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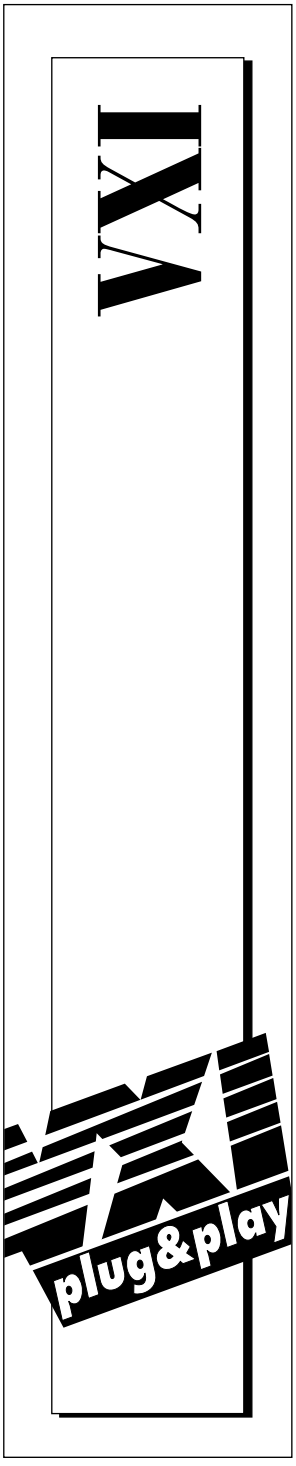
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VXI-1500
User Manual

March 1997 Edition
Part Number 321510A-01

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Important Information

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The VXI-1500 mainframe is warranted against defects in materials and workmanship for a period of one year from the date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

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

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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. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC). This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. 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.

Notices 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.***

This device complies with the FCC rules only if used with shielded interface cables of suitable quality and construction. National Instruments used such cables to test this device and provides them for sale to the user. The use of inferior or nonshielded interface cables 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: *Interference to Home Electronic Entertainment Equipment Handbook.* This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

For Your Safety



Before undertaking any troubleshooting, maintenance, or exploratory procedure, read carefully the **WARNING** and **CAUTION** notices.

This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

- **Mainframe Grounding—**The VXI-1500 mainframe requires a connection from the premise wire safety ground to the mainframe chassis earth stud. The earth safety ground must be connected during use of this equipment to minimize shock hazards. Refer to the *Connecting Safety Ground* section of Chapter 2, *Installation and Configuration*, for instructions on connecting safety ground.
- **Live Circuits—**Operating personnel and service personnel must not remove protective covers when operating or servicing the mainframe. Adjustments and service to internal components must be undertaken by qualified service technicians. During service of this product, the mains connector to the premise wiring must be disconnected. Dangerous voltages may be present under certain conditions; use extreme caution.
- **Explosive Atmosphere—**Do not operate the mainframe in conditions where flammable gases are present. Under such conditions this equipment is unsafe and may ignite the gases or gas fumes.
- **Part Replacement—**Only service this equipment with parts that are exact replacements, both electrically and mechanically. Contact National Instruments for replacement part information. Installation of parts with those that are not direct replacements may cause harm to personnel operating the mainframe. Furthermore, damage or fire may occur if replacement parts are unsuitable.
- **Modification—**Do not modify any part of the mainframe from its original condition. Unsuitable modifications may result in safety hazards.

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About This Manual

The *VXI-1500 User Manual* describes the features of the VXI-1500 mainframe. This manual contains information about configuring the mainframe, installing the modules, and operating and using the VXI-1500.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Getting Started*, describes the key features of the VXI-1500, lists the contents of your kit, and lists optional equipment you can order from National Instruments.
- Chapter 2, *Installation and Configuration*, describes the necessary procedures for correctly preparing and operating your VXI-1500 mainframe.
- Chapter 3, *Maintenance*, describes basic maintenance procedures you can perform on the VXI-1500 mainframe.
- Appendix A, *Specifications*, contains complete specifications for the VXI-1500 mainframe.
- Appendix B, *Pinouts*, describes the P1 and P2 connector pinouts for the VXI-1500 backplane.
- Appendix C, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* lists abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms.
- The *Index* contains an alphabetical list of key terms and topics used in this manual, including the page where you can find each one.

Conventions Used in This Manual

The following conventions are used in this manual:

bold italic Bold italic text denotes a note, caution, or warning.

italic Italic text denotes emphasis, a cross reference, or an introduction to a key concept.

Related Documentation

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

- ANSI/EIA-310-D-1992: Cabinets, Racks, Panels, and Associated Equipment
- ANSI/IEEE Std 1101-1987: IEEE Standard for Mechanical Core Specifications for Microcomputers
- VXI-1, Revision 1.4 System Specification
- VXI*plug&play* Systems Alliance VPP-8 Revision 2.0: *VXI Module/Mainframe to Receiver Interconnection*

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

Chapter 1

Getting Started

This chapter describes the key features of the VXI-1500, lists the contents of your kit, and lists optional equipment you can order from National Instruments.

Unpacking



Caution: ***Removal of the mainframe from the shipping carton requires two people.***

Carefully inspect the shipping container and the mainframe for damage. Check for visible damage to the metal work. Check and make sure all handles, hardware, and switches are not damaged. Inspect the inner chassis for any possible damage, debris, or detached components. 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 You Need to Get Started

The VXI-1500 kit contains the following items:

- ❑ VXI-1500 mainframe
- ❑ An assortment of filler panels
- ❑ Power cable (see Table 1-1)
- ❑ Removable front door

