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GPIB

GPIB-120B User Manual

April 2010
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While this hardware is compliant with the applicable regulatory EMC requirements, there is no guarantee that interference will not occur in a particular installation. To minimize the potential for the hardware to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this hardware in strict accordance with the instructions in the hardware documentation and the DoC[1].

If this hardware does cause interference with licensed radio communications services or other nearby electronics, which can be determined by turning the hardware off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver (the device suffering interference).
- Relocate the transmitter (the device generating interference) with respect to the receiver.
- Plug the transmitter into a different outlet so that the transmitter and the receiver are on different branch circuits.

Some hardware may require the use of a metal, shielded enclosure (windowless version) to meet the EMC requirements for special EMC environments such as, for marine use or in heavy industrial areas. Refer to the hardware's user documentation and the DoC[1] for product installation requirements.

When the hardware is connected to a test object or to test leads, the system may become more sensitive to disturbances or may cause interference in the local electromagnetic environment.

Operation of this hardware in a residential area is likely to cause harmful interference. Users are required to correct the interference at their own expense or cease operation of the hardware.

Changes or modifications not expressly approved by National Instruments could void the user's right to operate the hardware under the local regulatory rules.

[1] The Declaration of Conformity (DoC) contains important EMC compliance information and instructions for the user or installer. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Contents

About This Manual

This manual describes how to install, configure, and operate the National Instruments GPIB-120B.

Conventions

The following conventions appear in this manual:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
	This icon denotes a note, which alerts you to important information.
bold	Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
GPIB-120B	GPIB-120B refers to a National Instruments GPIB isolator/expander that expands and isolates the GPIB up to a maximum of 2500 VDC.
IEEE 488 and IEEE 488.2	*IEEE 488* and *IEEE 488.2* refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1992, respectively, which define the GPIB.
italic	Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

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 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*

1

Introduction

This chapter contains a description of the GPIB-120B, lists what you need to get started and optional equipment you can order, and explains how to unpack the GPIB-120B.

Description of the GPIB-120B

The GPIB-120B is a high-speed bus isolator/expander with the following features:

- It is transparent to user software.
- It electrically isolates two GPIB systems from each other and from the power supply.
- It expands the GPIB to interface up to 28 devices.
- It extends the GPIB by effectively doubling the 20 m cable limit.
- It has optional rack or din-rail mount hardware accessories.

The high-speed GPIB-120B bus isolator/expander connects two GPIB (IEEE 488) bus systems in a functionally transparent manner.

The two bus systems are electrically isolated from each other. The two bus systems are also isolated from the power supply. Isolation is maintained up to 2500 VDC (withstand 5 s). Isolating an instrument or group of instruments from an IEEE 488 bus Controller can eliminate ground loop noise and induced common-mode noise, which may cause measurement problems in both analog and digital systems. The two isolated bus systems are physically separate, as shown in Figure 1-1; however, the devices logically appear to be located on the same bus, as shown in Figure 1-2.

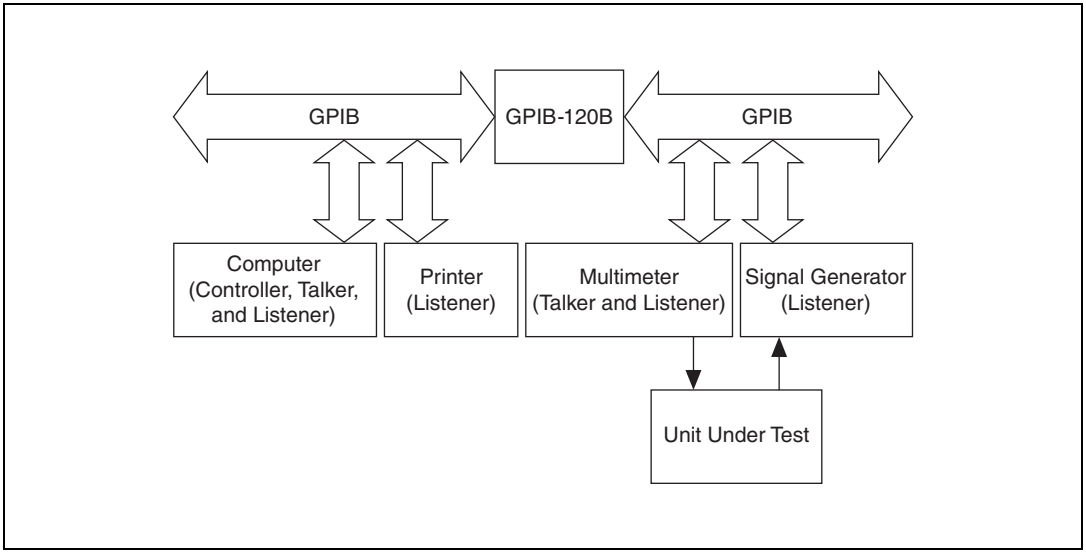

Figure 1-1. Typical GPIB-120B Expansion System (Physical Configuration)

