

# **VXI-1000**

## **Mainframe User Manual**



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## FCC/DOC Radio Frequency Interference Compliance

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

### Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class 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 A 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.

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# About This Manual

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The *VXI-1000 Mainframe User Manual* describes the features, functions, and operation of the VXI-1000 mainframe.

## Organization of This Manual

The *VXI-1000 Mainframe User Manual* is organized as follows:

- Chapter 1, *Introduction*, describes the features of the VXI-1000, lists the contents that should be included with your kit, and lists optional equipment.
- Chapter 2, *Structural Design*, describes the construction of the VXI-1000.
- Chapter 3, *Preparation for Use and Operation*, contains safety information and details on how to configure the VXI-1000 before use and then operate it safely.
- Chapter 4, *Backplane*, contains a description of the backplane circuit board.
- Chapter 5, *Power Supply*, describes the compact switching power supply in the VXI-1000.
- Chapter 6, *Cooling System*, describes the cooling and airflow system used in the VXI-1000.
- Appendix A, *Specifications*, contains the system, electrical, environmental, and mechanical specifications for the VXI-1000.
- 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 of terms used in this manual and a description of each.

## Conventions Used in This Manual

Throughout this manual, the following conventions are used to distinguish elements of text:

*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.

\*                              An asterisk (\*) following a signal mnemonic indicates the signal is active when in the low state (typically, 0.0 to 0.8 volts). A signal mnemonic without a trailing asterisk denotes the signal is active when in the high state (typically, 2.8 to 5.0 V).

Numbers in this manual are decimal (base 10) unless otherwise noted.



## **Related Documents**

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

- *IEEE Standard for a Versatile Backplane Bus: VMEbus*, ANSI/IEEE Std 1014-1987
- *VXIbus System Specification*, Revision 1.4, VXIbus Consortium (available from National Instruments, part number 350083-01)
- *VXIbus Mainframe Extender Specification*, VXI-6, Rev. 1.0, VXIbus Consortium (available from National Instruments, part number 340258-01)

## **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.

# Operator's Safety Summary

---

The general safety information in this summary is for both operating and servicing personnel. Specific warnings and cautions are found throughout the manual where they apply, and may not appear in this summary.

## Terms in This Manual





*WARNING* statements identify conditions or practices that could result in personal injury or loss of life or damage to the mainframe or other property.

## Terms as Marked on Mainframe

*DANGER* indicates a personal injury hazard immediately accessible as one reads the marking.

*CAUTION* indicates a personal injury hazard not immediately accessible as one reads the markings, or a hazard to the property, including the mainframe itself.

## Symbols as Marked on Mainframe

-  ATTENTION--refer to manual.
-  Refer to manual before using.
-  DANGER--High Voltage.
-  Protective ground (earth) terminal.

## Covers and Panels

To avoid personal injury, the VXI-1000's covers should be removed only by qualified service personnel. Do not operate the mainframe without covers and panels properly installed.

## Power Source

The VXI-1000 is intended to operate from a power source that does not apply more than 250 VAC between the line power conductors or between either conductor and earth ground.

## Grounding

The VXI-1000's chassis is connected to earth ground through the ground conductor of the line power cord. To avoid electrical shock, plug the mainframe power cord into a properly wired receptacle. A protective ground connection is essential for safe operation.

## Danger Arising from Loss of Ground

If the protective ground connection is lost, all accessible conductive parts can render an electric shock.

## Use the Proper Fuse

To avoid fire hazard, use replacement fuses of the type, voltage rating, and current rating specified.

## Do Not Operate in Explosive Atmosphere

To avoid explosion, do not operate the mainframe in an explosive atmosphere.

# Chapter 1

## Introduction

---

This chapter describes the features of the VXI-1000 VXIbus mainframe (hereafter called the VXI-1000), lists the contents that should be included with your kit, and lists optional equipment.

The VXI-1000 is a completely integrated 5-slot, C-size VXI support system. It incorporates the highest industry standards in backplane EMI/signal performance, pressurized cooling capability, high-efficiency power distribution, module development access, and support maintenance.

### Features

The VXI-1000 is a 5-slot VXIbus mainframe that is fully compatible with the *VXIbus System Specification*, and is compliant with UL, FCC, and VEDA standards. It is designed to be used in *benchtop* (horizontal), *tower* (vertical), or rack-mounted applications. The VXI-1000 has two 96-pin VXIbus connectors (P1 and P2) per module slot for full access to the VXIbus resources associated with C-size modules.

Figure 1-1 shows the VXI-1000 mainframe in the benchtop configuration.



Figure 1-1. VXI-1000 Mainframe

In its full configuration, the VXI-1000 has the following features:

- VXIbus compatible, 5-slot C-size fully integrated mainframe
- Two-speed pressurized-directed airflow, 40 to 50 W per slot cooling system
- High-quality, 50 ohm/time-matched signal lines, multi-layer backplane
- Jumperless Bus Grant and IACK daisy-chain connectors
- Compact 400 W switching power supply with autoranging
- Rugged, EMI-protected structural design
- Removable top and bottom covers for VXI module development access
- Optional 3.5 in. floppy drive or hard drive

## Unpacking

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 reshipment.

## What Your Kit Should Contain

Your kit should contain the following components:

Component	Part Number
VXI-1000 Mainframe with four blank filler panels	191000-01
<i>VXI-1000 User Manual</i>	320207-01
Power Cord	See Table 1-1.

Make sure each of these items is in your kit. If any item is missing, contact National Instruments.

The overall kit number for your VXI-1000 kit is determined by the power cord you specified, as shown in Table 1-1.

