NVISION®

NV1000 Terminal Equipment

Operations Manual

Manual Part No. MI1000-01A
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Manual Part No. MI1000-01
April, 1997

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NV1000 Terminal Equipment Operations Manual Introduction

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2. OVERVIEW
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4. INSTALLATION

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February, 1997

Table 1 - NV1000 Terminal Equipment Power Consumption

Model Number	Module Description	Typical Power Dissipation	Worst Case Power Dissipation*
NV1020	AES3 Digital Audio CODEC	5.8 Watts	8 Watts
NV1021	AES3 Processing Distribution Amplifier	3 Watts	
NV1022	AES3 Distribution Amplifier	3 Watts	
NV1023	SDIF-2 Word Clock Distribution Amplifier	3 Watts	
NV1035/6	20-Bit AES3 Analog-to-Digital Converters	4.5 Watts	
NV1045/6	20-Bit AES3 Digital-to-Analog Converters	6 Watts	9-10 Watts
NV1050	Four-Channel AES3 Digital Audio Sample Rate Converter	4 Watts	
NV1055	Four-Channel AES3 Mix/Minus with Router	4 Watts	
NV1060	Four-Channel AES3 Digital Audio Delay Generator	4 Watts	
NV1061	Single-Channel Longitudinal Time Code Delay Generator	4 Watts	
NV1080	AES3 Digital Audio Reference Generator	4.5 Watts	
NV1082	AES3/SDIF-2 Digital Audio Reference Generator	4.5 Watts	
NV1083	AES3/SDIF-2 Off-Speed Digital Audio Reference Generator	4.5 Watts	
NV1087	HDTV Sync Separator	4.5 Watts	
NV1308A	Asynchronous AES3 Digital Audio Router Module	4 Watts	
NV1308SA Input Module	Synchronous AES3 Digital Audio Router Output Module	3.5 Watts	
NV1308SA Output Module	Synchronous AES3 Digital Audio Router Input Module	4 Watts	

1. Manual Description

This manual provides detailed installation and operating information for NVISION NV1000 terminal equipment. It covers a variety of system and board-level configurations and includes interface information for typical applications. Maintenance and troubleshooting information is included along with relevant drawings and schematic diagrams.

The NV1000 Operations Manual comprises title and warranty pages at the front of the binder, this Operations Manual Introduction section, along with individual Manual Inserts for the frame/power supply assembly and each product you purchased. Manual Inserts are separated by divider tabs indexed by product model number.

An Appendix at the back of the manual may contain supplementary information which applies to the entire product line. The Appendix is also a convenient place to add notes and other important information regarding your equipment and installation.

2. NV1000 System Overview

The NV1000 line of digital audio terminal equipment is designed for mounting in standard 19" equipment racks. A wide variety of NV1000 signal processing and distribution products are available packaged in separate active modules. Up to 12 active modules and two power supplies can be installed in a two rack unit (3-1/2") frame without regard to the functional mix of product. Each module is furnished with a captive mating backplane that mounts in the rear of the frame, enabling external cable connections from the rear. Regulated DC power to the modules is furnished by a power distribution motherboard that runs across the rear of the frame along the bottom. Refer to the section on Power and Thermal Considerations for more information on installing NV1000 active modules.

A connector on the frame power supply backplane can be used to control external alarms or indicators to alert an operator if one or both power supplies fail. Refer to the FR1000/PS2001 Manual Insert (MI2001-xx) for details on how to implement this feature.

The NV1000 frame and power supply assemblies are UL listed.

The captive backplanes use high quality industry-standard connectors. Compact screw-type pluggable terminal blocks are used instead of XLR connectors for analog audio, time code and balanced AES/EBU (AES3-1992) signals. Standard BNC connectors are used for SDIF-2 and AES-3ID inputs and outputs. Mating terminal blocks are supplied with each backplane to facilitate field installation.

Specific information regarding individual modules and backplanes can be found in the Manual Inserts for each product.