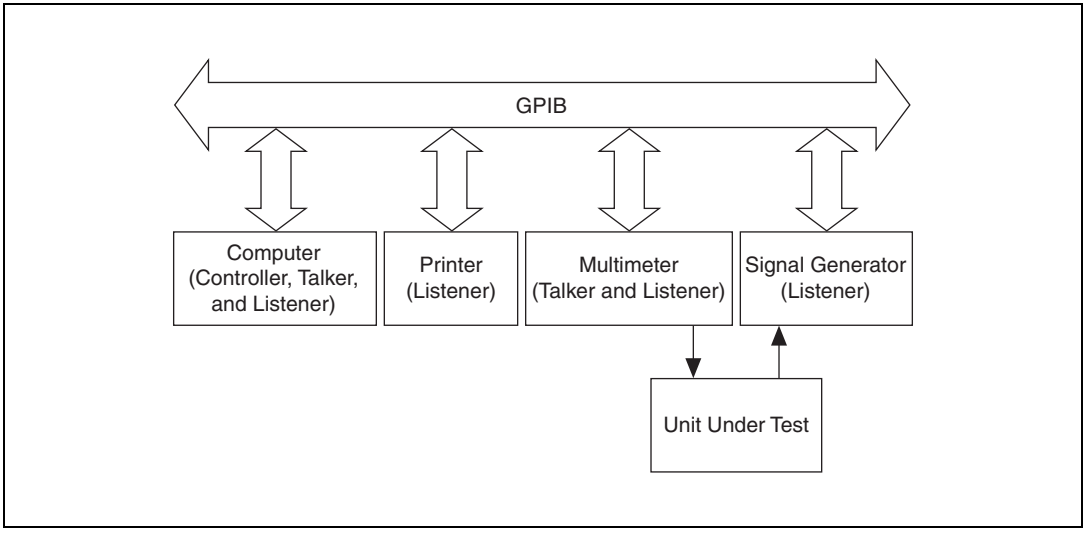

Figure 1-2. Typical GPIB-120B Expansion System (Logical Configuration)

With the GPIB-120B, it is possible to overcome the following two configuration restrictions imposed by the ANSI/IEEE Standard 488.1-1987:

- An electrical loading limit of 15 devices per contiguous bus.
- A cable length limit of 20 m total per contiguous bus or 2 m times the number of devices on the bus, whichever is smaller.

With each GPIB-120B, you can add up to 14 additional devices to the bus. The GPIB-120B appears as a device load on each side of the expansion; therefore, one GPIB-120B increases the maximum load limit from 15 devices to 28 devices. The cable length limit for the system is also increased an additional 4 m to 20 m, depending on the number of devices on that side of the expansion.

All signal expansion is bidirectional, meaning that Controllers, Talkers, and Listeners can be on either side of the expander. The GPIB-120B light-emitting diodes (LEDs) indicate the location of the System Controller, Active Controller, and Source Handshaker, with respect to the two sides of the expansion.

Because the GPIB-120B is a functionally transparent expander, the same GPIB communications and control programs that work with an unexpanded system can work unmodified with an expanded system.

What You Need to Get Started

- ❑ GPIB-120B
- ❑ 10–18 VDC 9 W power supply
- ❑ Standard GPIB cables to connect both sides of the GPIB-120B to buses on either side

Optional Equipment

You can contact National Instruments to order any of the following optional equipment.

- Rack-mount kit (part number 194906-01, shown in Figure 1-3)

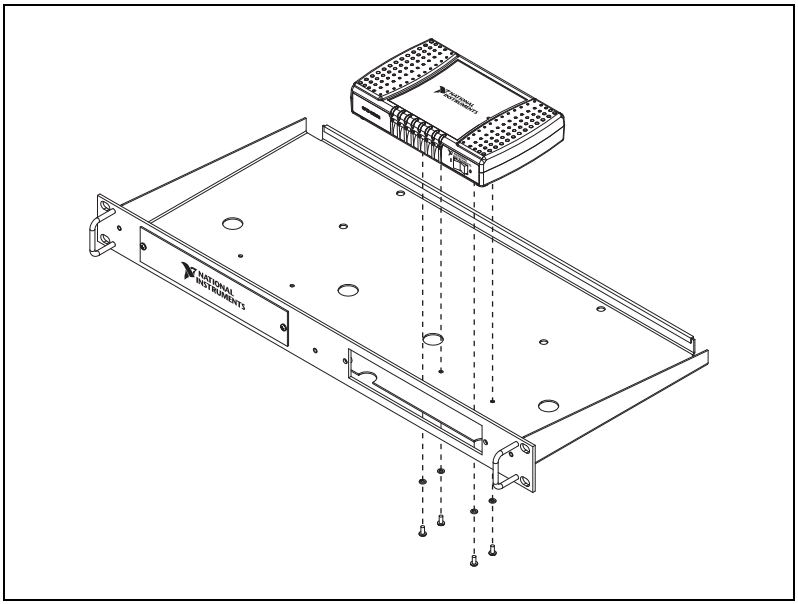

Figure 1-3. Rack Mount Kit

- DIN rail mount kit (part number 779689-01, shown in Figure 1-4)

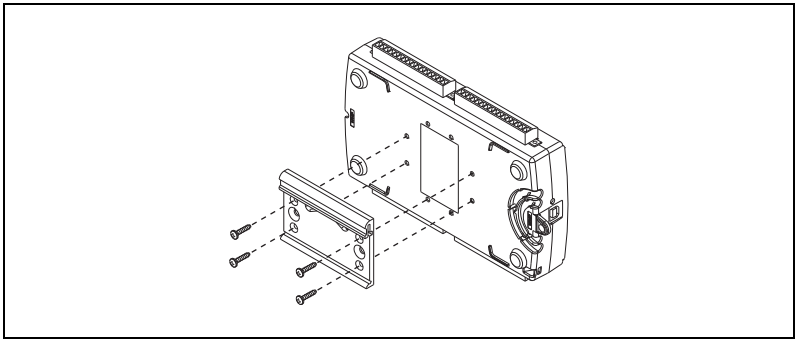

Figure 1-4. DIN Rail Mount Kit

- Shielded GPIB cables[1]
  - Type X2 double-shielded GPIB cables (1 m, 2 m, or 4 m)

Unpacking Your GPIB-120B

Follow these steps when unpacking your GPIB-120B.