Table 1-1. Power Cord Information

<b>VXI-1000 Kit No.</b>	<b>Power Cord</b>	<b>Reference Standards</b>
776323-01	Standard 120 V	ANSI C73.11/NENA 5-15-P/IEC83
776323-02	Switzerland 220 V	SEV
776323-03	Australia 240 V	AS C112
776323-04	Universal Euro 240 V	CEE (7), II, IV, VII IEC 83
776323-05	North America 240 V	ANSI C73.20/NENA 5-15-P/IEC83
776323-06	UK 240 V	BS 1363/IEC83

## Optional Equipment

<b>Component</b>	<b>Part Number</b>
Rack-Mount Kit	776324-01
3.5 in. Floppy Disk Drive or Hard Drive Data Storage	Contact National Instruments

# Chapter 2

## Preparation for Use and Operation

---

This chapter contains safety information and details on how to configure the VXI-1000 before use and then operate it safely.

### Safety

Before connecting the mainframe to a power source, read this chapter and the *Operator's Safety Summary* located in the front of this manual.

### Orientation

The VXI-1000 can be operated in either the benchtop (horizontal) or vertical (tower) orientation. The VXI-1000 has feet for stability in either orientation.

### Front Panel

The only feature on the front panel is the POWER on/off switch. This switch controls application of the AC voltages to the power supply. It operates only when line power is applied to the rear panel connector.

Additional operating features apply if your VXI-1000 contains the optional 3.5 in. floppy disk or hard drive. Consult the documentation that came with the floppy disk drive or hard drive unit for further details.

### Rear Panel

The rear panel of the VXI-1000 has the following features.

- Power cord connector
- Main power fuse
- Fan speed switch (HI/LOW)
- VXI module and power supply cooling fans with their respective air filter

The filters have snap off/on type covers for easy removal of the washable filter pads. Check and clean both filters routinely to guard against dirt or lint buildup that could inhibit the cooling abilities of the unit. Use mild detergent in warm water to wash the filter pads.

Figure 2-1 shows the location of the features on the rear panel.

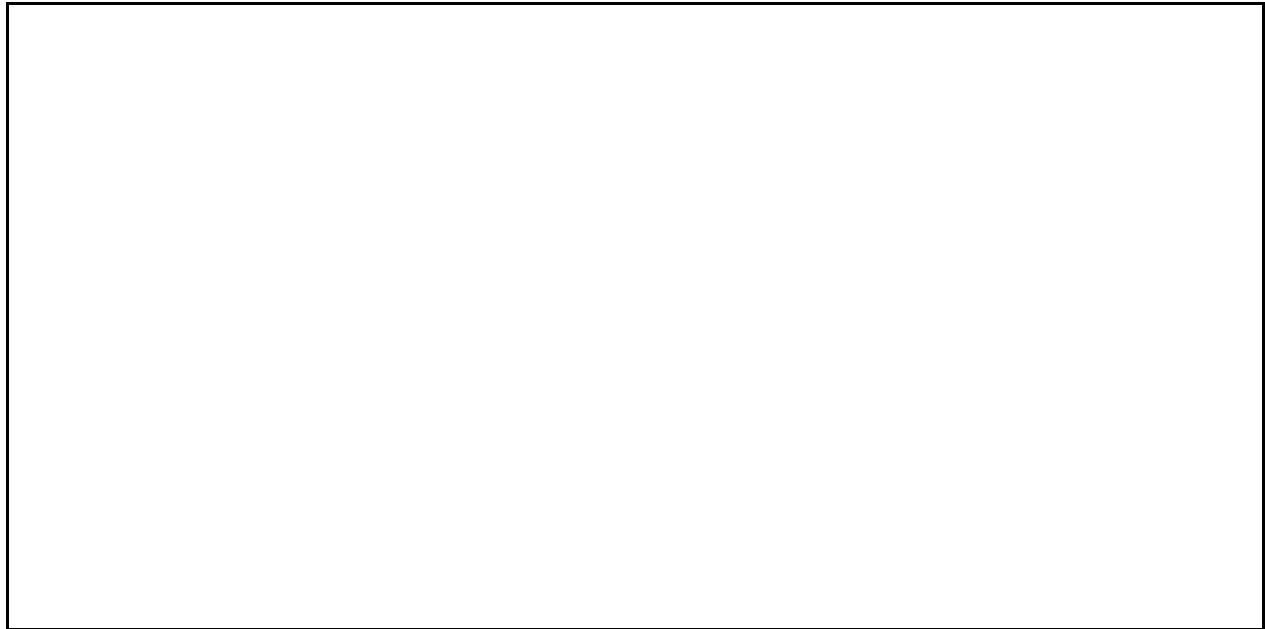


Figure 2-1. VXI-1000 Rear Panel Layout

## Current Protection and Grounding

This section contains information about current protection, line voltage requirements, line fuses, and power cord grounding.

### Module/Backplane Current Protection

The main power supply fuse, located on the rear panel of the VXI-1000, provides overload and short protection for the unit. This 250 V, Slow Blow 12 A for 110 VAC (6.3 A for 220 VAC) fuse is designed to fail before other power assets are adversely affected. The AC input to the power supply and each power output is protected by individual in-line fuses. The fuse holders are part of the power supply mounted to the rear panel.

**Warning:** *All installed modules that use mainframe power supply voltages should be current-protected on the module to protect both the module and the mainframe. Mainframe damage caused by shorted modules that are not current-protected may void all or part of the mainframe warranty.*

This manual provides the documentation required by the VXIbus specification Rule B.8.7 that allows you to verify compatibility between mainframe output power capability and module supply requirements. It is your responsibility to ensure the peak current capacity of the mainframe ( $I_{MP}$ —see Table 5-1) exceeds the sum of the peak module currents ( $I_{PM}$ ) of all installed modules for each supply used.