3. Power and Thermal Considerations

NOTE:	**THE FOLLOWING POWER AND THERMAL CONSTRAINTS MUST BE OBSERVED WHEN INSTALLING NV1000 TERMINAL EQUIPMENT.**

3.1 Power

The PS2001 power supply furnished with the FR1000 frame has sufficient capacity to power most combinations of installed modules, even when the frame is fully loaded. A second, fully-redundant PS2001 supply may be installed to provide protection against a failure in the primary supply or to guard against accidental loss of line voltage. For maximum protection, the line voltage for the redundant power supply should be taken from a different mains circuit.

Under some conditions, a frame may need to be fan-cooled or a second power supply installed. The following section covers the requirements for cooling heavily-loaded or multiple-frame installations.

3.2 Thermal Considerations

The operating temperature in the FR1000 frame must be kept below 50 Degrees C (122 Degrees F). Since the frame contains no internal fans, heavily-loaded frames must be fan-cooled using NVISION fan assemblies available separately.

Some rules for fan configuration follow:

1. The combined power dissipation of the active modules installed in a frame should not exceed 70 watts, and then only in a well-ventilated environment where the top and bottom of the frame is clear of obstructions and open to freely-moving air. In typical installations where equipment density is high and air movement is limited, the frame must be fan-cooled when the power dissipated in the frame reaches 45 watts.

CAUTION:	**SOME COMBINATIONS OF ACTIVE MODULES CAN EXCEED THE 70 WATT CAPACITY OF A SINGLE PS2001 POWER SUPPLY. IF YOU PLAN TO USE MORE THAN FOUR (4) NV1020 OR NV1035 MODULES IN A FRAME AND IF THE ANALOG OUTPUT CABLES ARE OVER 300 METERS (1000 FEET) IN LENGTH, CONTACT NVISION TECHNICAL SUPPORT BEFORE PROCEEDING.**

2. Table 1 - NV1000 Terminal Equipment Module Power Consumption lists the typical and worst-case power dissipation for each of the NV1000 modules available at the time this manual was issued. If your frame contains several digital-to-analog converter modules, you should also refer to the power consumption graphs in the Appendix at the rear of the instruction manual binder. Carefully add up the power requirements of your modules and plan your installation to minimize excess power dissipation in any one frame.

3. One FA1001 fan assembly will keep two fully-loaded frames (140 watts total) within acceptable limits. A bi-directional fan assembly (FA1002) is available which can cool two pairs of frames (140 watts per pair) when properly installed between them. See Figure 1 - Side View of Typical Fan Assembly Installations for typical cooling arrangements.

4. Position each fan assembly adjacent to or between their target frames in the rack. Maintain one rack unit of clear air space above or below the stack of NV1000 frames, depending on the cooling configuration used.

5. If you need help assessing cooling requirements for installations in demanding environments, contact NVISION Technical Support for assistance.

4. System Installation

4.1 Frame

1. Determine the placement of NV1000 frames in the rack. Where multiple frames are racked with fan assemblies, place each fan adjacent to the set of frames it is intended to cool. Refer to Section 3-2 above for fan installation information.

2. Using the 2.0 mm Allen wrench supplied, remove and set aside the FR1000 frame front door assemblies. See Figure 2 - NV1000 Frame Assembly.

3. Replace the appropriate frame rear panel covers with the captive backplanes furnished with each active module, leaving unused slots covered. Use the 2.5 mm Allen wrenches supplied for your convenience. The backplane mounting holes are oriented such that the assembly cannot be installed incorrectly. Figure 3 - Rear Panel Layout provides more detail. Ensure proper alignment of each active module to its backplane with the following procedure:

   a. Install the backplane, leaving the mounting screws loose.

   b. Plug the active module into the loose backplane, carefully aligning the connector and ensuring that it is fully seated.