1. Verify that the package you received contains the following.
   - GPIB-120B Isolator/Expander
   - 12 VDC power supply
   - Power cord appropriate for your location
2. Inspect the shipping container and contents for damage. If the container is damaged, and the damage appears to have been caused in shipment, file a claim with the carrier. If the equipment is damaged, do not attempt to operate it. Contact National Instruments for instructions. Retain the shipping material for possible inspection by carrier or reshipment of the equipment.
3. Verify that the voltage you will be using is in the input range of your power adapter. The GPIB-120B ships with a power adapter capable of working with an input AC voltage between 100 V and 240 V. This adapter provides 12 VDC to the GPIB-120B. This adapter can be replaced as long as the replacement provides the GPIB-120B with a DC voltage between 10 VDC and 18 VDC. and has appropriate safety certification marks for country of use. Refer to Appendix C, *Specifications*, for more information.

[1] To meet FCC emission limits for this Class A device, you must use a shielded GPIB cable. Operating this equipment with a non-shielded cable may cause interference to radio and television reception in commercial areas.

2

Hardware Overview

This chapter describes your GPIB isolator/expander.

GPIB-120B LEDs

The GPIB-120B has seven light-emitting diodes (LEDs). The POWER LED on the left side of the isolator/expander is lit whenever you power on the GPIB-120B.

For each bus, an LED indicates the status of the System Controller, Active Controller, or Source Handshake state, as shown in Figure 2-1. LEDs associated with Bus A are green, while those associated with Bus B are amber.

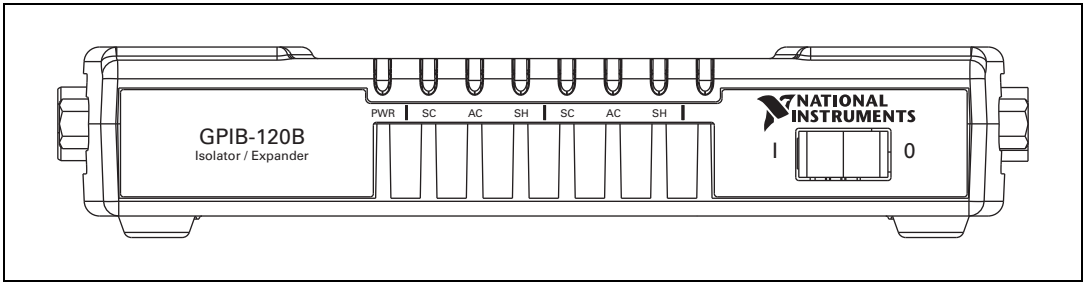

Figure 2-1. Front View GPIB-120B

Power On (PWR)

When you power on the GPIB-120B, all circuitry is cleared to an initialized state. The isolation/expansion system is fully operational when you power on the GPIB-120B and your instruments are connected. Where there is GPIB activity, it is recommended that you keep at least two-thirds of the devices on both buses powered on.

System Controller Detection (SC)

After you power on, Bus A and Bus B System Controller states are false. If a GPIB device on Bus A asserts IFC or REN, the Bus A System Controller state becomes true, and the Bus B System Controller state becomes false.

If a GPIB device on Bus B asserts IFC or REN, the Bus B System Controller state becomes true and the Bus A System Controller state becomes false.

Active Controller Detection (AC)

After you power on, Bus A and Bus B Active Controller states are false. If a GPIB device on Bus A asserts ATN, the Bus A Active Controller state becomes true and the Bus B Active Controller state becomes false.

If a GPIB device on Bus B asserts ATN, the Bus B Active Controller state becomes true and the Bus A Active Controller state becomes false.

Source Handshake Detection (SH)

A device is considered a source handshaker if it is an active Controller sourcing command bytes or if it is a Talker sourcing data bytes.

After you power on, Bus A and Bus B Source Handshake states are false.

If a GPIB device on Bus A asserts DAV, the Bus A Source Handshake state becomes true and the Bus B Source Handshake state becomes false.

If a GPIB device on Bus B asserts DAV, the Bus B Source Handshake state becomes true and the Bus A Source Handshake state becomes false.

Data Transfer Modes

The GPIB-120B isolator/expander has two data transfer modes—unbuffered mode and buffered mode. The data transfer mode determines how data is transmitted across the expansion. The switch on the back of the GPIB-120B sets the operation mode of the GPIB isolator/expander. The default switch setting is for unbuffered transfer mode.

Selecting a Data Transfer Mode

To select a data transfer mode, refer to the following descriptions of each mode.

Unbuffered Mode

In unbuffered mode, each data byte is transmitted using the GPIB double-interlocked handshaking protocol. For long data streams, transfers are slower than transfers using buffered mode. However, the GPIB isolator/expander is transparent in unbuffered mode.

Buffered Mode

In buffered mode, the GPIB isolator/expander uses FIFO (first-in-first-out) buffers to buffer data between the remote and local sides of the isolation barrier. For long data streams, the data throughput is much higher than with unbuffered mode.

However, a few applications may not operate properly in buffered mode. For example, a GPIB device on the local side of the isolator/expander is addressed to talk, another device on the remote side is addressed to listen. When the Talker sources data bytes, the GPIB isolator/expander accepts the data bytes and stores them in a FIFO buffer. At the same time, the GPIB isolator/expander reads data from the FIFO buffer and sources data bytes to the Listener. If the FIFO buffer contains data, the number of bytes sourced by the Talker differs from the number of bytes accepted by the Listener. Therefore, there could be situations in which the talker will assume the listener has accepted data which the listener has not yet received because it is still in the FIFO buffer. If this situation is unacceptable for your application, you must use unbuffered mode, in which the 3-wire interlocked behavior of GPIB is maintained.