It is also your responsibility to ensure the dynamic current capability of the mainframe ( $I_{MD}$ —see Table 5-1) exceeds the sum of the dynamic current ( $I_{DM}$ ) requirements of the installed modules for each supply used. For more information, refer to Section B.8.5, *Power Management*, of the VXIbus specification.

## Checking Line Voltage

The mainframe operates with autoranging that automatically adjusts for a 115 V (nominal) or 230 V (nominal) single-phase power source with a line frequency between 47 to 63 Hz. Make certain that the voltage is within one of the following ranges before connecting the power cord to the power source on the rear panel. Refer to Table 1-1 to verify that your power cord is appropriate for your VXI-1000.

- 115 V nominal – 90 to 130 VAC
- 230 V nominal – 180 to 264 VAC

**Warning:** *The mainframe can be damaged if it is operated with a power source line voltage that is outside the proper range.*

## Cooling Fans

The VXI-1000 contains two fans. One cools the VXI modules and the other cools the power supply.

Use the fan switch located on the rear panel to select between full speed and low-speed fan operation for cooling the installed modules. You can use low speed for low power conditions and for user development when quiet operation is more important than heat dissipation. Select full speed when all slots are occupied or under heavy load conditions.

The power supply cooling fan speed is automatically regulated by the power consumption from the 5 V power supply.

## Bus Grant and Interrupt Acknowledge Daisy-Chains

Jumpers are used on conventional backplanes to propagate the bus grant and interrupt acknowledge signals across unused slots. These signals are normally propagated by each installed module from the appropriate input pin ( $BGxIN^*$  or  $IACKIN^*$ ) to the appropriate output pin ( $BGxOUT^*$  or  $IACKOUT^*$ ).



The VXI-1000 is equipped with jumperless P1 connectors. These connectors provide a standard closed condition for propagating daisy-chain signals across unused slots.

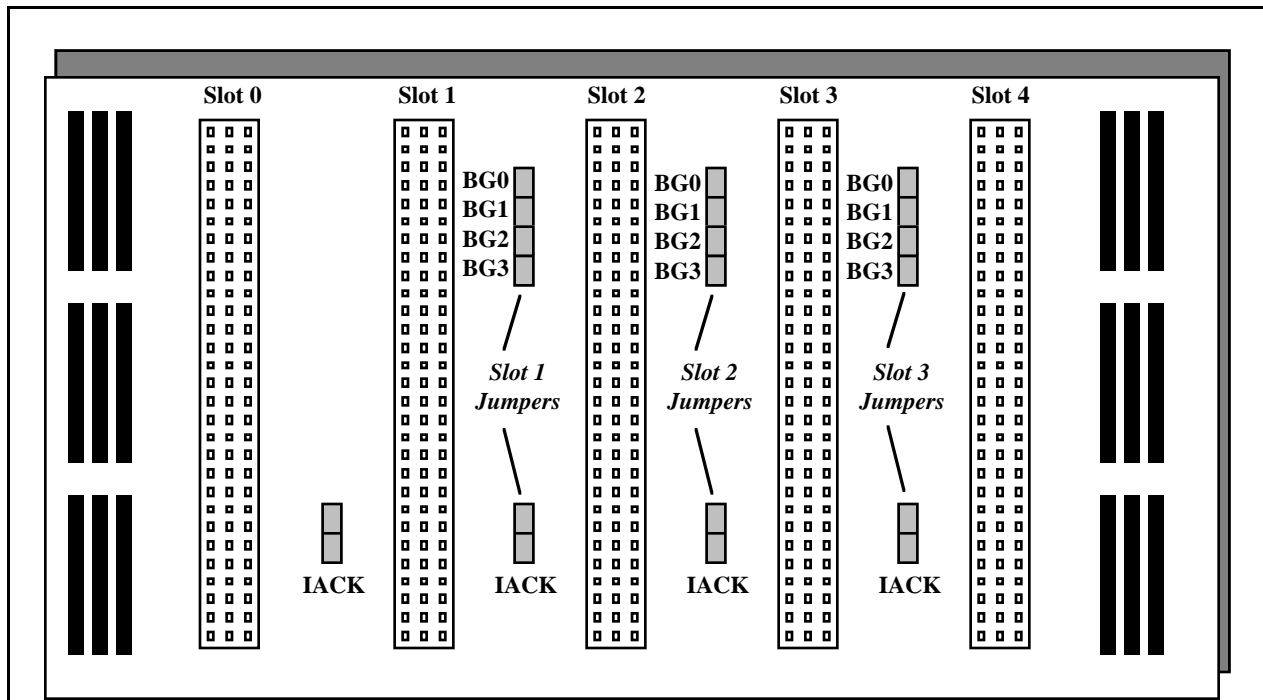


Figure 2-2. Bus Grant and Interrupt Acknowledge Jumper Locations on P1

The VXI-1000 also has a manual override for the jumperless connectors. You can use the additional manual back-up jumper connections on the P1 connector as shown in Figure 2-2 in the event the jumperless connector fails. When using the manual override feature, make certain that the Bus Grant jumpers located adjacent to Slots 1 through 4, and the Interrupt Acknowledge jumpers located adjacent to Slots 0 through 4, are configured properly. Before installing each module, check the jumpers associated with the slot(s) where the module is to be installed, and install them as the module requires.

# Chapter 3

## Structural Design

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This chapter describes the construction of the VXI-1000.

The rugged, EMI-protected structural design ensures that the unit can withstand the high electromagnetic environments found in most laboratory applications. Figure 3-1 shows the VXI-1000 with the top cover removed.