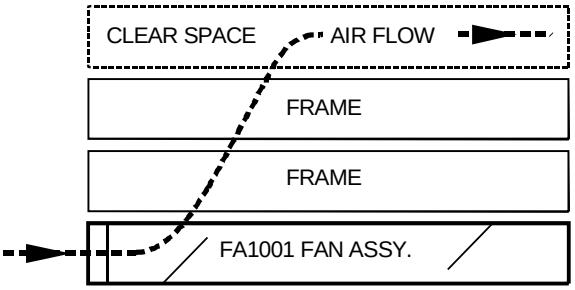

Figure 1a – FA1000 Fan Assembly Located Below Frames

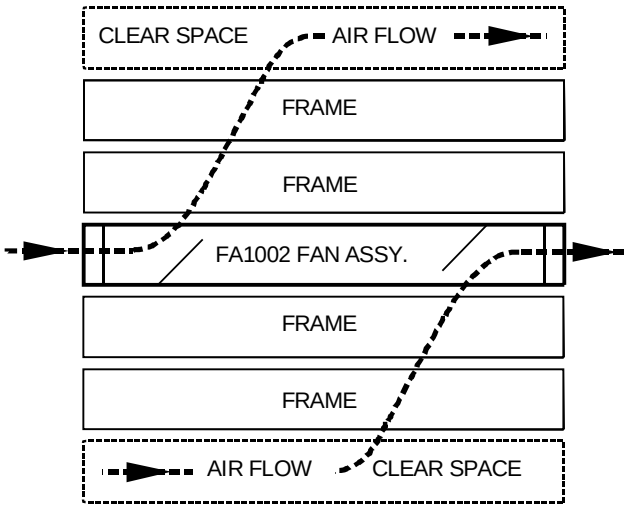

Figure 1b – FA1002 Bi-directional Fan Assembly Located Between Frames

Figure 1 - Side View of Typical Fan Assembly Installations

c. With the active module inserted, tighten the screws securing the backplane.

d. Remove the active module and continue with the installation.

CAUTION:	**LEAVE ALL UNUSED PROGRAM SLOTS COVERED TO PREVENT EXPOSURE OF THE INTERNAL VOLTAGE DISTRIBUTION BUSES.**

4. Support the frame at the rear if it is loaded with many modules and is heavy. Some racks with metric mounting hole spacing require that you use the two innermost mounting holes on the front rack-mounting ears when installing the frame. For these installations, rear support is mandatory.

   To add rear support, attach the rack-support hangers to the mounting rails in the rear of the rack. Position the hangers to receive the rear supports on the sides of the frame. Referring to Figure 2, remove the rearmost two bolts on each side of the FR1000 frame using a 5.5 mm nut driver (not supplied). Readjust the rear supports as necessary so that they will mate with the rack-support hangers when the frame is placed into position. Replace the bolts and proceed to the next step.

5. With the help of an assistant, lift the frame into position and guide the rear rack supports through the rear rack support hangers. Attach the front rack-mounting ears to the front of the rack with the appropriate screws. Ensure that the alignment of the frame is correct and that the rear supports are resting in the rear support hangers.

4.2 Fan Assembly

1. Position the fan assembly(ies) adjacent to the NV1000 frames which require cooling as previously discussed.
2. Attach the fan assembly rack mounting ears to the equipment rack with mounting screws.
3. Connect the external wall-mounted power transformer cable to the jack at the rear of the fan enclosure. Ensure that the fans are operational and that air moves freely through the frames before proceeding.

