate on the GPIB is only as fast as the slowest listener, the

GPIB system performance may become unacceptable if other GPIB devices are required to transfer data on the bus.

To alleviate this problem, the GPIB-PRL has been designed with a special SRQ-ON-EMPTY feature which can be enabled by setting the internal configuration switches. If maximum GPIB performance is required at all times this feature can be enabled and the GPIB-PRL will request service from the GPIB Controller when its buffer is empty (indicating it is ready for more data). The Controller can then determine the status of the GPIB-PRL buffer by performing a serial poll and analyzing the response byte. If the Controller observes that the GPIB-PRL buffer is empty, it can then send data (up to the buffer size) to the GPIB-PRL and send the Unlisten command to the GPIB-PRL so the GPIB can be used by other devices.

If the GPIB-PRL is serial polled, its response byte will depend on the status of the internal data buffer. If the buffer is empty, a 41 hex will be returned as the status byte. If the buffer is not empty, a 0 will be returned.

The GPIB-PRL will accept data at the GPIB address specified by the configuration switches. The GPIB-PRL also has the ability to be configured as a listen-only device if all GPIB address switches are set to ON. In this mode, no addressing is required to make the GPIB-PRL a GPIB listener and it cannot be unaddressed to listen. All data transferred on the GPIB will be accepted by the GPIB-PRL and output to the parallel port (even if the data was intended for another device). This scheme could be used to monitor all GPIB data bus activity.

Note: ***When the GPIB-PRL is configured as a listen-only device, it may not be serial polled.***

If the GPIB-PRL receives the universal Device CLear (DCL) command or its listen address and the Selected Device Clear (SDC) command, the GPIB-PRL will clear its internal data buffer and reset to its power-up state. The GPIB-PRL will also pulse the parallel port signal INIT* so that the parallel device will be initialized.

In G mode, the GPIB-PRL may act only as a GPIB Listener. The GPIB-PRL should not be passed control. If it is, the GPIB circuitry in the GPIB-PRL will accept control and immediately assert ATN*. This is an error condition which may lock up your system and, therefore, should be avoided. Neither Trigger nor Go To Local has any effect on the GPIB-PRL.

The interface signal descriptions and timing relationships for the G mode parallel port signals are shown in the following table.

G Mode Parallel Interface

Signal Pin	Return Pin	Signal	Direction	Description
1	19	**STROBE***	OUT	The STROBE* pulse is used to signal that data on the bus is valid. Pulse width will be greater than 0.5 µsec.
2	20	**DATA1**	OUT	These signals represent the data byte being transferred. Each signal is at a HIGH level when data is a logical 1 and a LOW level when data is a logical 0. DATA1 is the lowest order bit and DATA8 is the highest order bit. The data will be stable on the bus at least 0.5 µsec before STROBE* is asserted and will remain on the bus at least 0.5 µsec after STROBE*is unasserted.
3	21	**DATA2**	OUT	
4	21	**DATA3**	OUT	
5	23	**DATA4**	OUT	
6	24	**DATA5**	OUT	
7	25	**DATA6**	OUT	
8	26	**DATA7**	OUT	
9	27	**DATA8**	OUT	
10	28	**ACKNLG***	IN	Indicates that the data has been received by the parallel device. This signal should be active at least 0.5 µsec.
19-30	-	**GND**	-	Twisted-pair ground return lines for signals on pins 1-10.
31	-	**INIT***	OUT	Asserted when the GPIB-PRL receives either a universal device clear (DCL) or its listen address and a selected device clear (SDC). This signal will be asserted for approximately 100 µsec.
33	-	**GND**	-	Same as for pins 19-30.