- ❑ Grommeting for cable access ways
- ❑ *VXI-1500 User Manual*

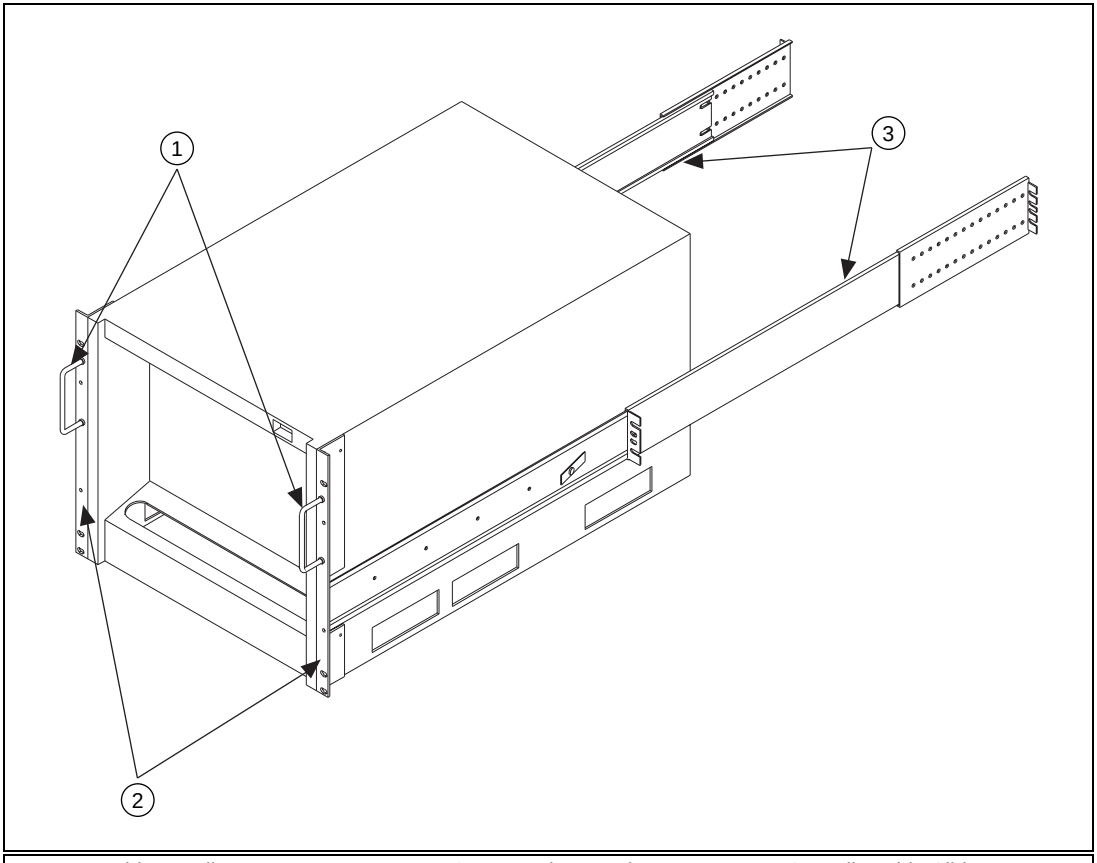
Table 1-1. Power Cables

Power Cable	Reference Standards
Standard 120 V (USA)	ANSI C73.11/NEMA 5-15-P/IEC83
Switzerland 220 V	SEV
Australia 240 V	AS C112
Universal Euro 240 V	CEE (7), II, IV, VII IEC83
North America 240 V	ANSI C73.20/NEMA 5-15-P/IEC83
United Kingdom 240 V	BS 1363/IEC83

If you are missing any of the above items or if you have the incorrect power cord, contact National Instruments.

Optional Equipment

An optional rack-mount slide kit is available from National Instruments. As shown in Figure 1-1, this kit allows you to easily slide the VXI-1500 mainframe into and out of a standard 19 in. (482 mm) instrument cabinet. The slide kit is suited for instrument racks from 24 in. (600 mm) to 32 in. (800 mm) deep. Contact National Instruments if you want to order the VXI-1500 rack-mount slide kit.



1	Removable Handles	2	Mounting Brackets	3	Adjustable Slides

Figure 1-1. Rack-Mount Slide Kit

The VXI-1500 has been designed to work with standard interlocking receiver devices defined by the VXI*plug&play* Systems Alliance VPP-8 specification. Refer to the *Receiver Interconnect Devices* section of Chapter 2, *Installation and Configuration*, for information about preparing your mainframe for receiver installation. Contact National Instruments for more information about suppliers of interlocking receiver devices.

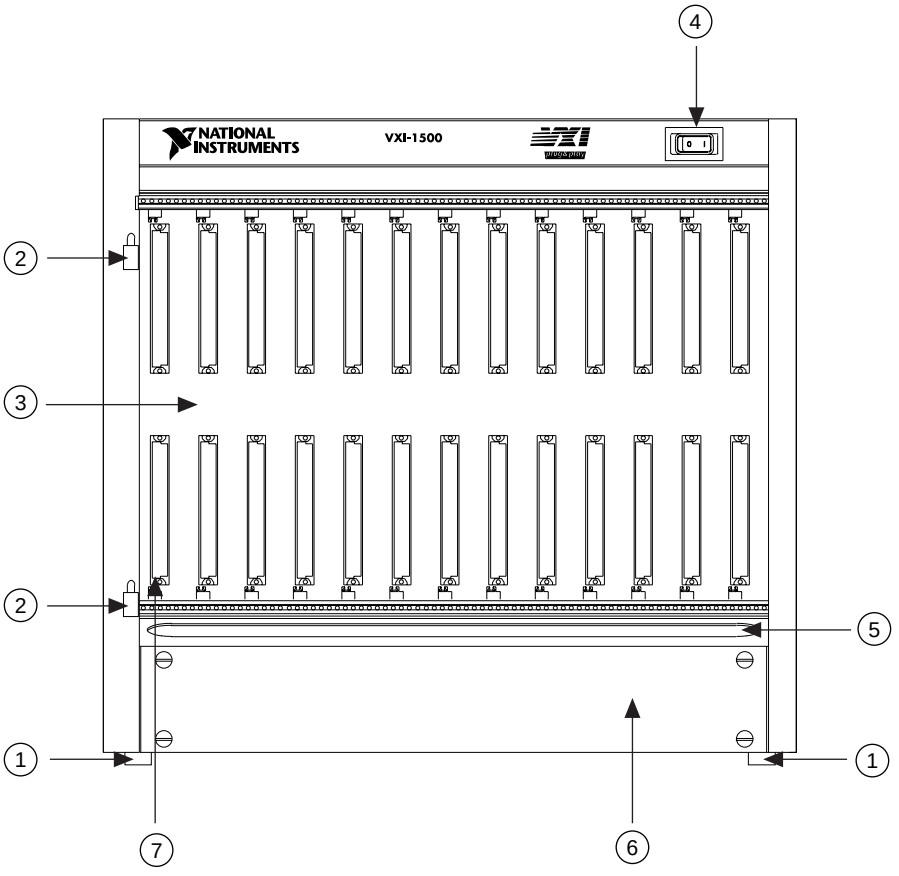
Key Features

The VXI-1500 combines a high-performance 13-slot backplane with a high-output power supply and a structural design that has been optimized for maximum usability in a wide range of applications. The mainframe's modular design ensures the highest level of maintainability resulting in a very low mean time to repair (MTTR). The VXI-1500 fully complies with the VXIbus Specification Revision 1.4 and is VXI*plug&play*-compatible.