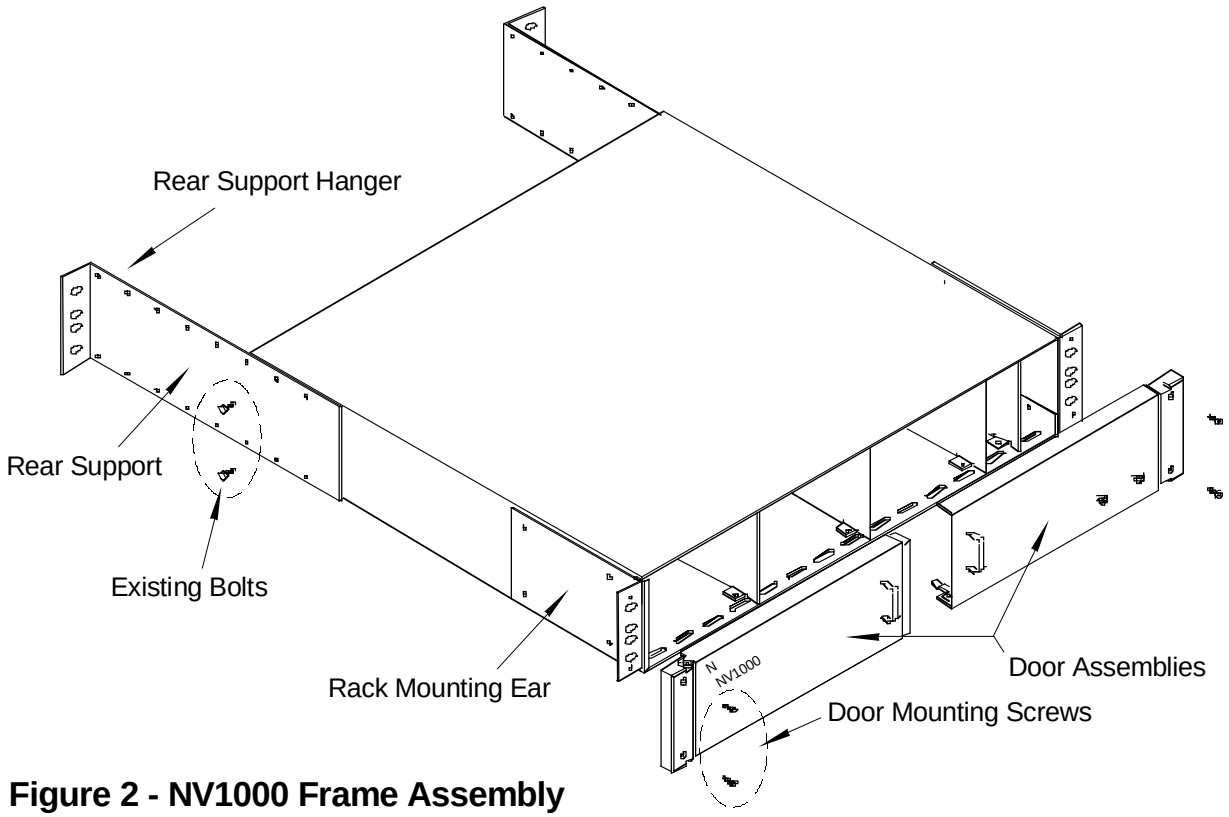

Figure 2 - NV1000 Frame Assembly

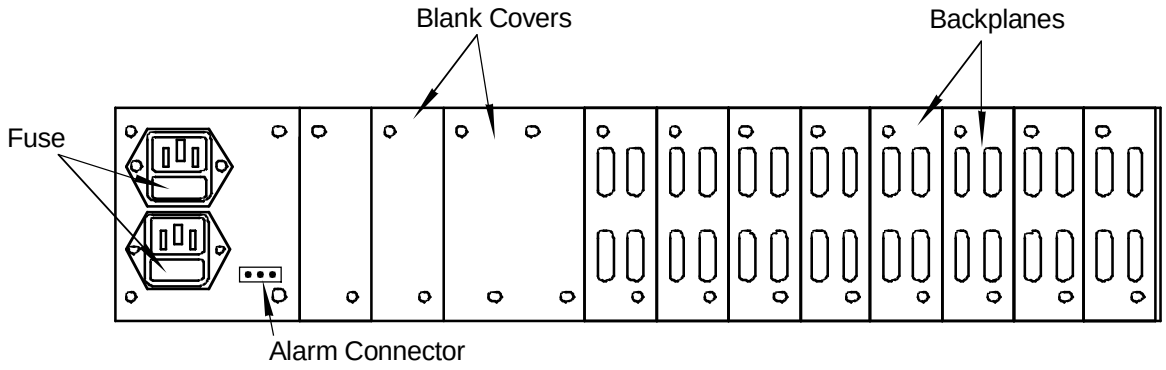

Figure 3 - Rear Panel Layout

4.3 External Cabling

With the frame installed in the rack, make external connections to the system as required. Application-specific installation information and cabling instructions are included in the Manual Insert for each active module.

4.4 Power Supply

CAUTION:	**THE FOLLOWING INSTALLATION PROCEDURES ARE TO BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY.**

1. Referring to Table 2 - PS2001 Jumper Table, ensure that Jumper J1 on each PS2001 power supply matches the incoming line voltage, either 120 VAC/60 Hz or 230 VAC/50 Hz, before inserting the power supply modules into the frame.