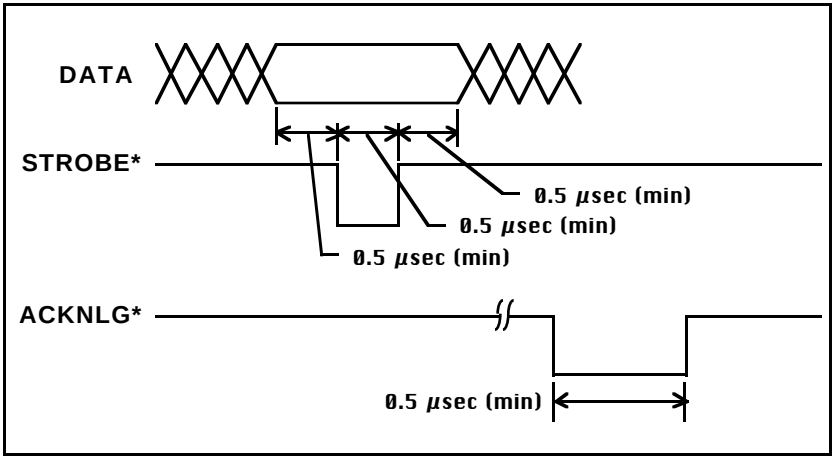

Figure 3-1. G Mode Parallel Interface Timing

P Mode Operation

P mode operation is similar to G mode operation except that the data is input from the parallel port and output to the GPIB port. The incoming data is stored in the internal data buffer until it is accepted by the GPIB device. The GPIB functionality implemented in P Mode is the ability to address a GPIB device to listen, the ability to talk and send data, and the ability to assert IFC* and to send the device clear command.

Upon power-on, the GPIB-PRL will read the status of the configuration switches and initialize the system. If switch 3 is OFF, the GPIB-PRL will be the System Controller and will assert IFC* for 500 µsec. The action of asserting IFC* for at least 100 µsec initializes the GPIB and makes the System Controller Controller-In-Charge (CIC). If switch 2 is also OFF, the GPIB-PRL will then send the GPIB listen address on switches 4-8. Switches 4-8 set the GPIB address configuration. If switches 4-8 are on, all 30 possible listen addresses are sent. This is useful if you do not know or do not care what your GPIB device's primary address is. By sending all possible listen addresses, the GPIB-PRL is sure to send out the one your instrument is expecting. This could also be used in a scheme where you have more than one printer or plotter of the same type producing multiple copies of a document or drawing. The GPIB-PRL will always assert REN* when addressing other devices.

If switch 2 is ON and switch 3 is OFF, the GPIB-PRL will not send out a listen address but will be the System Controller and will assert IFC*. This mode can be used if the GPIB-PRL is connected to a listen-only device which does not require addressing. In the above mentioned modes the GPIB-PRL will be programmed as a talk-only device.

If switch 2 is OFF and switch 3 is ON, the GPIB address on the switch will be considered the GPIB-PRL *talk* address. In this mode the GPIB-PRL will not be the System Controller and it does not have the ability to address itself or any other GPIB device. There must be a GPIB controller on the bus which will address the GPIB-PRL to talk and another GPIB device to listen.

If the parallel port signal INIT* is asserted, it will cause the GPIB-PRL to clear its internal buffer. Also, either the SDC or DCL command (mode dependent) will be sent over the GPIB to initialize the GPIB device.

The interface signal descriptions and timing relationships for the parallel port while in P Mode are shown in the following table.

P Mode Parallel Interface

Signal Pin	Return Pin	Signal	Direction	Description
1	19	**STROBE***	IN	The STROBE* pulse tells the GPIB-PRL that the data on the bus is valid. The GPIB-PRL will read the data in on the rising edge of STROBE*. The STROBE* signal should be asserted for at least 0.5 µsec.
2	20	**DATA1**	IN	These signals represent the data byte being transferred. Each signal is at a HIGH level when data is a logical 1 and a LOW level when data is a logical 0. DATA1 is the lowest order bit and DATA8 is the highest order bit. This data should be stable on the bus at least 0.5 µsec before STROBE* is asserted and should remain on the bus at least 0.5 µsec after STROBE* is unasserted.
3	21	**DATA2**	IN	
4	22	**DATA3**	IN	
5	23	**DATA4**	IN	
6	24	**DATA5**	IN	
7	25	**DATA6**	IN	
8	26	**DATA7**	IN	
9	27	**DATA8**	IN	
10	28	**ACKNLG***	OUT	Indicates that the data has been received by the GPIB-PRL and it is ready to accept more data. ACKNLG* will be asserted for a minimum of 10 µsec.
11	29	**BUSY**	OUT	A HIGH signal indicates that the GPIB-PRL is busy and cannot accept more data. BUSY will be high when a byte has been sent to the GPIB-PRL but has not yet been accepted.
19-30	-	**GND**	-	Twisted-pair ground return lines for signals on pins 1-11.