The key features of the VXI-1500 include:

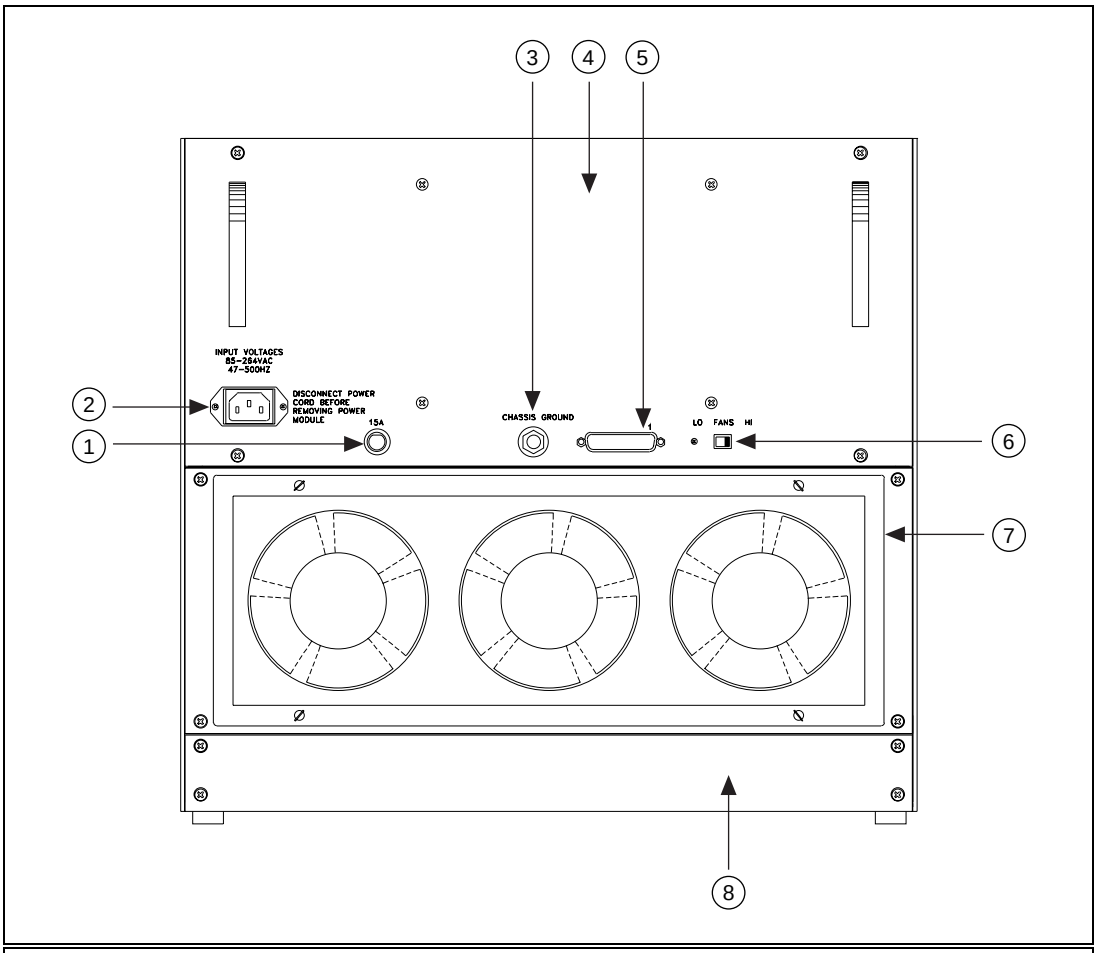
- Thirteen C-sized VXIbus slots (can accommodate A-sized and B-sized modules with appropriate adapters)
- Auto bus grant daisy-chaining (no backplane jumpers required)
- 1100 W (115 VAC input) or 1420 W (230 VAC input) of available power
- 1100 W of heat dissipation by filtered forced-air cooling
- Universal AC input: auto-voltage and auto-frequency ranging
- Over-current protection via push-reset circuit breaker (no loose fuses to replace)
- Removable modular power supply with a MTBF of 50,000 hours
- Remote power monitoring and inhibit via a rear panel connector
- On/Off switch located on the front panel for easy access and recessed to prevent accidental switching
- Removable positive pressure modular cooling unit with a MTBF of 30,000 hours
- Selectable fan speed for maximum cooling or quiet operation
- Full compliance with the VXI*plug&play* Systems Alliance VPP-8 specification (requires rack-mount slide kit option)
- Recessed module mounting surface for concealing cable backshells, terminal block carriers, and other accessories
- Integrated lower cable management channel
- Rack-mount or bench-top installation
- Removable front door

Figures 1-2 and 1-3 show some of these key features and components of the VXI-1500 mainframe. Figure 1-2 shows the front view of the VXI-1500 mainframe and Figure 1-3 shows the rear view.



1	Removable Rubber Feet	4	Recessed On/Off Switch	6	Removable Cable Access Panel
2	Hinges for Removable Door	5	Cable Access Way	7	Slot 0
3	Jumperless Backplane				

Figure 1-2. Front View of the VXI-1500 Mainframe



1	Circuit Breaker	5	Remote Power Monitoring and Inhibit Connector
2	Universal AC Input	6	Fan Speed Selector
3	Chassis Ground Stud	7	Removable Cooling Module
4	Removable Power Supply Module	8	Removable Cable Access Panel

Figure 1-3. Rear View of the VXI-1500 Mainframe

Chapter 2

Installation and Configuration

This chapter describes the necessary procedures for correctly preparing and operating your VXI-1500 mainframe.

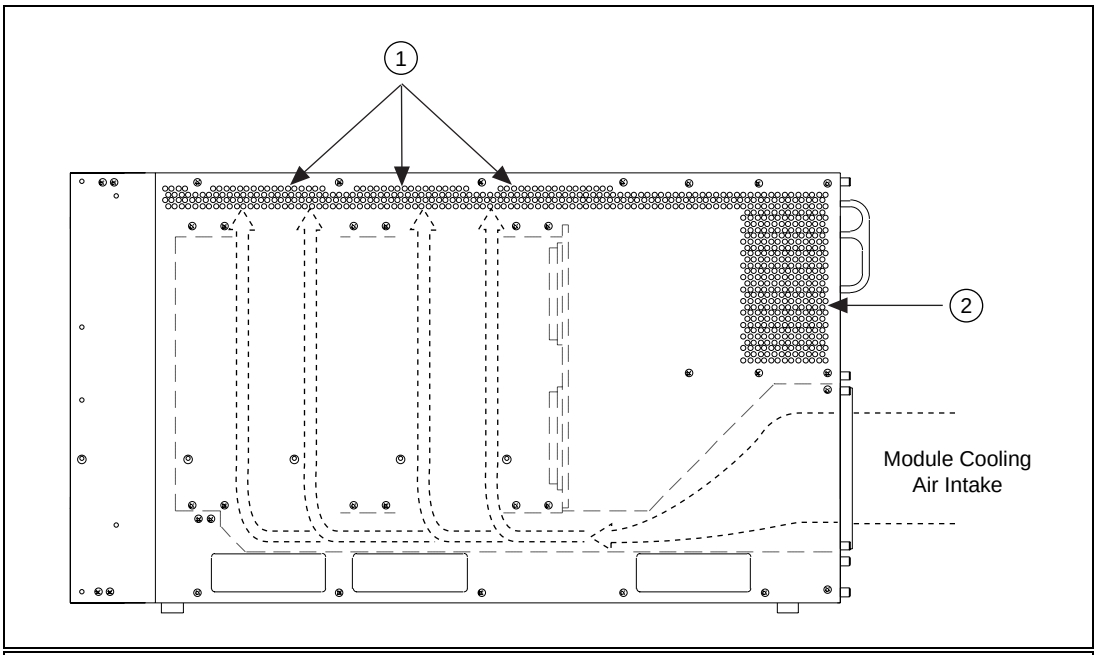
Before connecting the mainframe to a power source, read this chapter and the *For Your Safety* section located at the beginning of this manual.