CAUTION:	**JUMPER J1 ON THE PS2001 POWER SUPPLY MUST BE SET TO MATCH THE INCOMING LINE VOLTAGE, EITHER 120 VAC/60 HZ OR 230 VAC/50 HZ, OR DAMAGE TO THE EQUIPMENT MAY RESULT.**

2. Apply power to the NV1000 frame by attaching the line cord to each operational PS2001 power supply slot. Reapply power to any fan assemblies before adding power supplies and active modules.
3. Plug each PS2001 supply into one of the two slots on the right side of the FR1000 frame. Either slot is acceptable for a single supply. Power supply LEDs should glow indicating normal function.
4. Measure the power supply voltages on the front-panel test points on each PS2001 power supply. They should fall within the range of values indicated in Table 3 - Power Supply Voltages.

Table 2 - PS2001 Jumper Settings

Jumper No.	Setting	Function
J1	115 VAC	Configures PS2001 for 120 VAC nominal line voltage.
	230 VAC	Configures PS2001 for 230 VAC nominal line voltage.

4.5 Final

1. Remove the mains power from the frame by disconnecting the power cord(s) at the rear of the frame. Plug the active modules into the proper slots and reconnect the mains power. Proceed with system checkout.
2. After verifying system operation, replace the front door assemblies. Check door alignment before tightening the Allen screws that secure the cover.
3. Be sure to complete any warranty registration materials and return them to NVISION, Inc. This validates your warranty and adds your name to our product update mailing list.

Table 3 - Acceptable Test Point Voltages for PS2001 Power Supplies

PS2001 Test Points	Loaded Frame (One or More NV1000 Modules Installed)	Unloaded Frame (No NV1000 Modules Installed)
±7 VDC	6 < IVI < 8.5	7 < IVI < 10*
±17 VDC	16 < IVI < 18.5	17 < IVI < 22*

* When unloaded, the upper voltage limit may exceed the values shown.

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NV1000 Instruction Manual

FR1000 Frame Assembly and PS2001 Power Supply

CONTENTS:

1. GENERAL DESCRIPTION
2. CONFIGURATION AND INSTALLATION
3. OPERATION
4. FUNCTIONAL DESCRIPTION
5. MAINTENANCE AND TROUBLESHOOTING
6. DRAWINGS AND SCHEMATICS
7. APPENDICES AND CHANGE INFORMATION

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Table 1 - FR1000 Frame and PS2001 Power Supply Specifications

FR1000 Frame	
No. of Active Module Cells:	12
No. of Power Supply Cells:	2
Dimensions:	89 mm H x 483 mm W x 432 mm D (3-1/2" H x 19" W x 17" D); 2 RU.
Weight:	5 kgrams (11 lbs.), empty frame with one PS2001 power supply installed.
Alarm Connector:	Three-pin pluggable terminal block.
Alarm Signalling:	Isolated, dry-contact relay.
Alarm Conditions:	Normal / Minor / Major fault indications.
PS2001 Power Supply	
AC Mains Supply Voltage:	90-135 VAC or 180-270 VAC, user selectable.
Mains Frequency:	45-65 Hz.
DC Voltage Outputs:	±7 VDC, ±17 VDC.
Maximum Power Rating:	80 Watts.
Dimensions:	82 mm H x 25 mm W x 420 mm D (3-1/4" H x 1" W x 16-1/4" D).
Agency Approvals:	Underwriters Laboratories (UL) approved.

1. General Description

1.1 FR1OOO Frame Assembly Overview

The FR1000 frame used for NVISION terminal equipment occupies two rack-units of space (2 RU or 3.5") in a standard 19" equipment rack. It contains fourteen slots for twelve active modules and two power supplies. Each module is furnished with a captive backplane which is installed in the rear of the frame. Connectors on each backplane provide the signal and control interface between the active module and external equipment. Blank cover plates are installed over unused slots.

By convention, the active module slots are numbered 1 through 12, starting from the left when viewing the frame from the front. The two rightmost slots in the frame (slots 13 and 14) accept one or two PS2001 power supplies. A pair of AC power entry modules on the rear of the frame accept detachable power cords, one for each supply mounted in the frame.