Signal Pin	Return Pin	Signal	Direction	Description
31	-	**INIT***	IN	When this signal is asserted, the GPIB-PRL will be reset to its power-up state and its internal buffer is cleared. The DCL or SDL command will be sent to the GPIB device. INIT* should be asserted for a minimum of 50 µsec.
33	-	**GND**	-	Same as for pins 19-30.

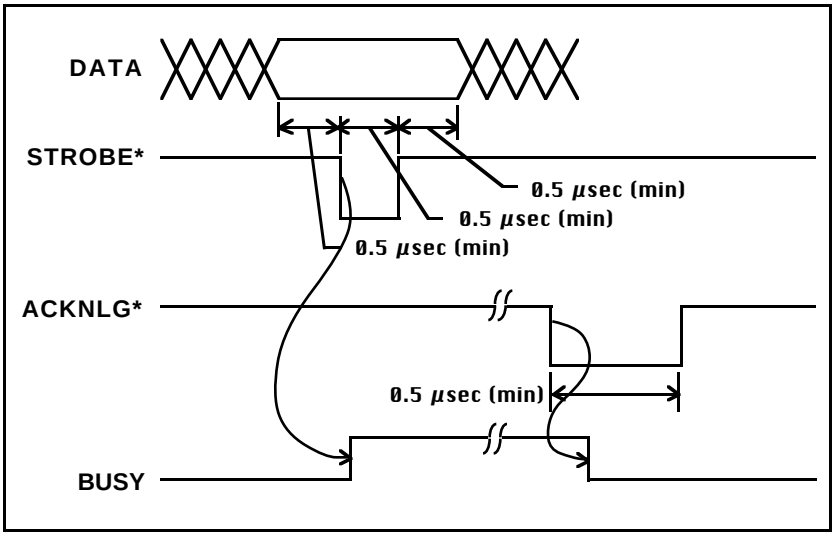

Figure 3-2. P Mode Parallel Interface Timing

Appendix A
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
(800) 433-3488 (toll-free U.S. and Canada)
Technical Support fax: (512) 794-5678

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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 65 33 00	1 48 65 19 07
Germany	089 7 14 50 93	089 7 14 60 35
Italy	02 48301892	02 48301915
Japan	03 3788 1921	03 3788 1923
Netherlands	01720 45761	01720 42140
Norway	03 846866	03 846860
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 27 00 20	056 27 00 25
U.K.	0635 523545	0635 523154
	or 0800 289877 (in U.K. only)	

Technical Support Form

Technical support is available at any time by fax. Include the information from your configuration form. Use 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 _____

(continues)

The problem is _____

List any error messages _____

The following steps will reproduce the problem _____

Hardware Configuration Form

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

National Instruments Products

- GPIB-PRL Revision _____
- Switch Settings:

  _____

Other Products

- Computer Make and Model _____
- Microprocessor _____
- Clock Frequency _____
- Type of Monitor Card Installed _____
- Application Programming Language (BASIC, C, Pascal, and so on)

  _____

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: **GPIB-PRL User Manual**

Edition Date: **November 1993**

Part Number: **320090-01**

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.

_____

_____

_____

_____

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_____

Thank you for your help.

Name _____

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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
C	Celsius
CMOS	complementary metal-oxide semiconductor
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
KB	kilobytes of memory
LED	light-emitting diode
m	meters
MB	megabytes of memory
s	seconds
VAC	volts alternating current
VDC	volts direct current