Site Considerations

The VXI-1500 is designed to operate on a bench or in an instrument rack. Determine how you want to use your VXI-1500 and follow the appropriate installation instructions.

The mainframe weighs 62 lb (28.2 kg) with no modules installed. The maximum module weight is 4 lb (1.8 kg) per slot. This results in a possible loaded mainframe weight of 114 lb (51.8 kg). Make sure your bench or instrument rack can accommodate this load.

Power supply and module cooling is facilitated through apertures in the rear and along both sides of the mainframe. Module cooling air enters through filters and fan inlets located in the lower rear of the mainframe and exits through the upper sections on both sides, as shown in Figures 2-1 and 2-2. Power supply cooling air enters in one side of the mainframe and exits out the other side, as shown in Figures 2-1 and 2-2. Place your VXI-1500 on a bench top or in an instrument rack in such a way as to allow adequate ventilation near the fan tray (air inlets) and near the air outlet apertures along both sides of the mainframe. Keep other equipment a minimum of 3.0 in. (76.2 mm) away from the air inlets.



1 Module Cooling Air Outlets 2 Power Supply Air Inlet

Figure 2-1. VXI-1500 Mainframe Airflow Side View

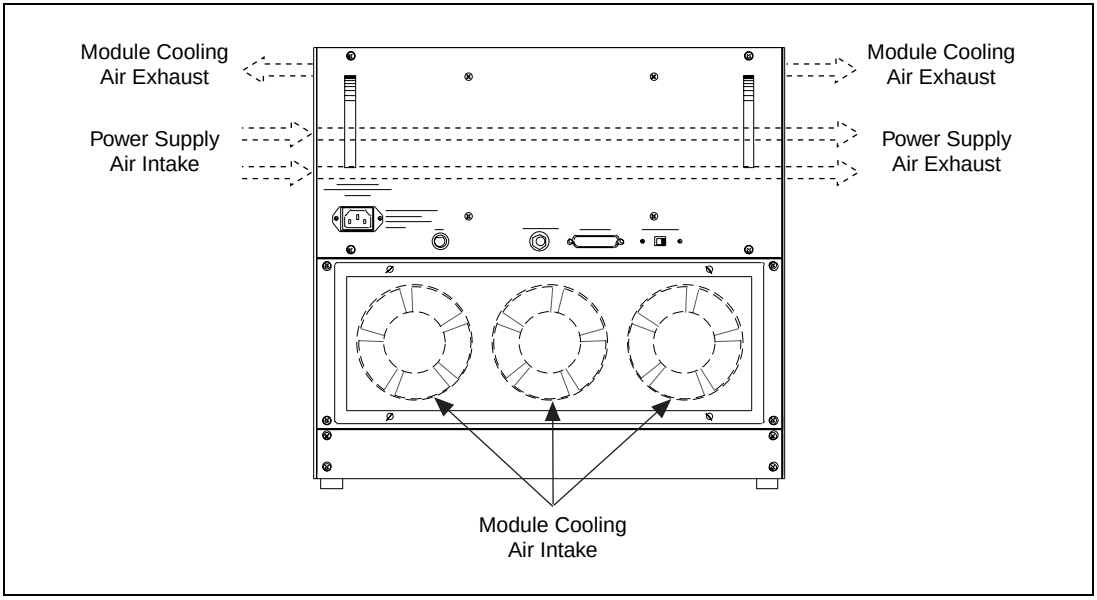


Figure 2-2. VXI-1500 Mainframe Airflow Rear View

Install your mainframe so that you can easily access the rear panel. This simplifies the replacement of the air filter, fan tray module, or power supply if necessary.

Rack Mounting

Rack-mount applications require the optional rack-mount slide kit available from National Instruments. Refer to the instructions supplied with the rack-mount slide kit for properly installing your VXI-1500 in an instrument rack.

☞ **Note:** ***You may wish to remove the rubber feet from your VXI-1500 for rack mounting. To do so, unscrew the rubber feet counterclockwise.***

Installing or Removing the Mainframe Front Door

The VXI-1500 comes standard with a removable front door, as shown in Figure 2-3. To remove the door, rotate both locking knobs counterclockwise, partially open the door, and lift straight up. To re-install the door, line up the hinges of the door with those on the mainframe and lower the door into position.

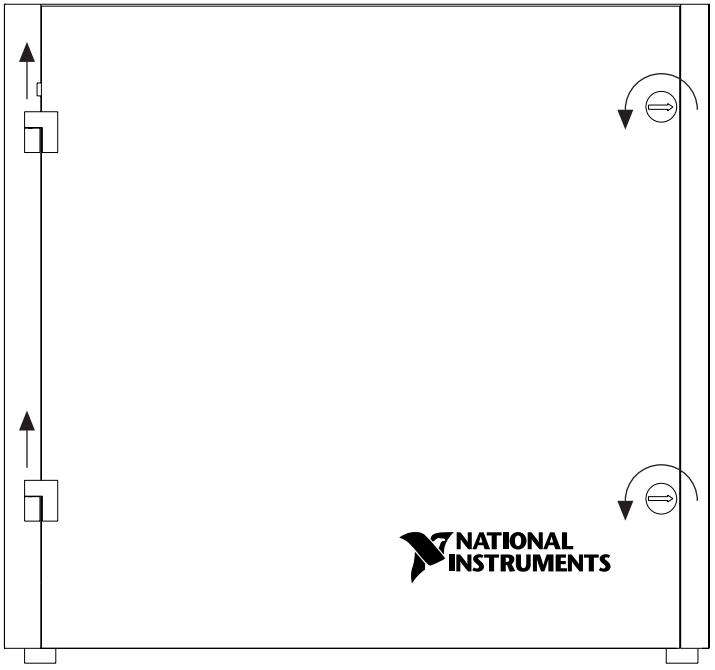


Figure 2-3. Removable Front Door

Setting Fan Speed

The fan speed selector switch is located on the rear panel of the VXI-1500. Refer to Figure 1-3 for a diagram of the fan speed selector. Select HI for maximum cooling effectiveness or LO for more quiet operation.