A 3-pin alarm connector on the power entry panel can be used to signal personnel if a power supply should fail inadvertently. Detailed information for using this feature is presented in Section 2.2.

The NV1000 frame assembly is UL listed.

1.2 PS2001 Power Supply Overview

The PS2001 power supply provides the FR1000 frame with pre-regulated DC power. An off-the-line switching supply, PS2001 power supplies can be configured for nominal voltage ranges of either 120 VAC or 230 VAC. When set to the lower range, the supply will operate within specifications with input voltages of 90 to 135 VAC. On the higher range, the supply operates properly with voltages between 180 and 270 VAC. The power supply operates within specifications for power line frequencies of 45 Hz to 65 Hz.

The PS2001 generates ± 17 VDC and ± 7 VDC and has a continuous output power rating of 70 Watts. One PS2001 supply furnishes sufficient power for most NV1000 frame and active module configurations.

CAUTION:	**SOME COMBINATIONS OF ACTIVE MODULES CAN EXCEED THE 70 WATT CAPACITY OF A SINGLE PS2001 POWER SUPPLY. IF YOU PLAN TO USE MORE THAN FOUR (4) NV1020 OR NV1035 MODULES IN A FRAME AND IF THE ANALOG OUTPUT CABLES ARE OVER 300 METERS (1000 FEET) IN LENGTH, CONTACT NVISION TECHNICAL SUPPORT BEFORE PROCEEDING.**

If redundant operation is desired, a second PS2001 can be installed for added protection. When this is done, the two supplies share the load equally. If one fails, the other assumes the full load. An alarm circuit (described later) can be used to alert personnel to a failure of either supply.

The PS2001 Power Supply is UL listed. These robust modules can be installed or removed from a live system without damage. For more information, refer to Table 1 - FR1000 Frame and PS2001 Power Supply Specifications.

2. Configuration and Installation

2.1 Installing Frames and Power Supplies

The proper installation of NV1000 frames and power supplies depends on the number and type of active modules used, their specific configuration and application, and the number of NV1000 frames used to house them. Please refer to the Manual Insert titled "NV1000 Terminal Equipment - Operations Manual Introduction" in the front of this manual for a review of the system-level factors which affect the installation of this equipment. A comprehensive installation procedure is included there.

2.2 Power Failure Alarm Connections

A 3-pin power alarm terminal block is located on the rear of the frame adjacent to the AC power entry modules. The alarm sensing circuits are located on the PS2001 power supplies. A mating connector is supplied for your convenience when installing external alarms circuits.

Alarm conditions are indicated by the state of relay closures as follows:

1. Both supplies operating: NORMAL
2. Failure of one supply: MINOR ALARM
3. Failure of both supplies: MAJOR ALARM

Refer to Table 2 - Alarm Conditions for information on wiring to the alarm connector.

Note that the relay contacts are rated at 2 Amperes at 24 VDC or 1 Ampere at 120 VAC, 60 Watts or 120 VA maximum.

3. Operation

NV1000 frames and power supplies have no operational controls that require daily attention. Periodic performance and maintenance checkouts are recommended and are covered in Section 5.

4. Functional Description

4.1 FR1000 Frame Description

Refer to schematic diagrams EM0001 and EM0002 in Section 6.

AC power enters the frame through frame-mounted AC power entry modules. These assemblies contain a protective fuse and provide EMI/RFI line filtering. An internal compartment accessible from the rear of the frame houses a spare fuse.

AC power is applied to the PS2001 power supplies across a power supply backplane (Assembly EM0001). The power supplies in turn provide pre-regulated DC voltages to the active modules in slots 1 through 12. A power distribution assembly (Assembly EM0002) comprises a pair of connectors (P1 and P2) which interface with the plug-in power supplies, internal wiring and a horizontally-mounted DC power distribution motherboard which runs along the lower rear of the frame.

Each active module installed in the frame mates with the power distribution motherboard and its signal/control backplane via separate connectors.

4.2 PS2001 Power Supply Description

Refer to Table 3 - PS2001 Jumper Setting and the schematic diagrams for the PS2001 power supplies in Section 6.