Buffered mode applies only to data transfers. GPIB command bytes are not stored in the FIFO buffers; they are transmitted using the GPIB double-interlocked handshaking protocol.

Setting the Data Transfer Mode

To use buffered mode, set the switch to the ON position, as shown in Figure 2-2. To use unbuffered mode, set the switch to the OFF position.

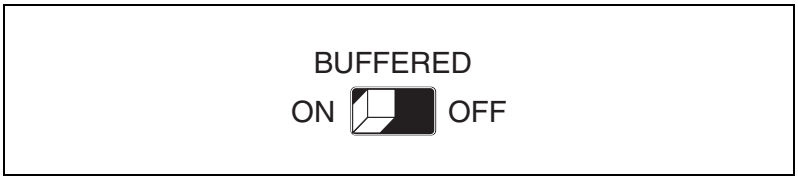

Figure 2-2. Switch Setting for Buffered Mode

Note The placement of the switch to select buffered or unbuffered mode is recessed to avoid unintentional toggling during operation of the GPIB-120B. To flip the switch, a flathead screwdriver or similar tool may be required.

Verify that the switch on your GPIB isolator/expander is in the desired position before powering on the unit.

Data Direction Control

Bus B sends the data lines to Bus A if the Bus B Source Handshake state is true or if a Controller on Bus A is conducting a parallel poll.

Bus A sends the data lines to Bus B if the Bus A Source Handshake state is true or if a Controller on Bus B is conducting a parallel poll.

Parallel Poll Detection

Controllers can conduct parallel polls on Bus A or Bus B, and devices on both Bus A and Bus B can respond to parallel polls.

If a Controller on Bus A conducts a parallel poll, the parallel poll detection circuitry on side B conducts a parallel poll on Bus B. The result of the parallel poll is driven on the data lines of Bus A.

If a Controller on Bus B conducts a parallel poll, the parallel poll detection circuitry on side A conducts a parallel poll on Bus A. The result of the parallel poll is driven on the data lines of Bus B.

Refer to the *Parallel Poll Operation* section in this chapter for important information about conducting parallel polls with the GPIB-120B.

Parallel Poll Operation

According to IEEE 488, devices must respond to a parallel poll within 200 ns after the Controller-In-Charge (CIC) asserts the Identify (IDY) message—Attention (ATN) and End or Identify (EOI). The CIC waits at least 2 µs before reading the Parallel Poll Response (PPR). In some cases, a remote device on an expanded system cannot respond to parallel polls this quickly because of propagation delays across the expander and the longer cables.

When the GPIB-120B notices that a GPIB controller is conducting a parallel poll, it sends a message to the secondary side to initiate a parallel poll. The parallel poll on the secondary side is of the same duration as the poll on the primary side, but delayed by the time it takes to get the message to the secondary side. In the GPIB-120B this time is approximately 400 ns. When the poll on the primary side finishes, a message is sent to finish it on the secondary side, where the poll finishes about 400 ns later. Therefore, if the secondary side of the GPIB-120B waited until the end of its parallel poll to send the result of the poll to the primary side, it would be after the primary side poll has ended. Thus the controller would miss the responses of the devices on the secondary side.

To solve this problem, the secondary side of the GPIB-120B samples the state of the bus every 600 ns during parallel polls and sends that data back to the primary side. Therefore, taking the start of the poll on the primary side as time 0, the state of the secondary bus is sent to the primary side at times 600 ns, 1200 ns, 1800 ns and so on, and again when the poll actually ends.

For slow devices or topologies in which a device on the secondary bus responds to the parallel poll after the last data packet was sent to the primary side, the controller would miss the response from this device. If you encounter this situation, you must configure your controller to conduct parallel polls longer than 2 µs.

3

Configuring and Using Your Hardware

This chapter describes how to configure and use your GPIB-120B.

Connecting the GPIB-120B

To connect the GPIB-120B, follow the steps below.

1. Make sure that the power switch on the isolator/expander is in the off (0) position.
2. Plug the utility power cord of your 12 VDC power supply into an acceptable electrical outlet (100–240 VAC). Plug the other end of the power cord into the power supply. Connect the 12 VDC output of the power supply into the rear panel of the GPIB-120B.
3. Link your GPIB instrument(s), board(s), and other device(s) to the GPIB-120B with appropriate cables.
4. Verify that the switch is in the data transfer mode required for your application. Refer to the *Setting the Data Transfer Mode* section in Chapter 2, *Hardware Overview*.
5. Move the power switch to the on (1) position.

A

GPIB Basics

This appendix describes the basic concepts of GPIB, including its physical and electrical characteristics, and configuration requirements.

The ANSI/IEEE Standard 488.1-1987, also known as General Purpose Interface Bus (GPIB), describes a standard interface for communication between instruments and controllers from various vendors. It contains information about electrical, mechanical, and functional specifications. GPIB is a digital, 8-bit parallel communications interface with data transfer rates of 1 Mbyte/s and higher, using a three-wire handshake. The bus supports one System Controller, usually a computer, and up to 14 additional instruments. The ANSI/IEEE Standard 488.2-1992 extends IEEE 488.1 by defining a bus communication protocol, a common set of data codes and formats, and a generic set of common device commands.

Types of Messages

Interconnected GPIB devices communicate by passing messages through the interface system, including device-dependent messages and interface messages.