Connecting Safety Ground

The VXI-1500 requires connection from the premise wire safety ground to the mainframe chassis grounding stud located on the rear panel. Refer to Figure 1-3 for a diagram of the chassis grounding stud. To connect the safety ground, complete the following steps:

1. Connect a 16 AWG (1.3 mm²) or larger wire to the chassis (safety) grounding stud using a toothed grounding lug. The wire insulation must be green with a yellow stripe or non-insulated (bare).
2. Attach the opposite end of the wire to permanent earth ground using toothed washers or a toothed lug.

The chassis is designed with a three-position NEMA 15-5 style plug which is internally connected to the chassis of the mainframe. To minimize shock hazard, the earth safety ground must be connected when the mainframe is powered on.

Connecting to AC Mains Power and Testing Power Up

Caution: ***Make sure the mains power switch located on the front panel of the VXI-1500 (upper right) is in the Off position (0). Refer to Figure 1-2 for a diagram of the mains power switch.***

Do not install VXI modules prior to performing the first power-on test.

The power supply is universal, allowing the mainframe to connect to all standard worldwide input voltages. Refer to Chapter 1, *Getting Started*, for power cord specifications. Attach input power through the rear AC inlet using the appropriate line cord supplied. Refer to Figure 1-3 for a diagram of the IEC 320 inlet.

Switch the mainframe to the On (1) position. Observe that all fans become operational.

Using a digital voltmeter, check all voltages to ensure they are within the allowable limits. Refer to Table 2-1 and connect one lead of the voltmeter to a supply pin on the remote power monitoring connector (25-pin D-sub) located on the rear panel. Refer to Figure 1-3 for a diagram of the remote power monitoring connector. Connect the reference lead of the voltmeter to one of the ground pins. Compare each voltage reading to the values listed in Table 2-1.

Table 2-1. Power Supply Voltages at Power Monitoring

DB25 Pin	Supply	VXI Acceptable Voltage Range
1	+5 V	4.875 to 5.25 V
3	-12 V	-12.6 to -11.64 V
5	-24 V	-25.2 to -23.28 V
7	-2 V	-2.1 to -1.9 V
2	+12 V	11.64 to 12.6 V
4	+24 V	23.28 to 25.2 V
6	-5.2 V	-5.46 to -5.044 V
14, 15, 16, 17, 18, 19, 20	Logic Ground	N/A

If the voltages are within the specified ranges, the mainframe complies with VXI voltage limit specifications.

☞ **Note:** ***If fans or power unit fail to function properly, refer to the*** *Troubleshooting the VXI-1500* ***section of Chapter 3,*** *Maintenance****.***

Installing VXI Modules

Caution: ***Turn off the mainframe power before installing VXI modules.***

Install C-size modules directly into the 13 C-size slots of the mainframe by first placing the module's card edges into the front module guides (top and bottom). Slide the module to the rear of the mainframe until the module connectors mate solidly with the backplane connectors. Secure the module's front panel to the mainframe using the module's front-panel mounting screws.

Installing Filler Panels

To optimize module cooling performance, you should install filler panels into unused or empty slots. Secure with the captive mounting screws. Your kit includes an assortment of filler panels of various widths. Use the widest filler panels first to minimize the number of panels that you need to install. To further improve cooling performance, you can install airflow blockers into unused slots.

Routing Cables

The VXI-1500 has a built-in cable channel providing a variety of options for instrument cable routing. The channel is located in the bottom section of the mainframe. Cables may be routed out the front by removing the cable access panel via the four thumbscrews. See Figure 1-2 for a diagram of the cable access panel. Likewise, cables can be routed out the rear by removing the rear cable access panel. See Figure 1-3 for a diagram of the rear cable access panel. Cable apertures are also located in the bottom of the chassis.

Note: ***Use the extra grommeting included in your kit to help protect your cables from possible damage by the front or rear aperture edges.***

Remote Power Monitoring and Inhibit Interface

The VXI-1500 mainframe provides for remote power monitoring and inhibit via a 25-position female D-sub connector located on the rear panel. Table 2-2 shows the pinout of the DB-25 connector.

Table 2-2. DB-25 Connector Pinout

DB25 Pin	Function
1	Output #1 +5 V (signal)
14	Output #1 (return)
2	Output #2 +12 V (signal)
15	Output #2 (return)
3	Output #3 -12 V (signal)
16	Output #3 (return)
4	Output #4 +24 V (signal)
17	Output #4 (return)
5	Output #5 -24 V (signal)
18	Output #5 (return)
6	Output #6 -5.2 V (signal)
19	Output #6 (return)
7	Output #7 -2 V (signal)
20	Output #7 (return)
8	Auxiliary Vcc +5 V
21	Auxiliary Ground
10	General Shutdown
11	Reset Module B1 (switch)
24	Reset Module B2 (switch 0v)
12	Remote AC Fail Signal

To use the remote power output inhibit feature, connect the General Shutdown (pin 10) signal to Auxiliary Ground (pin 21). The power supply inhibits its DC output as long as the General Shutdown signal is pulled to ground. DC output resumes when the General Shutdown pin is

disconnected. For remote reset, connect a momentary switch between pin 24 and pin 11 of the DB-25 connector.

Receiver Interconnect Devices

Your VXI-1500 mainframe has been designed to meet the VXI*plug&play* Systems Alliance VPP-8 specification, *VXI Module/Mainframe to Receiver Interconnection*. The specification defines the required mounting structure to ensure that any VXI*plug&play*-compatible interface will mount to a VXI*plug&play*-compatible mainframe. For more information on interface devices contact one or more of the following suppliers:

- MAC Panel: (910) 861-3100
- TTI Testron: (401) 766-9100
- Virginia Panel Corporation: (540) 932-3300

If you are planning to use a receiver interconnect device, you must have the optional rack-mount slide kit and you must remove the following accessories:

- **Front handles**—Remove the screws holding the handles in place from behind the front mounting bracket (supplied with the rack-mount slide kit).
- **Mainframe front door**—Lift straight up to remove the door.
- **Door hinges**—Remove the bolts holding the hinges to the front bezel. The bolts can be accessed with a hex-key tool without removing any other parts.

Follow the instructions provided with the receiver interconnect device for installation onto your VXI-1500 mainframe.

Chapter 3

Maintenance

This chapter describes basic maintenance procedures you can perform on the VXI-1500 mainframe.

Service Interval

Clean the mainframe fan filter at a maximum interval of six months. Depending upon the amount of use and ambient dust levels in the operating environment, the filters may require more frequent cleaning.