Power enters the system through one or both fused AC power entry modules, designated as P/S 1 and P/S 2 on the rear panel of the FR1000 frame. These assemblies accept industry-standard detachable line cords. The power entry modules are fused (1.6 Ampere) and contain a line filter for protection against radio frequency and electromagnetic (RFI/EMI) interference. The bi-directional filter attenuates noise from both the power line and the power supply to acceptable limits set by FCC and VDE guidelines. The 1.6 Ampere fuse is used for both 120 VAC and 230 VAC operation. A spare fuse, accessible at the rear of the frame, is included inside each connector assembly.

Table 2 - Alarm Conditions

Alarm Condition	Relay Contacts C – NO	Relay Contacts C – NO
Normal	Closed	Open
Minor	Closed	Closed
Major	Open	Closed

CAUTION:	HIGH VOLTAGES EXIST IN THE INPUT AND RECTIFIER CIRCUITRY. ALWAYS USE CAUTION WHEN HANDLING COMPONENTS IN THESE DANGEROUS AREAS.

Alternating current flows from the power entry modules across connectors P1 or P2 to the active power supply module. The input voltage is rectified by diodes D20-D23 and filtered by capacitors C26 and C27, providing unregulated DC at a high voltage, nominally 350 VDC.

CAUTION:	THE SETTING OF JUMPER J1 MUST MATCH THE INCOMING LINE VOLTAGE, OR DAMAGE TO THE EQUIPMENT MAY RESULT. ALWAYS CHECK FOR THE CORRECT SETTING BEFORE APPLYING POWER TO THE UNIT IN A NEW INSTALLATION.

CAUTION:	THE SETTING OF J1 SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

Jumper J1 selects the power supply's input voltage. When the jumper is in the 115 VAC position, the input circuit is a voltage doubler. The unregulated DC output is the sum of the positive and negative half-cycle peak voltages. When the jumper is in the 230 VAC position, the AC input is rectified by the full-wave bridge rectifier circuit. Either configuration produces the same unregulated output voltage, nominally 350 VDC. The power supply module incorporates several protective elements. A common problem with off-the-line switching power supplies is high peak in-rush current resulting from the low impedance at the power supply input. The PS2001 Power Supply limits this high peak in-rush current through use of thermistor RP1. The resistance-temperature characteristic of the thermistor is such that when the thermistor is cold, the high resistance of the device limits the current. As the capacitors start to charge, current flowing in the circuit warms the device, dropping the resistance and minimizing its effect.

Lightning storms and nearby inductive switching can cause high voltage transients on the AC power lines. Metal oxide varistors (MOV) DV1 and DV2 protect both the AC and DC circuits from these spikes. Their variable impedances clamp the lines to safe levels during transient voltages.

Table 3 - PS2001 Jumper Settings

Jumper No.	Setting	Function
J1	115 VAC	Configure PS2001 for 120 VAC nominal line voltage.
	230 VAC	Configure PS2001 for 230 VAC nominal line voltage.

Electrical shock is always a potential hazard when handling electronic equipment. The PS2001 power supply minimizes this by discharging the high-voltage input capacitors C26 and C27 upon removal of the module from the frame. With the power supply inserted in the frame, diode D18 is connected to ground through the power supply backplane, keeping field-effect transistor (FET) Q4 turned off. Removing the module from the frame allows Q4 to conduct, quickly discharging the capacitors.

The unregulated 350 VDC is fed into switching field-effect transistors Q1 and Q2. These FETs, configured in a half-bridge topology, chop the DC voltage. The resulting 40 kHz square wave is subsequently fed to a step-down transformer, T2. The secondary side of the transformer has two identical sets of windings which feed two full-wave rectifier bridges. The first full-wave bridge consists of D2, D3, D8, and D9. The second consists of D5, D6, D11, and D12. Both transformer windings share a common ground. The use of Schottky diodes D5, D6, D11 and D12 improves regulation by minimizing voltage losses in the outputs.