- Device-dependent messages, also called *data* or *data messages*, contain device-specific information, such as programming instructions, measurement results, machine status, and data files.
- Interface messages, also called *commands* or *command messages*, manage the bus itself. Interface messages initialize the bus, address and unaddress devices, and set device modes for remote or local programming.

  The term *command* as used here does not refer to device instructions, which are also called commands. Those device-specific instructions are data messages.

Talkers, Listeners, and Controllers

GPIB devices can be Talkers, Listeners, or Controllers. A Talker sends out data messages. Listeners receive data messages. The Controller, usually a computer, manages the flow of information on the bus. It defines the communication links and sends GPIB commands to devices.

Some devices are capable of playing more than one role. A digital voltmeter, for example, can be a Talker and a Listener. If your system has a National Instruments GPIB interface and software installed, it can function as a Talker, Listener, and Controller.

The GPIB is like a typical computer bus, except that the typical computer has circuit cards interconnected via a backplane bus, whereas the GPIB has standalone devices interconnected via a cable bus.

The role of the GPIB Controller is similar to the role of the CPU of a computer, but a better analogy is to the switching center of a city telephone system. The switching center (Controller) monitors the communications network (GPIB). When the center (Controller) notices that a party (device) wants to make a call (send a data message), it connects the caller (Talker) to the receiver (Listener).

The Controller addresses a Talker and a Listener before the Talker can send its message to the Listener. After the message is transmitted, the Controller may unaddress both devices.

Some bus configurations do not require a Controller. For example, one device may always be a Talker (called a Talk-only device) and there may be one or more Listen-only devices.

A Controller is necessary when the active or addressed Talker or Listener must be changed. The Controller function is usually handled by a computer.

With the GPIB interface board and its software your personal computer plays all three roles.

- Controller—to manage the GPIB
- Talker—to send data
- Listener—to receive data

Controller-In-Charge and System Controller

You can have multiple Controllers on the GPIB, but only one Controller at a time can be the active Controller, or Controller-In-Charge (CIC). The CIC can be either active or inactive (standby). Control can pass from the current CIC to an idle Controller, but only the System Controller, usually a GPIB interface, can make itself the CIC.

GPIB Signals and Lines

Devices on the bus communicate by sending messages. Signals and lines transfer these messages across the GPIB interface, which consists of 16 signal lines and 8 ground return (shield drain) lines. The 16 signal lines are discussed in the following sections.

Data Lines

Eight data lines, DIO1 through DIO8, carry both data and command messages.

Handshake Lines

Three hardware handshake lines asynchronously control the transfer of message bytes between devices. This process is a three-wire interlocked handshake, and it guarantees that devices send and receive message bytes on the data lines without transmission error. Table A-1 summarizes the GPIB handshake lines.

Table A-1. GPIB Handshake Lines

Line	Description
NRFD (not ready for data)	Listening device is ready/not ready to receive a message byte. Also used by the Talker to signal high-speed GPIB transfers.
NDAC (not data accepted)	Listening device has/has not accepted a message byte.
DAV (data valid)	Talking device indicates signals on data lines are stable (valid) data.

Interface Management Lines

Five hardware lines manage the flow of information across the bus. Table A-2 summarizes the GPIB interface management lines.

Table A-2. GPIB Interface Management Lines

Line	Description
ATN (attention)	Controller drives ATN true when it sends commands and false when it sends data messages.
IFC (interface clear)	System Controller drives the IFC line to initialize the bus and make itself CIC.
REN (remote enable)	System Controller drives the REN line to place devices in remote or local program mode.
SRQ (service request)	Any device can drive the SRQ line to asynchronously request service from the Controller.
EOI (end or identify)	Talker uses the EOI line to mark the end of a data message. Controller uses the EOI line when it conducts a parallel poll.

Physical and Electrical Characteristics

Devices are usually connected with a cable assembly consisting of a shielded 24-conductor cable with both a plug and receptacle connector at each end, as shown in Figure A-1. With this design, you can link devices in a linear configuration, a star configuration, or a combination of the two configurations. Figure A-2 shows the linear and star configurations.