Clean dust from the mainframe exterior (and interior) as needed, based on the operating environment. Periodic cleaning reduces instrument breakdown and increases reliability.

Preparation

The information in this section is designed for use by qualified service personnel. Read the *For Your Safety* section at the beginning of this manual before attempting any procedures in this chapter.



Caution: ***Many components within the mainframe are susceptible to static discharge damage. Service the mainframe only in a static-free environment. Observe standard handling precautions for static-sensitive devices while servicing the mainframe. Always wear a grounded wrist strap, or equivalent, while servicing the mainframe.***

Cleaning

Cleaning procedures consist of exterior and interior cleaning of the mainframe and cleaning the fan filter. Refer to your module user documentation for information on cleaning the individual VXIbus modules.

Caution: ***Always power-off the mainframe and disconnect the power cord before cleaning or servicing the mainframe.***

Interior Cleaning

Use a dry, low-velocity stream of air to clean the interior of the mainframe. Use a soft-bristle brush for cleaning around components. If you must use a liquid for minor interior cleaning, use a 75% isopropyl alcohol solution and rinse with deionized water.

Exterior Cleaning

Clean the exterior surfaces of the mainframe with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, wipe with a cloth moistened in a mild soap solution. Remove any soap residue by wiping with a cloth moistened with clear water. Do not use abrasive compounds on any part of the mainframe.

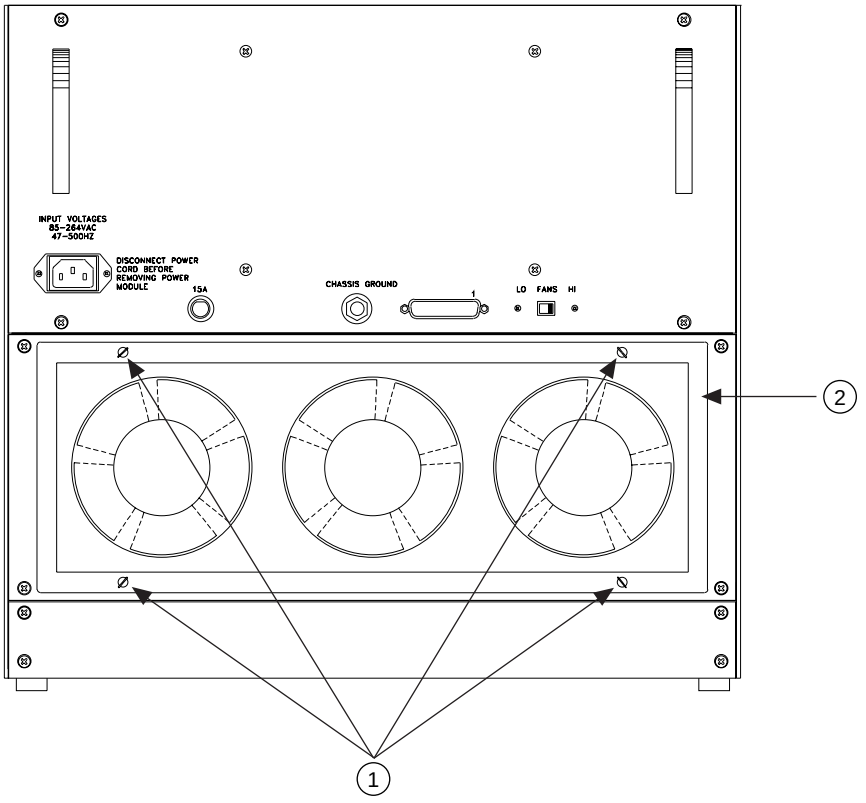
Caution: ***Avoid getting moisture inside the mainframe during exterior cleaning. Use just enough moisture to dampen the cloth.***

Do not wash the front- or rear-panel connectors or switches. Cover these components while cleaning the mainframe.

Do not use chemical cleaning agents; they may damage the mainframe. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Cleaning the Fan Filters

The mainframe cooling filter is easily removed from the rear of the mainframe by removing the four thumb screws shown in Figure 3-1.



1 Thumbscrews	2 Fan Filter

Figure 3-1. VXI-1500 Thumbscrews

Clean the fan filter by washing in a mild soap solution, and then vacuuming or blowing air through the filter. Rinse the filter with water and allow to dry before replacing it in the mainframe.

Resetting the AC Mains Circuit Breaker

In the event that your VXI-1500 encounters an over-current condition, the circuit breaker located on the rear panel will trip to prevent damage to the mainframe. Complete the following steps to reset the circuit breaker:

1. Turn the front panel power switch to the Off (0) position.
2. Depress the circuit breaker to reset it.
3. Turn the front panel power switch to the On (1) position.

If the circuit breaker trips again, complete the following steps:

1. Disconnect the mainframe from the AC mains power source.
2. Turn the front panel power switch to the Off position.
3. Remove all VXIbus modules from the mainframe.
4. Complete the test procedure described in the *Connecting to AC Mains Power and Testing Power Up* section in Chapter 2, *Installation and Configuration*.
5. If any voltages are outside the acceptable limits, contact National Instruments.
6. If all voltages are within the acceptable limits, verify that the power requirements of your VXIbus modules can be met by your VXI-1500. Overloading the chassis can cause the breaker to trip. Refer to Appendix A, *Specifications.*
7. The over-current condition that caused your VXI-1500 circuit breaker to trip may be due to a faulty VXIbus module. Refer to the documentation that was supplied with your VXIbus modules for troubleshooting your modules.

Troubleshooting the VXI-1500

Refer to Table 3-1 to troubleshoot the VXI-1500 mainframe. The table lists possible causes why the power does not come on and gives recommendations for correcting the problem.

Table 3-1. Troubleshooting

Possible Cause	What to Do
VXI-1500 mainframe not connected to power source.	Make sure that the VXI-1500 is connected to a live electrical outlet. Try operating another piece of equipment from this outlet.
Power switch is not switched on.	Set the front power switch to the On (1) position.
Remote inhibit input on the rear panel of the mainframe is active.	De-activate the remote inhibit control provided by your system.
Circuit breaker is tripped.	Reset the circuit breaker. Refer to the *Resetting the AC Mains Circuit Breaker* section in this chapter.
Power supply failure.	Contact National Instruments.

Appendix A

Specifications

This appendix contains complete specifications for the VXI-1500 mainframe.

Electrical

Table A-1. AC Input Specifications

Characteristic	Description
Input Voltage Range	85 to 264 VAC
Input Frequency Range	47 to 500 Hz
Over-Current Protection	15 A circuit breaker
Inrush Current	30 A Rms at 115 VAC 60 A Rms at 230 VAC
Line Regulation	0.2% maximum from 10% to full load
Power Factor	.99 at 115 VAC .98 at 230 VAC
Efficiency	80% typical
Transient Surge	1.2/50 μs; 3 kV pulse, 2 joules, no damage either polarity
Power Disconnect	Front-panel power switch. Rear-panel connection allows for remote inhibit operation. Power cord provides main power disconnect. The power switch must be in the On position prior to use of remote inhibit.