The rectified output waveforms are filtered in the two-stage circuit formed by inductors L1 through L5 and capacitors C9 through C18. This produces low voltage DC outputs of approximately ± 17 Volts and ± 7 Volts. Inductor L5 is a coupled inductor. The coupling of the output windings improves the load regulation, particularly at light loads. Schottky diodes D4, D7, D10, and D13 assure proper load sharing when two supplies are operating together.

The pulse width modulation (PWM) submodule U1 tightly regulates the secondary outputs. A primary-side auxiliary winding on transformer T1 monitors the flux and feeds back a proportional voltage to U1. This voltage is then compared to a reference voltage to regulate the pulse width of the outputs of U1. These pulses are applied to the switching FETs Q1 and Q2 through pulse transformer T3.

A primary-side bootstrap multivibrator in the PWM sub-module starts the power supply. The multivibrator provides pulses to FET Q3, which in turn produces enough voltage to power the PWM and its internal power supply circuitry. After the power supply starts, an auxiliary winding in transformer T1 provides the necessary power to the PWM submodule to keep its internal power supply operational.

Although each of the active plug-in modules has on-board voltage regulators and current limiters, the PS2001 power supply has its own current limiting circuitry. This protects the system from on-board malfunctions that draw excessive primary current.

Current transformer T2 monitors the primary current and steps it down to a level where it can safely drive the PWM submodule, U1. When the current-limit threshold is exceeded, a pulse-by-pulse shutdown is generated. Operation is restored immediately once the excessive current returns to normal, employing the same soft-start initiation just as if the supply had been powered up from a cold start.

Relay K1 and integrated circuit (IC) U2 comprise the alarm circuitry. With the supply operating normally, K1 is energized and a connection is made between the common and normally-open contacts. If the power supply fails, the relay de-energizes, closing the common and normally-closed contacts.

5. Maintenance and Troubleshooting

The FR1000 frame assembly and PS2001 power supplies are reliable and require no adjustments. We recommend that you check your installation at least once a year to ensure that the power supplies are operating normally. This is easily done by measuring the supply operating voltages at the test points on the front of each power supply module with a hand-held digital voltmeter. The voltages should match the values shown in Table 4 - Acceptable Test Point Voltages for PS2001 Power Supplies.

Table 4 - Acceptable Test Point Voltages for PS2001 Power Supplies

PS2001 Test Points	Loaded Frame (One or More NV1000 Modules Installed)	Unloaded Frame (No NV1000 Modules Installed)
±7 VDC	6 < |V| < 8.5	7 < |V| < 10*
±17 VDC	16 < |V| < 18.5	17 < |V| <22*

*When unloaded, the upper voltage limit may exceed the value shown.

It is also good practice to ensure that air flow around the frame has not been blocked by other equipment added in the rack. If active modules have been added to the FR1000 frame, its power-handling capacity and cooling requirements should be reassessed to ensure that the system is still configured properly. See "NV1000 Terminal Equipment - Operations Manual Introduction" at the front of this manual for more information.

Fan assemblies used to cool heavily-loaded or stacked NV1000 frames should also be checked periodically to verify that they are operating properly. Any accumulated dust should be removed.

Should problems arise that you cannot resolve, contact NVISION Technical Support. Infomation on reaching NVISION is included in Table 5 at the top of the facing page.

Table 5 - How to Reach NVISION Technical Support

Telephone:*	+1 916 265 1000
Facsimile:	+1 916 265 1021
Internet:	support@nvision1.com
Mail:	NVISION, Inc., P.O. Box 1658, Nevada City, CA 95959, USA
Shipping:**	NVISION, Inc., 443 Crown Point Circle, Grass Valley, CA 95945 USA

*Available from 8:00 a.m. to 5:00 p.m., M-F, California (USA) Pacific Time Zone

**Material Return Authorization required.

6. Drawings and Schematics

Drawings and schematics for the FR1000 frame and PS2001 power supply subassemblies are included in this section.

7. Appendices and Change Information

Applicable technical data, Application Notes and Field Modification Notes that pertain to the FR1000 frame and PS2001 power supply are located here. Additional system information may be found in the Appendix at the rear of the NV1000 Operations Manual. Reviewing these materials will ensure that you are familiar with any product or system-level information that may have changed or been added since the Manual was first printed.