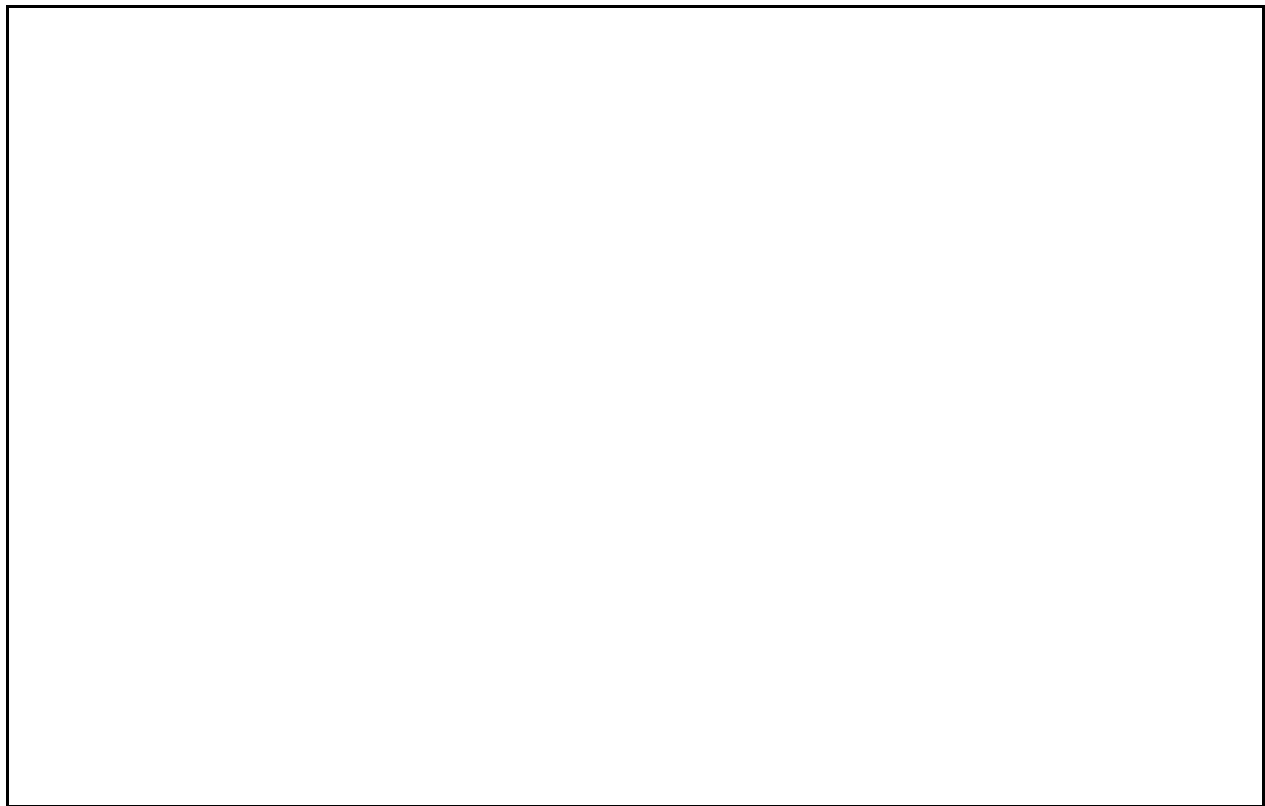


Figure 3-1. VXI-1000 Mainframe Structural Design

## Top and Bottom Cover Design

By removing the top and bottom covers, you can access installed modules from either side while being protected from internal electrical or mechanical hazards. When you remove the 16 Phillips screws that hold each cover in place, the cover easily slips off its bezel and horizontal frame strut. Inner sheet metal covers protect you from potential hazards within the chassis.

**Warning:** *Do not remove the inner covers; to do so will cause misalignment of the card guides and may expose you to hazardous electrical high power situations.*

## Painting

A two-coat textured paint process protects external surfaces most susceptible to abrasion.

## Carrying Handle and Rack-Mounting Slide Capability

A collapsible handle is mounted on the side of the unit for easy portability. Four rubber feet support the unit in either benchtop (horizontal) or tower (vertical) configurations. The VXI-1000 has built-in attachment points for rack-mounting slides should you wish to purchase and install optional slide mounts for use in a rack-mount system.

## VXI Module Filler Panels

The VXI-1000 is shipped from the factory with four blank filler panels to cover empty slots, thereby maintaining adequate air flow in the mainframe and reducing electromagnetic emissions.

# Chapter 4

## Backplane

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This chapter contains a description of the backplane circuit board.

The VXI-1000 uses a multi-layer, standard C-size backplane that can accommodate up to five VXIbus modules. The backplane serves as the VMEbus and VXIbus interface for each of the five module slots and provides termination for the bus signals.

The backplane fully complies with the VXIbus specification and gives complete grounding, signal separation, signal integrity up to 100 MHz, and EMI protection. It also has precision time-matching (<200 picoseconds) and impedance matching (<5%) to ensure a minimum skew for clock lines.

### Power Monitor

The power monitor coordinates the activities of the power switch, power supplies, and ACFAIL\* signals generated by installed modules. This circuitry ensures that the VXI-1000 generates the proper timing between the ACFAIL\*, SYSRESET\*, and +5 V signals at power-up and power-down.

**Warning:** *To guard against failure of the VXI-1000 power failure monitor, do not cycle AC power within 5 seconds.*

### Battery Back-Up

An external +5 V standby power source can be connected to the +5STDBY and GND terminals. The terminals are located on the rear side of the backplane. If you would like this option, contact National Instruments. Do not open the unit to install this option yourself.

### VXIbus Module Connectors

The VXIbus module connectors consist of two 96-pin DIN connectors (P1 and P2) for each of the five module slots. Figure 4-1 shows the VXIbus connector. The pin and signal information for these connectors can be found in Tables 4-1, 4-2, and 4-3.