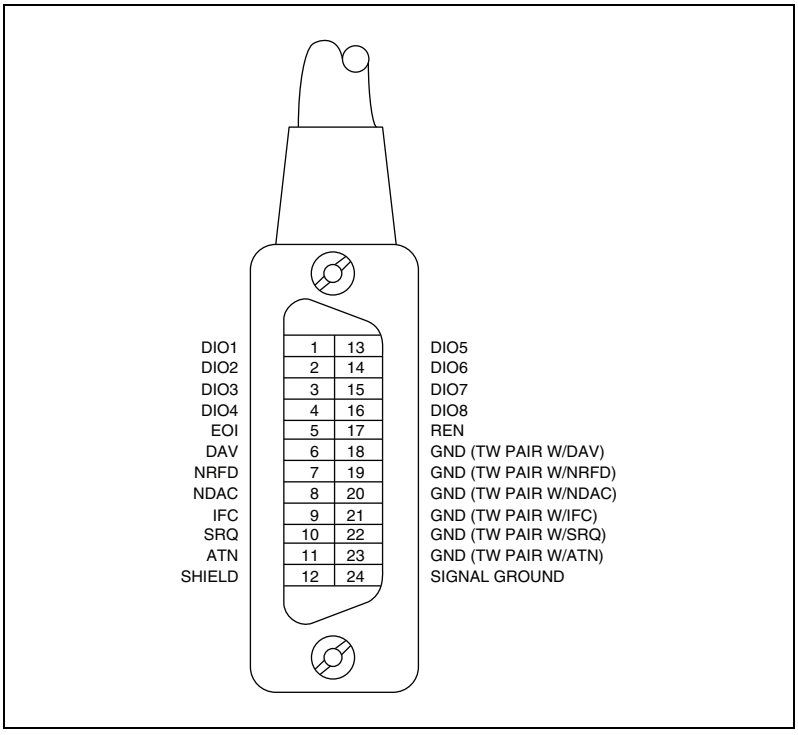

Figure A-1. GPIB Connector and the Signal Assignment

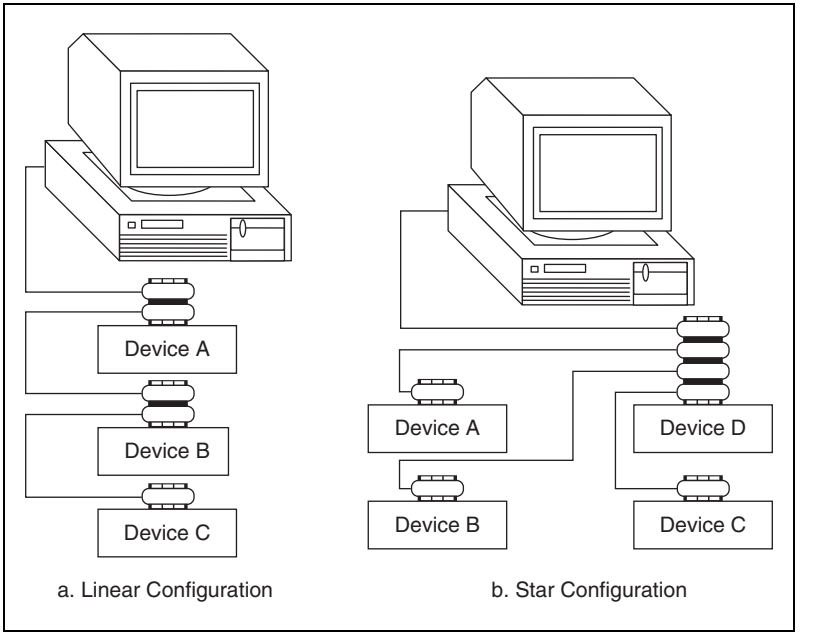

Figure A-2. Linear and Star System Configuration

The standard connector is the Amphenol or Cinch Series 57 *Microribbon* or *Amp Champ* type. For special interconnection applications, use an adapter cable using a non-standard cable and/or connector.

The GPIB uses negative logic with standard TTL (transistor-transistor logic) level. For example, when DAV is true, it is a TTL low level (≤ 0.8 V), and when DAV is false, it is a TTL high level (≥ 2.0 V).

Configuration Requirements

To achieve the high data transfer rate that the GPIB was designed for, you must limit the number of devices on the bus and the physical distance between devices. The following restrictions are typical:

- A maximum separation of 4 m between any two devices and an average separation of 2 m over the entire bus.
- A maximum total cable length of 20 m.
- A maximum of 15 devices connected to each bus, with at least two-thirds powered on.

For high-speed operation, the following restrictions apply:

- All devices in the system must be powered on.
- Cable lengths must be as short as possible with up to a maximum of 15 m of cable for each system.
- There must be at least one equivalent device load per meter of cable.

If you want to exceed these limitations, you can use a bus expander to increase the number of device loads. You can order GPIB-120B bus expanders from National Instruments.

B

Multiline Interface Messages

This appendix lists the multiline interface messages and describes the mnemonics and messages that correspond to the interface functions.

The multiline interface messages are commands defined by the IEEE 488 standard. The messages are sent and received with ATN asserted. The interface functions include initializing the bus, addressing and unaddressing devices, and setting device modes for local or remote programming. For more information about these messages, refer to the ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*.

Table B-1. Multiline Interface Messages

Hex	Dec	ASCII	Message
00	0	NUL	—
01	1	SOH	GTL
02	2	STX	—
03	3	ETX	—
04	4	EOT	SDC
05	5	ENQ	PPC
06	6	ACK	—
07	7	BEL	—
08	8	BS	GET
09	9	HT	TCT
0A	10	LF	—
0B	11	VT	—
0C	12	FF	—
0D	13	CR	—
0E	14	SO	—
0F	15	SI	—
10	16	DLE	—
11	17	DC1	LLO
12	18	DC2	—
13	19	DC3	—
14	20	DC4	DCL
15	21	NAK	PPU
16	22	SYN	—
17	23	ETB	—
18	24	CAN	SPE
19	25	EM	SPD
1A	26	SUB	—
1B	27	ESC	—
1C	28	FS	—
1D	29	GS	—
1E	30	RS	—
1F	31	US	CFE

Hex	Dec	ASCII	Message
20	32	SP	MLA0
21	33	!	MLA1
22	34	"	MLA2
23	35	#	MLA3
24	36	$	MLA4
25	37	%	MLA5
26	38	&	MLA6
27	39	'	MLA7
28	40	(	MLA8
29	41	)	MLA9
2A	42	*	MLA10
2B	43	+	MLA11
2C	44	,	MLA12
2D	45	-	MLA13
2E	46	.	MLA14
2F	47	/	MLA15
30	48	0	MLA16
31	49	1	MLA17
32	50	2	MLA18
33	51	3	MLA19
34	52	4	MLA20
35	53	5	MLA21
36	54	6	MLA22
37	55	7	MLA23
38	56	8	MLA24
39	57	9	MLA25
3A	58	:	MLA26
3B	59	;	MLA27
3C	60	<	MLA28
3D	61	=	MLA29
3E	62	>	MLA30
3F	63	?	UNL