Table A-1. AC Input Specifications (Continued)

Characteristic	Description
Power Supply Conducted Emissions	Below EN55022 Class B, FCC B

Table A-2. DC Output Specifications

Characteristic	Description
Maximum Power Available to Modules	1100 W at 115 VAC input and 0° to 40° C 1420 W at 230 VAC input and 0° to 35° C
DC Current Capacity (I_{MP})	Voltage — I_{MP} (Steady-State Current) +24 V — 8.3 A +12 V — 16.7 A +5 V — 80.0 A -2 V — 10.0 A -5.2 V — 38.5 A -12 V — 16.7 A -24 V — 8.3 A
Load Regulation	.2% maximum from 10% to full load
Maximum Ripple and Noise	Voltage — Ripple/Noise +24 V — 100 mV_{pp} +12 V — 50 mV_{pp} +5 V — 50 mV_{pp} -2 V — 50 mV_{pp} -5.2 V — 50 mV_{pp} -12 V — 50 mV_{pp} -24 V — 100 mV_{pp}
Over-Current Protection	105% to 139% at > 5 V output; 125% at ≤ 5 V output
Over-Voltage Protection	115% to 135% of rated voltage
Power Supply Unit MTBF	50,000+ hours

Table A-2. DC Output Specifications (Continued)

Characteristic	Description
Power Supply Unit MTTR	Replacement in under 5 minutes

Cooling

Table A-3. Cooling Specifications

Characteristic	Description
Per Slot Cooling Capacity	85 W Figures A-1 and A-2 show the worst-case slot-cooling curves of the mainframe.
Module Cooling System	Forced air circulation (positive pressurization) via three 140 cfm fans with HI/LO speed selector
Slot Airflow Direction	P2 to P1, bottom of module to top of module
Module Cooling Intake	Bottom rear of mainframe
Module Cooling Exhaust	Along both sides of mainframe
Power Supply Cooling System	Forced air circulation via integrated fan
Power Supply Cooling Intake	Right side of mainframe (viewed from front)
Power Supply Cooling Exhaust	Left side of mainframe (viewed from front)
Module Cooling Fan MTBF	30,000+ hours
Module Cooling Fan MTTR	Replacement of fan unit in under 5 minutes

Figures A-1 and A-2 show the VXI module cooling performance curves for blocked empty slots and open empty slots, respectively.

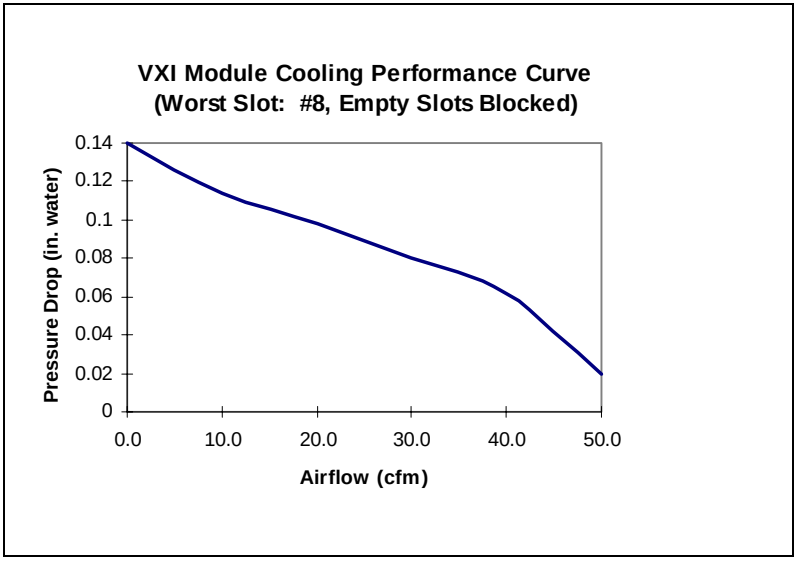


Figure A-1. VXI Module Blocked Slot-Cooling Curve

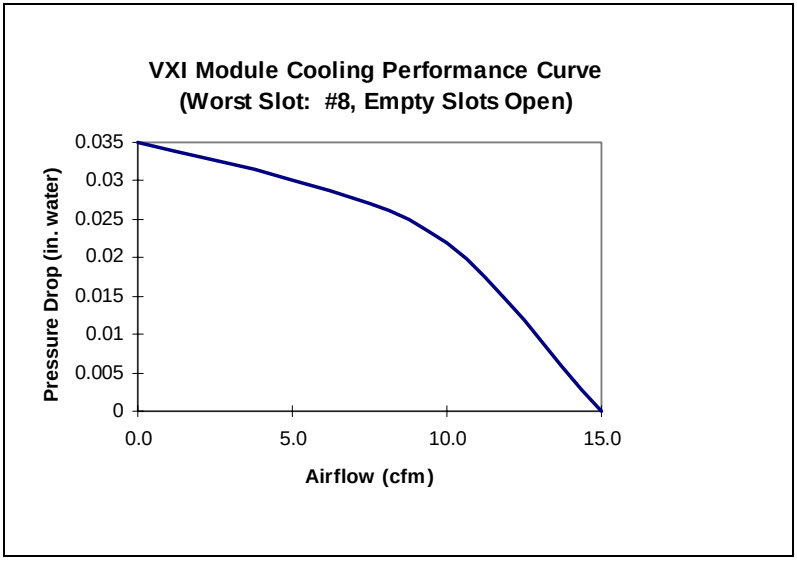


Figure A-2. VXI Module Open Slot-Cooling Curve

Safety

Table A-4. Safety Specifications

Characteristic	Description
Safety Characteristics	EN61010-1 (UL 3111-1, c-UL)
IEC Characteristics	Installation Category II Pollution Degree 2 Safety Class 1

Environmental

Table A-5. Environmental Specifications

Characteristic	Description
Operating Temperature	0° to 40°C at full power 0° to 55°C at half power
Storage Temperature	-20° to 65°C
Operating Relative Humidity	10% to 95% RH non-condensing
Altitude	1.24 miles (2 km)
Functional Shock (Operating)	MIL-T-28800E CLASS 3 (Half-Sine Shock Pulse, 11 ms duration, 30 g peak)
Random Vibration (Operational)*	5 to 500 Hz, 0.31 g
Random Vibration (Non-Operational)*	5 to 500 Hz, 2.5 g
Electromagnetic Compatibility (EMC) Emissions	Refer to DOC supplied with chassis for compliance to relevant directives.
EMI	FCC Class A compliant
* Random vibration profiles were developed in accordance with MIL-STD-810E Method 514. Test levels exceed those recommended in MIL-STD-810E for Category 1 (Basic Transportation, Figures 514.4-1 through 514.4-3.	