Figure 4-1. 96-Pin VXIbus Connector

Table 4-1 describes the P1 connections.

Table 4-1. VXIbus P1 Module Connector Pin Assignments

Pin	Row A Signals	Row B Signals	Row C Signals
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	BG0IN*	D11
5	D04	BG0OUT*	D12
6	D05	BG1IN*	D13
7	D06	BG1OUT*	D14
8	D07	BG2IN*	D15
9	GND	BG2OUT*	GND
10	SYSCLK	BG3IN*	SYSFAIL*
11	GND	BG3OUT*	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GND	BR3*	A23
16	DTACK*	AM0	A22
17	GND	AM1	A21
18	AS*	AM2	A20
19	GND	AM3	A19
20	IACK*	GND	A18
21	IACKIN*	SERCLK	A17
22	IACKOUT*	SERDAT*	A16
23	AM4	GND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13
26	A05	IRQ5*	A12
27	A04	IRQ4*	A11
28	A03	IRQ3*	A10
29	A02	IRQ2*	A09
30	A01	IRQ1*	A08
31	-12 V	+5VSTDBY	+12 V
32	+5 V	+5 V	+5 V

Table 4-2 describes the P2 connections for Slot 0 modules.

Table 4-2. VXIbus Module P2 Connector Pin Assignments (Slot 0)

Pin	Row A Signals	Row B Signals	Row C Signals
1	ECLTRG0	+5 V	CLK10+
2	-2 V	GND	CLK10-
3	ECLTRG1	RSV1	GND
4	GND	A24	-5.2 V
5	MODID12	A25	LBUSC00
6	MODID11	A26	LBUSC01
7	-5.2 V	A27	GND
8	MODID10	A28	LBUSC02
9	MODID09	A29	LBUSC03
10	GND	A30	GND
11	MODID08	A31	LBUSC04
12	MODID07	GND	LBUSC05
13	-5.2 V	+5 V	-2 V
14	MODID06	D16	LBUSC06
15	MODID05	D17	LBUSC07
16	GND	D18	GND
17	MODID04	D19	LBUSC08
18	MODID03	D20	LBUSC09
19	-5.2 V	D21	-5.2 V
20	MODID02	D22	LBUSC10
21	MODID01	D23	LBUSC11
22	GND	GND	GND
23	TTLTRG0*	D24	TTLTRG1*
24	TTLTRG2*	D25	TTLTRG3*
25	+5 V	D26	GND
26	TTLTRG4*	D27	TTLTRG5*
27	TTLTRG6*	D28	TTLTRG7*
28	GND	D29	GND
29	RSV2	D30	RSV3
30	MODID00	D31	GND
31	GND	GND	+24 V
32	SUMBUS	+5 V	-24 V

Table 4-3 describes the P2 connections for modules in other slots.

Table 4-3. VXIbus Module P2 Connector Pin Assignments (Slots 1-4)

Pin	Row A Signals	Row B Signals	Row C Signals
1	ECLTRG0	+5 V	CLK10+
2	-2 V	GND	CLK10-
3	ECLTRG1	RSV1	GND
4	GND	A24	-5.2 V
5	LBUSA00	A25	LBUSC00
6	LBUSA01	A26	LBUSC01
7	-5.2 V	A27	GND
8	LBUSA02	A28	LBUSC02
9	LBUSA03	A29	LBUSC03
10	GND	A30	GND
11	LBUSA04	A31	LBUSC04
12	LBUSA05	GND	LBUSC05
13	-5.2 V	+5 V	-2 V
14	LBUSA06	D16	LBUSC06
15	LBUSA07	D17	LBUSC07
16	GND	D18	GND
17	LBUSA08	D19	LBUSC08
18	LBUSA09	D20	LBUSC09
19	-5.2 V	D21	-5.2 V
20	LBUSA10	D22	LBUSC10
21	LBUSA11	D23	LBUSC11
22	GND	GND	GND
23	TTLTRG0*	D24	TTLTRG1*
24	TTLTRG2*	D25	TTLTRG3*
25	+5 V	D26	GND
26	TTLTRG4*	D27	TTLTRG5*
27	TTLTRG6*	D28	TTLTRG7*
28	GND	D29	GND
29	RSV2	D30	RSV3
30	MODID	D31	GND
31	GND	GND	+24V
32	SUMBUS	+5 V	-24V

# Chapter 5

## Power Supply

---

This chapter describes the compact switching power supply in the VXI-1000. It supports seven DC outputs in accordance with the VXIbus specification.

**Caution:** *All outputs have over-voltage protection. An over-voltage condition on any of the power supply output modules will cause the power supply to shut down. Before resetting the supply, remove AC power for a minimum of two minutes.*

Refer to Appendix A, *Specifications*, for more power supply specifications.

### Features

The VXI-1000 power supply has the following features.

- Independent voltage overload and short circuit protection
- Minimal voltage regulation change due to line voltage and load variations
- Thermal protection
- Autoranging (110 VAC or 230 VAC)
- Ripple/noise filtered
- Variable-speed cooling fan



## Power Supply Ratings

Table 5-1 shows the ratings of the power supply outputs. These ratings are within the acceptable limits of the VXIbus specification and support the general requirements of test module development. Ripple is also within the acceptable limits of the VXIbus specification.