Table B-1. Multiline Interface Messages (Continued)

Hex	Dec	ASCII	Message
40	64	@	MTA0
41	65	A	MTA1
42	66	B	MTA2
43	67	C	MTA3
44	68	D	MTA4
45	69	E	MTA5
46	70	F	MTA6
47	71	G	MTA7
48	72	H	MTA8
49	73	I	MTA9
4A	74	J	MTA10
4B	75	K	MTA11
4C	76	L	MTA12
4D	77	M	MTA13
4E	78	N	MTA14
4F	79	O	MTA15
50	80	P	MTA16
51	81	Q	MTA17
52	82	R	MTA18
53	83	S	MTA19
54	84	T	MTA20
55	85	U	MTA21
56	86	V	MTA22
57	87	W	MTA23
58	88	X	MTA24
59	89	Y	MTA25
5A	90	Z	MTA26
5B	91	[	MTA27
5C	92	\	MTA28
5D	93	]	MTA29
5E	94	^	MTA30
5F	95	_	UNT

Hex	Dec	ASCII	Message
60	96	`	MSA0, PPE
61	97	a	MSA1, PPE, CFG1
62	98	b	MSA2, PPE, CFG2
63	99	c	MSA3, PPE, CFG3
64	100	d	MSA4, PPE, CFG4
65	101	e	MSA5, PPE, CFG5
66	102	f	MSA6, PPE, CFG6
67	103	g	MSA7, PPE, CFG7
68	104	h	MSA8, PPE, CFG8
69	105	i	MSA9, PPE, CFG9
6A	106	j	MSA10, PPE, CFG10
6B	107	k	MSA11, PPE, CFG11
6C	108	l	MSA12, PPE, CFG12
6D	109	m	MSA13, PPE, CFG13
6E	110	n	MSA14, PPE, CFG14
6F	111	o	MSA15, PPE, CFG15
70	112	p	MSA16, PPD
71	113	q	MSA17, PPD
72	114	r	MSA18, PPD
73	115	s	MSA19, PPD
74	116	t	MSA20, PPD
75	117	u	MSA21, PPD
76	118	v	MSA22, PPD
77	119	w	MSA23, PPD
78	120	x	MSA24, PPD
79	121	y	MSA25, PPD
7A	122	z	MSA26, PPD
7B	123	{	MSA27, PPD
7C	124	|	MSA28, PPD
7D	125	}	MSA29, PPD
7E	126	~	MSA30, PPD
7F	127	DEL	—

Multiline Interface Message Definitions			
DCL	Device Clear	PPE	Parallel Poll Enable
GET	Group Execute Trigger	PPU	Parallel Poll Unconfigure
GTL	Go To Local	SDC	Selected Device Clear
LLO	Local Lockout	SPD	Serial Poll Disable
MLA	My Listen Address	SPE	Serial Poll Enable
MSA	My Secondary Address	TCT	Take Control
MTA	My Talk Address	UNL	Unlisten
PPC	Parallel Poll Configure	UNT	Untalk
PPD	Parallel Poll Disable		

C

Specifications

This appendix lists the specifications and characteristics of the GPIB-120B isolator/expander.

System Configuration

Loading per expansion ..... Up to 14 additional devices (28 total devices in the expansion system, not including the GPIB-120B on the bus.)

Multiple expansions ..... Permitted in any combination of star or linear pattern

Performance Characteristics

Maximum transfer rate

- Buffered mode ..... > 1.25 Mbytes/s
- Unbuffered mode ..... > 450 kbytes/s

Interlocked IEEE 488 handshake ..... Maintained across the expansion in unbuffered mode

IEEE 488 capability identification codes

- SH1 ..... Complete Source Handshake
- AH1 ..... Complete Acceptor Handshake
- T5, TE5 ..... Complete Talker
- L3, LE3 ..... Complete Listener
- SR1 ..... Complete Service Request
- RL1 ..... Complete Remote Local
- PP1, 2 ..... Complete Parallel Poll
- DC1 ..... Complete Device Clear
- DT1 ..... Complete Device Trigger
- C1–5 ..... Complete Controller
- E2 ..... Tri-state GPIB driver

Operational Characteristics

Operating modes.....Buffered or unbuffered (interlocked) mode

Electrical Characteristics

GPIB-120B

Isolation

(between ports and between each port and the power supply).....2500 VDC dielectric withstand, 5 s max

Input voltage range.....10–18 VDC

Current consumption @12 V.....300 mA typical
500 mA maximum

Fuse rating and type.....F 2.2 A 125 V, surface mount

12 VDC Power Supply

(shipped with GPIB-120B)

Input voltage range.....100–240 VAC
47–63 Hz

Environment

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree.....2

Indoor use only.

Operating Environment

Ambient temperature range..... 0 to 55 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Note For the GPIB-120B to operate correctly over the entire specified ambient temperature range, stacking the product is not recommended.

Relative humidity range..... 10% to 90%, noncondensing
(Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range..... –20 to 70 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range..... 5% to 95%, noncondensing
(Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

Operational shock..... 30 g peak, half-sine, 11 ms pulse
(Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)

Random vibration

Operating..... 5 to 500 Hz, 0.3 g_{rms}

Nonoperating..... 5 to 500 Hz, 2.4 g_{rms}
(Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Physical Characteristics

Overall dimensions .....6.30 × 3.68 × 1.24 in.
(16.01 × 9.35 × 3.15 cm)

Case material .....PC-ABS plastic

Weight .....8.64 oz (245 g)

GPIB cable.....Type X2 shielded

Figure C-1 shows the GPIB-120B dimensions.