Backplane

Table A-6. Backplane Specifications

Characteristic	Description
Size	C-sized, 13 slot, VXIbus Specification, Revision 1.4
Bus Grant/Interrupt Acknowledge	Auto-configuring (jumperless)
VXIbus CLK10 and CLK100 Distribution	Differential tracking and line length equalization utilized to minimize signal skew. On-board socketed ECL buffers utilized for distribution.
Backplane Bare-Board Material	UL 94 V-0 recognized (File No. E 116551)
96-Pin Backplane Connectors	Conform to IEC 603-2 and are UL 94 V-0 rated

Mechanical

Table A-7. Mechanical Specifications

Characteristic	Description
Overall Dimensions	
Standard Mainframe (7U)	
Height	39.2 cm (15.45 in.)
Width	43.7 cm (17.20 in.)
Depth	71.3 cm (28.02 in.)
	Note: 1.27 cm (.5 in.) added to height when feet are installed.
Weight	28.18 kg (62 lb.) with no modules installed

Table A-7. Mechanical Specifications (Continued)

Characteristic	Description
Maximum Module Weight	1.8 kg (4 lb.)
Materials	Sheet aluminum (5052-H32) and Cold Rolled Steel
Finish	
Unpainted Aluminum	Conductive Clear Iridite
Cold Rolled Steel	Clear Chromate Zinc Plating
Paint	Polyurethane Enamel

Appendix

B

Pinouts

This appendix describes the P1 and P2 connector pinouts for the VXI-1500 backplane.

Table B-1 shows the P1 connector pinouts for all slots in the VXI-1500.

Table B-2 shows the P2 connector pinouts for all non-Slot 0 slots.

Table B-3 shows the P2 connector pinouts for the VXIbus Slot 0.

Table B-1. P1 Connector Pinouts

Pin	Row A	Row B	Row C
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	DTACL*	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	+5 V STDBY	+12 V
32	+5 V	+5 V	+5 V

Table B-2. P2 Connector Pinouts for All Non-Slot 0 Locations

Pin	Row A	Row B	Row C
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	+24 V
32	SUMBUS	+5 V	-24 V

Table B-3. P2 Connector Pinouts for VXIbus Slot 0

Pin	Row A	Row B	Row C
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

Appendix C

Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems and a form you can use to comment on the product documentation. When you contact us, we need the information on the Technical Support Form and the configuration form, if your manual contains one, about your system configuration to answer your questions as quickly as possible.

National Instruments has technical assistance through electronic, fax, and telephone systems to quickly provide the information you need. Our electronic services include a bulletin board service, an FTP site, a Fax-on-Demand system, and e-mail support. If you have a hardware or software problem, first try the electronic support systems. If the information available on these systems does not answer your questions, we offer fax and telephone support through our technical support centers, which are staffed by application engineers.

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United States: (512) 794-5422
Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

United Kingdom: 01635 551422
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

France: 01 48 65 15 59
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity



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E-Mail Support (currently U.S. only)

You can submit technical support questions to the applications engineering team through e-mail at the Internet address listed below. Remember to include your name, address, and phone number so we can contact you with solutions and suggestions.

`support@natinst.com`

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Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 527 2321	09 502 2930
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 5734815	03 5734816
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

Technical Support Form

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

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

Name _____

Title _____

Company _____

Address _____

_____

Fax (____)_____ Phone (___) _____

Computer brand _____ Model _____ Processor _____

Operating system (include version number) _____

Clock 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 _____

_____

_____

Hardware and Software Configuration Form

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

Complete Part Number _____

Serial Number _____

Line Voltage _____

Fan Speed _____

Safety Ground Connected? _____

Rack-Mount or Bench-Top Configuration? _____

Using Remote Power Monitoring? _____

Filler Panels Installed in Empty Slots? _____

Other Products

List and describe all devices installed in your mainframe. Indicate if any are receiver interconnect devices.

Slot	Logical Address	Interrupt Level	Manufacturer, Description, and Function
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

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: *VXI-1500 User Manual*

Edition Date: March 1997

Part Number: 321510A-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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Glossary

Prefix	Meaning	Value
µ-	micro-	10^{-6}
m-	milli-	10^{-3}
c-	centi-	10^{-2}
k-	kilo-	10^{3}
M-	mega-	10^{6}

Symbols

°	Degrees.
≥	Equal or greater than.
≤	Equal or less than.
%	Percent.

A

A	Amperes.
AC	Alternating current.
ANSI	American National Standards Institute.
AWG	American Wire Gauge.

B

backplane	An assembly, typically a printed circuit board, with 96-pin connectors and signal paths that bus the connector pins. A C-size VXIbus system will have two sets of bused connectors called J1 and J2.

C

C	Celsius.
cfm	Cubic feet per minute.
CFR	Cooperative Fuel Research.
CSA	Canadian Standards Association.

D

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.
DC	Direct current.

E

ECL	Emitter-coupled logic.
EIA	Electronic Industries Association.
EMC	Electromagnetic Compatibility.

F

FCC	Federal Communications Commission.

G

g	Unit of acceleration.

H

Hz	Hertz; cycles per second.

I

I_{MP}	Mainframe peak current.
IEC	International Electrotechnical Commission; an organization that sets international electrical and electronics standards.
IEEE	Institute of Electrical and Electronics Engineers.
in.	Inches.

L

lb	Pounds.

M

m	Meters.
MTBF	Mean time between failure.
MTTR	Mean time to repair.

N

NEMA	National Electrical Manufacturers Association.

R

RH	Relative humidity.
RMS	Root mean square. A method used to measure electrical output in volts and watts.

S

s	Seconds.
Slot 0 module	A device configured for installation in Slot 0 of a VXIbus mainframe. This device is unique in the VXIbus system in that it performs the VMEbus system controller functions, including clock sourcing and arbitration for data transfers across the backplane. Installing such a device into any other slot can damage the device, the VXIbus backplane, or both.

U

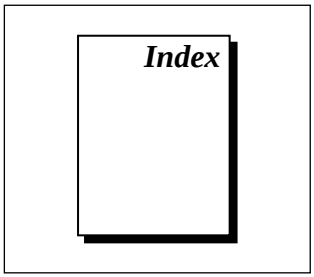
UL	Underwriter's Laboratories.

V

V	Volts.
V_{PP}	Peak to peak voltage.
VAC	Volts alternating current.
VPP	VXI*plug&play*.
VXI	VMEbus Extensions for Instrumentation.
VXIbus	See *VXI*.

W

W	Watts.



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