Table 5-1. Power Supply Ratings

DC Output Voltage	Accuracy	DC Current <sup>1</sup>	AC Current <sup>2</sup>	Power	PARD <sup>3</sup>
+5 V	+5/-2.5 %	35.0 A	1.3 A	175 W	<50 mV
+12 V	+5/-3.0 %	4.5 A	4.0 A	30 W	<50 mV
-12 V	+5/-3.0 %	2.0 A	1.3 A	24 W	<50 mV
+24 V	+5/-3.0 %	2.0 A	2.0 A	48 W	<150 mV
-24 V	+5/-3.0 %	2.0 A	2.0 A	48 W	<150 mV
-2 V	±5/-5.0 %	4.0 A	0.3 A	8 W	<50 mV
-5.2 V	+5/-3.0 %	10.0 A	0.5 A	52 W	<50 mV
+5 V STDBY	N/A	0.0 A	0.0 A	0 W	N/A

- Notes:**
1. *Peak DC current defined as  $I_{MP}$  in the VXIbus specification.*
  2. *Dynamic AC current defined as  $I_{MD}$  in the VXIbus specification.*
  3. *PARD = Periodic and Random Deviations (volts peak-to-peak, 2 Hz to 10 MHz).*

## Power Supply Fusing

The VXI-1000 has three levels of fusing to protect against high current/voltage conditions, as shown in Figure 5-1. Fusing begins with a 12 A Slow-Blow fuse at the power entry module for 110 VAC (6.3 A for 230 VAC) located at the rear panel of the unit. The second level of protection is built into the power supply at the AC entry point where a 15 A Slow-Blow fuse is installed. The third level of protection is facilitated at each of the DC outputs except for the 2 V and 5 V outputs.

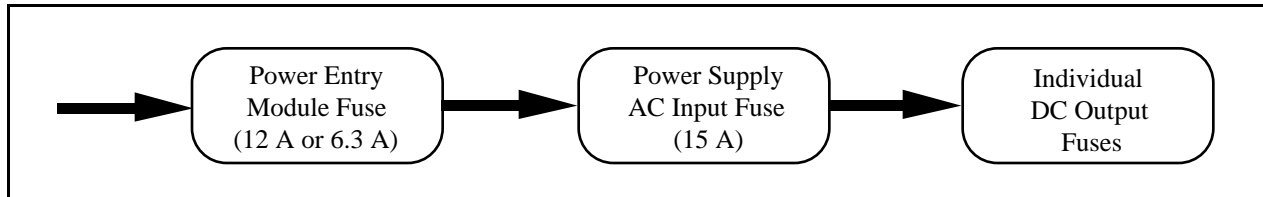


Figure 5-1. Three Levels of Electrical Fuse Protection

The most sensitive protection is at the power entry module. You can easily access this fuse on the rear panel and replace it without opening the mainframe. The other fuses should be replaced by National Instruments.

**Warning:** *The mainframe can be damaged if it is improperly fused. Replace fuses with the same type and rating as specified.*

# Chapter 6

## Cooling System

This chapter describes the cooling and airflow system used in the VXI-1000. The cooling system maintains cooling of power supplies and VXI modules at >40 W per slot (10° C rise). Two high-volume, low-noise fans cool different parts of the unit. A two-speed fan cools the VXI modules, and a variable-speed fan cools the power supply. Both fans draw air from the rear of the unit through easy access filters.

### VXI Module Cooling

The VXI module fan channels air through a pressurized plenum duct system that distributes the airflow through exhaust ports directly into the underside of the modules, as shown in Figure 6-1. This design ensures constant airflow and removes the need for alternate routing under any module configuration or front panel baffle installation. The card guides serve as additional ducting by acting as baffles to ensure that the air is channeled into the module and not redirected around them. The vents at the top and sides of the chassis give a 1:2 ratio of intake:exhaust to ensure a minimum restriction of airflow.

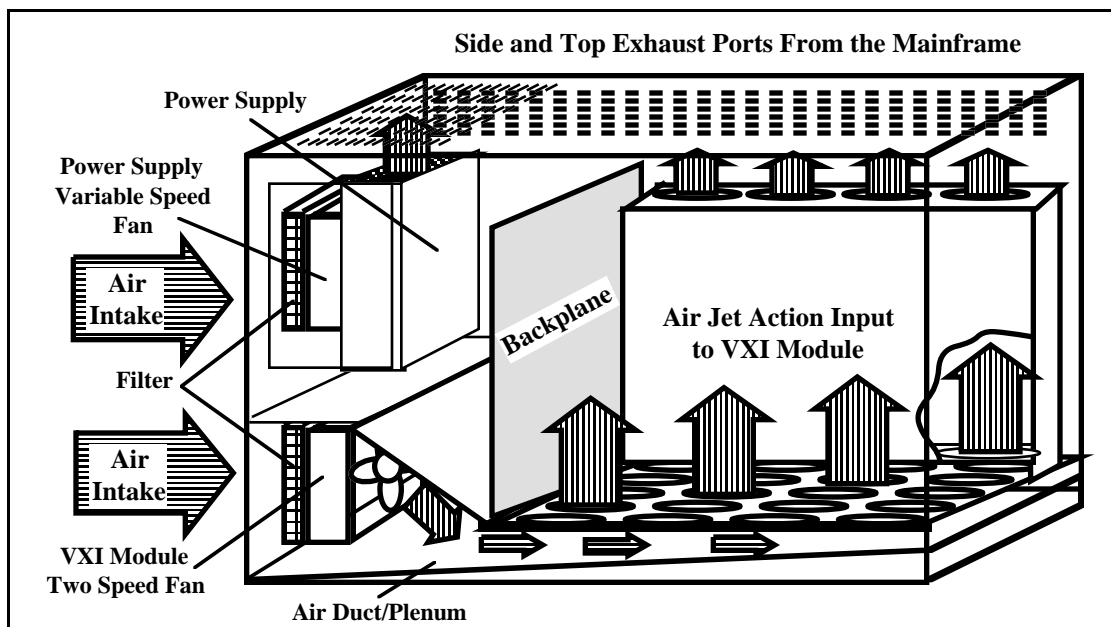


Figure 6-1. VXI-1000 Cooling System

The VXI-1000 is capable of dissipating heat at 40 to 50 W per module slot for a 10° C rise, as required by the VXIbus specification.