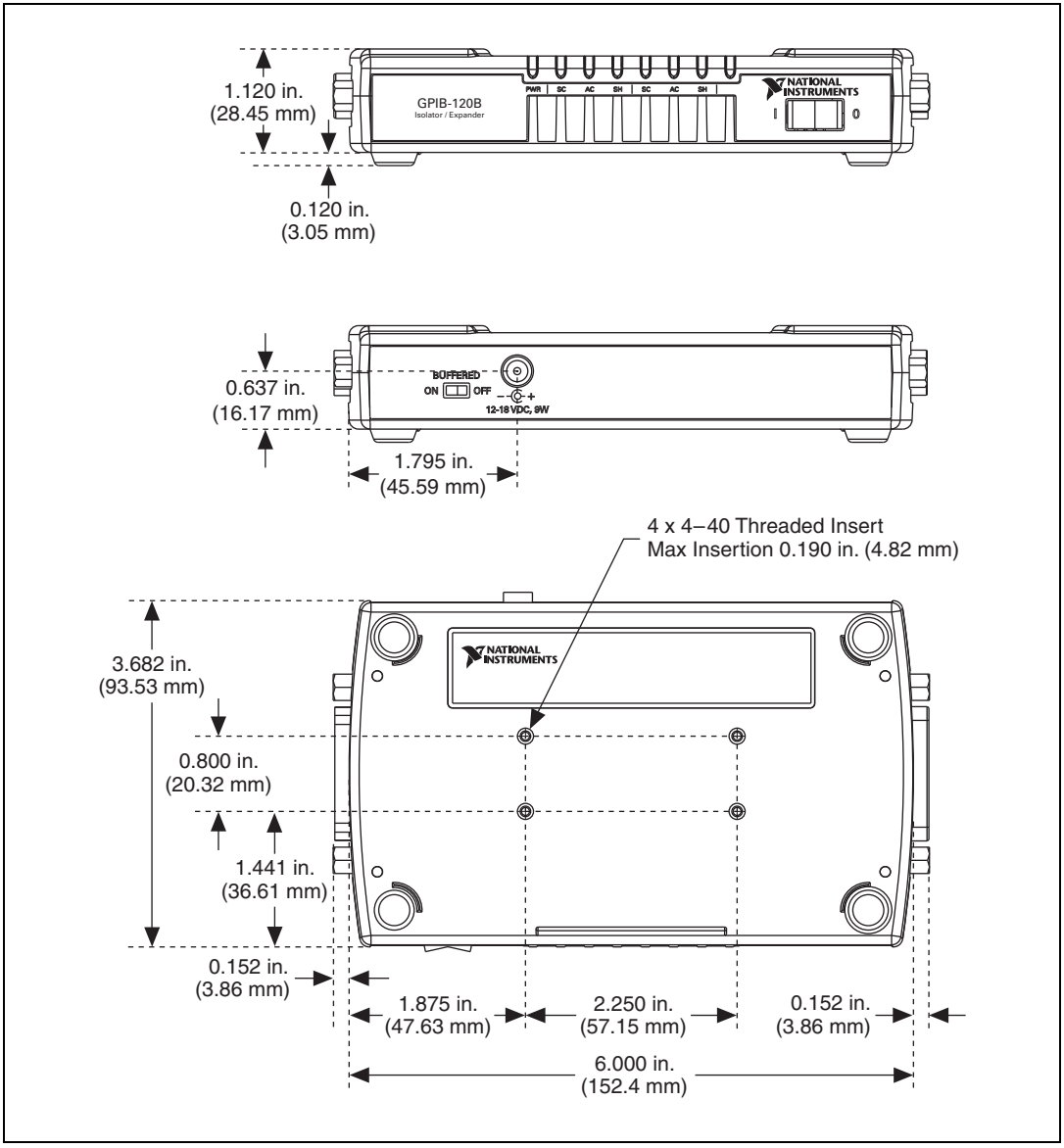

Figure C-1. GPIB-120B Dimensions

Note The GPIB-120B has threaded inserts for mounting options.

Safety

This product is designed to meet the requirements of the following standards of safety for information technology equipment:

- IEC 60950-1, EN 60950-1
- UL 60950-1, CSA 60950-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

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D

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Glossary

Symbol	Prefix	Value
p	pico	10^{-12}
n	nano	10^{-9}
µ	micro	10^{-6}
m	milli	10^{-3}
c	centi	10^{-2}
k	kilo	10^{3}
M	mega	10^{6}

°	degrees
%	percent
A	amperes
AC	alternating current
AHE	HS488 Acceptor Handshake Extended interface function
ANSI	American National Standards Institute
ASCII	American Standards Code for Information Interchange
ASIC	application-specific integrated circuit
ATN	Attention
C	Celsius
CIC	Controller-In-Charge
CPU	central processing unit
CSA	Canadian Standards Association
DAV	data valid
dB	decibels
DC	direct current

DIO	digital input/output
DIP	dual inline package
EOI	End or Identify
EOS	End of String
F	Farads
FCC	Federal Communications Commission
FIFO	first-in-first-out
g	grams
GPIB	General Purpose Interface Bus
hex	hexadecimal
Hz	hertz
IDY	Identify
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IFC	Interface Clear
in.	inches
lb	pounds
LED	light-emitting diode
m	meters
s	seconds
SHE	HS488 Source Handshake Extended interface function
TTL	transistor-transistor logic
UL	Underwriter's Laboratories
V	volts
VAC	volts alternating current

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