## Two-Speed Fan Control

The speed of the module cooling fan is controlled by the speed selector switch located on the rear panel. The low-speed setting is suitable for development environments where quiet operation is more important than maximum heat dissipation.

## Power Supply Cooling

The power supply fan pulls air through the filter unit directly into the power supply. The physical layout of the power supply modules and the openings at each end ensure that the air is routed to the areas that generate the most heat.

## Variable-Load Fan Speed Control

The power supply fan is controlled by a feedback loop that monitors the 5 V power output. As the load increases on the 5 V line, the speed of the fan increases automatically to ensure an increased.

## General Fan and Noise Characteristics

The fans are mounted with damping studs on the rear panel of the mainframe to reduce noise. Each fan also features an electronic rotor safety lock that shuts down power to the rotor if the fan stops or jams, and resets and starts automatically when the fan is freed to rotate.

The fan speed adjusts from a low/high condition of 0.2/0.8 in. water pressure at 100/182 CFM, with a noise level of 29/49 dB, within the respective enclosure. Table 6-1 shows fan and noise characteristics.

Table 6-1. Fan and Noise Characteristics

Speed	Speed (rpm)	Current (A)	Maximum Airflow		Maximum Air Pressure		Noise (dB)	
			CFM	CMM	In. of Water	mm of Water	Intake	Exhaust
<b>High</b>	3600	0.255	45.41	1.29	0.211	5.37	40.0	40.0
<b>Low</b>	1800	0.120	24.64	0.70	0.056	1.43	23.0	23.0

# Appendix A

## Specifications

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This appendix contains various performance specifications of the VXI-1000.

### Input Power

The VXI-1000 operates on 115 VAC single-phase line power with a 250 V, 12 A Slow Blow fuse or on 220 VAC single-phase line power with a 250 V, 6.3 A Slow Blow fuse.

The lighted power switch on the front panel controls AC power application to the VXI-1000.

Table A-1 describes the input power specifications of the VXI-1000.

Table A-1. Input Power Specifications

Characteristic	Specification
Power Input Requirements Autoranging Voltage Range: 115 V Nominal 230 V Nominal Frequency Inrush Surge Current Power Consumption	90 to 130 VAC 180 to 264 VAC 47 to 63 Hz 68 A maximum for up to 40 ms at 115 VAC 30 A maximum for up to 40 ms at 230 VAC 575 W maximum
Heat Dissipation	1535 Btu per hour (489 W) maximum

### Backplane

The backplane is a 12-layer, VXIbus C-size circuit board that acts as the interface between the installed VXIbus modules. It has the following characteristics.

- Standard 6U (13.986 in. high) C-size by 6.58 in. wide
- Can accommodate up to five C-size VXIbus modules at the standard 1.2 in. spacing
- Jumperless daisy-chain connectors
- Signal integrity up to 100 MHz
- EMI protection for backplane signals
- Fully complies with VXIbus specification
- Precision time-matching of <200 picoseconds and impedance-matching of <5% ensures a minimum skew for clock lines and minimum propagation delays between slots

## Power Supply

The VXI-1000 power supply meets the criteria in *VXIbus System Specification*, Section B.8.

Safety certifications:

- UL 1244
- CSA 22.2 No. 220
- CSA bulletin 1402C
- EN 60 950

Table A-2 describes the specifications of the power supply.

Table A-2. Power Supply Specifications

Characteristic	Specification
Autoranging	Selects operating voltages of 90 to 130 VAC or 180 to 264 VAC at 47 to 63 Hz
Soft Start	Prevents initial power surge on critical power supply and backplane components
Soft Shutdown	Holds power for a minimum of 20 ms after power loss
Line Regulation	$\pm 0.1\%$ or $\pm 5$ mV
Load Regulation	$\pm 0.2\%$ or $\pm 10$ mV for load changes from 50% to 0% or 100% of maximum rated values
Ripple/Noise filtration	To $<150$ mV for $\pm 24$ VDC and $<50$ mV for other supplies
Shock	Tested to MIL-STD 810-D Method 516.3, Procedure III
Vibration	Tested to MIL-STD 810-D Method 514.3, Category 1, Procedure I

## Module Cooling

A two-speed cooling fan ensures that the VXI-1000 is capable of dissipating heat at >40 W per slot for a 10° C rise, as required by the VXIbus specification. The high-volume, low-noise fan draws air from the rear of the unit into the pressurized plenum.

The cooling capacity decreases as a function of the pressure drop across the installed module. Figure A-1 depicts the cooling performance curve for the worst slot at low fan speed.

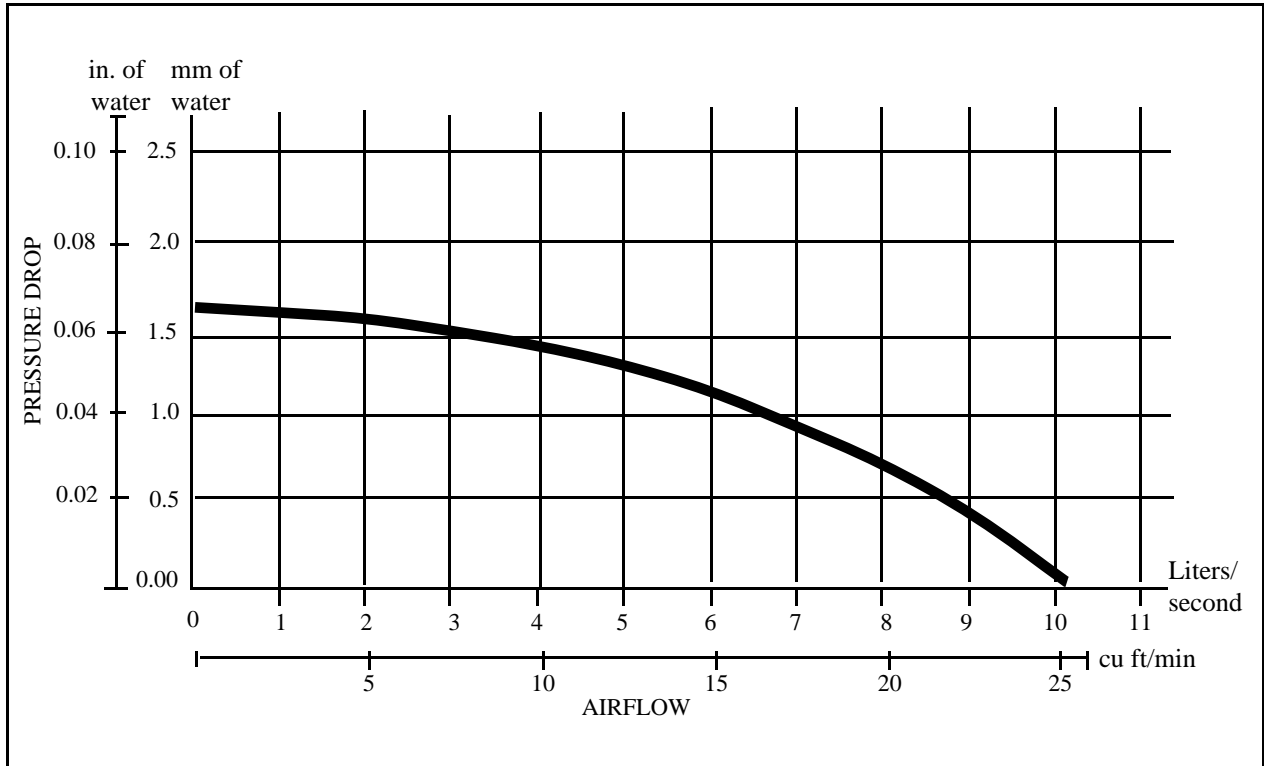


Figure A-1. VXI Module Cooling Performance Curve

## Environmental

Table A-3 describes the environmental specifications of the VXI-1000.

Table A-3. Environmental Specifications

Characteristic	Specification
Temperature Operating	0° to 50° C without derating Derating of 2.5% per ° C above 50° C, up to 70° C
Storage	-55° C to +85° C
EMI	FCC Class A

## Physical

Table A-4 describes the physical specifications of the VXI-1000.

Table A-4. Physical Specifications

Characteristic	Specification
Slots Number	Accommodates up to five single-wide VXI modules, including one Slot 0 module and four other modules
Size	C-size
Dimensions Height	7 in. (177.8 mm)
Width	17 in. (431.8 mm)
Depth	22 in. (558.8 mm)
Weight	29 lb.



# Appendix B

## Customer Communication

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

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

### Corporate Headquarters

(512) 795-8248

Technical support fax: (800) 328-2203  
(512) 794-5678

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

# Technical Support Form

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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 (\_\_\_\_) \_\_\_\_\_

Mainframe \_\_\_\_\_ VXI-1000 \_\_\_\_\_

Slot 0 Controller 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 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

List any error messages \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

The following steps will reproduce the problem \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# VXI-1000 Hardware and Software Configuration Form

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Record the settings and revisions of your hardware and software on the line to the right of each item. Complete a new copy of this form each time you revise your software or hardware configuration, and use 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.

## National Instruments Products

- VXI-1000 kit number is dependent on the power cord in your kit. Refer to your packing slip.
  - Part Number 776323-\_\_\_\_\_
  - Serial Number \_\_\_\_\_
- Line Voltage:
  - Power Source (115 V or 230 V nominal) \_\_\_\_\_
  - Line Frequency (VAC) \_\_\_\_\_

Slot	Module Description	Logical Address	Interrupt Level	Module Function
0				
1				
2				
3				
4				

# Documentation Comment Form

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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: **VXI-1000 Mainframe User Manual**

Edition Date: **November 1993**

Part Number: **320207-01**

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

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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.

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National Instruments Corporation  
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Austin, TX 78730-5039

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MS 53-02  
(512) 794-5678

# Glossary

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

°	degrees
Ω	ohms
A	amperes
AC	alternating current
backplane	The printed circuit board that is mounted in a mainframe to serve as the interface between modules.
Btu	British Thermal Unit
C	Celsius
CFM	cubic feet per minute
CMM	cubic meters per minute
daisy-chain	A method of propagating signals along a bus, in which the devices are prioritized on the basis of their position on the bus.
dB	decibel
DC	direct current
EMI	electromagnetic interference
Hz	hertz (cycles per second)
I <sub>MD</sub>	mainframe dynamic current
I <sub>MP</sub>	mainframe peak current
in.	inches
lb.	pounds
MB	megabytes of memory

*Glossary*

m	meter
P1	The leftmost backplane connector for given slot in a horizontal mainframe such as the VXI-1000 (when viewed from the front panel side).
P2	The rightmost backplane connector for a given slot in a horizontal mainframe such as the VXI-1000 (when viewed from the front panel side).
PARD	Periodic and Random Deviations
power monitor	A device that monitors line and backplane power and detects faults. A power monitor can generate the power-down and power-up timing required by the VXIbus specification.
rpm	revolutions per minute
s	seconds
Slot 0 module	A VXIbus device that provides the VMEbus System Controller services and the VXIbus CLK10 and MODID functions. Additional Slot 0 services include trigger control.
V	volts
VAC	volts alternating current
VDC	volts direct current
W	watts